TurkStream Natural Gas Pipeline – Offshore Section: Final EIA Report Turkey

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COURTESY ENGLISH TRANSLATION

DISCLAIMER

The English version of this report is only a courtesy translation. The information and commitments contained within the original Turkish version shall prevail.

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1 General Characteristics of the Project

This Environmental Impact Assessment *(EIA)* Report has been prepared in line with Turkish EIA Regulation no: 29186 dated November 25, 2014, for the **Offshore Section of TurkStream Gas Pipeline in Turkey**; the design, installation and operation of which is planned by South Stream Transport B.V. (*the Project Owner*).

An Intergovernmental Agreement (*IGA*) was signed by the Republic of Turkey and the Russian Federation (*the parties*) on 10 October 2016 regarding the TurkStream Gas Pipeline Project, a section of which constitutes the subject of this EIA report. In the IGA "**TurkStream Gas Pipeline**" project has been defined as below. Detailed definitions in regards to the IGA are provided in Chapter 3.1 and the IGA is given in **Appendix-1.A**.

*"**TurkStream Gas Pipeline**" signifies a new gas pipeline system with a maximum technical design capacity of 31,5 billion cubic meters per annum, for two lines with technical design capacity of 15,75 billion cubic meters per annum per each line, running from the Russian Federation (from the Russkaya compressor station in the Krasnodar Region of the Russian Federation) across the Black Sea to the receiving terminal on the coast of the Republic of Turkey and further across the territory of the Republic of Turkey up to the border of the Republic of Turkey with its neighboring countries, constructed in order to supply natural gas from the Russian Federation to the Republic of Turkey, as well as to ensure transit of Russian gas across the Republic of Turkey into the countries bordering the Republic of Turkey, with the offshore section 1, the offshore section 2, the onshore section 1 and the onshore section 2.*

In accordance with the IGA, the **TurkStream Gas Pipeline Project– Offshore Section** jointly comprises two pipelines known as **Offshore Section 1** and **Offshore Section 2**, which extend from the Russian Federation across the Black Sea to a Receiving Terminal (*Receiving Terminal*) in Turkey. The Receiving Terminal will be constructed as a part of the Offshore Section within the scope of the project in the area of Kıyıköy town, Vize District, Kırklareli Province in Turkey . An approved EIA Report already exists for the Offshore Section up to Kilometer Point 660 (*KP660*[1]) close to the border of Turkish and Bulgarian Exclusive Economic Zones (EEZ). Therefore, this EIA Report covers Offshore Section 1 and Offshore Section 2 from KP660 to the downstream of the Receiving Terminal (*the Project*).

The component sections of the TurkStream Gas Pipeline are described below and schematically presented in Figure 1.1:

TurkStream Gas Pipeline - Offshore Section

- (1) "**Russian Section**" which extends from Russkaya Compressor Station on the coast of Anapa in the Russian Federation to the border of the Russian-Turkish EEZ (out of the scope of this EIA);
- (2) "**Turkish EEZ Section**" which starts at the border of Russian and Turkish Exclusive Economic Zones, extending to the border of Turkish and Bulgarian Exclusive Economic Zones (KP660). This section has received an EIA Approval from the Ministry of Environment and Urbanization under the name of "South Stream Offshore Pipeline – Turkey Section Project" in July 2014. The validity of the EIA was confirmed in two nota verbale from Turkish Government to Russian government (NV 201583505896-ESGY8010242 dated 18 June 2015

[1] KP660: It is the 660th km point of the pipeline from the KP0 point on the Russian coast.

and 2016/83505896-ESGY/11363303 dated 3 September 2016)(**Appendix-1.B**) This section is out of the scope of this EIA and the relevant EIA Approval decision is given in **Appendix-1.C**.;

- (3) "**The Project**" which is comprised of one Receiving Terminal and 2 pipelines starting from close to the border of Turkish and Bulgarian Exclusive Economic Zones (KP660) extending to the downstream of the Receiving Terminal on the Turkish mainland in the town of Kıyıköy,Vize District, Kırklareli Province and which constitutes the subject of this EIA Report*;*

TurkStream Gas Pipeline - Onshore Section

- (4) "**Onshore Section 1**" refers to the section which extends from the Receiving Terminal of Offshore Section 1 and across the Republic of Turkey up to the connection point with the existing gas transmission system of the Republic of Turkey. This section is out of the scope of this EIA as it lies under the responsibility of BOTAŞ and shall be referred to as "**BOTAS section**" in this EIA.
- (5) "**Onshore Section 2**" refers to the section from the Receiving Terminal of Offshore Section 2 and across the Republic of Turkey up to the border of Turkey with its neighboring countries. This section is out of the scope of this EIA and will be developed by a Turkish-Russian joint venture, and shall be referred to as "**European section**" in this EIA.

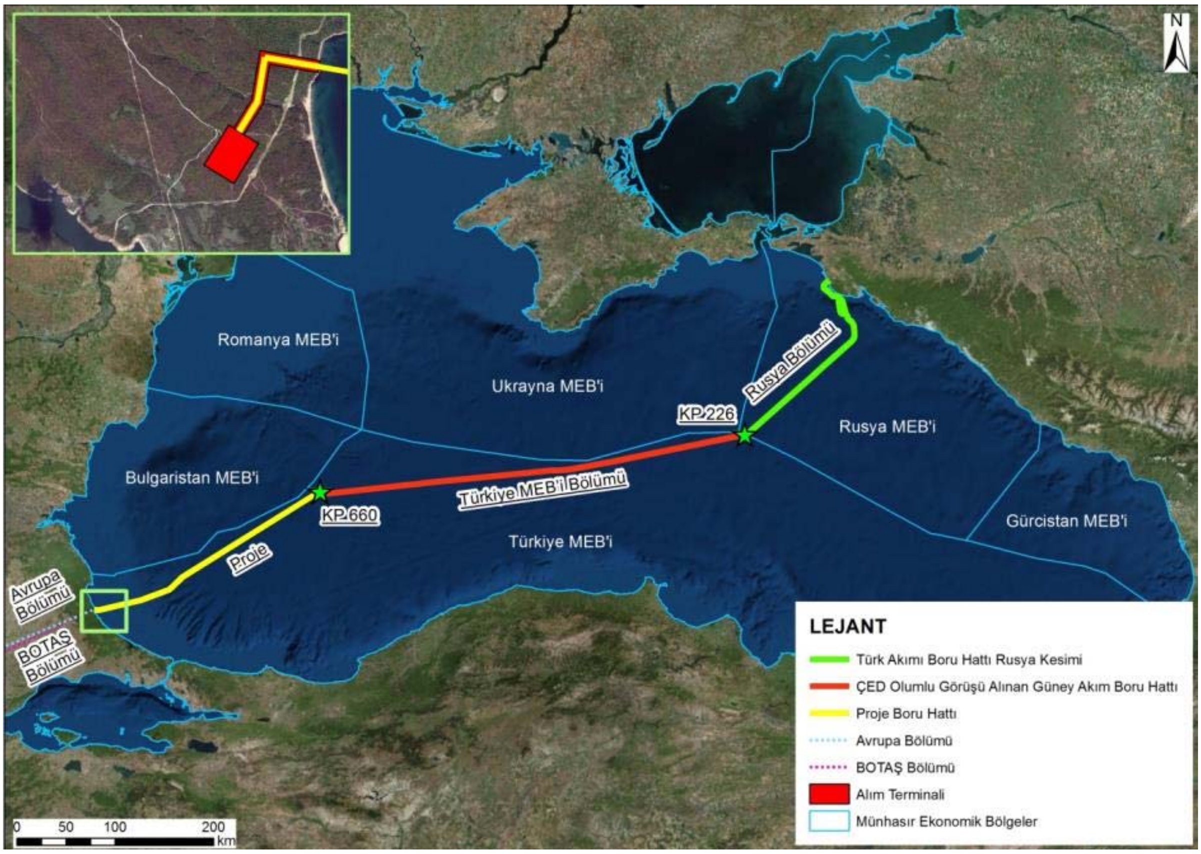


Figure 1.1: TurkStream Offshore Pipeline – (The section from KP660 to the Onshore Section on the Turkish Coast; "The Project" is indicated in yellow)

1.1 General Characteristics of TurkStream Gas Pipeline – Offshore Section

"**The Project**" which is a component of the TurkStream Gas Pipeline Project – Offshore Section starting from KP660 and the subject of this EIA report, consists of three sections in itself;

- **The Offshore Section**: This section extends from KP660 in the Turkish EEZ to approximately 2.5 km from the Turkish coast, where the water depth is approximately 30 m. The offshore section continues for approximately 270 km in the Turkish EEZ and Turkish territorial waters (measured along the pipeline route). In the Offshore Section, the pipelines will be laid directly on the seabed.
- **The Shore Crossing Section**: This section will commence approximately 2.5 km from the Turkish coast in a water depth of approximately 30 m and extend to the nearshore section, north of Selves Beach. The Project also has a "*nearshore"* sub-segment, which involves the necessary construction activities both in the Shore Crossing and Landfall Section at the junction of shore crossing and Landfall sections . This nearshore sub-segment also defines the area necessary to construct and install the Pipeline where the Shore Crossing Section pipes are connected to the Landfall Section pipes. The nearshore segment commences approximately 200 m offshore (if required, at the end of the causeway), in a water depth of approximately 5 m and extends for approximately 250 m (200 m Shore Crossing Section and 50 m Landfall section). The activities for the nearshore will include both marine construction activities such as shallow water vessels to undertake shore crossing dredging, and terrestrial construction activities (north of Selves Beach), such as trench excavation and pipeline installation via a shore pull. For the purposes of this EIA Report, marine construction activities will be dealt with in the Shore Crossing section, whilst terrestrial activities will be dealt with in the Landfall section.
- **Landfall Section**: The landfall section will commence north of Selves Beach and will extend inland from the coast to include the onshore pipelines and the Receiving Terminal. The Landfall Section, including the Receiving Terminal, will be approximately 2 km in length. From the coast to the Receiving Terminal, the pipelines will be buried using conventional construction techniques. For safety reasons, the buried onshore Pipeline will have a minimum soil cover of 1.5 m.

1.2 The Foundation of the Project and its Goals

The Project, which is the subject matter of this EIA Report, begins at KP 660 at the border of Turkish and Bulgarian Exclusive Economic Zones (EEZ) extending for approximately 275 km to the Receiving Terminal to be built in the town of Kıyıköy, Vize District of Kırklareli Province on mainland Turkey. It consists of two 813-mm (32 inch) pipelines laid across the Black Sea creating a new route that will enhance the long-term security of gas supplies from Russia to Turkey and onwards to Southeastern European countries. The project will also contribute to Turkey's strengthening of its geo-strategic position in regional energy management.

Maps (scale:1/25,000) showing the part of the Project within the Turkish EEZ, territorial waters, landfall and the surrounding areas are provided in **Annex 1.D**.

1.2.1 Capacity of the TurkStream Gas Pipeline

The design capacity of the TurkStream Gas Pipeline will be able to transport 31,5 billion cubic meters (bcm) of natural gas per year. Each of the two pipelines will have a maximum flow rate of approximately 47.9 million standard cubic metres (MSCM) per day (approximately 15.75 bcm per year).

The anticipated operating pressure at the Landfall Section on mainland Turkey will be between 6.7 and 9.9 MPa. The pipeline is planned to be operating seven days a week and 24 hours a day.

1.2.2 Starting Point of the TurkStream Gas Pipeline

TurkStream Gas Pipeline Project – Offshore Section starts at the Landfall Facilities near Anapa in the Russian Federation and extends to the first weld after the Receiving Terminal that is planned to be built in the landfall section in town of Kıyıköy in Vize District of Kırklareli Province on mainland Turkey.

"The Project" as assessed in this EIA Report will cover the section from KP660, which has not yet been approved.

1.3 Project Status in Terms of EIA Regulation

This EIA Report was prepared in accordance with the “Turkish EIA Regulation” which first took effect upon its publication in Official Journal 29186 on 25 November 2014 and then updated on 26 May 2017, and which was based on Turkish Environmental Law 2872 dated 11 August 1983. In this regulation, the project is defined as follows:

Appendix - 1: The List of Projects to which Environmental Impact Assessment Shall be Applied

29- Pipelines for the transportation of gas, oil or chemicals with a diameter over 600 mm and a length of more than 40 km.

A Project Description File covering relevant requirements of the EIA regulation has been submitted to the Provincial Directorate of Environment and Urbanization in Kırklareli. Consultations have been pursued with the members of the Review and Evaluation Committee (REC) appointed by the Ministry of Environment and Urbanization. Also based on the areas of expertise identified by the MoEU in line with the Project requirements, specialist groups (Agricultural Engineer, Forest Engineer, Aquaculture Engineer, Specialist Biologist and Archaeologist) have been included in the process of the preparation of the EIA Report.

An Environmental Impact Assessment (EIA) consistent with the national permit requirements in effect in Turkey has already been conducted by the Project Owner for the Turkish EEZ Section of the currently cancelled South Stream Offshore Pipeline. Within the scope of that EIA process, detailed surveys and design studies were conducted for the Turkish section extending for 460 km along the Turkish EEZ in the Black Sea. That final EIA File was submitted to the Turkish Ministry of Environment and Urbanization (MoEU) on 10 July 2014 (General Directorate of Environmental Impact Assessment Permits and Inspection), and “EIA Approval” was obtained on 18 July 2014 (**Appendix 1.C**) and it remains valid.

South Stream Offshore Pipeline Project - Turkish Section holding “EIA Approval”, includes the section of the TurkStream Offshore Pipeline, which starts at the boundary of the Russian and Turkish EEZs and continues, passing though the Turkish EEZ only, until KP660 on the boundary of the Turkish and Bulgaria EEZs. As mentioned above, this section of the TurkStream Offshore Pipeline shall be referred to as the **“Turkish EEZ Section”** in this EIA Report**.**

1.4 Owner of the TurkStream Gas Pipeline Project – Offshore Section

TurkStream Offshore Pipeline and therefore the Project were designed by South Stream Transport B.V., a company founded in the Netherlands on 14 November 2012 to assume responsibility for the design, construction, operation and ownerships of the pipeline. The company was founded as an international partnership between PAO Gazprom and European shareholder companies. In December of 2014, PAO Gazprom became the sole shareholder in South Stream Transport B.V., thus assuming responsibility for the TurkStream Gas Pipeline – Offshore Section.

As the world's largest supplier of natural gas, PAO Gazprom accounted for approximately 11% of global gas production as of 2015 (Ref 1.1). It was founded as a corporation in 1993 and is partially owned by the Russian state. The company's primary activities include the exploration, production, transportation, storage and marketing of gas, condensed natural gas and oil as well as the generation and marketing of thermal and electrical energy. (Ref.1.2).

By 2015, PAO Gazprom controlled approximately 72% of Russian gas reserves, and produced 66% of Russian natural gas and 14% of its electricity. As a leading company in the construction and operation of gas pipelines, it controls a network of gas pipelines spanning 171,200 kilometers, carrying approximately 602.6 billion cubic meters of gas per year. (Ref. 1.1). The amount of natural gas to be supplied within the scope of the TurkStream Gas Pipeline corresponds to a 5% increase in the capacity of PAO Gazprom.

1.5 Agreements to Execute the Project

An Intergovernmental Agreement (IGA) was signed by the Republic of Turkey and the Russian Federation (the parties) on 10 October 2016 regarding the TurkStream Gas Pipeline which is the subject matter of the EIA Report. The IGA document is provided in **Annex 1.A**, whilst its details are given in Chapter 3.1. The IGA entered into force on 21 February 2017 following the ratification by the parties.

In addition to the IGA a number of nota verbale have been exchanged between the Russian and Turkish governments in relation to implementation of the TurkStream Gas Pipeline Project – Offshore Section.

1.6 Stages of Investment, Timeframe and Lifespan

Development of the Project consists of five basic stages, consistent with the anticipated timeline provided below:

- **Front End Feasibility Stage** (2007 – 2014): During this stage, a variety of natural gas pipeline routes and coastal options were assessed, after which the Front End Engineering and Design (FEED) and EIA studies for the South Stream Offshore Pipeline Project crossing the Turkish EEZ in the Black Sea (for the Turkish EEZ section) were conducted. The EIA study for the South Stream Offshore Pipeline Project - Turkish Section in accordance with Turkish environmental legislation was included in this study;
- **Feasibility/Development Stage** (2015-2017): This stage includes a FEED study for the section from KP660 to Kıyıköy on the Turkish coast (the Project) and the completion of an EIA process pursuant to the Turkish national permit requirements (environmental legislation);

- **Construction Stage and Pre-Operation Stage** (2018 – end of 2019): This stage includes all of the construction work and pre-operation activities;
- **Fully Operational Stage** (2020 – end of 2069): The operational design lifespan of the TurkStream Gas Pipeline – Offshore Section is 50 years; and
- **Decommissioning Stage** (2070 and afterwards).

The project timeline including the commissioning stage of the Project is presented in Table 1.1.

Table 1.1: Project Timeline (2017-2019)

Sections	Operations	2017				2018				2019			
		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Offshore Section	Preparations prior to pipe-lay				■								
	Pipeline Route Pre-lay Survey (14 days in advance of pipe-lay)					■							
	Pipe-lay – from KP660 in Turkish EEZ up to approximately 30m WD					■	■		■				
	Above Water Pipeline Tie-in at connection point at 30 m WD										■		
	Post-lay Seabed Intervention (including surveys)									■	■		
Shore Crossing Section	Access Roads			■	■								
	Shore Crossing Site Preparation						■						
	Construction of cofferdams or causeways							■	■				
	Dredging for open-cut (up to approximately 2km offshore)								■	■			
	Shore Pull and Shallow Water Pipe-lay to 30 m WD: approximately 5 to 10 days per pipeline									■			
	Shore Crossing Site Restoration and Backfill of Trenches										■	■	
Landfall Section	Landfall Section Pipelines - site establishment, installation of office and equipment					■	■						
	Landfall Section Pipelines Construction							■	■	■			
	Receiving Terminal - site establishment, installation of office and equipment						■						
	Receiving Terminal Enabling/Early Civil Works - Site Preparation/Leveling					■	■	■	■				
	Receiving Terminal Installation							■	■	■	■	■	■
	Land Clearing and Installation of Pipeline Markers											■	■
	Pre-Commissioning of Shore Crossing and Landfall Pipelines										■		
	Pre-Comissioning of the Receiving Terminal											■	■
	Pre-Commissioning of TurkStream Gas Pipeline											■	■
	Commissioning of TurkStream Gas Pipeline												■
	TurkStream Gas Pipeline Operational												■

1.7 Project Investment's Service Objectives, Significance and Necessity

Among the world's energy resources, natural gas is becoming increasingly important. It is expected that by 2040 the energy demand for natural gas will have increased dramatically and that natural gas will compete with coal as the second largest fuel in the global energy market after petroleum (Ref. 1.1). Demand for natural gas is expected to increase significantly in the upcoming decades in the energy markets of the EU and Turkey. Expectations for natural gas imports are growing due to the projected decline of natural gas production in the European Union (EU) and limited production in Turkey. The TurkStream Gas Pipeline which is positioned as a strategic energy transfer center, is part of a strategy of diversifying PAO Gazprom's supply routes that can respond to market demand with flexible, sensitive and competitive pricing to provide safe and secure natural gas. Benefits of the TurkStream Gas Pipeline include the following:

- It provides a safe supply of natural gas via an alternative route from Russia to markets in Europe and Turkey.
- It supports the economic development of Turkey by meeting the increasing demand for natural gas in the country.
- It strengthens Turkey's geostrategic position in the regional energy management.

1.7.1 Turkish Demand for Natural Gas

Projections for the future estimate that there will be an increase in demand for natural gas:

- The Mediterranean Energy Perspectives-Turkey report prepared by the Mediterranean Energy Observation Centre (OME: L'Observatoire Méditerranéen de l'Energie) envisages a demand projection of 50 billion and 80 billion cubic meters respectively under proactive and conservative models for year 2030 (Ref. 1.3); and
- The projection of BOTAŞ for 2030 is 81 billion cubic meters, while the MEDPRO Reference Scenario indicates 78 billion cubic meters (Ref. 1.4).
- Based on these different scenarios, one could conclude that Turkey's demand for natural gas will reach approximately 80 billion cubic meters by 2030, which is at least a 60% increase over the estimated consumption in 2015. However, gas prices will have an effect on determining the role of natural gas in the energy mix, as well as growth projections in this regard.
- Although domestic consumption of natural gas has risen significantly, domestic production of natural gas has remained limited. In 2015, domestic production of natural gas was only 0.38 billion cubic meters, so Turkey's demand for natural gas is primarily met by imports either via pipelines or as Liquefied Natural Gas (LNG). Turkey's total natural gas imports in 2015 stood at 48.4 billion cubic meters.(Ref. 1.2).

1.7.2 Europe's Demand for Gas

Natural gas has an important place among the energy sources used by Europe: In 2014, natural gas accounted for approximately 22% of energy consumption in the European Union (EU) member states (EU-28); only about 34% of this demand is met by domestic EU-28 production in Europe (from gas fields in the EU (Ref. 1.6). Gross domestic consumption of natural gas (production plus net imports) in the EU in 2015 was approximately 397 billion m^3, of which approximately 119.5 billion m^3 was production, with net imports of approximately 279 billion m^3(Ref. 1.7). Secure supplies of natural gas for the EU are provided by various sources, including traditional suppliers such as Russia, Norway and Algeria. When we look at the larger European area (without restricting ourselves to the EU-28 member countries), we see that Russia supplied approximately 148 billion m^3 of natural gas in 2014 (Ref. 1.8).

The International Energy Agency (IEA) projects that the demand for natural gas in the EU, which was 478 billion m^3 in 2012, will reach 559 billion m^3 by 2040, and that production of natural gas in the EU, which was 174 billion m^3 in 2012, will fall to 106 billion m^3 by 2040 (Ref. 1.1). Table 1.2 provides future demand and production amounts of natural gas in the EU based on the "New Policies Scenario" of The IEA.

Table 1.2IEA: Future Natural Gas Demand and Production in the EU based on the New Policies Scenario (Ref. 1.1)

(billion m^3)	2012	2030	2040	Δ '12-'40
Production	174	123	106	-68
Consumption	478	528	559	81
Import	304	405	453	149

The TurkStream Gas Pipeline will meet increasing demand for natural gas by providing a transportation capacity of 31.5 billion m^3 per year. The plan is to direct 15.75 billion m^3 of this amount every year to the European supply network. The IEA report results recommends that this capacity could contribute significantly to the anticipated need for imported natural gas in keeping with the increasing demand in 2040 based on declining production in the EU and the New Policies Scenario.

1.8 General Characteristics of the Russian Section of the TurkStream Gas Pipeline

The project area of the Russian Section of TurkStream Gas Pipeline consists of three parts: Landfall, Nearshore (Shore Crossing) and Offshore (Figure 1.2).

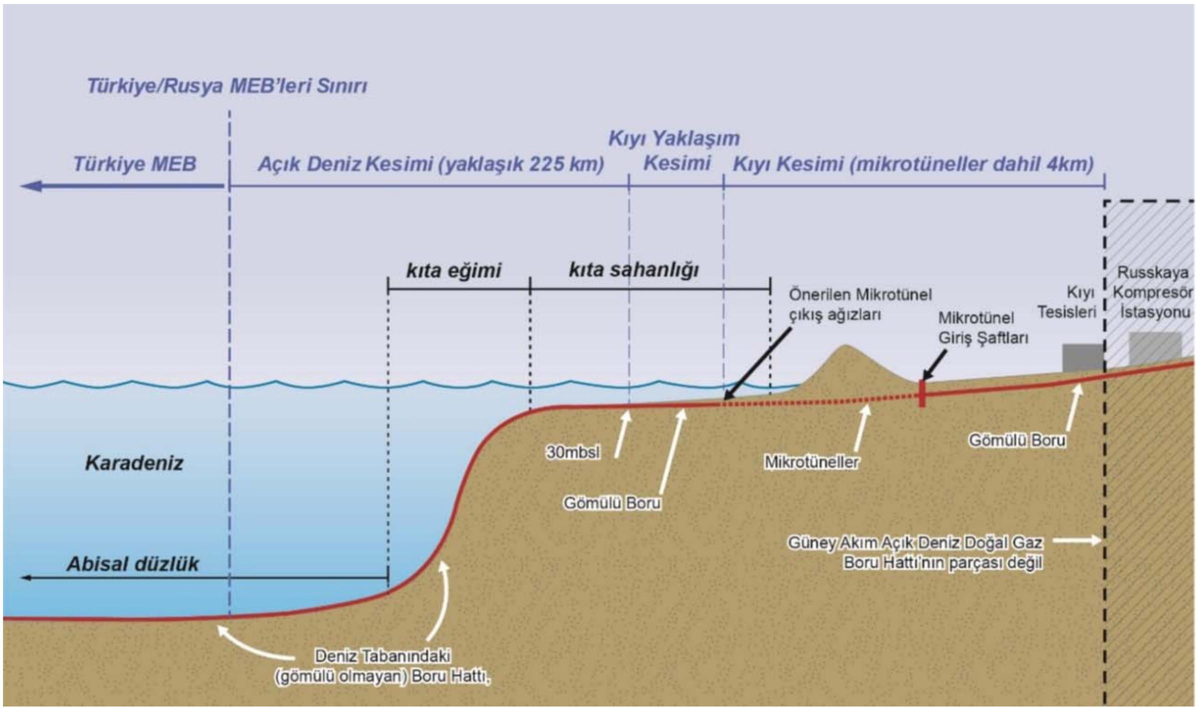


Figure 1.2: The Landfall, Shore Crossing (Nearshore) and Offshore Parts of the Russian Section of the TurkStream Gas Pipeline

The shore crossing section is 3.9 km long and contains permanent landfall facilities, including metering equipment, PIG capture facilities and Emergency Shutdown Valves. The Landfall section also includes buried onshore pipelines of approximately 2.5 km in length and microtunnels (which house the pipelines) of further 1.4 km length. The microtunnels start at approximately 400 m from the coast and terminate in a water depth of approximately 23 m. The landfall facilities in Russia will be connected to the Russkaya Compressor Station via pipelines of 3,2 km in length. The Russkaya Compressor Station and the connecting pipelines are not part of the TurkStream Gas Pipeline. They are designed as part of the project known as "Expansion of UGS (Unified Gas Supply System of Russia)" developed by PAO Gazprom to supply gas to "Turkstream Gas Pipeline". The construction of the shore crossing section started as part of the South Stream Offshore Pipeline Project and reached its final stages.

The shore crossing section contains two pipelines that are buried in trenches, and begins at the exit of the microtunnels, approximately 400 m from shore, in water that is approximately 23 m deep. This section is approximately 400 m long and ends at 30 m water depth.

The offshore section in Russia begins at 30 m water depth and runs up to the Turkish EEZ boundary. This section is 225 km long in pipeline length. The pipelines will be laid directly on the sea floor in this section. A summary of the work to be performed in Russia is provided in Table 1.3.

Table 1.3:Russian Section of the TurkStream Offshore Pipeline (based on October 2013 data)

Section	Details
Russia	
Landfall	Approximately 2.5 km of land pipelines extending from nearshore facilities up to the entrance of microtunnels positioned at about 1 km off shoreline are buried in trenches on the shore. In addition to pipelines, the nearshore facilities will be surrounded with a fence and include the following: Gas metering and monitoring Two pipeline inspection gauge (PIG) capture facilities (one for each pipeline) Emergency Shutdown Valve; Four block valves (two for each pipeline); Prefabricated containers that protects the electrical and measuring equipment; and One vent stack.
Shore Crossing	This section includes two pipelines of approxiamately 1.8 km extending from the entrance of microtunnels positioned at about 1 km off shoreline up to a depth of 30m. Approxiamately 1.4 km of the pipelines will be housed in microtunnels. The exit point of the microtunnels will be approximately 400 meters from the shore and at a depth of 23 meters. The pipelines will be buried for approximately 170 m after the microtunnel exit point, then they will be laid on the seafloor.
Offshore	Two pipelines, each of which is 225 km, which will be laid directly on the seafloor across the Black Sea from the nearshore area to the boundaries of the Russian and Turkish EEZs.

1.9 Description of Project Area

The Project consists of three main sections (Figure 1.3). The below described Offshore, Shore Crossing and Landfall Sections of TurkStream Offshore Pipeline extending from KP660 to the downstream of Receiving Terminal and located on sea areas within the Turkish territory and on the Turkish mainland constitute the "**Project Area**" to be assessed in this EIA study.

- **Offshore Section**: The offshore section extends from KP660 in the Turkish EEZ to approximately 2.5 km from the Turkish coast, where the water depth is approximately 30 m. The Offshore Section continues approximately for 270 km within the Turkish EEZ waters of the Black Sea and within Turkish territorial waters (measured along the pipeline route). In the Offshore Section, the pipelines will be laid directly on the seabed.
- **The Shore Crossing Section**: This section will commence approximately 2.5 km off the Turkish coast and from the Turkish territorial waters with a depth of approximately 30 m and extend to the nearshore section, north of Selves Beach. The Project also has a "*nearshore"* sub-segment, which defines the necessary area to construct and install the Pipeline where the Shore Crossing Section is connected to the Landfall Section. The nearshore segment commences approximately 200 m offshore, in a water depth of approximately 5 m and extends for approximately 250 m (200 m Shore Crossing Section and 50 m Landfall section). Shore crossing activities will include both marine construction activities such as shallow water vessels to undertake shore crossing dredging, and terrestrial construction activities (north of Selves Beach), such as trench excavation and pipeline installation via a shore pull. For the purposes of this EIA Report, construction activities at the sea will be dealt with in the Shore Crossing Section, whilst terrestrial construction activities will be dealt with in the Landfall Section.
- **Landfall Section**: The Landfall Section will commence from the coastline (the point where the pipeline is pulled onshore) and will extend inland from the coast to include the onshore pipelines and the Receiving Terminal. The Landfall Section, including the Receiving Terminal, will be approximately 3 km in length. From the coast to the Receiving Terminal, the pipelines will be buried using conventional land-based construction techniques. In line with safety requirements, the buried onshore pipeline will have minimum soil cover of 1.5 m.

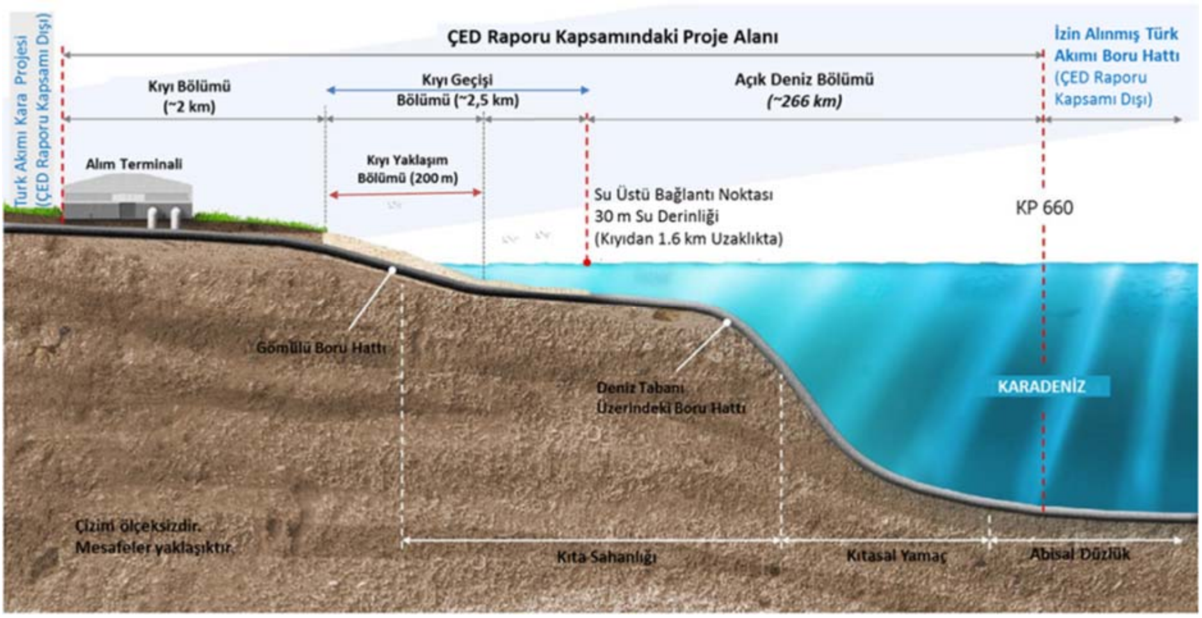


Figure 1.3: Sections of the Project

Permanent components of the Project comprise the following main elements:

- Two 32-inch diameter (813 mm) subsea steel pipelines approximately 272 km in length from KP660 point in the Turkish EEZ to north of Selves Beach. These pipelines will be laid directly on the seabed apart from the final 2.5 km (approximately) before the beach, where they will be buried in dredged trenches;

- Two 32-inch diameter (813 mm) buried onshore steel pipelines approximately 3 km in length from the Selves Beach (from the beach) to the Receiving Terminal; and
- Receiving Terminal.

The anticipated approximate layout of the Project is shown in Figure 1.4.

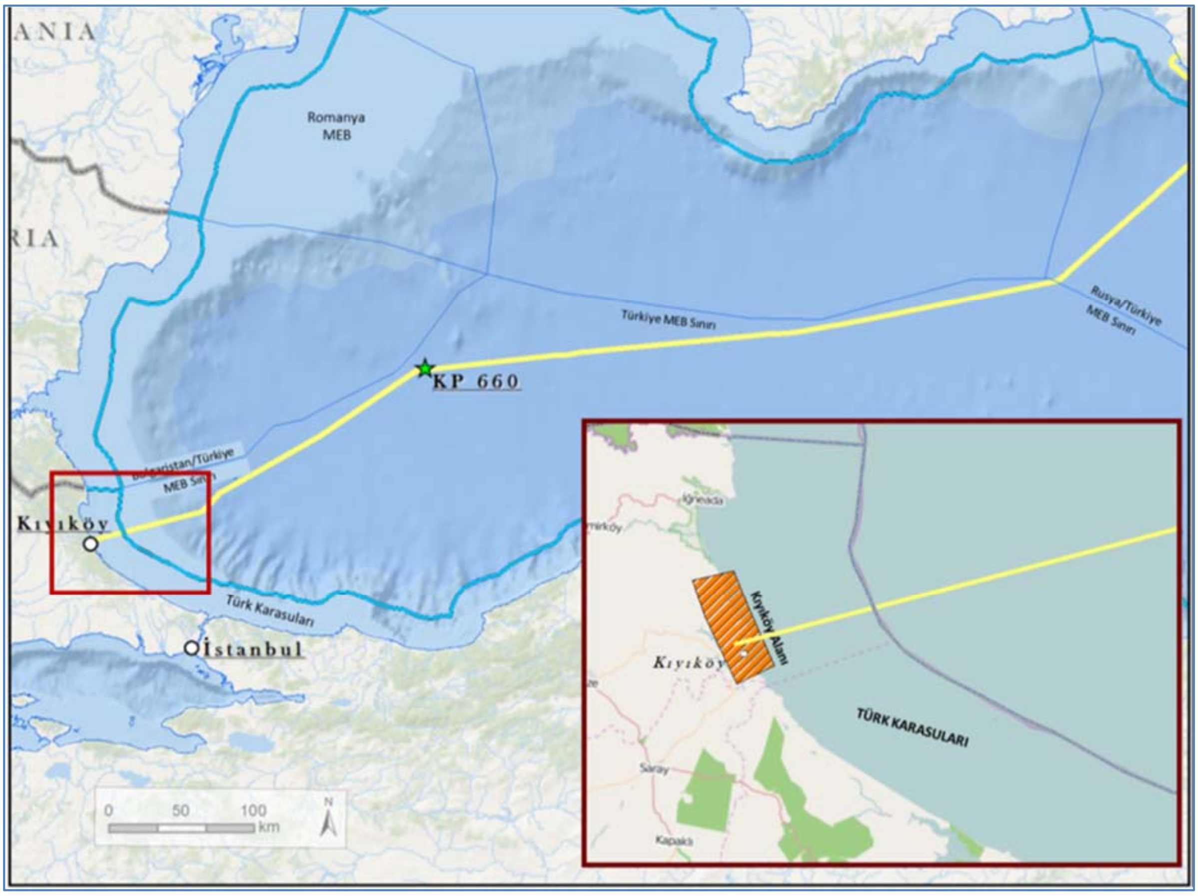


Figure 1.4: The Anticipated Approximate Layout of the Project

1.9.1 Offshore and Shore Crossing Sections

The Offshore and Shore Crossing Sections of the Project will extend from KP660 on the border of Turkish and Bulgarian EEZs to the Receiving Terminal to be built in Kıyıköy, Vize District, Kırklareli Province, Turkey and will consist of two pipelines (each with a 813 mm/32 inch diameter) to be laid on the seabed parallel to each other for approximately 275 km.

Coordinates of the pipeline corridor for the Offshore and Shore Crossing sections are given in Table 1.4 below, the settlement plan for this corridor is given in Figure 1.4, and the layout of the corridor is presented in Figure 1.5.

Table 1.4: Pipeline Corridor Coordinates (from KP660 to the shore)

Point Number	UTM WGS84 6°		GEOGRAPHICAL	
	X	Y	Longtitude	Latitude
ID-01	90870.699	4622717.50	41°39'04.1529" N	28°05'14.3846" E
ID-02	97391.786	4621127.01	41°38'24.7033" N	28°09'59.1516" E
ID-03	134018.025	4632070.44	41°45'22.0002" N	28°35'53.2803" E
ID-04	136176.187	4626445.40	41°42'23.7043" N	28°37'38.8258" E
ID-05	150382.891	4633174.97	41°46'24.2397" N	28°47'37.6460" E
ID-06	159436.560	4633151.17	41°46'37.6299" N	28°54'08.8415" E
ID-07	168221.775	4635947.38	41°48'21.4642" N	29°00'22.8396" E
ID-08	173606.985	4638992.22	41°50'08.0024" N	29°04'09.6351" E
ID-09	175822.200	4641003.65	41°51'16.3439" N	29°05'41.4948" E
ID-10	181752.101	4641916.83	41°51'54.5453" N	29°09'56.3267" E
ID-11	196844.185	4650853.92	41°57'05.0601" N	29°20'33.0938" E
ID-12	193589.088	4655904.63	41°59'43.9586" N	29°18'02.5325" E
ID-13	317812.305	4742741.56	42°48'56.0009" N	30°46'17.3828" E
ID-14	326011.543	4743718.54	42°49'34.5191" N	30°52'17.1005" E
ID-15	325893.232	4744711.49	42°50'06.5907" N	30°52'10.7881" E
ID-16	325774.926	4745704.44	42°50'38.6620" N	30°52'04.4739" E
ID-17	317077.823	4744668.22	42°49'57.7834" N	30°45'42.8118" E
ID-18	192504.081	4657588.25	42°00'36.9123" N	29°17'12.2991" E
ID-19	189249.134	4662639.30	42°03'15.7360" N	29°14'41.4600" E
ID-20	176943.235	4655353.73	41°59'02.2092" N	29°06'01.7246" E
ID-21	169523.874	4654211.98	41°58'14.2105" N	29°00'42.3744" E
ID-22	165346.991	4650420.12	41°56'05.2288" N	28°57'49.0937" E
ID-23	162588.847	4648861.00	41°55'10.5789" N	28°55'52.8331" E
ID-24	157278.769	4647171.53	41°54'07.7162" N	28°52'06.4244" E
ID-25	147249.777	4647199.10	41°53'52.7332" N	28°44'52.2628" E
ID-26	131140.851	4639570.82	41°49'19.6837" N	28°33'32.3002" E
ID-27	133298.690	4633945.50	41°46'21.4258" N	28°35'18.0624" E
ID-28	97338.705	4623201.87	41°39'31.6464" N	28°09'51.8408" E
ID-29	91345.426	4624663.75	41°40'07.9058" N	28°05'30.0477" E

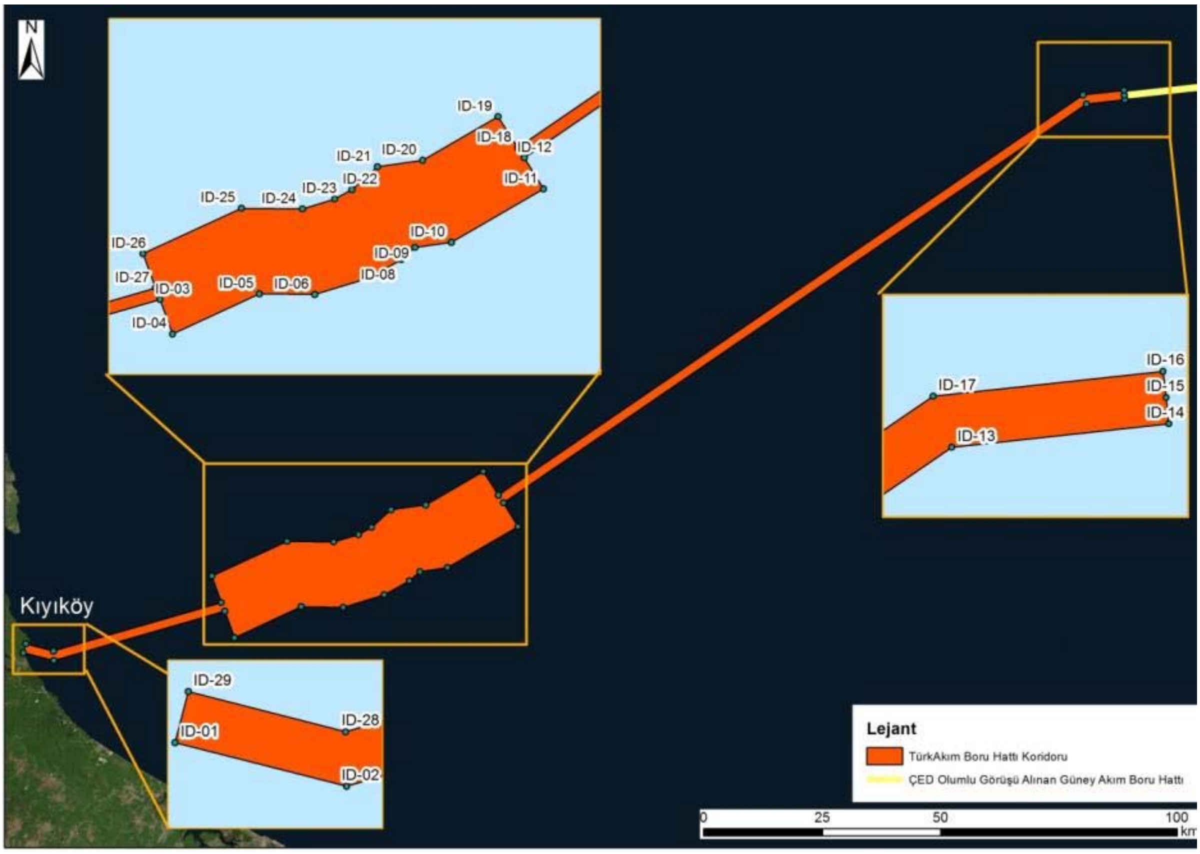


Figure 1.5: Pipeline Safety Corridor Route

1.9.2 Landfall Section

The Landfall Section will be approximately 3 km in length, starting at the point where the pipeline is pulled onshore, including the Receiving Terminal. In the landfall section, the pipe laying will be done through conventional open-cut construction technique.

The general layout plan of the Receiving Terminal is shown in Figure 1.6, below. Minor changes can be made to the layout of the Receiving Terminal and/or the route of the pipeline in the landfall after the completion of detailed surveys to verify the suitability of this area for settlement. The plan featuring the components and the necessary process equipment to be used in the Receiving Terminal and their optimum layout is presented in Figure 1.7 and in Annex-1.E.

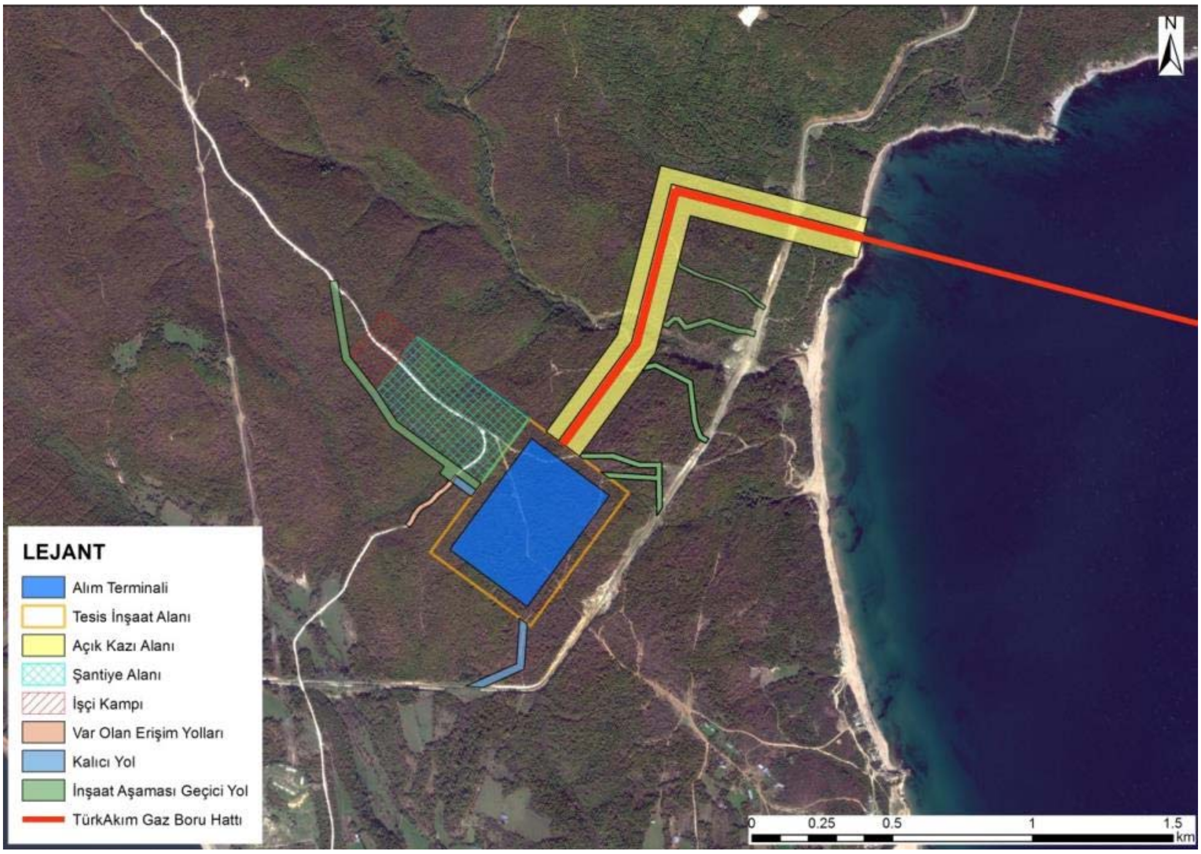


Figure 1.6: Receiving Terminal Layout Plan

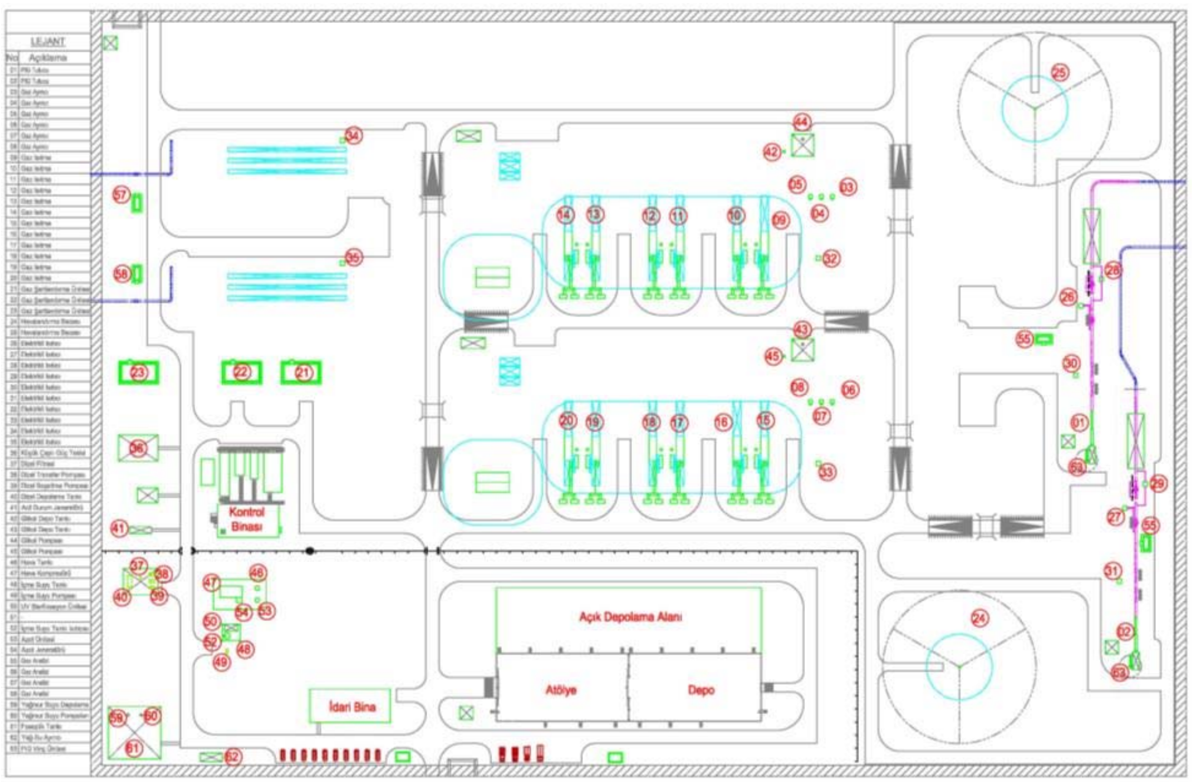


Figure 1.7: Receiving Terminal Fundamental Components

1.10 Operational Safety Zones

1.10.1 Offshore and Shore Crossing Sections

A nota verbale dated 13 February 2017 and numbered 2017/87769974-Moscow BE/11978880 regarding an operational safety zone of 420m in width which can be implemented to the TurkStream Gas Pipeline – Offshore Section was issued by the Turkish Government to the Russian Government (**Appendix 1.F**).

The necessary approvals have been obtained from the relevant public authorities for a 420 metres-wide operational safety zone along the pipeline route. This safety zone signifies an operational safety zone that prohibits the sea-bed related activities of third parties (e.g. anchorage, trawling). This zone shall not prevent vessels from crossing over the pipeline or fishing activities that do not involve dredging and / or anchoring.

In the Offshore and Shore Crossing sections, pipelines will be laid as parallel as possible. However, FEED and detailed design limitations (geological constraints on the continental slope or cultural heritage items or random discoveries such as UXOs), may require some final, minor deviations to the design.

Any change in the operational safety zones shall be put in place in collaboration with the relevant official authorities and in accordance with the Turkish legislative requirements and international standards, after obtaining necessary permits.

1.10.2 Landfall Section

1.10.2.1 Pipeline RoW

An operational RoW shall be formed on the buried pipelines in according with the requirements of BOTAŞ Technical Safety and Environment Regulation. Operational RoW is the corridor in which the Project Owner cannot perform activities in order to inspect, maintain and test the pipeline during the operational phase including certain field works (e.g. planting of rooted plants or building constructions). The permanent RoW will be identified by marking it at certain intervals in a clearly visible manner along the pipeline.

According to the BOTAŞ Technical Safety and Environment Regulation, the width of the RoW shall be 31 m, with a distance of approximately 10 m between the axes of the pipelines, 14 m from one pipeline and 7 m from the other.

1.10.2.2 Receiving Terminal Fire Safety Zone

According to the Good International Industry Practice (GIIP) and with reference to the opinion letter (**ANNEX-5.A**) dated 03.07.2017 of the Provincial Public Health Directorate of Kırklareli, a fire safety zone (also a health protection band) of 50 m in width will be established around the Receiving Terminal, free from trees / vegetation cover. This safety zone will increase the land acquisition volume of the Receiving Terminal by about 27 hectares for the operational phase.

1.10.2.3 Additional Safety Zone

In addition to the RoW and Receiving Terminal fire safety zone around the pipelines, operational onshore safety zones are determined based on the results of Quantitative Risk Analysis (QRA) prepared in accordance with international standards. These safety zones are established using the following acceptable threshold values for Individual Risk (IR) levels in order to protect the public health and infrastructure:

IR = $1x10^{-5}$ yearly restrictions for residential units

IR = $1x10^{-6}$ yearly restrictions for sensitive uses (schools, hospitals, sports areas, etc.) and high density residential units

The results are summarized in Table 1.5 and shown in Figure 1.8.

Table 1.5: Onshore Pipeline Safety Zones

Zone	Receiving Terminal		Onshore Pipeline	
	Quantitative Risk Analysis minimum distance	**Maximum distance**	**Quantitative Risk Analysis minimum distance**	**Recommended distance***
Zone 1 (10^{-5} limit): Construction of dwellings or other residential buildings is prohibited.	230 m	410 m	Not required	31 m right of way
Zone 2 (**10^{-6}** limit): Construction of dwellings or other residential buildings (with maximum two floors) is allowed. Sensitive uses such as hospitals, schools, recreational areas, public spaces are not allowed.	390 m	565 m	Not required	31 m right of way

*BOTAŞ Technical Safety and Environment Regulation

The safety zone for the Receiving Terminal varies depending on the position of equipment in the Receiving Terminal; these safety zones are the largest in the north-west and the smallest in the south-east side of the Receiving Terminal. A more restrictive “inner” restriction zone prohibiting all dwellings 230 to 410 metres from the Receiving Terminal shall be formed.

In a less restrictive zone extending from 390 to 565 metres from the Receiving Terminal, two-storey non-sensitive dwellings are allowed. There is no restriction for construction of residential units outside these zones. Since QRA does not set restrictions on construction in the vicinity of the pipeline, the only restriction on the construction of residential units in this area will be 31 m-wide according to the requirements of the BOTAŞ Technical Safety Environment Regulation.

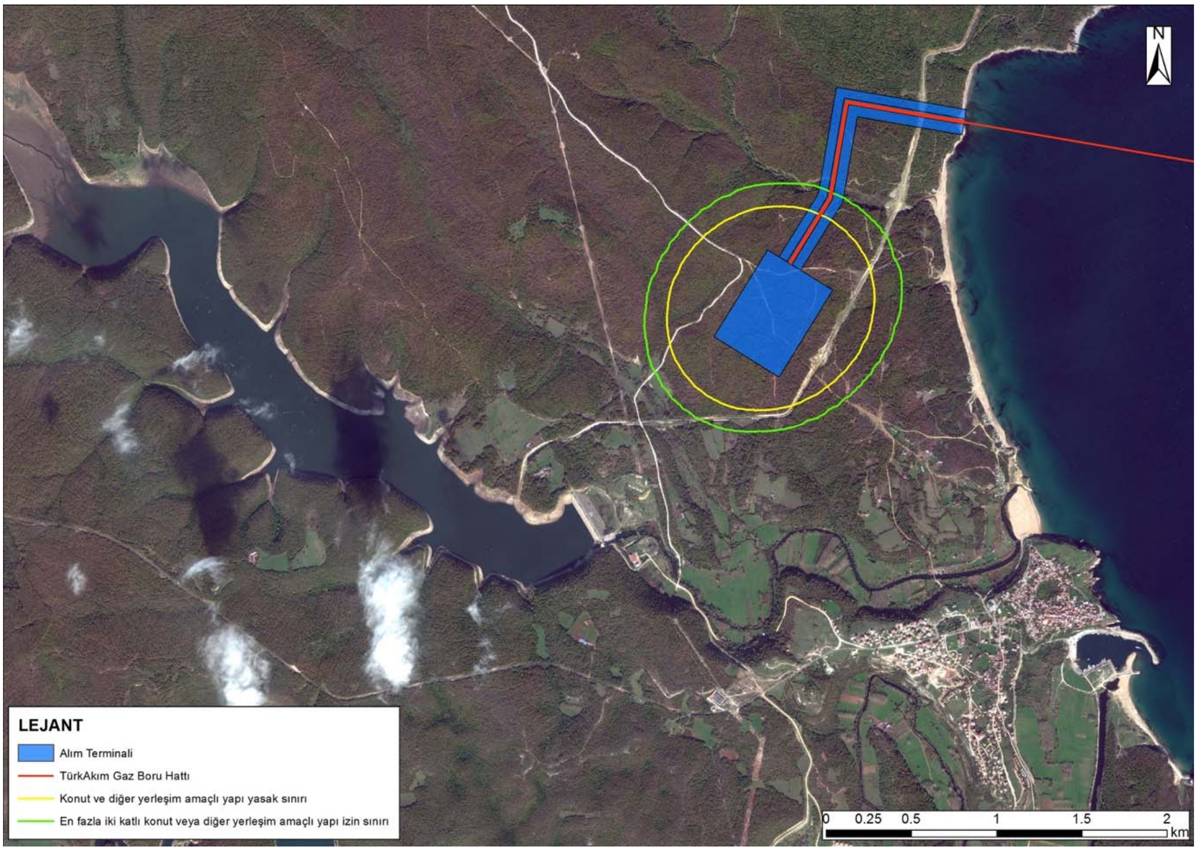


Figure 1.8: Quantitative Risk Analysis - Risk Map

The final width of the RoW and RT (Receiving Terminal) safety zones will be determined according to the relevant legislation and the views of public authorities. As stated in the opinion letter of Kırklareli Public Health Directorate dated 03.07.2017, according to the Regulation on Business Licenses, since the Receiving Terminal is within the scope of Category 1 Non-Sanitary Establishment, taking into account the adverse effects of the Receiving Terminal on the environment and public health, in accordance with the Directive No. 6359 dated 17.02.2011 of the Ministry of Health, it is required that the advisory health protection band distance for the Receiving Terminal is maintained and kept within the boundaries of the lot by the competent authority to issue licenses. A health protection band and a fire safety zone of 50 m in width will be established around the Receiving Terminal, free from trees / vegetation cover.

1.11 Characteristics of the Project

1.11.1 General Characteristics (Pipeline length and diameter, pipeline material and wall thickness, pipeline capacity, etc.)

At maximum capacity the TurkStream Offshore Pipeline will be able to transport up to 31,5 billion cubic metres (bcm) of natural gas per year. Each of the two Project pipelines will have a maximum flow rate of approximately 47.9 million standard cubic metres (MMSCM) per day (approximately 15.75 bcm per year).

From the KP660 point, the total length of pipe in the Offshore, Shore Crossing and Landfall sections, up to the Receiving Terminal, will be approximately 275 km for a single line.

1.11.1.1 General Characteristics of Pipes to be Used

The pipelines will be constructed of steel line pipes made of 12 m long sections, which will be welded together. The pipe sections will be coated both inside and outside prior to delivery to the Marshalling Yard. The internal coating will be an epoxy paint which improves internal cleanliness and the operational gas flow rate, whilst the external coating will be made of three-layer-polypropylene (3LPP) to protect the pipelines from corrosion.

Shallow water sections of the subsea pipelines (including buried pipelines) will be additionally coated with reinforced concrete to increase their weight to improve stability against sea currents and provide additional protection from external damage due to third party activities. Surveys to be conducted during the final design stage are required to determine the exact dimensions of the concrete coating. Concrete-coated pipelines will be shipped to the Coastal Supply Facility, ready to be installed. In addition, the pipelines will be protected against corrosion by a cathodic protection system consisting of sacrificial anodes for the Shore Crossing and Offshore Sections and an Impressed Current Cathodic Protection (ICCP) system for the Landfall Section.

The dimensional data of the 32-inch pipes to be used for the Project are summarised in Table 1.6 below. Pipes to be used in the Offshore, Shore Crossing and Landfall Sections will have the same dimensions (32 inches), except those used at the RT. Pipes to be used at the Receiving Terminal will have diameters of 4 inches, 6 inches, 24 inches, 32 inches.

Table 1.6: Pipeline Dimensional Data of 32-inch Pipes

Parameter	32-inch Pipe
Pipe nominal outside diameter	812.8 mm
Pipe nominal inside diameter	734.8 mm
Wall thickness	39 mm
Internal or external corrosion allowance	0 mm
Wall thickness fabrication tolerance	±1 mm

1.11.1.2 General Characteristics of the Receiving Terminal

The RT including landfall facilities incorporating emergency shutdown valve stations (ESDs) and Pipeline inspection gauge (PIG) traps will be established on an area of approximately 17,5 ha and will primarily consist of the following components:

- Gas metering and monitoring;
- Gas purification;
- Gas heating;
- Temperature and pressure control;
- Overpressure protection;
- Metrology equipment;
- Two Pipeline Inspection Gauge (PIG) trappers (one per pipeline);
- Numerous emergency shutdown valves (ESDV) (exact number to be provided later);
- Numerous block valves (exact number to be specified during FEED);
- Other valve systems incorporated in the Receiving Terminal include: Motor-operated valves (MOVs) and ball line valves, pressure control valves (PCVs) temperature control valves (TCVs) and flow control valves (FCVs);
- Isolation joints;
- Prefabricated containers to install electrical and control devices;
- The construction of two single-storey buildings of 15 x 50 and 15 x 40 in size is foreseen (for electrical and administrative purposes).
- Two vent stacks and connected pipe systems up to maximum 50 m in height;
- Four diesel generators (to be used only when operating the first pipeline);
- Two buried power cables;
- Rainwater drainage system; and
- Fire water storage tanks, the size of which will be determined via consultation with the relevant authorities.

Above ground and underground piping systems and equipment will be installed in the Receiving Terminal. The basic components of the Receiving Terminal include equipment used for monitoring the operating process (gas temperature and pressure, etc.), gas metering and monitoring, gas purification, gas heating and overpressure protection, electric heating system, ventilation system for depressurizing pipelines; and buildings where the electrical equipment and control devices used for the monitoring of the operational conditions in the offices, sanitary facilities and the pipelines.

Two pipeline, each containing their own integrated equipment (sequence of actions), will join the Receiving Terminal. The equipment will be resized to allow the system to function at the highest design capacity. Backups for each of the pipeline equipment will be readily available, enabling the pipeline 1 and 2 to function independently from each other and to activate without delay. In case of an unexpected event such as equipment in one of the pipelines becoming inoperable, necessary conditions for steering the gas flow between pipelines will be ensured. Depending on the needs of the moment, some of the gas flow may be steered towards the other pipeline equipment to ensure continuous production. Backup equipment of this line may need to be made online to ensure the necessary gas processing capacity.

1.11.1.3 Design Pressure

The Project has a design pressure of 300 bar although the expected maximum operating pressure is anticipated to be approximately 284 bar. The operating pressure of the Pipeline will vary across its length, particularly in relation to friction inside the pipelines and ambient temperature conditions surrounding the pipelines. If the system is operating at maximum flow rate by the time the gas arrives at the Landfall Section in Turkey, the arrival operating pressure at the Receiving Terminal will have fallen to between 65 bars and 99 bars.

The operating temperature of the gas on arrival on the coast of Turkey will normally be approximately -5 °C. However, during extreme winter conditions, there is potential for the gas temperature to fall to -8 °C and as such, the pipelines have been designed to a minimum temperature of -10 °C.

The design and operating data concerning the pipeline is summarized in Table 1.7.

Table 1.7: Summary of System Pressures and Temperatures

Parameter	Value
Design Pressure (In Russia)	300 bar at +180 m reference elevation
Maximum operating pressure (in Russia)	284,5 bar
Minimum operating delivery pressure(in Turkey) Maximum operating delivery pressure (in Turkey)	At +100 m reference height 67 bar at +100 m reference height 99 bar (at the Receiving Terminal)
Design Pressure • main 32-inch pipeline • RT 32-inch pipeline • Main RT piping • bypass heaters / piping • venting piping • vent stack	minimum / maximum -10 °C / + 55 °C -30 °C / + 55 °C -40 °C / + 55 °C -40 °C / + 93 °C -150 °C / + 55 °C -150 °C / + 55 °C
Operating Temperature • maximum (compressor outlet in Russia) • minimum (landfall requirement in Turkey) • minimum (at the exit of RT fence)	50 °C -5 °C (normal) -8 °C (in extreme winter conditions)* +1 °C

* incoming line into the RT

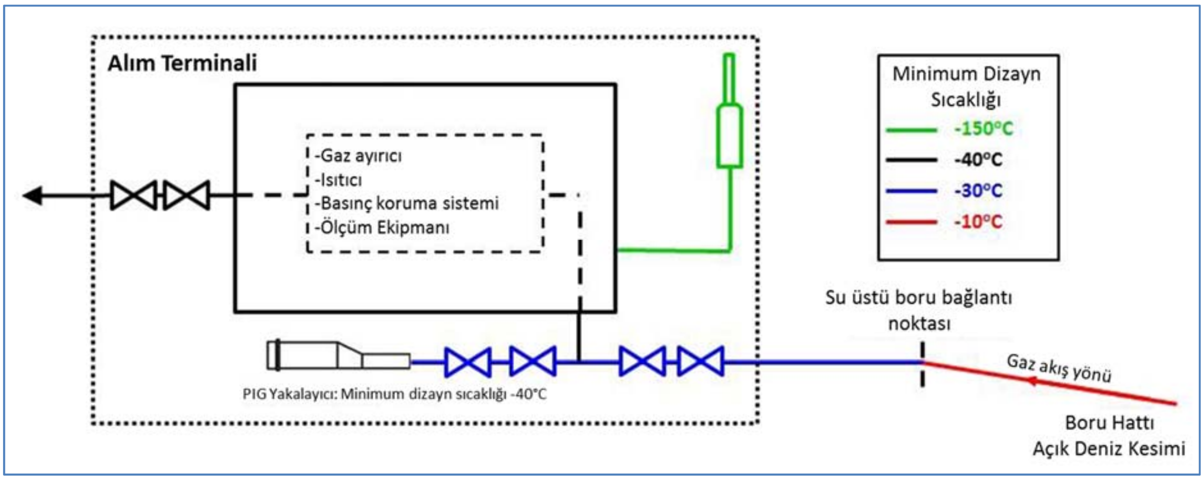


Figure 1.9: Receiving Terminal Minimum Design Temperatures

1.11.2 Natural Gas Properties

The gas that will be carried by the pipeline will have been processed so that it is "dry" (will have a water dew point of -22 °C @ 6.5 MPa and a hydrocarbon dew point of -22°C @ 2.7 MPa). A summary of the probable composition of the gas is provided in Table 1.8. These gas properties are valid only as design values, so the natural gas properties may be different from those shown in the table. However, any variation will be very small, and will not lead to results that affect the dimensions and design of the main system components.

Table 1.8: Gas Composition

Component	Mole %	Component	Mole %
Methane	97.5389	n-pentane	0.0171
Nitrogen (N_2)	0.9305	Hexane	0.0205
CO_2	0.4101	Heptane	0.0033
Ethane	0.8800	Octane	0.0004
Propane	0.1399	Nonane	0.0001
i-butane	0.0150	Water	0.0014
n-butane	0.0249	Methanol	0.0005
i-pentane	0.0171	Hydrogen sulphide (H_2S)	0.0003

1.11.3 Principles of Pipeline Design

The Project will be undertaken in compliance with nationally and internationally recognized standards for the design, materials, fabrication, installation, testing, commissioning, operation, maintenance and decommissioning of offshore gas pipelines and the receiving terminal.

The Codes and Standards for the pipeline system are listed in order of priority; in case of contradiction, the framework from a higher priority takes precedence:

- **Intergovernmental Agreement (IGA):** The formal agreement of the Turkish and Russian authorities on the TurkStream Gas Pipeline, and which codes and standards are applicable, will form the first code framework to be adhered to. The IGA takes other codes and standards to be applied as reference, as well;
- **National Laws and Regulations**: If available, the design has to be checked against, and aligned with, any applicable national requirements.
- **DNV-OS-F101 (2010):** This is the primary pipeline design code that will be used for the 32-inch Offshore Pipeline up to and including the pig trap inside the Receiving Terminal. This code does not apply to downstream of the offshore pipeline pig trap;
- **European Standards (EN):** EN 14161/ISO 13623 is the applicable pipeline system design code developed by the European Committee for Standardization (CEN). This standard shall be applied from the PIG trap station (excluding the PIG trap station) up to the connection point of the Project with the "BOTAS section". From this section of the pipeline onwards, BOTAŞ shall be responsible from the rest.
- **Gazprom Corporate Standards (STO), Russian State Standards (GOST) and Russian Regulation Document (RD)**: Certain aspects of FEED Design will be performed in accordance with certain Gazprom Corporate Standards (STO) and Russian State Standards (GOST), but with the following restrictions:
    - To the extent that the referenced STOs and GOSTs are not in contradiction with codes or standards from (one of) the above frameworks.
    - The existing purchased equipment (as part of the South Stream Offshore Pipeline Natural Gas Pipeline Project) do not contradict with the relevant Gazprom Institutional Standards, Russian State Standards and/or Russian Regulatory Documents requirements.
- **International Design Codes**: The European Standards shall be used as the overarching Code Framework for the RT during the FEED Design. Since the EN (ISO) Standards are not design handbooks or a code of practice, other design codes shall be used to provide guidance where the national and/or EN codes provide insufficient detail. Examples of additional sets of codes:
    - API (American Petroleum Institute) Standards;
    - IEC (International Electrotechnical Commission) Standards;
    - ISO (International Standards Organisation) Standards;
    - ASME (American Society of Mechanical Engineers); and
    - AISC (American Institute of Steel Construction).

1.11.3.1 Philosophy of Business and Operational Safety

It will be developed in accordance with the Occupational Health and Safety (OHS) and the Integrated Environmental Management System; Good International Industrial Practices (GIIP) and in compliance with the requirements of ISO 14001 (Environmental Management System) and OHSAS 18001 (Occupational Health and Safety Management System). Detailed information on the Integrated Management System is presented in Chapter 12 (Environmental and Social Management System).

The pipeline system was designed in accordance with the OS F101 design code as approved by Det Norske Veritas (DNV) which specifies that hydrotests are not required in waters deeper than 30 meters. The design of the pipeline, design factors and strict manufacturing tolerances will ensure that the pipeline is quite robust and durable.

The philosophy of business is based on the principle of constant gas supply in pipelines (a certain amount of gas shall be stored in pipelines without fail). During normal operations, the gas inventory in each Pipeline is evaluated to range between 100 and 120 MMSCM with a pipeline throughput of 47.9 MMSCM per day. The principle of continuous gas storage in pipelines is based on the correct and synchronized operation of the Russkaya Compressor Station (CS) in Russia and the Receiving Terminal in Turkey. The Russkaya CS in Russia and the RT in Turkey will measure the flow, pressure and temperature of the gas during normal operation.

The pipelines must operate within the pipeline inventory limits to maintain a safe and reliable system. With constant gas inventory, the daily promised gas transport volume can be met with accurate flow measurements and reliable valve controls. Accordingly, a safety management plan will be prepared in order to reduce all risks to "as low as reasonably practicable" (ALARP).

Pressure, temperature, flow, and gas composition (including water and hydrocarbon dew point) will be monitored from the Russkaya Compressor Station in Russia and the Receiving Terminal in Turkey. These parameters will be traceable and accessible in real time via the local "Supervisory Control and Data Acquisition" (SCADA) system in the Russkaya Compressor Station in Russia and the Receiving Terminal in Turkey. The parameters mentioned above will also be monitored in real time by the SCADA system through the Pipeline Performance System (online simulator) to calculate the amount of gas in each of the two pipelines. The control of the gas flow during normal gas transportation transactions will be carried out jointly by the Russkaya Compressor Station in the Russian Section and the Receiving Terminal in Turkey.

The design of the Receiving Terminal has been developed based on the above mentioned international codes and standards and on the detailed evaluations of the HSE (health, safety, environment) risks that may arise from the process facilities. The evaluations were carried out using structural methods (HAZOP, HAZID, etc.). All of these have resulted in the design of a Receiving Terminal that includes systems for monitoring and reporting (alarm) critical process parameters, fire and gas detection, passive protection measures, process isolation / process isolation for shutdown and ventilation, ventilation and gas discharge factors. The aim of isolation is to ensure that the system sections can be isolated independently when needed (e.g. in an emergency such as a pipeline leak), and as required as well as to prevent gas inlet/outlet. The ventilation system also allows the pressure in the pipeline and the Receiving Terminal to be lowered, thus allowing maintenance, for example, when necessary. Low and high level alarms will be set up at the RT to ensure that gas inventory requirements are within specified limits (eg, 100 and 120 MMSM at maximum efficiency). In the event of an irregularity (or deviation) in the levels, this information will be transmitted to the Central Control

Room (CCR) / Backup Control Room (BUCR) and the Russkaya Compressor Station in Russia so that the operators can perform balancing operations (increase or decrease of gas inventory). As a result of these operations, it may be necessary to make an operational decision regarding the interruption of the gas flow from the Pipeline. Alarms will also be inserted to detect changes in gas pressures and temperatures. Detailed information on alarm and safety systems can be found in Section 1.13.4.

After laying each pipeline, various activities known as “pre-commissioning activities” will be conducted to ensure that the pipeline meets operational requirements. The primary purpose of these activities is to ensure that the pipeline was laid without any important errors and that it is ready to be filled with gas. Cleaning, measurement and drying procedures will be conducted along the pipeline and therefore in the Turkish EEZ as well.

The TurkStream Gas Pipeline will be brought into service, by the introduction of gas from the Russian gas network, only after all control and monitoring systems have been commissioned at both ends of the pipelines in Russia and Turkey. Each pipeline will be commissioned separately. The commissioning process is addressed in detail in Section 1.13.4.

1.11.3.2 Design Process of the RT

From the beginning of the design phase of the Receiving Terminal, best known codes of practice have been applied to create a design proposal. While this process is not based on the development of several different designs and the selection of the best alternative, it involves improving the design as much as possible by obtaining more information to optimize the design.

In general, one of the factors influencing design decisions is the 'System Inlet and System Outlet' requirements. The RT connects the TurkStream Gas Pipeline - Offshore Section at the system inlet , to the Turkish natural gas network at the system exit. In order to allow the gas at the system exit to be at the specified temperature and pressure, the following must be included in the design of the RT:

- Gas heating systems; ve
- Pressure and temperature regulation (by means of valves and devices).

The minimum design temperature of -10 ^{o} C of the offshore pipeline has been determined to provide sufficient tolerance in the case of sea water and gas being at the lowest temperature at the same time, taking into account the difficulties in pipeline manufacturing.

Also, some of the other factors that affect design decisions are listed below:

- **Applicable Codes and Standards**: Another subject to be considered in design will be the use of codes and standards. While making design choices such as fire safety, emergency access roads; industrial codes, standards and any other measures taken within the framework of national legislation will form the basis of the design;
- **Location-based optimization:** As more review data and data regarding the location is collected, the Design Optimization of the Receiving Terminal will continue. As a result of the optimization work, a change in the design of the plants is not expected; and
- the placement within the boundaries of the Receiving Terminal may change. The facilities may be displaced in a suitable location within the boundaries of the RT considering factors such as site levelling, the entrance doors to the RT, the interior routes, etc.

1.11.3.3 Design of Specific Crossings

1.11.3.3.1 Offshore and Shore Crossing Sections

In the offshore section, the pipeline will be laid directly on the seabed. This technique will minimize seabed disturbance over most of the Offshore Section. However, although the route of the pipelines will be designed to minimise seabed intervention requirements, some intervention may be required in specific areas, either before or after pipe-laying. This is to limit or remove pipeline free span lengths (for example in areas where the seabed is rough and uneven) and to protect the pipelines and cables at cable crossing locations.

During the preparation of this EIA Report, it has been determined that there is no pipeline crossing in the Project area belonging to third parties, but there will be transitions from already laid cable systems. Project Owner will sign a crossing agreement with the owners of the cables intersecting with the Project. As stated in the opinion letter of Turkish Petroleum Corporation (TPAO) Directorate of Environmental Protection dated 04.07.2017 which is presented in (**Annex-5.A**), the three-dimensional seismic data acquisition activity of TPAO (Tuna / Danube 3D) to be launched in November 2017 in an area of 7.5000 km^2 in the Western Black Sea with an offshore license no 3921 is planned to last approximately 6 months. The Tuna / Danube 3D area has not been finalized yet. In addition, the exact location of an exploratory well (Riva-1) which is planned to be launched in 2019 in Western Black Sea and which holds an offshore license no 3920 is not yet known however it is estimated that it will not deviate greatly from the designated location. In order to avoid an overlap between the construction stages of the Project and these future works, works in the scope of the Project shall be carried out with the continuous coordination between the Project Owner and TPAO.

The pipeline will be positioned in accordance with the future agreements for third party zones and / or cable crossings along with relevant permits (with directional changes, if necessary) and will be constructed within the prescribed measures.

The type and extent of seabed intervention, which may be necessary, is described in the following sections. While the locations of these measures are not yet known, there are various intervention methods and within each method a wide range of alternatives exist, which may be applied depending on particular circumstances such as water depth, burial depth or soil conditions. Detailed information on special transitions in the Offshore and Shore Crossing sections are provided in Section 1.13.2.5.

1.11.3.3.2 Landfall Section

Existing third-party services will be positioned, marked, protected or directed in accordance with contracts made by their owners and related permissions. All these services will be protected by leaving the agreed distance between the pipeline and existing services through excavator felts or geotextile material covering and blockade protection. Where necessary, gaps will be included to support these services. For buried facilities, during pipe laying, the pipeline contractor will find these services and will record the depth, type and dimensions through manual excavation. Alternatively, it may be necessary to disconnect existing lines or change their routes, after reaching a mutual agreement with the third party owners of these services (including underground communication cables). The final decision will depend on the negotiations with the third party owners of the structures (owners /operators of public services and infrastructure) and on detailed design work. Construction activities will be coordinated with the third party owners / operators of the structures. All requirements of crossing agreements or similar arrangements shall be respected. In case of a discovery of aerial cables, appropriate markings, work practices and worker trainings shall be ensured.

As explained above, the pipelines belonging to the Project intersect with the roads or pipelines fully owned by İSKİ. According to the opinion letter (**Annex-5.A**) of İSKİ Department of Research-Development and Planning dated 05.09.2017, the existing Ø4500 Ç, Ø2200, Ø1800 Ç main water pipelines will be preserved and will not be harmed in any way during the prospective drilling activities. In order to be able to operate in the said areas, a permit stating that there is no harm in undertaking the said activities within these areas allocated to İSKİ by the Regional Directorate of Forestry will be obtained from the Regional Directorate of Forestry. Following the reception of permits, static calculation report containing the analysis of the road projects to be used, water pipeline's pipe wall thickness in terms of the prospective additional traffic and filling loads as well as the forestry allocation document will be submitted to İSKİ for approval. Necessary applications will be made to ensure that an observer from İSKİ's Department of European Water Pipeline and Distribution is present on site throughout the construction phase.

Information on special crossings in the Landfall Section is provided in Section 1.13.2.7.

The planned pipeline route in the Landfall section of the Project will cross Sazlıdere stream. The crossing technique will be determined via detailed surveys. The necessary approvals for the crossing will be obtained through negotiations with DSI and other relevant official institutions.

1.11.3.4 Heaters

In order to heat the gas, there will be 12 heating systems (6 for each pipeline, total of 102 MW thermal capacity), each with a power of 8.5 MW, and the heaters will be powered by the gas obtained from the system.

1.11.3.5 Monitoring Metrology Equipment

The E&I equipment required to monitor the operation of the Pipeline will be initially housed in containers or in buildings located within the RT. The monitoring metrology equipment will continuously measure the gas composition (including water and hydrocarbon dew point), temperature, flow rate and pressure of the gas being transported.

1.11.3.6 Emergency Shutdown

Local emergency shutdown systems will be installed at the RT. Should there be an incident (unplanned event) the ESD System will be activated and the pipelines will isolate themselves. The gas volume in the pipelines will then be automatically isolated from the RT, by closing the landfall facilities inlet and outlet ESD valves, thereby maintaining a constant gas inventory within the offshore pipeline.

The underlying principle is to stop the supply of gas to a fire (should there be one), and at the same time maintain a constant gas inventory within the pipeline. Detailed information on emergency shutdown has been provided in Section 1.13.4.4.

1.11.3.7 Block Valves

Each pipeline within the RT will be equipped with numerous block valves. The block valves enable segments of pipes or various pieces of equipment to be isolated for maintenance work.

1.11.3.8 Pipeline Inspection Gauge (PIG) Trap Facilities

Bidirectional permanent PIG traps, one on the Russian landfall facility and one on the Receiving Terminal, will be constructed for each 32-inch pipeline. PIG traps are used for inserting smart PIGs into a pipeline then launching, receiving, and finally removing them without gas flow interruption. The PIG traps will be used to send and receive PIGs during pre-commissioning tests, whereas during the Operational Phase they will be used to receive PIGs only. PIGs are used for activities such as checking for defects (gauging), cleaning, drying and inspection of the inside of the pipeline.

There will be no need to utilise PIG under normal operating conditions due to the gas compound to be transported in the pipelines. However, internal examination of pipelines will be carried out periodically using PIG. Hence, the system will be designed so as to be capable of sending and receiving PIG from one PIG trap to another.

1.11.3.9 Vent System

The venting system is designed for venting the current gas in the RT (and PIG trap area) during pipework, to the atmosphere (to depressurise) via two separate vent systems in cases of planned shutdown of the pipelines. The vent pipes shall be installed on 2 vent stacks with a maximum height of 50 m. The height of the vent stacks could be reduced during the FEED.

Flow of gas to the vent stack is controlled via the measuring vent at the outlet of blow down valves (BDV). The BDV and the measuring vent are connected to the local vent pipe.

During normal operations, the vent stack will not emit any gas. Venting will normally take place during planned maintenance or shutdown activities that may require gas within certain areas of the Receiving Terminal to be released to atmosphere as well as during emergencies. In the event of an emergency such as a fire or gas leakage, first intervention to the vent system after the alarm has been activated will be manual. After a certain period of time, pressure decreasing will automatically start unless the operator starts or cancels the venting operation.

The vent stack will be fitted with appropriately designed silencers to reduce the noise associated with the venting process. There will be no flaring from the vent stack.

1.11.3.10 Telecommunication System

A Telecommunication System will be installed at the RT. The Telecommunication System will be designed to require minimum operator activity while operating under normal conditions. Use of a service with high bandwidth with high availability is planned. Accordingly, for the Telecommunication System, broadband terrestrial connection will be used as the primary transmission technique. A backup terrestrial connection or satellite connection will be used as the backup transmission technique.

Except for PIG operations requiring in situ personnel, operation and control including commissioning and closing of pipelines will be ensured remotely from a control room and Central Control Room (CCR) and Backup Control Room (BUCR) located in the Receiving Terminal. These two control rooms will be located in the Netherlands and will operate 24 hours and seven days a week like the control room at the Receiving Terminal.

Central Control Room (CCR) and Backup Control Room (BUCR) will be interconnected and connected to the Russian Landfall Facilities and the Receiving Terminal in Turkey via a secure Wide Area Network (WAN) system. WAN structure is a system established to enable data communication between the personnel and systems present at the Receiving Terminal and the personnel and systems on other locations (Central Control Room (CCR), Backup Control Room (BUCR), BOTAŞ –the operator company of the pipeline section on Turkey side, Remote Security and Landfall Facilities in Russia).

Connection of the Receiving Terminal of BOTAŞ line and/to the Receiving Terminal of the Remote Security Contractor will be confirmed mutually. Technical requirements for the information security system of the Receiving Terminal will also be met for these two connections. These two connections will be linked to the Receiving Terminal Local Area Network (LAN) via a firewall. If necessary, to connect the BOTAŞ line and the Remote Security Contractor to the Receiving Terminal, alternative types of connection that are approved in detailed design phase may be used.

In the event of failure of these two WAN connections, an alternative connection will be established with a Very Small Aperture Terminal (VSAT) System. This system secures the connection between the Central Control Room (CCR), Backup Control Room (BUCR) and the Russian landfall facilities.

1.11.3.11 Auxiliary Facilities

1.11.3.11.1 Fire and Gas Detection System

The purpose of the Fire and Gas (F&G) detection system is to protect and alert personnel and area from the consequences of a fire and/or gas release. The F&G detection system is a safeguarding system which acts completely autonomously from other safety systems. A large number of strategically located detectors will be found in the Fire and Gas Detection System of the RT.

When a failure occurs in a Security Guard System (SGS) transmitter or at the restarting, the transmitter is deactivated or bypassed. Special operating procedures will have to be implemented throughout the replacement of the transmitter and tests because of the decreased of the pipeline protection. Temporary deactivation of the transmitter is allowed only upon the application of strict operating procedures during restarting or commissioning. Deactivation can only be done for a very short period of time and is not considered part of the operation. Operating procedures to be followed during the deactivation will be included in the Operating Guideline to be developed at the detailed design phase.

In an emergency case, the RT will be isolated from the offshore pipeline. In this scenario, gas in the isolated section of the RT can be vented if this is required to prevent escalation of the emergency. In case of a gas fuelled fire at the RT, rapid isolation of the leak will be undertaken as quickly as possible. This will reduce the amount of any gas leak and will limit the duration and intensity of possible fires. The rapid initiation of the isolation provisions will occur following detection of a gas leak or fire by the installed alarm systems.

In the unlikely event that the gas cloud from the vent stack ignites during the ventilation, the vent stack will be designed in accordance with this scenario so that no dangerous situations arise. In the event of a fire at the RT, the required measures in accordance with the Emergency Response Plan will be implemented.

1.11.3.11.2 Drainage

To prevent possible surface water contamination, sediment and erosion control methods will be applied to manage the surface flow and to limit land loss from the field, including appropriate drainage systems on construction sites. Drainage systems will be able to separate the sediments from the drained water and will also contain oil separators. The RT will have an appropriate surface water drainage system. The design of the drainage system will be finalised during the detailed design phase by the Project engineers and will conform to applicable relevant legislation.

1.11.4 Proposed Pipeline Route

The proposed route for the project was selected after the alternative route evaluation process described in Chapter 4 (Grounds for the Route Selection and Assessment of Alternatives. Detailed information on the planned route of the pipeline is also provided in Section 1.9.

Unless seabed bathymetry or environmental risks will dictate otherwise, the pipelines will in general be laid parallel to one another in a corridor (the width of which will be agreed with relevant Turkish authorities) in as straight a line as possible following the pipeline route identified during the front end engineering and design stage to minimize the total length of the pipeline.

The design and routing of the Offshore Section of the pipeline have been carried out in accordance with the various studies mentioned in Section 1.13.1 and detailed in other sections of the EIA. However, a number of detailed surveys will be required before, during and after installation of the pipelines to ensure they avoid any obstacles, are laid along the correct route and are laid without defect. The results of these survey will dictate the final route configuration.

1.11.5 Coastal Marshalling Yards

The Project will require the procurement of materials, equipment and labour from locations in Turkey and from abroad. Established road and sea transportation routes will be utilised during the Project.

The Marshalling Yard would be used to receive line pipe from the supply mills, store that pipe, and finally facilitate the load of the pipe to the pipe supply vessels that would deliver it to the pipe-lay vessel. Activities that are likely to be undertaken at the ports of Turkey in support of onshore construction include:

- Temporary storage of pipes to be used in the Project;
- Delivery of pipes to the pipe-lay vessel via pipe supply vessels;
- Load out of pipes to the Landfall Section construction area via road transport;
- Receipt, temporary storage and load out of equipment and supplies to the landfall section construction spread;
- Receipt and storage of wastes from vessels generated during construction of the Nearshore and Offshore Section construction spreads prior to onward transport to suitably licensed waste handling facilities;
- Base for the supply vessels necessary to deliver construction materials;

Wastes from the vessels to be used in the scope of the Project will be managed in the framework of the provisions of the Regulation on Reception of Wastes from Ships and Waste Control enacted upon publication on the Official Journal dated 26.12.2004 and numbered 25682.

The existing ports in Turkey will be used during construction and commissioning phases of the Project. Samsun and Trabzon Ports were inspected in order to assess their feasibility of usage. For this reason, the Project Owner carried out an environmental status assessment in Samsunport on 2 February 2017 and in Trabzonport on 8 March 2017 to evaluate the possibility of being used to support the activities listed above. The findings of the environmental status evaluation conducted in the ports of Samsun and Trabzon are summarized below.

As stated in the letter of MoEU, EIA and Directorate General of Permit and Inspection dated 05.06.2017 (**Annex-5.A**), the provisions of the Law on Environment no 2872 and of related regulations shall be respected and necessary permissions shall be obtained in accordance with the legislation in force for the port(s) to be used within the scope of the Project.

1.11.5.1 Assessment of Samsun Port as the Coastal Marshalling Yard

Samsunport is located on the Black Sea coast north of Turkey. Located about 650 km from Istanbul, the Port is one of the biggest commercial ports in Turkey. The Port is situated in an industrial setting, in close proximity to the city centre of Samsun. According to Samsunport representatives, the nearest residential units to the port are located approximately 300m to the west. A summary of the land uses surrounding the Port is provided in Table 1.9 below.

Table 1.9: Summary of Land Uses surrounding Samsunport

Direction	Land Use	Notes
North	Industrial Free Zone, including a Highway Authority bitumen plant, Coast Guard Command and a depot operated by the Regional Transportation Directorate.	A redundant above-ground asphalt pipeline connects a dedicated berth in the far west of the Port to the bitumen plant.
East	Black Sea.	-
South	Access roads, commercial and administrative buildings.	-
West	Access roads, commercial, administrative and residential buildings.	Nearest residential units to the port area are approximately 300m to the west.

In terms of operational activities at the port, Samsunport operates 24 hours per day (three 8-hour shift system) provides "general port services" handling a range of cargos including dry bulk cargo, general cargo, liquid bulk cargo and containers. According to the declaration of Samsun Port authorities, the freight handling amount in the port is approximately 3.000.000 tons/year.

According to Samsunport representatives, the port site has been used for maritime trade activities (in part) between the 1920s and 1940s and has been a fully operational commercial port since the 1950s.

The scope of the port services considered for the project can be summarized as the handling, storage and delivery of the pipes to the Project Site. It is foreseen that pipes will be transferred by South Stream Transport B.V. to Samsun, after which they will be stored until required by the pipe-lay vessel(s). Inbound and outbound transfers of the pipes to the port are planned to be done by sea.

Samsun Port has the International Ship and Port Facility Security Code (ISPS) Certificate in line with the security measures prepared by the International Maritime Organization (IMO) regarding maritime safety. The port has also been reported to have an approved Safety Plan. As part of the ISPS system, the port has a closed-circuit camera system (135 cameras which can rotate 360^{o} , night vision) and 24-hour surveillance (provided by a team of about 29 security personnel).

Samsunport has an Environmental Management System with ISO 14001 certification.

Samsun Port has the following insurance certificates which are valid:

- Coastal Facility Marine Pollution Liability Insurance; and
- Hazardous Substances and Hazardous Waste Financial Liability Insurance.

Wastes from ships that will be generated due to 32project activities (wastes defined in MARPOL 73/78) will be managed in the framework of the provisions of the Regulation on Reception of Wastes from Ships and Waste Control enacted upon publication on the Official Journal dated 26.12.2004 and numbered 25682.

It is not expected that Project activities will cause any significant environmental impact on the port and its environment, as the services proposed for the project will be carried out within the normal and routine activities of the port.

The findings that have been identified during the environmental status assessment are summarized below:

- According to Samsunport officials, there will be no need for port repair or special dredging for the Project;
- Samsunport must ensure that all required environmental permits, licenses and exemptions are provided (and valid) before the TurkStream Gas Pipeline Project activities begin;
- Samsun Port should define within the Waste Management Plan what the disposal/recovery options for wastes such as bevelling waste, pipe heads etc. due to project activities and agree with the Project Owner on such options;
- The Samsunport should periodically conduct visual inspections of the rainwater outlet channels connected to the areas used for TurkStream Gas Pipeline Project in order to check whether there is any sign of pollution of oil or other pollutants;
- Regarding fuel storage tanks, Samsun Port should implement secondary protection, and refuelling procedures to reduce the environmental risk associated with potential fuel spills;
- The Samsunport should ensure that there are appropriate spill kits on the berth, main pipe storage areas; and
- Appropriate secondary protection (overflow/spill trays) should be provided for all hazardous materials used and/or stored within the scope of TurkStream Gas Pipeline Project. In addition, risk assessments for chemicals must be prepared and appropriate checks should be made in line with safety forms.

1.11.5.2 Assessment of Trabzon Port as the Coastal Marshalling Yard

Trabzon Port is located on the northern Black Sea coast of Turkey, approximately 590 km north-east of Ankara. The port is located in a region close to Trabzon city center and in a commercial/industrial settlement area. The closest residential units to the Port are located about 50-75 m south of the port and continue to the west along the D010 Highway. A summary of the land uses surrounding the Port is provided in Table 1.10 below.

Table 1.10: Summary of Land Uses surrounding Trabzon Port

Direction	Land Use	Notes
North	Black Sea.	-
East	The Black Sea, cement factory, D010 Highway	The cement plant is reported to be shut down.
South	Trabzon Free (Industrial) Zone, D010 Highway and commercial buildings and residences	The Free Zone also includes commercial logistics users who are part of the Albayrak Group.

Direction	Land Use	Notes
West	D010 Highway and commercial buildings and residences	-

Trabzon Port operates according to the demands of its customers and is able to provide services 24 hours a day if necessary. Trabzon Port provides "general port services" including handling of bulk dry cargo (grain, coal and finished metals), general cargo and containers (approximately 10.000.000 tons per year).

According to Trabzon Port authorities, the port site has been used for maritime trade activities (at least in part) for a century and has been a fully operational commercial port since the 1950s.

The scope of the port services considered for the project can be summarized as the handling (using mobile container cranes and container stacker), storage and loading of the pipes to be sent to the Project area. It is envisaged that the pipes will be transferred to Trabzon by sea from Russia and/or Bulgaria and then stored until required by the pipe-laying ship. Inbound and outbound transfers of the pipes to the port are planned to be done by sea.

It is also possible that the pipe supplying contractors of the Project Owner may ask to be allocated a temporary site from the Trabzon Port for a pipe repair workshop.

The Trabzon Port has the ISPS Certificate in compliance with the safety measures prepared by the International Maritime Organization regarding maritime safety. The port has also been reported to have a Safety Plan approved by the Ministry. As part of the ISPS system, the port has a closed-circuit camera system and 24-hour surveillance (provided by security personnel).

Trabzon Port has an Environmental Management System with ISO 14001 certification.

Trabzon Port has the following insurance documents:

- Coastal Facility Marine Pollution Liability Insurance; and
- Hazardous Substances and Hazardous Waste Financial Liability Insurance.

Wastes from ships that will be generated due to 33project activities (wastes defined in MARPOL 73/78) will be managed in the framework of the provisions of the Regulation on Reception of Wastes from Ships and Waste Control enacted upon publication on the Official Journal dated 26.12.2004 and numbered 25682.

It is not expected that Project activities will cause any significant environmental impact on the port and its environment, as the services proposed for the project will be carried out within the normal and routine activities of the port.

The findings that have been identified during the environmental status assessment are summarized below:

- According to Trabzon Port officials, there will be no need for port repair or special dredging for the Project;
- Trabzon Port must ensure that all required environmental permits, licenses and exemptions are provided (and valid) before the TurkStream Gas Pipeline Project activities begin;

- Trabzon Port should define within the Waste Management Plan what the disposal/treatment options for wastes such as threading waste, pipe heads etc. due to project activities and agree with the Project Owner on such options;
- The Trabzon Port should periodically conduct visual inspections of the rainwater outlet channels connected to the areas used for TurkStream Gas Pipeline Project in order to check whether there is any sign of pollution of oil or other pollutants;
- Fuel tanks used in project work areas must be equipped with basic spill prevention/response equipment (overflow pan and spill kits);
- Appropriate secondary protection (overflow/spill pallets) must be provided for all hazardous materials used or stored for the TurkStream Gas Pipeline Project and these items must be clearly labelled. In addition, chemical risk assessments must be prepared and appropriate checks should be made in line with safety forms.
- The Trabzon Port should ensure that there are spill kits on the berth and main pipe storage areas. These kits must contain basic materials and equipment compatible with International Good Industrial Practices.

1.11.6 Numbers and Characteristics of the Vessels, Machinery and Equipment to be Used in the Project

1.11.6.1 Construction Phase

1.11.6.1.1 Vessels and Equipment Planned to be Used for Offshore Construction

Information on the vessels to be used for construction activities of the Offshore Section is based on the general characteristics of the vessel type designated for the type of ship to be used, as the vessels to be used in pipe-laying operations are not yet finalized. A summary of how long they will need to stay for the project (only in waters of Turkey and Turkish EEZ) as well as the ship types and numbers to be used is provided in Table 1.11. The primary vessel will be the pipe-lay vessel. Other vessels participating in the pipe-lay process will be the support vessels (surveys, crew change) and supply vessels (pipes, fuel and provisions). Information on the ship's fleet will be subject to future updates from the pipe-lay company.

Table 1.11: Offshore Construction Vessels and Their Technical Specifications

Construction Activity	Type of Vessel	Task	Number of Vessels	Indicative Duration (Days) Per Vessel and per Pipeline (unless stated otherwise)	Indicative Vessels	Power Rating (kW)	Persons on Board	Utilisation (%)
Pre-Lay Seabed Intervention / Preparation Works (e.g. for cable crossings, preliminary examinations and procument)	Rock dumping vessel	Cable crossings	1	8 days	Rockpiper	15,192	60	60
	Survey vessel	Surveying the sea floor during intervention works	1	8 days	Normand Poseidon	8,400	50	60
	Multi service vessel (MSV)	ROV support, Diving support, Consumables supply, Bunker supply, Provisions supply, Water supply	1	8 days	Highland Navigator	7,160	50	60
	Fast supply vessels	Crew changes	1	1 day (2 half day trips)	GSP Lyra	2,520	70	60
	Maintenance vessel	Provisions delivery, delivery of spare parts	1	1 day	Normand Flipper	7,160	16	60
	Fuel/wastewater collector vessel	Bilge and wastewater collection	1	1 day	Bryansk	610	5	60
	Rescue vessel	Safety and rescue operations	1	Only required in case of emergency	GSP Vega	9,548	23	60
Offshore Pipe-laying >30 m water depth	Offshore pipe-lay vessel	Deep water pipe-laying	1	76 days Plus 38 days running at 25% capacity for mobilisation/demobilisation	Pioneering Spirit	95,000	571	40
	Tugs	General support	1	As above	Normand Neptun	13,880	40	60
	Pipe-lay supply vessel (PSV)	Supplying pipe to pipe-lay vessel	5	As above	Spliethoff E-type	5,430	16	60
	Survey vessel	Surveying the sea floor in front and	2	As above	Normand Poseidon	8,400	50	60

Construction Activity	Type of Vessel	Task	Number of Vessels	Indicative Duration (Days) Per Vessel and per Pipeline (unless stated otherwise)	Indicative Vessels	Power Rating (kW)	Persons on Board	Utilisation (%)
		behind the pipelay vessel						
	Multi service vessel (MSV)	ROV support, Diving support, Consumables supply, Bunker supply, Provisions supply, Water supply	2	As above	Highland Navigator	7,160	50	60
	Helicopter	Crew changes	1	4 days (8 half day trips)	Super Puma	1,200	10	60
	Crew boats, fast cats (back-up option)	Crew changes	1	2 days (4 half day trips)	GSP Lyra	2,520	70	60
	Maintenance vessel	Delivery of spare parts / equipment	1	4 days	Normand Flipper	7,160	16	60
	Fuel/wastewater collector vessel	Bilge and wastewater collection	1	4 days	Bryansk	610	5	60
	Rescue vessel	Safety and rescue operations	1	Only required in case of emergency	GSP Vega	9,548	23	60
Post-lay Seabed Intervention Works (e.g. for free span correction and surveys)	Post-lay trenching support vessel	Post-lay trenching for free-span correction (if required)	1	15 days	Calamity Jane	15,086	72	60
	Survey vessel	Surveying during intervention works	1	15 days	Normand Poseidon	8,400	50	60
	Fast supply vessel	Crew changes	1	1 day (2 half day trips)	GSP Lyra	2,520	70	60
	Maintenance vessel	Provisions delivery, delivery of spare parts	1	1 day	Normand Flipper	7,160	16	60
	Fuel/wastewater collector vessel	Bilge and wastewater collection	1	1 day	Bryansk	610	5	60

Construction Activity	Type of Vessel	Task	Number of Vessels	Indicative Duration (Days) Per Vessel and per Pipeline (unless stated otherwise)	Indicative Vessels	Power Rating (kW)	Persons on Board	Utilisation (%)
	Rescue vessel	Safety and rescue operations	1	Only required in case of emergency	GSP Vega	9,548	23	60

1.11.6.1.2 Vessels and Equipment Planned to be used for Shore Crossing Section Construction

The information for the Shore Crossing Section construction vessels is, as in the case of Offshore Construction, is based on designated vessel types. This is because the fleet, contractor, dredging contractor, and similar information to be used in pipeline laying activities are not yet finalized. The anticipated vessels to be used for the Shore Crossing section of the Project and their technical specifications are provided in Table 1.12.

Table 1.12: Shore Crossing Construction Vessels and Their Technical Specifications

Construction Activity	Type of Vessel	Task	Number of Vessels	Duration (days) per vessel	Indicative Vessels	Power Rating (kW)	Persons on Board	Utilisation (%)
Shallow Water Pipe-lay Activities (10-30 m water depth) and Pipeline installation	Shallow water pipe-lay vessel	Preparing pipelines and pipeline trains for shore pull in the shore crossing	1	7 days (2 days of pipe laying, 5 days for shore pull) In addition, for mobilization and demobilization, at 25% capacity for 3 days	Tog Mor	3,750	140	40
	Anchor Handling Tugs	Anchoring of the pipe laying vessel	3	As above	Normand Neptun	13,880	15	60
	Pipe-lay supply vessel (PSV)	Supplying pipe to pipe-lay vessel	2	As above	Spliethoff E-type	5,430	15	60
	Survey vessel	Pre-lay, as-built and post-lay surveys of seabed and of pipeline	2	As above	Normand Poseidon	8,400	50	60
	Multi service vessel (MSV)	ROV support Diving support Consumables supply Bunker supply Provisions supply Water supply	2	As above	Highland Navigator	7,160	50	60
	Crew boats, fast cats	Crew changes	1	1 day (2 half day trips)	GSP Lyra	2,520	70	60
	Maintenance vessel	Delivery of spare parts/equipment	1	1 day	Normand Flipper	7,160	16	60

Construction Activity	Type of Vessel	Task	Number of Vessels	Duration (days) per vessel	Indicative Vessels	Power Rating (kW)	Persons on Board	Utilisation (%)
	Fuel/wastewater collector vessel	Bilge and wastewater collection	1	1 day	Bryansk	610	5	60
	Rescue vessel	Safety and Rescue Operations	1	Only required in case of emergency	GSP Vega	9,548	50	60
Excavation of the Open-cut Section and Trenches through Dredging (till about 2km offshore)	Cutter Suction Dredger (CSD)	Dredging of the trenches in the Shore Crossing Section The use of CSD depends on seabed conditions (**it will be used in areas where the seabed is hard**). May be used in combination with TSHD.	1	35-140 days	Taurus II	24,610	30	60
	Back-hoe dredging equipment (BHD) (excavation the rock through dredging)	Potentially, excavation of the rocky section in the outlet section by dredging	1	35-40 days	Nordic Giant	2,085	20	60
	Trailer Suction Hopper Dredger (TSHD)	Dredging of the trenches in the Shore Crossing Section The use of TSHD will depend on seabed conditions (only used in areas with soft sediments). Can be used together with CSD or BHD.	1	7 days	Shoalway	6,666	17	60
	Small survey vessel	Examination of the seabed before, during	1	As above	Dunai	500	10	60

Construction Activity	Type of Vessel	Task	Number of Vessels	Duration (days) per vessel	Indicative Vessels	Power Rating (kW)	Persons on Board	Utilisation (%)
		and after the dredging process						
	Tug	Transporting the CSD and split hopper barge, and transport of water and fuel, etc.	1	As above	Mustang	4,536	8	60
	Crew boats, fast cats	Crew changes	1	2 days (4 half day trips)	GSP Lyra	2,520	70	60
	Maintenance vessel	Delivery of spare parts / equipment	1	2 days	Normand Flipper	7,160	16	60
	Fuel/wastewater collector vessel	Bilge and wastewater collection	1	2 days	Bryansk	610	5	60
	Rescue vessel	Safety and Rescue Operations	1	Only required in case of emergency	GSP Vega	9,548	50	60
Backfilling of the Trenches	TSHD	Transportation of stored sandy / soft excavation material from temporary storage areas and backfilling of trenches with excavation mud	1	50 days	Shoalway	6,666	17	60
	BHD	Removal of passages and backfilling of trenches	1	As above	Nordic Giant	2,085	20	60
	Small survey vessel	Inspection of trenches before, during and after backfill	1	As above	Duna	500	10	60
	Crew boats, fast cats	Crew changes	1	1 day (2 half day trips)	GSP Lyra	2,520	70	60

Construction Activity	Type of Vessel	Task	Number of Vessels	Duration (days) per vessel	Indicative Vessels	Power Rating (kW)	Persons on Board	Utilisation (%)
	Maintenance vessel	Delivery of spare parts / equipment	1	1 day	Normand Flipper	7,160	16	60
	Fuel/wastewater collector vessel	Bilge and wastewater collection	1	1 day	Bryansk	610	5	60
	Rescue vessel	Safety and Rescue operations	1	Only required in case of emergency	GSP Vega	9,548	50	60

1.11.6.1.3 Machinery and Equipment to be used for the Construction of Landfall Section

Machinery, plant/equipment foreseen for pipeline laying with the open-cut technique in the Landfall Section and construction of the RT, as well as the approximate/typical requirements of them are presented in Table 1.13.

Table 1.13: Technical Specifications of Machinery and Equipment to be Used in the Landfall Section

Construction Equipment			Number of Plant / Equipment per Phase				
Equipment	**Power Rating / Weight**	**Activity dB LAeq, T @10m**	**Site Preparation (Inc. access roads and equipment mobilisation)**	**RT (2 pipelines)**	**Trench Excavation (2 pipelines)**	**Pipeline Installation (2 pipelines)**	**Demobilisation / Reinstatement**
Bulldozer	250 kW - 35 t	86	4	2	1	1	1
Grader	87 kW - 22 t	77	2	2	1	1	1
Tracked Excavator	102 kW - 22 t	78	6	2	4	2	2
Tipper Lorry	75 kW - 25 t	85	4	4	2	1	2
Shovel	74 kW - 19 t	76	2	4	2	1	2
Tracked Side Boom	230 kW - 50 t	77	0	2	0	6	0
Tracked Crawler Crane	250 kW - 120 t	75	1	4	0	1	0
Small Mobile Crane	370kW – 60 t		0	2	0	0	0
Large Mobile Crane	450kW – 72 t		0	1	0	0	0
Welding Machines	20 kW – 0,6 t	65	0	6	0	10	0
Pipe Bending Machine	129 kW - 25 t	66	0	0	0	1	0
Generators	250 kW	98	2	10	2	4	2
Mobile Stone Crusher	460 kW		1 to 3	0	0	0	0
Concrete Preparation Plant			0	1	0	0	0
Linear Crane (nearshore only)			0	0	0	1	0

The use of the stone crushing plant on site is considered. With the use of the stone crushing plant, traffic movements will be reduced as reusable stones will be processed on site. There are different types of stone crushing facilities that can be selected depending on the amount of excavation and filling, the material type, the levelling type and the time schedule of the land works. Depending on the size of the crushing plant to be selected 1 to 3 stone crushers may be required. It is predicted that a stone crusher with a capacity of 200 metric tons per hour would be sufficient for such works, although it may vary according to the height of levelling. Figure 1. shows two different types of stone crushing facilities.

Figure 1.10: Typical mobile stone crushers (large diameter (a), small diameter (b))

Although the linear crane is part of the work carried out in the Shore Crossing Section, it will be located onshore. A typical linear crane spread includes:

- Towing winch of 300 metric tonnes (or more);
- A sufficient number of cable pulling sheaves;
- One winding drum;
- One power supply (for crane);
- One control cabinet (for crane);
- One workshop container;
- Containers for towing equipment and spare parts; and
- Generator for winding drum.

A typical crane holding device and a typical winding drum are shown in Figure 1.9.

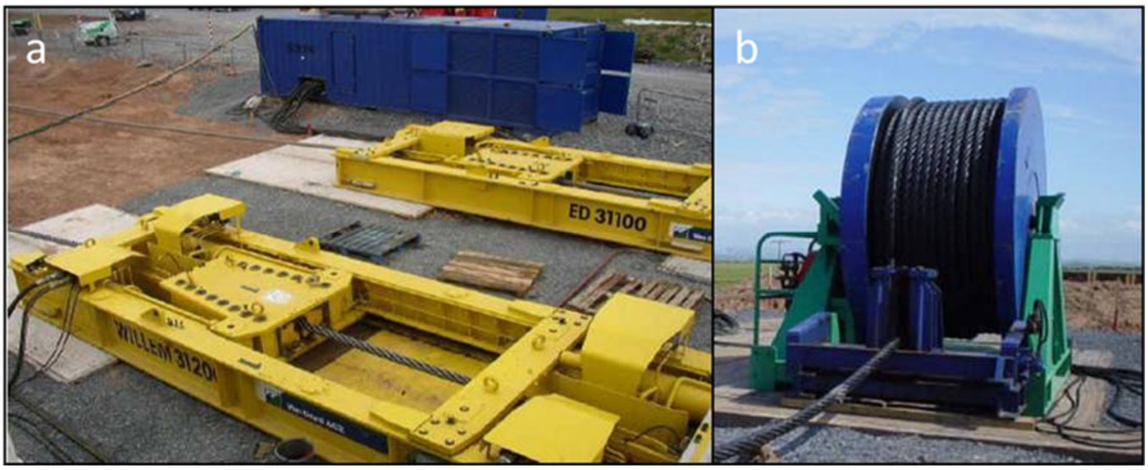


Figure 1.9: Crane holding device (a) and winding drum (b)

The necessary land equipment for the construction of the causeway is provided in

Table 1.14.

Table 1.14: Land Equipment for the Causeway

	Engine Power	Engine Cylinder Volume	Sound Power	Daily Operating Hours	Estimated Duration of Use
Excavator	317 kW / 425 horsepower / 431 PS	763.0 inch cubes	Outside - 106.0 dB Operator - 69.0 dB	10 hours / day	2 - 3 months
Bulldozer	215 horsepower	567.0 inch cubes	-	10 hours / day	2 - 3 months
Truck	365-475 horsepower (268-349 kW)	758.0 inch cubes	-	10 hours / day	2 - 3 months
Wheel Loader	265 horsepower	428.0 inch cubes	107.0 dB	10 hours / day	2 - 3 months

During construction of the Landfall Section pipelines and RT a range of materials will be required. An estimate of the quantities of the main materials to be used for construction of the two Landfall Section pipelines and RT are shown in Table 1.15. Quantities shown are approximate and subject to final optimisation during the detailed design process.

Table 1.15: Materials to be used during Construction of the Landfall Section

Material	Quantity (two pipelines)
Landfall Section Pipelines	
Steel (pipe sections)	14.000 tonnes
Imported Backfill Material (sand or soft earth)	15.000 tonnes
Field Joint Coating (HSS)	1.550 sleeves
Weld Material	35 tonnes
Pre-cast Concrete Jacking Pipes	950 jacking pipes
RT – Receiving Terminal	
Steel (piping and equipment)	9.000 tonnes
Concrete (foundations of piping, equipment and containers)	12.000 tonnes
Imported fill material for site preparation (stone/rock)	30,000m^3 (tonnes)[1]
Field Joint Coating (HSS)	100 sleeves
Weld Material	1 tonnes
Paving Blocks /Slabs (to form areas of hardstanding)	9.000 tonnes
Crushed Rock (paving foundations)	4.800 tonnes
Gravel (surfacing of areas outside paved areas)	9.000 tonnes

Material	Quantity (two pipelines)
Access Roads and Temporary Facilities	
Rocks/stones for access roads	22,000 m^3 (13,000 m^3, of this amount will be used for temporary roads while 9,000 m^3 will be used for permanent roads.)
Asphalt concrete for access roads	1.320 m^3
Rock for temporary facilities' hardstanding areas	33.000 m^3

1. Assuming a bulk density of 1,5 tonnes/m^3.

1.11.6.2 Operation Stage

A standard survey vessel shall be used during the operation phase in the Offshore and Shore Crossing Sections. As the name of the vessel will be determined close to the specified stage, the Normand Flipper was used as an example in this document. The specifications for the Normand Flipper are provided above in Table 1.12.

In the Landfall Section, the RT (including Emergency Shutdown valve stations (ESD) and Pipeline Inspection Gauge (PIG) trap facilities) will be located on an area of approximately 17.5 ha and will consist of the equipment provided under the Section 1.11.1.2.

During operation, some chemicals and liquids will be stored and used at the Receiving Terminal to provide safe and reliable operations. As the exact quantities and types will be determined during the detailed design, an overview is presented in the Table 1.16. In order not to harm the ecological environment and people, necessary precautions will be taken during the detailed design phase in accordance with the related legislation. Detailed information on the subject and mitigating measures are given in the **Chapter 10** (Evaluation of Project Activities).

Table 1.16: Chemicals and Liquids to be used during the operation stage (this is an indicative list)

Chemical	Area of Usage
Diesel	Emergency generator
Glycol	Heaters
Greasing Agent (grease oil)	Emergency generator, valves, workshop, RT maintenance
Cleaning Additive	Workshop, RT maintenance
Fire-extinguishing Additives	Fire-extinguishing system (buildings)

1.11.6.3 Decommissioning Stage

Alternatives in the decommissioning stage as reviewed by this EIA involves either removing the pipeline or leaving it in place. Leaving the pipeline in place will require no construction activity. Equipment that would be used for removal of the pipeline would be evaluated in consideration with the new technologies to be developed at the end of 50 years.

1.12 Definition of Environmental and Engineering Surveys and Their Goals

Two construction methods were evaluated in the EIA Application file of the Project for the Shore Crossing Section, namely micro-tunnels and open-cut. Since the submission of the EIA Application File to the Provincial Directorate of Environment and Urbanisation of Kırklareli (June 2015), a range of engineering studies, geological and environmental surveys and socio-economical assessments have been conducted to determine the pipeline route in the Offshore and Shore Crossing Sections, to optimize the location of the Landfall Section and to select the construction method.

The preliminary assessments made in 2015 assessed the micro-tunnel option as a shore crossing technique and therefore a large part of the environmental and engineering work carried out for the preparation of this EIA Report in the scope of the EIA study in 2015 has been revised or renewed taking into account the pipeline route which has been largely changed for the Shore Crossing Section and the Landfall Section and the open-cut excavation technique as well as the studies carried out in 2017.

The studies which are conducted in order to identify the engineering requirements and environmental restrictions of the project at this stage are summarized below.

1.12.1 Engineering Studies

The design and routing of the Offshore and Shore Crossing Sections of the pipelines have been informed by a number of engineering surveys as outlined in other sections of the EIA. A number of further surveys will be required before, during and after installation of the pipelines to ensure they avoid any obstacles, are laid along the correct route and are laid without defect.

A number of engineering surveys for the pipeline route and the RT site in the Landfall Section were conducted for the preliminary stage. For the final design, detailed engineering surveys will be carried out after detailed inspection permits which will be obtained after the EIA stage.

1.12.1.1 Pre-Construction Surveys

1.12.1.1.1 Offshore and Shore Crossing Sections

Detailed engineering surveys will be carried out before construction on the inspection corridor covering each pipeline route. Pre-lay surveys will be carried out extensively along the pipeline route and ahead of the pipe-laying fleet. The purpose of pre-construction engineering surveys is to verify the projected/planned route surveys, optimize the route and determine the exact route of the pipeline. These engineering surveys will include a full range of geophysical survey techniques, geological sampling techniques (piston cores, box cores, CPT), and visual surveys using a remotely operated vehicle (ROV).

Pre-construction surveys will be used to check the presence of large rock masses or potentially explosive (suspicious) explosive materials/ammunition (UXO) that may be encountered along the selected final route and assess the likelihood of locally changing the route or removing them from the route. The Pre-lay surveys will also be used for seabed preparations works, such as the installation of seabed supports in areas of cable or third party facilities crossing, the pre-lay trenching of seabed (if envisaged by the engineering) or the seabed protection intervention (if necessary).

A dedicated UXO and Cultural Heritage Object (CHO) survey will be carried out in specific locations along the Pipeline route, where detailed desktop studies will have highlighted a higher likelihood of

UXOs & CHOs presence. The UXO survey will be carried out in advance of the pre-lay surveys. According to risk assessment of coincidental findings and information to be obtained from relevant official institutions, identified UXOs will be avoided by changing the route or by repositioning them far away from the pipeline corridor. A UXO Risk Mitigation Plan will be developed by the Project Owner in close conjunction with relevant official authorities. However, a final check for the presence of UXOs will also be undertaken during pre-lay surveys ahead of the pipe-lay spread.

According to the current scenario, it is envisaged to use the Dynamic Positioning (DP) system in order to correctly position the pipe laying vessel in the Offshore Section during pipe laying at depths of 30 m or more. In shallower waters, anchors might also be used for vessel positioning. In this case, a temporary security corridor, which will be calculated by the contractor, will be created on both sides of the pipeline route. Along this corridor, anchors from the pipe-lay vessel, the deployment of which will be controlled by GPS positioned anchor handling tugs, will be laid on the seabed during installation of the pipelines.

If anchoring outside of the survey corridor is required, an anchoring corridor survey will be conducted to determine possible UXO, anthropogenic residues, sensitive environmental habitats, or geological features and CHOs to be protected/avoided.

Where UXO, CHO, sensitive habitats or potentially dangerous debris are detected, anchor safety zones will be established where practicable. The appointed pipeline installation contractor will be required to develop anchor patterns and anchor handling procedures, and undertake a risk assessment to ensure that the areas of concern are not impacted by the anchors or the sweep of the anchor wires.

In addition, the Landscape and Habitat Restoration Plan will be developed in conjunction with a monitoring program, including completion criteria, to confirm that the area has returned to its former state.

1.12.1.1.2 Landfall Section

Pre-construction surveys for the Landfall Section consist of the following studies;

- **Landfall Section and RT Geological Study:** Detailed geological study covering the entirety of the Landfall Section and RT area;
    - Literature review;
    - Geological mapping on site (geology, lithology, stratigraphy, tectonics, hydrogeology, geomorphology).
- **Landfall Section (Route) Topographical Survey:** At the route location;
    - Utilizing commonly used field survey techniques, using total station systems and / or real-time kinematic satellite navigation (RTK GPS) to provide the required tolerance values.
- **RT Topographical Survey:** At the RT location;
- **Access Road Topographical Survey:** At the locations of access roads;
- **Landfall Section (Route) Geophysics Survey:** Ground survey with electrical resistivity method, ground survey with seismic refraction method, magnetometer measurements, karstic (space) survey;
    - *Resistivity:* continuous soil resistivity profile along the route line;

- *Seismic refraction:* High-resolution seismic refraction profiling to create a two-dimensional seismic velocity profile section at a target depth of less than 15 m below ground level;
- *Magnetometer:* Continuous magnetometer profiling along the route line for the detection of metal objects below 5 m of ground clearance, and first potential UXO survey on both sides of the pipeline centreline at 5 m and 15 m wide intervals;
- *Carstic:* Equipment to be clarified, evaluated equipment includes ground radar, seismic break and coupling of seismic reflection data, multi-component seismic and/or microgravity data.

- **RT Geophysics Survey:** Ground survey with electrical resistivity method, ground survey with seismic refraction method, magnetometer measurements, carstic (space) survey;
  - *Resistivity:* Continuous resistivity measurements along the main grid (25 m x 100 m);
  - *Seismic Refraction:* along the long edge with parallel intervals of 50 m up to a depth of 40 m, in the opposite direction with an interval of 200 m;
  - *Magnetometer:* Continuous magnetometer profiling along the route line for the detection of metal objects below 5 m of ground clearance, and first potential UXO survey along the line at 25 m intervals.
  - *Carstic:* Equipment to be clarified, evaluated equipment includes ground radar, seismic break and coupling of seismic reflection data, multi-component seismic and/or microgravity data.
- **Landfall Section (Route) Geotechnical Survey:** Geotechnical surveys covering drillings, trial pits, and the Piezocone Penetration Test:
  - *Drilling:* A series of drilling operations is required; the exact location of the drilling points will be determined through consultation with the designated contractor;
  - *Trial pits:* Up to 3 m depth at 500 m intervals;
  - *Piezocone Penetration Test:* The test will be carried out in accordance with the technical specifications of the Project.
- **Geotechnical Survey of RT:** Geotechnical surveys including drillings, trial pits, Piezocone Penetration Test;
  - *Drilling:* A series of drilling operations is required; the exact location of the drilling points will be determined through consultation with the designated contractor;
  - *Piezocone Penetration Test:* The test will be carried out in accordance with the technical specifications of the Project.
- **Access Roads Geotechnical Survey:** Geotechnical surveys covering drillings, trial pits, and the Piezocone Penetration Test:
  - *Drilling:* up to 10 m depth at 1.000 m intervals;
  - *Trial Pits:* Up to 3 m depth with intervals of 1,000 m;
  - *Piezocone Penetration Test:* The test will be carried out in accordance with the technical specifications of the Project.

1.12.1.2 As-Laid Surveys

A post-lay survey will be performed once each pipeline has been laid on the seabed. The survey will establish the as-laid position (horizontal and vertical), the interaction/separation with the seabed, the potential need of seabed intervention, if not already anticipated by engineering studies, the condition of the pipeline and would comprise bathymetry and other survey sensors in conjunction with visual inspection by remotely operated vehicles (ROV).

It is not anticipated that any post-lay work will need to be done in the Landfall Section.

1.12.1.3 As-Built Surveys

1.12.1.3.1 Offshore and Shore Crossing Sections

After completion of pipe-laying and all seabed intervention, trenching (if necessary), rock placement works (if necessary), cable crossing and relevant seabed support inspection, a "post-lay survey" will be conducted to ensure the pipelines have been installed correctly, to document the condition and to ensure the integrity of the installed pipeline.

All study results shall be shared in writing and electronically with the Ministry of Foreign Affairs of the Republic of Turkey within one month after the completion of the studies, with a preliminary report and the final report within six months after the completion of the studies.

1.12.1.3.2 Landfall Section

Following the construction phase at the Landfall Section, some engineering surveys are planned to be carried out in order to observe the residences in the area where the RT is located. The duration and frequency of these surveys have not yet been determined at this stage.

1.12.2 Environmental Surveys

During the project site selection, in addition to technical and engineering studies, a number of environmental and social reviews have been carried out in order to evaluate alternatives. Detailed information on these surveys has been provided in the relevant sections of this EIA Report.

In addition, within the scope of the Project, environmental surveys were planned, taking into consideration the requirements of the EIA and the views of the members of the Review and Evaluation Commission. While some of the planned environmental surveys were carried out in 2015, the updated status of these reviews and other studies are presented in the relevant sections of this EIA Report.

Environmental surveys include the following; however additional topics could be incorporated into the surveys in accordance with the views of stakeholders and the requirements of the MoEU:

- Marine (landfall and offshore) biology;
- Chemical characteristics of seawater;
- Marine and land archaeology;
- Terrestrial Ecology;
- Bird Watching;
- Monitoring of Air Quality and modelling studies;
- Environmental noise monitoring and modelling studies;
- Surface and groundwater analyses;
- Land Use;

- Assessment of agricultural lands;
- Assessment of forest areas;
- Visual impact studies;
- Land traffic; and
- Underwater noise modelling (at the stage of preparation).

1.13 Scope of the Project Process

1.13.1 Design and Fundamental Engineering Studies

Design and fundamental engineering studies consist of two stages: feasibility and development. Information on the design principles of the project is provided in detail under Section 1.11.3. This stage includes the preparation of feasibility studies evaluating various natural gas pipeline routes and shore crossing options, and developing a front end (conceptual) design. In February 2017, it was decided to implement the open-cut construction method as it is the final decision of the Project Owner. The projected Pipeline Route alternatives are provided below, in Figure 1.10.

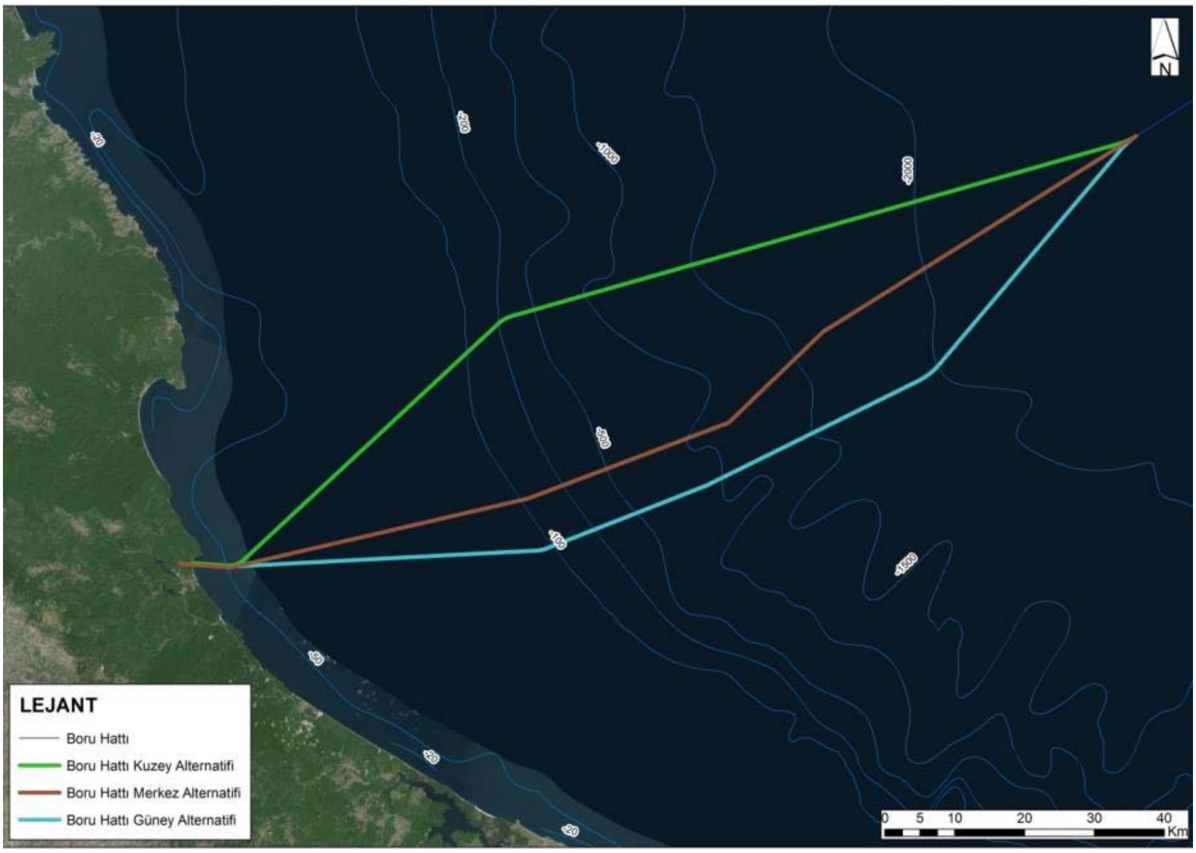


Figure 1.10: Projected Pipeline Route Alternatives

1.13.2 Changes in Construction Activities and Construction Method (Pipe-Lay Alternatives)

In this section Project's construction activities are described. Pipe-lay process is expected to start from KP660 in Turkish EEZ; and will be a continuation of South Stream Offshore Pipeline – Turkish Section Project (Turkish EEZ Section).

1.13.2.1 Offshore Section Pipe-laying Process

Offshore pipe-laying is accomplished by the sequential alignment, welding and lowering of pipes from the pipe-lay vessel. Pipe sections are transported to the pipe-lay vessel pre-coated with polypropylene anti-corrosion coating and internally with epoxy flow coating.

The pipes are carefully stacked on board the pipe-lay vessel using deck cranes. The pipes are then transported using conveyor systems (continuous conveyor belt systems) to the pipe bevelling station where the pipes are made ready for welding. Bevelling (threading) consists of shaping the edge of the pipe, which is to be welded, so that the weld itself fits within the overall pipe profile. The bevelling process produces large volumes of scrap metal which are required to be stored in containers for collection and disposal onshore. Metal scraps from bevelling and weld flux will be collected and stored temporarily in containers in the construction sites in accordance with the legislative requirements before being collected by licensed waste hauliers for disposal. Following bevelling (threading), the pipes are transported to the line-up station, where the pipes are lined up in preparation for welding, using traverse carriage (roller) systems. This is the beginning of the ignition line.

During the production of the pipelines, all the pipe pieces will be welded together. Each weld will be subject to visual inspection and non-destructive examination (NDE) to ensure the weld meets the required specification. Critical processes such as welding will be inspected by the contractor’s quality assurance crew, and thereafter inspected the Project Owner. Following successful weld testing, the pipes move along to the coating stations. The number of coating stations will depend on the pipe-lay vessel used. In the coating stations, field joint coating will be applied to the welds for corrosion protection. For concrete coated pipe sections, infilling of the gap between the concrete ends of the pipe sections will be undertaken with moulded solid polyurethane or polypropylene to ensure a flush outer pipe surface is obtained.

The newly welded, coated and inspected pipeline section is lowered into the water with the pipe laying platform (stinger). This platform is used to lower the pipes into the water by creating a gentle slope profile towards the intended sea depth, reducing the stresses on the pipeline during installation.

Buckle arrestors (pipe reinforcement) are used in the pipeline to avoid buckle propagation in the event of local buckling by placing arrestors at regular intervals and/or in susceptible areas along the length of the pipeline. The buckle arrestors will be welded onto the pipelines in those areas that are susceptible to collapse, local buckling or propagation buckling.

The pipe-lay vessel then advances an appropriate distance (dependent on pipeline string length) by pulling on its anchor lines or utilising dynamic positioning (DP) thrusters, resulting in the pipeline string exiting the pipe-lay vessel via the stinger. Once the pipeline string has exited the pipe-lay vessel, the pipe-lay vessel will stop forward motion to commence work on the preparation and the welding of the next pipeline string.

All pipe-laying will be performed by the S-lay technique. Figure 1.11 below presents a schematic drawing of the S-Lay pipe-laying method. The S-Lay technique requires the load out of single 12 m pipe sections to the pipe-lay vessel. The S-Lay pipe-laying method was originally developed for shallow waters but the method has evolved to be used in deeper water by the use of larger pipe-lay vessels and longer (and more curved) stingers. The average pipe-lay rate for S-Lay technique is expected to be in the order of 3,5 km per day (24 hour period), depending on weather conditions.

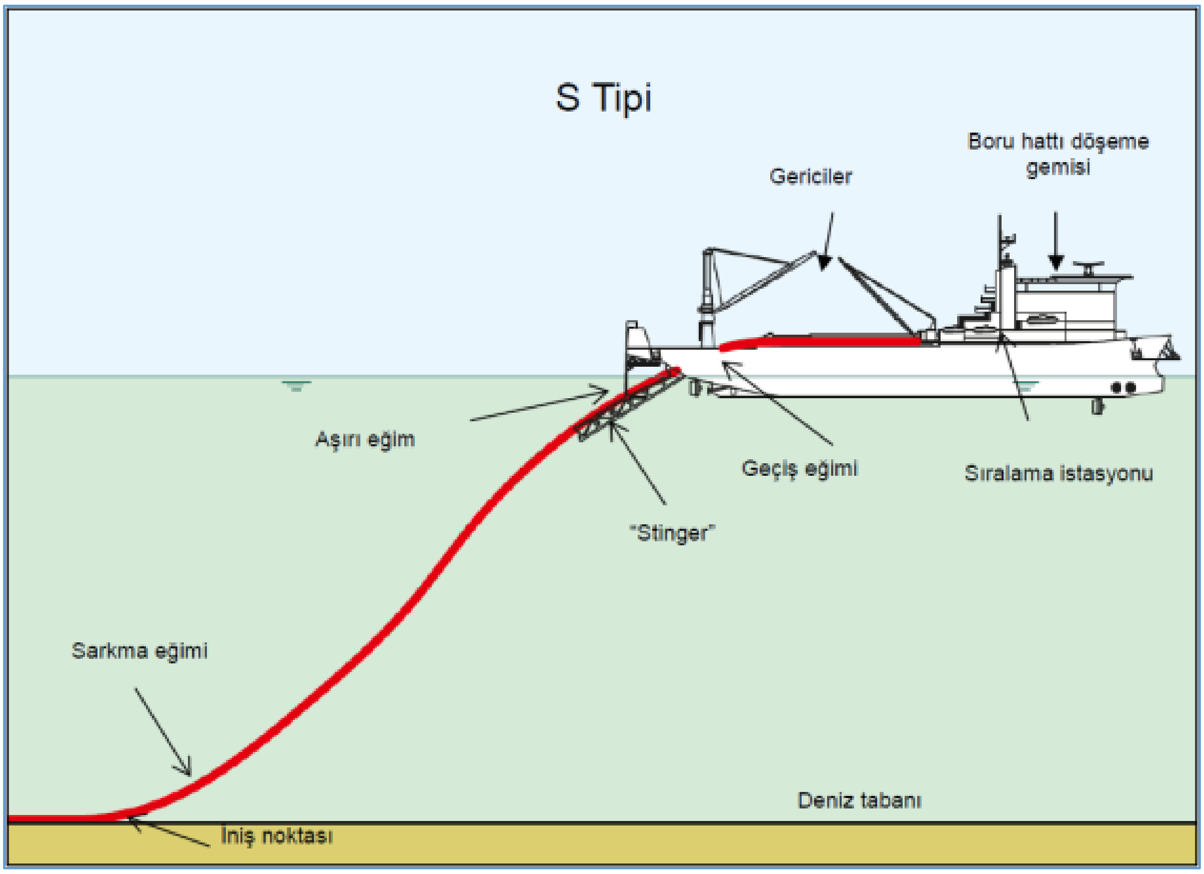


Figure 1.11: S-Lay Pipe-Lay Method

The installation of the offshore pipeline section may require both shallow water and deep water pipe-lay vessels. A shallow water pipe-lay vessel is capable of working in a water depth range of approximately 10 m up to approximately 150 m. These vessels are generally anchored but can also use DP and install the pipeline by the S-Lay method. DP is a computer controlled system that drives the vessels thrusters (directional propellers) to maintain position without the use of anchors. A deep water pipe-lay vessel is capable of laying pipe in water depths from approximately 30 m to any depth required depending on the pipeline dimensions. These vessels are DP. Figure 1. below shows a typical deep water S-Lay pipe-lay vessel.

For the majority of the offshore pipe-laying work the pipe-lay vessel will be manoeuvred along the pipe-lay route using DP. Anchored pipe-lay vessels can potentially be used in water depths of up to 600 m. However, for this Project it is anticipated that anchoring will only be undertaken in the Shore Crossing Section i.e. out to approximately 30 m water depth. In the Shore Crossing Section where an anchored pipe-lay vessel is anticipated to be used, up to 12 anchors may be deployed from the vessel and the position of the anchor itself could be as far as 1.5 km from the centreline of the vessel, depending on the water depth. The details of a typical offshore construction fleet are listed in Section 1.11.6.1.1 - Table 1.11.

During the pipe laying process, contactless monitoring will be carried out to ensure that the pipeline is installed correctly and to avoid areas that are defined as environmentally or culturally sensitive.

Figure 1.12: Typical Deep Water S-Lay Vessel (Image supplied courtesy of '*Allseas, Switzerland*')

1.13.2.2 Offshore Construction Fleet Navigation Safety Zone

During the pipe-lay process, a navigational Safety Exclusion Zone is proposed of 2 km radius (1.1 nautical miles (NM)) for DP vessels and 1.5 km (0.8 NM) radius (depending on the water depth and anchor spread) for an anchored pipe-lay vessel (at 30 m water depth).

However, the navigational Safety Exclusion Zone will not inhibit access of boats to and from any Port or harbour on the coast. It will be ensured at all times that boats/ vessels are allowed passage to their harbour. During construction the exact location of the vessels will be notified to the competent authorities as required by Turkish legislation.

In order to avoid accidents that may occur in the sea traffic, a consensus will be reached through negotiations with the relevant authorities for the construction of a safety exclusion zone of approximately of 2 km radius (1.1 nautical miles (NM)) for a DP vessel and 1.5 km radius (0.8 nautical miles) for an anchored pipe-lay vessel. The relevant marine authorities will then be responsible for informing the other vessels that are under way of the location of the pipe-laying activities and the associated exclusion zones. Furthermore, as laid down in the opinion letter (Annex-5.A) of Directorate General of Shipyards and Coastal Structures of the Ministry of Transport, Maritime and Communications, dated 03.07.2017, although there aren't any important coastal structures near the site where the facility will be built, markings will be placed in areas which will be crossed by the pipes starting from the seaside in such a way to emphasize the importance of the site within those areas and to draw attention day and night.

In addition, the working hours and project coordinates of the vessel routes and vessels to be determined during construction and operation phases of the Project shall be notified to the relevant

Port Authorities, Turkish Naval Forces Command Office of Hydrography and Oceanography, Coast Guard Commands and the Directorate General of Coastal Safety and instructions of these official institutions will be followed.

1.13.2.3 Protecting Pipeline from Floods During Pip-Laying in the Offshore Section

It is expected that a flood prevention device will be developed by the appointed pipe-lay contractor for installation within the pipeline during construction. The device will sit inside the pipeline where the pipeline touches down onto the seabed. As the pipe-lay progresses the device will be moved along the pipeline in the same direction as pipe-laying. The actual means of movement of the flood prevention device will be determined by the pipe-lay contractor during the development of the flood prevention device. However, possible methods are listed below:

- Air pressure from a start-up head;
- Control umbilical connected to the pipe-lay vessel; and
- Power unit powered by battery.

Each device will be designed to be controlled remotely and to allow adequate operation and monitoring control.

In the event that there is a loss of tension or loss of vessel position during pipe-laying causing the pipeline to become overstressed to the point where it ruptures and floods, then the flood prevention device will detect the change in pressure, will activate and seal the pipeline, thus preventing sea water from flooding the pipeline. The damaged section of the pipeline between the flood prevention device and the pipe-lay vessel will then be removed and the undamaged pipeline section (protected by the flood prevention device) will be recovered back to the pipe-lay vessel and pipe-lay will resume.

1.13.2.4 Support Vessels

In addition to pipe-lay vessels, support vessels (e.g. survey, light construction, crew swap) and supply vessels (supply of pipe, fuel and provisions) will be used in the pipe-laying operations. Supply is the process of replenishing the ship with fuel or water. For such operations, the services for which the necessary permits are available will be used. If it becomes necessary to use coastal facilities in Turkey, applications will be made to obtain the necessary permits within the scope of current legislation.

All materials and equipment will be transported by support vessels to the pipe-lay vessel from ports of Russia, Turkey or Bulgaria. As it is agreed with the Ministry of Foreign Affairs of the Republic of Turkey, ship operators shall have received all relevant operating permits prior to construction. As part of the ship's activities, the following measures will be taken:

- Refuelling of ships (except pipe-lay vessels) will take place at designated port facilities;
- In the event that ships are required to refuel at sea (e.g. pipe-lay vessels), necessary safety measures will be taken;
- Refueling will be carried out with properly trained individuals;
- Emergency Response Plans (SOPEP, SMPEP) will be developed against oil spills and leakage response equipment such as appropriate absorbent pads, granules, etc. will be provided; and
- Wherever feasible, all vessels involved in the Project will use the MGO or MDO during the time they are in the Project Area.

1.13.2.5 Seabed Intervention and Special Crossings

In the offshore section, the pipeline will be laid directly on the seabed. This technique will minimize seabed disturbance over most of the Offshore Section. During the pipe laying process, ground monitoring will be done in real time to ensure that the pipeline is correctly positioned, has the required horizontal distance (safety distance), and avoids obstacles. After the pipes are laid on the sea floor, the first seabed survey will be conducted.

However, although the route of the pipelines will be designed to minimise seabed intervention requirements, some intervention may be required in specific areas, either before or after pipe-laying. This is to limit or remove pipeline free span lengths (for example in areas where the seabed is rough and uneven) and to protect the pipelines and cables at cable crossing locations.

The type and extent of seabed intervention, which may be necessary, is described in the following sections the locations where these measures may be necessary are not yet known. There are various intervention methods and within each method a wide range of alternatives exist, which may be applied depending on particular circumstances such as water depth, burial depth or soil conditions. The seabed intervention methods can be divided in two main categories:

- Pre-installation intervention; and
- Post-installation intervention.

Intervention methods that can be used pre-installation include placing of supports by means of dredging and gravel or mattresses in areas where free span pipeline sections are anticipated. For post-installation intervention, a wide variety of methods can be applied. Typical post-construction methods include trenching, rock dumping and placement of mattresses. The various intervention methods that may be applied along the Project pipelines are described below.

At this stage post-installation methods are proposed only for any required free span correction. The reason for this is, in general, that pre-lay intervention methods of pipelines are less risky on pipelines than post-lay intervention methods. It should be noted that where supports are listed as being required, the decision on the method to be employed will be subject to detailed design and preference of the appointed pipe-lay contractor. Pre- and post-installation methods associated with cable crossings are described below.

If free-span correction is required the post-installation seabed intervention methods that could be utilised for the Project include dredging (trenching) to remove shoulder spans and the installation of mass flow excavation and pipeline support structures. Detailed information about these methods is provided below.

1.13.2.5.1 Dredging Process

If support spans are identified, post-lay dredging (trenching after pipe laying) may be necessary to straighten/correct free span sections. This process will be carried out by lowering the pipeline sections in question below the natural seabed level using post-lay trenching techniques.

Trenching can be done by various means. While some equipment are self-propelled, others are pulled by a vessel, and while some make contact with the pipeline, others avoid direct contact with the pipeline and the loads. The method to be applied depends on water depth, soil conditions and burial depth to be achieved. The trenching methods can be grouped into three main categories; jetting, mechanical cutters and ploughing. The method to be applied will be determined by the selected pipe-lay contractor and will be dealt with in future stages in the detailed designs. For each option, a support vessel which will be equipped with special equipment to operate ROV trenching equipment is required. During the dredging activities in the Shore Crossing Section, a consensus will be reached through negotiations with the relevant authorities for the construction of a safety exclusion zone of approximately of 500 m radius (0.3 nautical miles (NM)) around the dredging ship.

The jetting technique lowers the pipeline below the seabed surface through a combination of lateral excavation and high pressure water jetting to displace the sediment from under the laid pipeline. Through this process, the pipeline falls into the opening which is formed underneath. If necessary, the displaced sediment may be pumped over the preceding section of the pipeline to backfill the trench. This method minimises displacement of sediment and benthic organisms herein and requires no temporary or permanent disposal of excavated sediments.

Mechanical cutters cut the soils under the pipeline to gradually lower it under the seabed surface. Mechanical cutters are pieces of equipment fitted with heavy crawlers that allow the cutter to crawl along the surface of the pipeline. This tool typically consists of cutter discs and suction pumps at the rear of the tool that push the excavated soil away from the trench. A support vessel is required to mechanically lower a cutter into the water and carefully position it on the pipeline.

The ploughing technique uses a relatively large structure which is pulled over the seabed, which lifts the pipeline, cuts the soil and deposits it at the side of the trench and finally lowers the pipeline in the created trench. The trench can be left to backfill naturally or the deposited soil can be replaced on top of the pipeline in a successive operation by a backfill plough. A plough requires a support vessel with a large bollard pull and a large lifting A-frame.

1.13.2.5.2 Mass Flow Excavation

An alternative option is the use of a mass flow excavation tool. This tool is an ROV that uses subsea jetting equipment to excavate the seabed. The mass flow excavation tool generates a large volume column of water travelling vertically down to the seabed at high velocity. The water column hits the seabed at high speed, producing a powerful excavation force. This type of equipment allows for localised pre- and post-installation span correction in very deep waters in most soils without risk of damage to the pipeline. The excavation tool is controlled from a support vessel.

1.13.2.5.3 Support Structures

If there are free spans, each free span will also have an artificial structure placed in the middle of the span to provide vertical support to the pipeline at excessive span length locations.

Supports may include structural, mechanical and/or rock berm. The selected support must be stable under earthquake and seabed currents conditions.

1.13.2.5.4 Mattresses, Grout and Sand Bags

Mattresses, grout and sand bags can be placed underneath the pipeline following pipe-lay to provide vertical support. Mattresses are normally installed from a vessel with a crane or a frame with ROV support. Depending on the requirements and marine conditions, there are mats of different types, sizes and thicknesses and they are usually manufactured from prefabricated concrete.

Empty grout bags can be lowered to the seabed on a deployment frame from a vessel by means of ROV manipulation and filling. The empty bag is placed under the pipeline and subsequently pumped full of grout material. The weight of the pipeline is taken over by the grout bag as it fills. The grout then hardens to create a rigid support.

Sand bags, on the other hand, are pre-filled and require the pipeline to be lifted slightly to allow them to be installed underneath the pipeline. This enables the sand bags to carry the weight of the pipeline when it is lowered back down. Sand bags are normally installed from a vessel with a crane or frame with ROV support.

1.13.2.5.5 Rock Dumping

Alternatively, post-installation rock dumping can be undertaken for the post-installation free span correction. Post-installation rock dumping involves the placement of rocks (coarse gravel or small stones) underneath the pipeline to provide vertical support for the pipelines. If necessary, this will be ensured through a pipe extending vertically from the rock dumping ship, so that the stones are placed exactly on the sea floor, under the hanging pipe sections. An ROV equipped with a positioning system will be placed at the lower end of the pipe extending vertically from the rock laying ship to assist in the correct positioning of the stones and a post-installation survey will be conducted to confirm correct positioning.

Rock dumping will be subject to a license that must be obtained from local authorities. For the rock dumping process, stone material which will have a stable chemical and mechanical structure throughout the project life will be chosen. The selected stone material should meet specific durability/strength requirements to ensure the permanence throughout operation phase of the Project. duration. The average size of the rock material will be 50 mm but may range from 20 to 100 mm. There is also a condition stipulating that the material used may not contain any contaminants, such as heavy metals. Material for rock placement will be extracted from approved quarry sites. At the time of preparing this EIA Report, the source of rock material is unknown; rock may be brought from within Turkey or from another country depending on the availability and quality of rock sources. As laid down in the opinion letter (Annex-5.A) of Marine and Coastal Area Department of Directorate General of Environmental Management of Ministry of Environment and Urbanization, dated July 2017, the stone quarry to be determined is required to have a license and a document stating either EIA approval or the non-requirement for EIA. The efforts on this issue still continues and qualified stone quarries shall be used. In line with this, fill material to be used will be ensured to match the criteria so that it does not dissolve in the sea environment, include heavy metals, cause muddiness and sea pollution by diffusing, all in order not to affect the sea environment, and necessary structural measures will be put in place. Before starting the said activities, licence and EIA document (EIA decision) of the selected stone quarry will be submitted to the MoEU.

A safety exclusion zone of approximately 0.5 km radius (0.3 NM) for rock or mattress placement vessels in the Shore Crossing Section will be established during construction to avoid accidents in the sea traffic.

1.13.2.5.6 Mechanical Supports

Mechanical supports come in many different forms and shapes and are designed for specific task and conditions. The foundation of the structure can be adapted to loads and bearing capacity of the soil. This method is suitable for spans of several meters between the pipe and the seabed i.e. where the use of rock dumping is not efficient. Post-installation mechanical supports also give more flexibility during pipe laying. The foundation methods for subsea mechanical structures are generally piling, suction piles or gravity based. Suction piles are generally preferred in deep water where the top soil layer consists of soft sediments because of the ease of installation and their suitability for any free span locations identified during the FEED.

The precise scope of the measures applied during the post-lay seabed intervention can be finalized in the detailed design stage. These measures will be re-evaluated after the pipeline is built and examined.

1.13.2.5.7 Cable Crossing Methods

There are four cables running along the pipeline route, starting from KP660 point until the Receiving Terminal exit point in Turkey. Pipelines will have to be laid along the existing four cables and an additional cable system to be built (depending on the installation calendar of the cable). Crossing points for the existing cables are given below.

- Three of the cables (ITUR, Kilia-Odessa Telegraph Cable and the Caucasian Cable System) are in the abyssal plain; and
- The fourth cable (KAFOS) crossing will be on the continental slope, between the primary shelf border and the secondary shelf border, where the sea bottom dip is 1.5° at most.

Cable crossings will be constructed in a way to ensure that pipelines and cables are positioned at a safe distance from each other. Assessed cable crossing methodologies are explained below:

- For the Caucasian Cable system that is in use and the Black Sea Fibre Optic System (KAFOS) and the out-of-service Italy-Turkey-Ukraine-Russia (ITUR) cable, two support structures are proposed to be installed on one side of the cables before prior to pipe laying;
- Support structures will be placed at sufficient distance so that there is at least 2 m clearance between the cables; and
- The support structure for the Kilia-Odessa telegraph cable, which is thought to be buried and is out-of-service, will be placed on top of the cable prior to pipe laying.

There are plans to lay one more cable in addition to the existing four cables. Depending on the installation calendar, pipelines may have to cross over this cable. General information on cable lines are given below in Table 1.17.

Table 1.17: Deep Sea Cable System Information

Name	Cable Type	Status	Position	Operator	Approximate Distance (km) from the Turkish Coast measured throughout the Pipeline
Italy-Turkey-Ukraine-Russia (ITUR)	Telekom/ LWP	Out-of-service	Abyssal Plain	Rostelecom	190
Kilia-Odessa Telegraph Cable	Telegraph	Out-of-service		Unknown	140
Caucasian Cable System	Unknown	In Use		Caucasas Online	230
Black Sea Fibre Optic System (KAFOS)	Telekom/ Double armour	In Use	Continental Slope	Vivacom	60

Name	Cable Type	Status	Position	Operator	Approximate Distance (km) from the Turkish Coast measured throughout the Pipeline
Romania-Turkey HVDC Interconnection Link	HVDC	In planning phase	Turkish Territorial Waters	Transelectrica S.A.	Unknown

Cable crossings will be on the abyssal plain where the sea bottom is flat, while the cable crossing on the continental slope will be between the primary continental shelf and the secondary continental shelf, where the sea bottom dip is at most 1.5^{o}.

Selection of the construction materials to be used for cable crossings will vary depending on the water depth. Heaps of rock, concrete mattresses or grout bags may be used in shallow waters. Use of rock heaps or grout bags are not suitable options for cable crossings in deep waters. In such points with great water depth, where support of flexible concrete mattresses or use of flexible concrete mattresses is not suitable, cable crossings will be ensured with steel structures supported by mud-mat. In the event that steel structures are used, materials and coating systems that are suitable to the environmental conditions specific to the Black Sea must be selected. Ground conditions are another factor affecting the details of support structures.

Where the sea bottom is composed of sand or rocks, use of rectangular flexible concrete mattresses are planned. Lifting frames may be used to land the concrete mattresses into the sea.

In places where the sea bottom has softer ground conditions, concrete mattresses comprising interlinked concrete beams will be used as support structure.

To meet the requirements for bearing capacity of soil, load of pipelines must be spread to a sufficiently large area. Because the flexible concrete mattresses cannot spread the pipeline load to a large enough area, use of these concrete mattresses as support structure in places where the sea bottom is composed of soft clay is not feasible. A support structure will be used if it is determined that the soil is too soft for the use of concrete mattresses. The support structures made of steel consist of a base plate and rigid bars.

Since there is no life in areas where water depth is greater than 150 metres in the Black Sea according to the Pre-engineering and Design studies and organisms living in a large part of the pipeline route are concentrated in shallow parts of the continental slope and in stream mouths located in the north-western sections of the coast, bottom fishing is not practiced in the majority of the Project pipelines. Consequently, there will be no need to protect these areas because cable crossings in areas where water is deeper than 150 metres will be ensured using heaps of rocks.

The support height will be determined so as to provide a minimum vertical spacing between the cables and pipelines. Taking into consideration the layout of the pipeline and the support structure at the seabed as well as the layout of existing cables; there shall be a vertical spacing of at least 0.3 meters between the pipelines and the existing cables throughout the design life of the pipelines. Where applicable, vibrations in free space will be taken into consideration when determining the size of this gap. This will prevent the cables from over-stress or being crushed by the pipeline crossing over them. Support structures (such as concrete mattresses) will mostly be placed beneath the pipeline, on both sides of the crossing to meet the said vertical gap requirement. However, use of concrete mattresses is not appropriate for cable crossing in the case of ITUR, Caucasian and KAFOS cables because the bearing strength of the ground is insufficient.

In cases where there is no contractual requirement, a cable crossing option guaranteeing the safe operation of pipelines and the existing cables.

To avoid harming the cables and to preserve the minimum vertical gap between the pipeline and the cable throughout the design life of the pipelines, support structures will be placed on one or both sides of the cables.

It is recommended that two support structures are placed on one side of the cables prior to pipe laying for cables that are in operation. Cable crossing support structure will be placed so that there is at least a 2-metre clearance between the cable and the support structure.

Final crossing designs will be subject to separate agreements with cable owners. The illustration of the presumptive crossing technique is presented below in Figure 1.13.

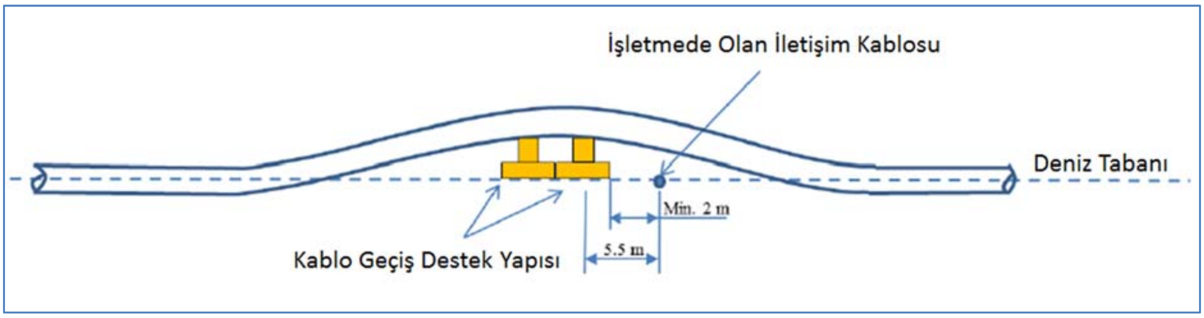


Figure 1.13: Cable Crossing Example for the Existing Cable in Operation

Although the ITUR cable is out of service, requirements for the cable crossing will be determined on the basis of the Project Owner’s decision.

Another out-of-service cable, Kilia-Odessa telegraph cable is presumed buried and the support structure will be placed on the sea bottom prior to the installation of the pipeline so that the structure is above the cable and there is at least a 0.3-m vertical gap between the cable and the pipeline. A drawing of the probable crossing technique is given below in Figure 1.16.

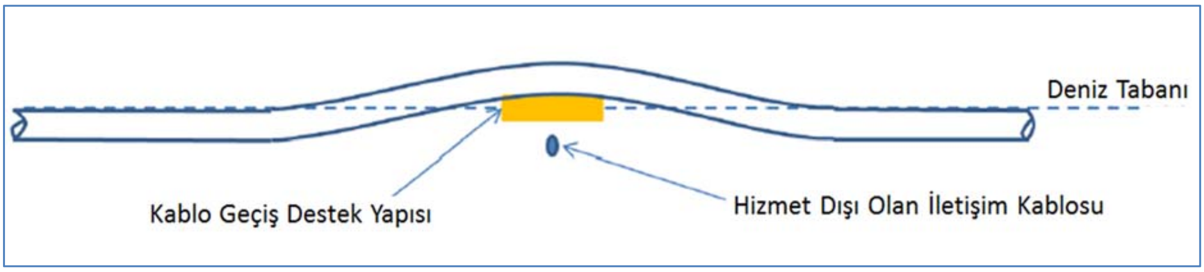


Figure 1.14: Crossing Example for the HOlan Existing Cable

1.13.2.6 Shore Crossing Section Pipe-laying Process

The Shore Crossing Section stretches up to 30 m depth offshore. Pipelines will be installed into trenches of approximately 2.5 m dug by dredging. The minimum cover on top of the pipelines is designed as at least 2.5 m for water depths less than 10 m, and 1 m for the trenched section beyond that point up to a water depth of 20-25 m.

In order to open trenches, wherever possible, sand dredging will be preferred over rocks. The dredged material will be temporarily stored either next to the trenches or temporarily stored in storage areas outside the construction corridor before being used for the backfill of the trenches. For the temporary storage option, the excavated material will be pumped to the temporary disposal site using the Cutter Suction Dredger. Using a backhoe dredger, the excavated material will be stored directly in an area near the trench. The excavated material will be carried to the temporary storage area using the Trailer Suction Hopper Dredger. The list of equipment to be used in the Shore Crossing Section is provided under the Section 1.11.6.1.2 Table 1.12.

Open-cut technique is a relatively simple and frequently used method with the lowest risk level for the Shore Crossing construction. In order to enable the pipeline to be pulled to the shore at the required trench depth, trenches are excavated in the Nearshore section via a backhoe dredger and via an excavator in the Landfall Section.

The causeway (defined in the following sections) shall act as a barrier against sedimentation of the trench and shall also provide adequate protection against wave attacks on the pipelines during the installation. The causeway will be constructed using rock masses and stones in suitable dimensions to create a stable barrier during pipe-lay.

The main activities to be completed in the preparation work for the Shore Crossing Section Construction area are as follows:

- Preparation of access roads;
- The preparation and levelling of area;
- Preparation of causeways; and
- Installation of temporary site installations, including shore pulling equipment and related infrastructure.

After completion of pipe laying at about 30 m water depth offshore, subsea heads used for dropping the pipeline to the seabed and retrieving the pipeline from the seabed will be welded to both pipelines. Following the successful implementation of the pre-operation tests in the Shore Crossing and Landfall Sections, it is necessary to connect (interconnect) the two ends of the pipeline (those in offshore and nearshore) on the sea surface. The connection of the pipeline parts on the water surface will be carried out at a location where the depth of the sea is about 30 m, after which the pipeline will be lowered to the sea bottom and placed there.

1.13.2.6.1 Causeway Construction

Causeways are considered to be built to protect the trenches from sea movements where the open-cut shore crossing technique is implemented (depending on the bottom dredging equipment).

In this method, protective barriers against waves are formed on both sides of the trench from the rocks and stones brought to the area. The layout of the causeways is outlined below in Figure 1.15. Implementation projects of causeways will be created after detailed field studies.

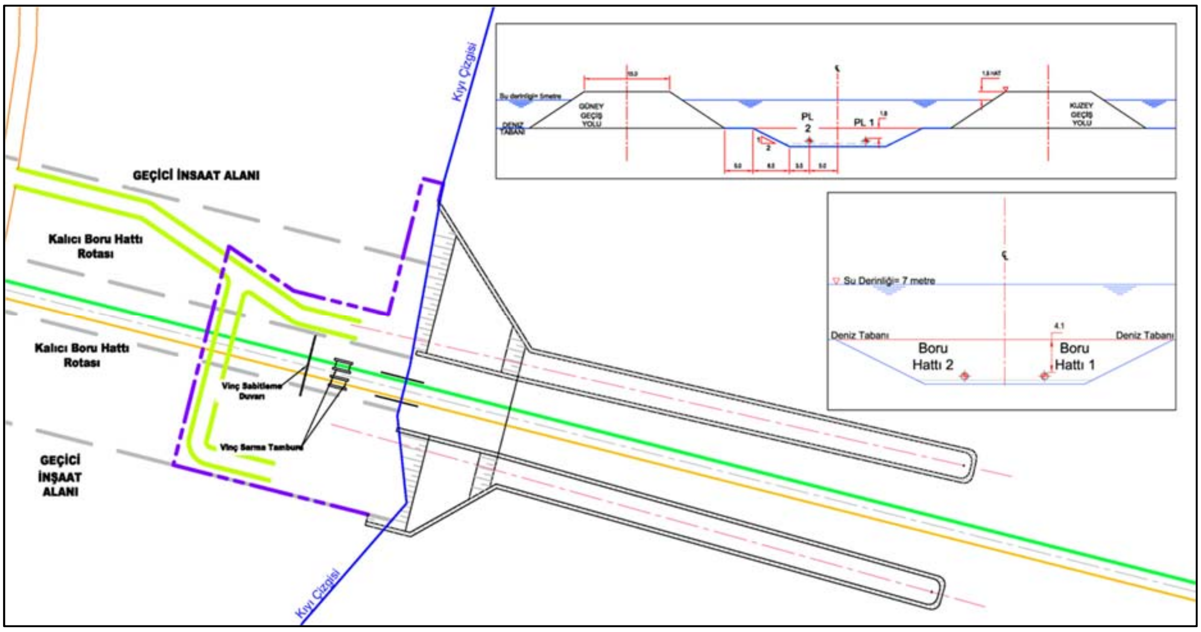


Figure 1.15: Causeway Layout Plan

The innermost layer of the causeway (core) can be constructed using materials extracted from quarries, while the outer layer called the protective layer is composed of rocks. This protective layer will provide protection and resistance against strong winds and sea movements that may occur during construction. A filter layer is located between the innermost layer and the protective layer to prevent the materials forming the innermost layer of the passageway from leaking into the voids in the protective layer.

The innermost layer of the passageway will be constructed using dump trucks, supported by bulldozers and/or shovels where necessary. The trucks that start moving on the shore, approach the sea on the causeway in reverse and unload their load at the nearest point to the sea (Figure 1.16). The inner layer is trimmed to the design geometry using an excavator. The excavator can also be used to construct the tip of the causeway. If the excavator arm is not long enough a backhoe on a pontoon can be used.

Figure 1.16: Causeway construction: dump truck (left) supported by shovel and bulldozer (right)

Protective layers are constructed using a backhoe or excavator, and the passageway is constructed step by step. In order to construct the protective layer and the middle filter layer, the core construction is interrupted and the trucks are used to deliver the stone to the excavators or backhoes. When end tipping with dumper trucks resumes, the excavator moves from the causeway.

Some materials will be stored near the site so that the construction can be carried out without interruption due to problems that may arise with the stone quarry and/or traffic.

During the construction phase, there will be a safety zone on the causeway preventing the entry of unauthorized ships or persons into the sea or the shore. This security zone will extend 500 m both to the north and the south of the corridor.

After the installation of the pipes and the backfill of the trenches, the causeways and the rocks will be removed and disposed in accordance with the relevant legislation. In the preliminary design of the causeway, when determining the approximate geometry, the values provided in Table 1. were used.

Table 1. 18: Causeway Design Geometry

	Causeway Geometry
Length	200 m
Crest height	Sea level + 1.5 m
Crest (top) width	7 m
Side Slope	1 V : 5 H
Protective layer thickness	1.5 m
The middle layer (filter layer) thickness	0.75 m

With the aim of preventing the stones from falling into the trench due to the slope of the causeway, a berm of 5 m will be formed from the bottom of the causeway to the edge of the trench.

The stones to be used as the protective layer have to meet certain criteria. These criteria are to be determined during the detailed design of the causeway, but are predicted to be as follows:

- Protective layer density;
- Water absorption capacity (below a value to be specified, generally < 3%);
- Length/width ratio of individual blocks (below a value to be specified, generally <3);
- In addition, the used stones should be durable and not have a structure that can dissolve by absorbing water.

The estimated stone volumes for the causeway are approximately 45,000 m^3 as broken down in Table 1.19.

Table 1.19: Estimated Causeway Volume

Material	Volumes	
Quarry run (core)	16,000 m^3x2	= 32,000 m^3
Filter layer	3,500 m^3 x2	= 7,000 m^3
Protective layer	3,000 m^3 x2	= 6,000 m^3
Total volume	**45,000 m^3**	

In the present scenario, it is envisaged that the materials will be transported by barges to the shore crossing construction site. However, albeit unlikely, in the event that barges are not used and the transport of all materials are to be done by trucks, trucks with a transport volume of 15 m^3 each will be used. In order to limit the truck movements, it is aimed to use the material from the trenches in the construction of the causeway. If the material is to be transported by truck, the determined quarry will be with suitable characteristics and located as close to the site as possible. As laid down in the opinion letter (Annex-5.A) of Marine and Coastal Area Department of Directorate General of Environmental Management of Ministry of Urbanization and Environment, dated July 2017, stone quarries with licenses and documents stating either EIA approval or the non-requirement for EIA will be identified and used. The efforts on this issue still continues. The most suitable stone quarries will have to be selected so as to ensure that delays relating to the operation of transport of the materials to the site as well as delays related to transport of other materials to be used in the construction of causeway are limited and to allow these materials to be stored in designated (licensed) areas. Prior to starting the said operations, license and EIA document (EIA decision) of the determined stone quarry will be submitted to the MoEU.

A list including the power and motor sizes of land equipment estimated to be used for construction of the causeway is shown in Table 1..

Table 1. 20: Presumptive Land Construction Equipment

Equipment	Engine Power	Engine Cylinder Volume	Sound Performance	Daily Operating Hours	Estimated Duration of Use	Estimated Quantity
Excavator	317 kW/425 Horsepower / 431 PS	763.0 inch cubes	Outside - 106.0 dB Operator - 69.0 dB	10 hours / day	2-3 months	3
Bulldozer	215.0 horsepower	567.0 inch cubes	-	10 hours / day	2-3 months	2
Trucks	365-475 horsepower (268-349 kW)	758.0 inch cubes	-	10 hours / day	2-3 months	4
Wheel Loader	265.0 horsepower	428.0 inch cubes	107.0 dB	10 hours / day	2-3 months	2

1.13.2.6.2 Trench Excavation

According to the pipe laying technique, trenches will be excavated as a preparation for the pulling of the pipes to the shore and the excavated material will be temporarily stored. The most favourable scenario is that dredged material will be temporarily stored in a 500 m wide area along the pipelines. Since the material cannot be stored on rocky outcrops or in shallow areas (because it is very close to the beach), it will be stored ahead of the outcrops (i.e., in waters deeper than 12 m without rocky outcrops).

Cutter Suction Dredger

A 'cutter suction dredger' (CSD) can be used to scan the rocks if necessary; however, a ‘backhoe’ dredger (BHD) can also be used if the rock is more suitable for the backhoe dredger. The cutter suction dredger has a rotary cutter head which crumbles hard land into small pieces. For the temporary storage of the material, the disintegrated soil is sucked in by the scanner's pumps and transported to the temporary disposal sites via the floating hose. The schematic view of a typical cutter suction dredger and a floating hose is shown in Figure 1.. The length of the floating hose is determined to be no more than 1 kilometre, as it is more convenient for application. It is possible to use longer floating hoses, but in this case a booster pump must be used. The layout of the trench opened using the cutter suction dredger is in the form of a single trench for the two pipelines.

Figure 1.17: Cutter Suction Dredger with Floating Hose

Backhoe Dredger

If the ground is suitable, a rock hammer (rammer) can be used with a backhoe positioned on a self-elevated pontoon, as shown in Figure 1.. Using a backhoe dredger, the excavated material will be stored directly in a temporary area near the trench. The trench layout opened using the backhoe dredger is a separate trench for each pipeline.

Figure 1.20: Backhoe Dredger on a Self-Elevating Pontoon (Left) and an Elevated Excavator (Right)

Trailer Suction Hopper Dredger

If the trench is backfilled with sediments, it can be cleaned using a 'Trailer Suction Hopper Dredger' before the pipeline is laid. The trailer suction hopper dredger sucks the material on the seabed through a dredging head connected to a suction pipe. Pumps and a floating hose are used, as in the case of the cutter suction dredger, to transport material to temporary storage areas to be stored temporarily. A typical trailer suction hopper dredger is shown below in Figure 1.18.

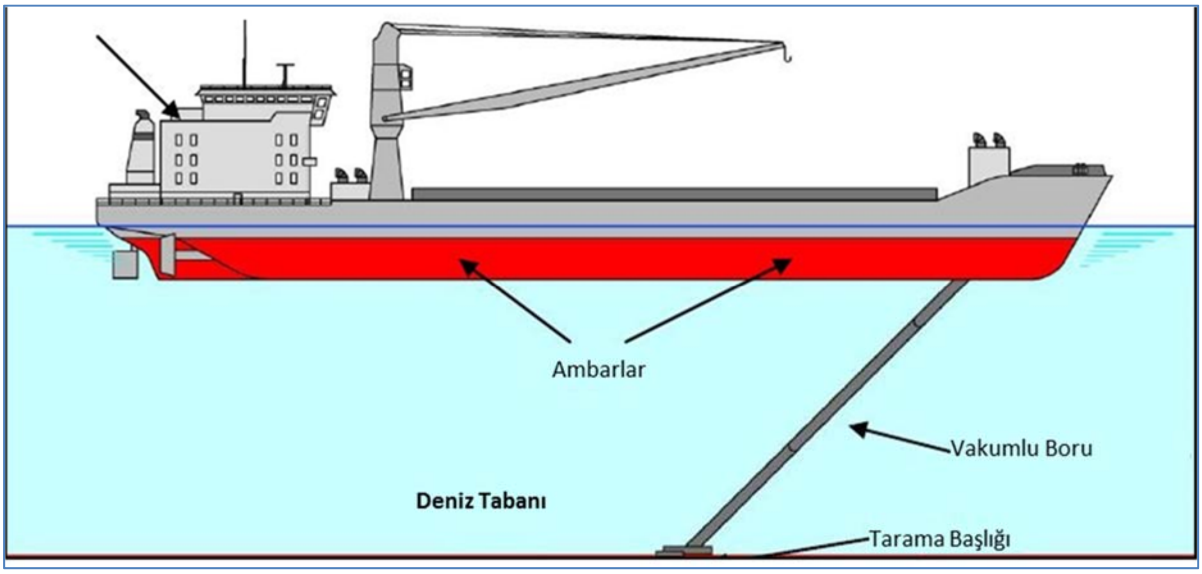


Figure 1.18: Schematic Presentation of a Trailer Suction Hopper Dredger

Regular inspections provide the required depths/sections of the trench by monitoring the progress and size of the excavation. Prior to the pipeline installation, a survey is performed to determine the amount of siltation in the trench. If there is an unacceptable level of siltation, maintenance dredging is required in order to restore the trench to designed depth. Alternatively, the initial dredging phase may require a deeper trench to compensate for sedimentation between completion of trenching and installation of pipeline.

Temporary Storage Considerations

Once the excavated material has been dumped into the temporary storage area, it will sink and sit on the seabed. The fine-grained material will remain suspended in the water for a while during the sinking process. The suspended material may spread out of the temporary storage area due to water currents and wave movements. The excavated material shall be stored as close to the construction site as possible in order to prevent the material from diffusing. In addition, efforts will be made to store the material in areas where currents and wave motion are observed at low levels and the sea is sheltered.

As laid down in the opinion letter (Annex-5.A) of Marine and Coastal Area Department of Ministry of Environment and Urbanization, dated July 2017 the option of reusing the material dredged from sea floor primarily in the land is considered but it is acknowledged to be a more beneficial use to cover the pipelines in the Shore Crossing Section as the Project site on land is located in the forest area. During the period when dumping activities will be carried out, Dredging Environmental Management Plan prepared by The Institute of Marine Sciences and Technology of Dokuz Eylül University and included in Annex-7.B will be received and required permits will be obtained upon application to Kırıkkale Provincial Directorate of Environment and Urbanization or to the MoEU in order to determine the sea areas where the material dredged from sea floor is dumped.

1.13.2.6.3 Dredging Volume

It is envisaged to bury the concrete-covered pipes in trenches dredged. It should be borne in mind that the depth of the trench may show a similar change to the graphic given below in Figure 1. when passing through the outcrops. Soft sediments, the volume of the cover layer on the pipeline and trench width are factors that can increase the amount of material that needs to be excavated. The causeway excavation is usually carried out by excavators on the coast, backhoe dredgers on a pontoon or a cutter suction dredger.

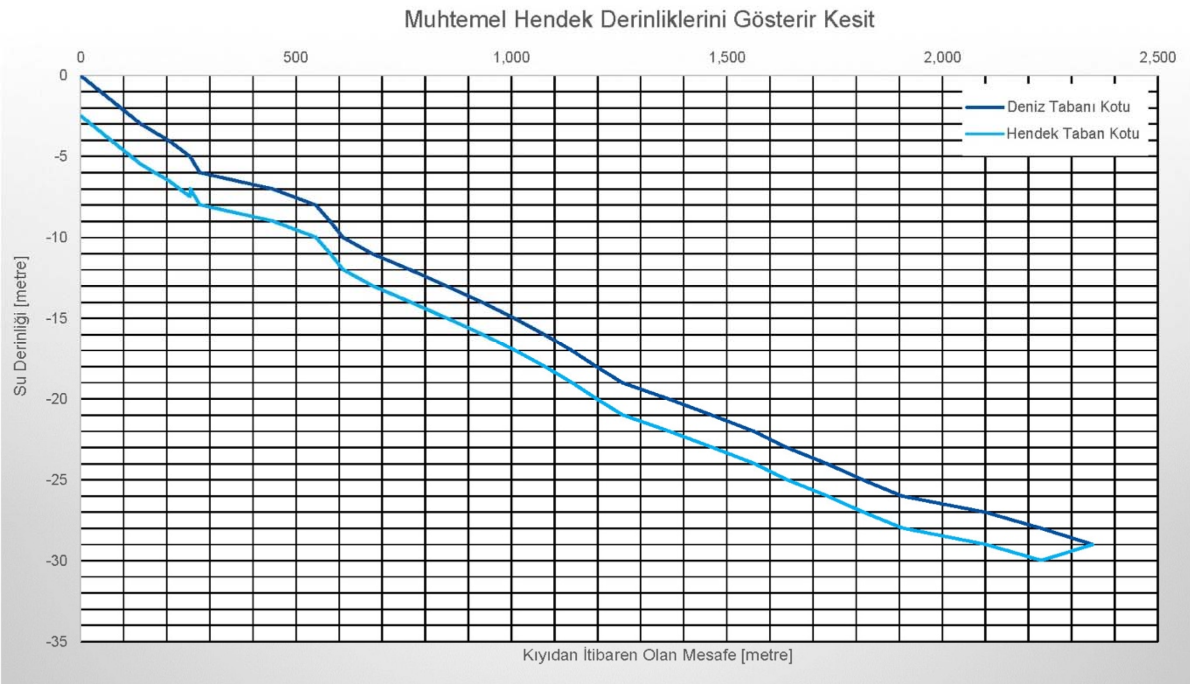


Figure 1.19: Section Showing Presumptive Trench Depth (Shore Crossing Section)

For the scenario of using hydraulic equipment (cutter suction dredger) in trenching operation, the relevant trenching equipment and estimated quantities are provided below in Table 1.21, for the presumptive scenario of using mechanical equipment (backhoe dredger), the trenching equipment and estimated quantities are given below in Table 1.21.

Table 1.21: Dredging Requirements in the Nearshore Section for the Scenario of Using Hydraulic Equipment

Approximate Distance from Shore Crossing (KP-km)	Length (m)	Equipment	Dredging Depth (m)	Equipment	Dredging Volume for Each Equipment (both pipelines) (m^3)
2.275 – 2.440	165	Trailer Suction Hopper Dredger	variable	Trailer Suction Hopper Dredger	100,000
0.785 – 2.275	1,490	Trailer Suction Hopper Dredger	1.98		
0.650 – 0.785	135	Cutter Suction Dredger	1.98	Cutter Suction Dredger	300,000
0.100 – 0.650	550	Cutter Suction Dredger	1.98		
0.000 – 0.100	100	Cutter Suction Dredger	3.98		
				TOTAL AMOUNT	**400.000 m^3**

Table 1. 21: Dredging Requirements in the Nearshore Section for the Presumptive Scenario

Approximate Distance from Shore Crossing (km)	Length (m)	Equipment	Dredging Depth (m)	Equipment	Dredging Volume for Each Equipment (both pipelines) (m^3)
2.275 – 2.440	165	Trailer Suction Hopper Dredger	variable	Trailer Suction Hopper Dredger	100,000
0.785 – 2.275	1,490	Trailer Suction Hopper Dredger	1.98		
0.650 – 0.785	135	Backhoe Dredger	1.98	Backhoe Dredger	75,000
0.100 – 0.650	550	Backhoe Dredger	1.98		
0.000 – 0.100	100	Elevated Excavator	3.98	Elevated Excavator	5,000
				TOTAL AMOUNT	**180,000 m^3**

In the scenario of using hydraulic equipment, it is predicted that the highest volume of dredging material will be removed. It is expected that the trenching times for both scenarios will be as given below in Table 1..

Table 1. 23: Trenching and Berm Building Durations for Both Scenarios

	Equipment	Duration
Scenario of Using Hydraulic Equipment	Cutter Suction Dredger	5-20 weeks (depending on floor structure)
	Trailer Suction Hopper Dredger	Approximately 1 week
	Temporary berm construction	Approximately 12 weeks (material brought from outside only)
Presumptive Scenario	Elevated Excavator	Approximately 5-6 weeks
	Backhoe Dredger	Approximately 7-8 weeks
	Trailer Suction Hopper Dredger	Approximately 1 week
	Temporary berm construction	Approximately 8 weeks (material brought from outside and combination of dredged material next to the trench)

The storage areas envisaged for the dredging material to be formed in the event of the above-mentioned probable trenching scenario are given in Figure 1.20 and Figure 1.21 below, respectively, for the scenario of using hydraulic equipment and the presumptive scenario.

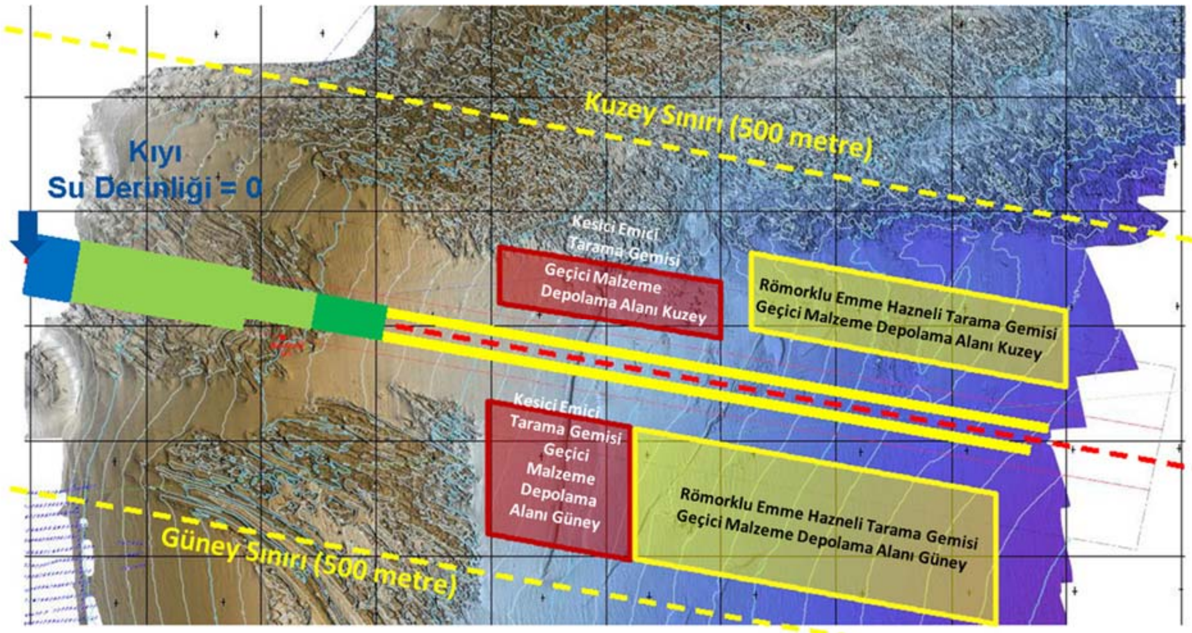


Figure 1.20: Temporary storage areas for the dredged material in the scenario of using hydraulic equipment

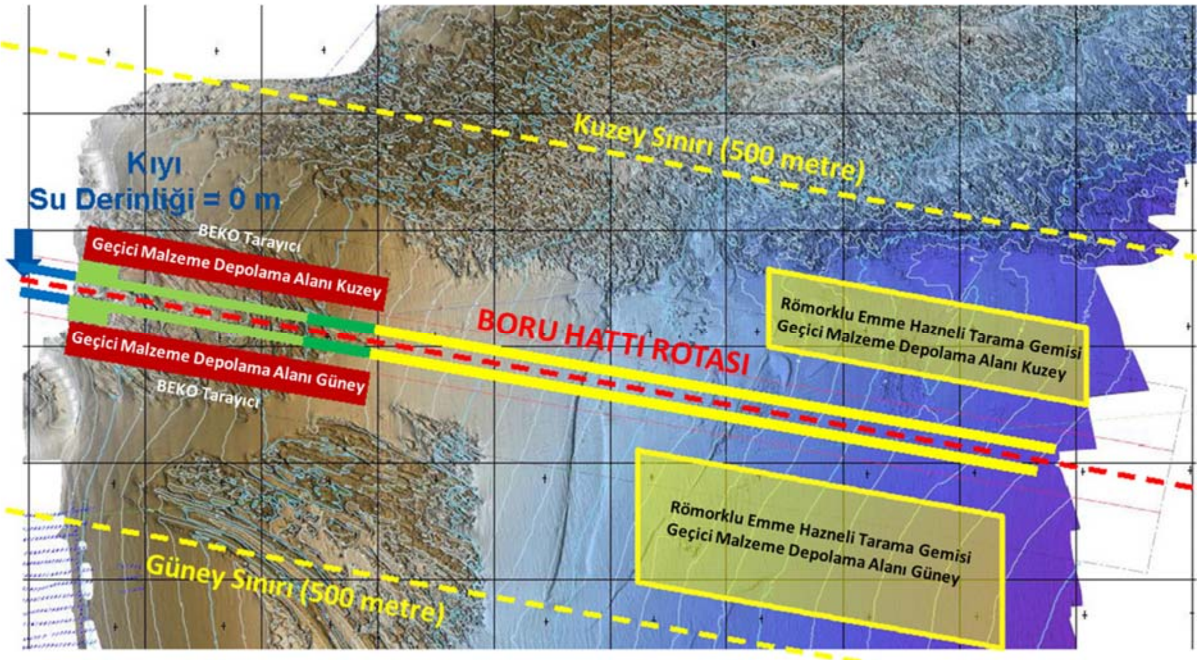


Figure 1.21: Temporary storage areas for the dredged material in the presumptive scenario

1.13.2.6.4 Shore Crossing Pipe-laying

Construction Area Preparation

To provide shore access and to lay pipelines with the open-cut excavation method, rocky areas will need to be excavated to a certain extent to obtain a soft slope in the causeway, to allow the entry of heavy equipment. The shore will be levelled to obtain a flat work platform. The dimensions and position of the work area will be determined by obtaining the necessary permits in accordance with the relevant legislation, together with the design and permit activities.

The details of a typical shore crossing construction fleet for each pipeline are provided under the Section 1.11.6.1.2 in Table 1.12.

The main preparatory work to be completed on the construction site for shore crossing are: Preparation of the causeway, levelling of the site and construction of temporary site facilities such as grounds for pipe pulling equipment.

Pipe Laying with the Shore Pull Method

For the pipe laying process, 'shore pull method' was evaluated within the scope of the Project. In this method, pipe strings will be manufactured in the pipe-lay vessels and pulled towards the shore. Welding the pipe sections (including NDE) generally is not a time consuming process, however, for these activities to take place, appropriate weather conditions (wind, waves) need to be present.

At the end of the pipeline, a towing head attached to the tow rope is mounted. A linear crane (single sheave) located on the shore is used in the pipe laying with the shore pull method. With the help of anchoring or piling, the crane will be fixed on shore.

A pipe laying vessel located over the pipeline will move to the position where the tow ropes are lowered to take and connect them to the 'towing head', which forms the first part of the pipeline in the Landfall Section. While the pipes are welded together on the pipe laying vessel located above the pipeline, the tow ropes will be pulled by a crane positioned onshore. Hydrostatic lift can be used to reduce the weight of the pipeline and thus the required pulling force. A typical shore pull operation is shown below in Figure 1..

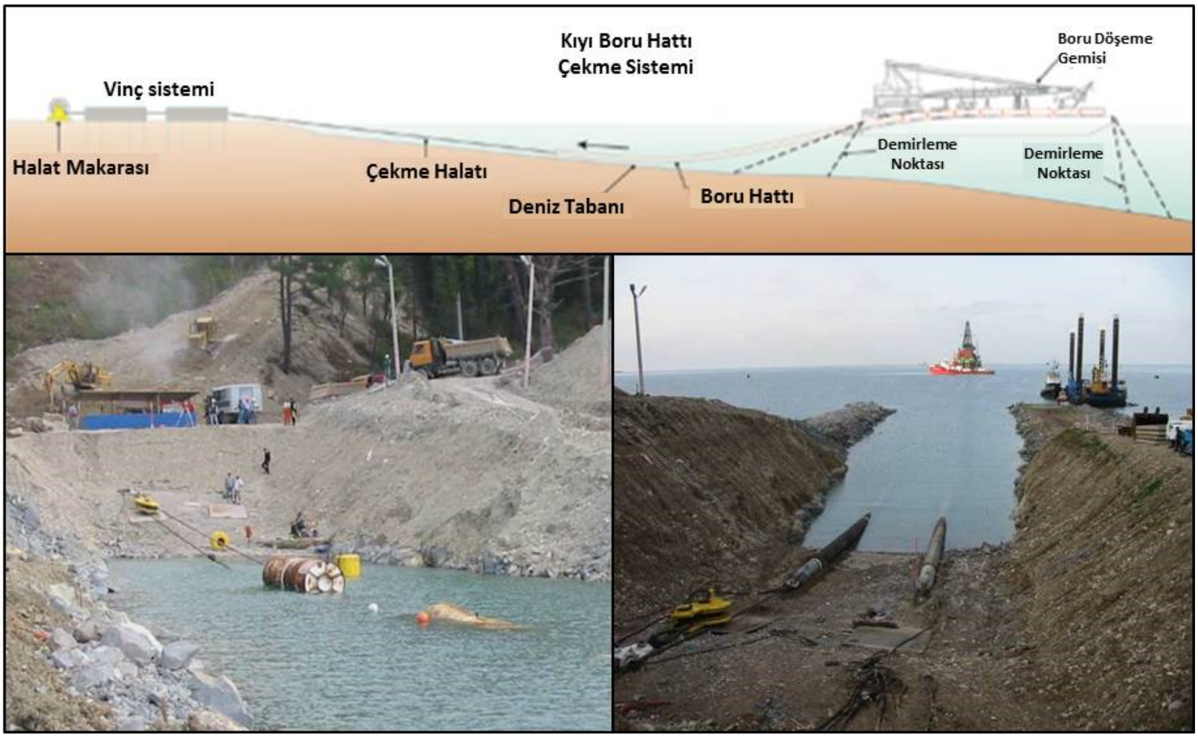


Figure 1.22: Shore Pull Process with Linear Crane (Blue Stream Project)

The pipeline has to be pulled in to the shore, such that the “first weld” of the at the end of the pipeline arrives in its target box onshore. The towing head is cut from the pipeline and the pipeline end will be prepared for welding. The crane spread will then be relocated for the next pull location, and after completing all operations, will be demobilized and removed from the site. After each pull-in operation the tow rope has to be re-laid inside the trench under the sea.

A suitable area will be required for the shore-pull operation, the installation of crane (complete with its anchoring system) and for storing and conserving the pull cable. After completion of the shore pull, the remaining portion of the Nearshore section of the pipeline will be installed by the pipe lay vessel within the scope of the marine activities described below. Backfilling of the trench will not be undertaken until installation of the pipelines in the nearshore section is complete, as described below.

After completion of the shore pull process, the backfill process will be completed by using the previously excavated material taken from the areas where the dredged material is stored, to the extent possible.

Following the shore pull process, the pipe laying operation in the nearshore section will be continued with a ship which is used during the shore-pull process and which is suitable for pipe laying in the shallow water, towards the connection area away from the shore, where the water depth is about 30 m. At the connection point, temporary plugs shall be fitted on each pipeline to ensure the use of PIGs that are suitable for submerging at sea and that would allow testing to be carried out prior to commissioning.

The pipe laying process in the Nearshore is finalized after the sequential alignment, welding, and lowering of the pipes through a pipe laying vessel suitable for operation in shallow waters. It is expected to use S-Lay method in shallow waters. A typical S-Lay pipe-laying vessel is shown in Figure 1..

Figure 1.23: S-Lay Pipe-laying Vessel

In order to lay pipes in shallow waters, the draft (depth of water intake) of the ship must also be low. Low draft usually translates into a flat cargo ship with limited or no propulsion system. Ships used in shallow waters usually have anchor manoeuvring winches, mooring ropes and anchors. Usually, an anchored vessel is chained with eight (8) to 12 anchors in a semi-circular pattern from the four corners of the head and stern side. Under normal conditions, there are two or three anchors at each corner of the vessel. During pipe laying, the position of the ship anchors is changed by an anchor locator (tugboat) to allow the ship to proceed. As pipe laying continues, the tugboat(s) constantly update the position of the anchors, allowing the pipe-laying vessel to move without delay. Depending on the depth of the water and the pipe laying vessel used, it is estimated that all anchors up to a depth of 30 m, will be at a distance of 1.5 km (0.8 nautical miles) to the pipeline (centreline). The anchorage system for a typical pipe-laying vessel is shown below in Figure 1..

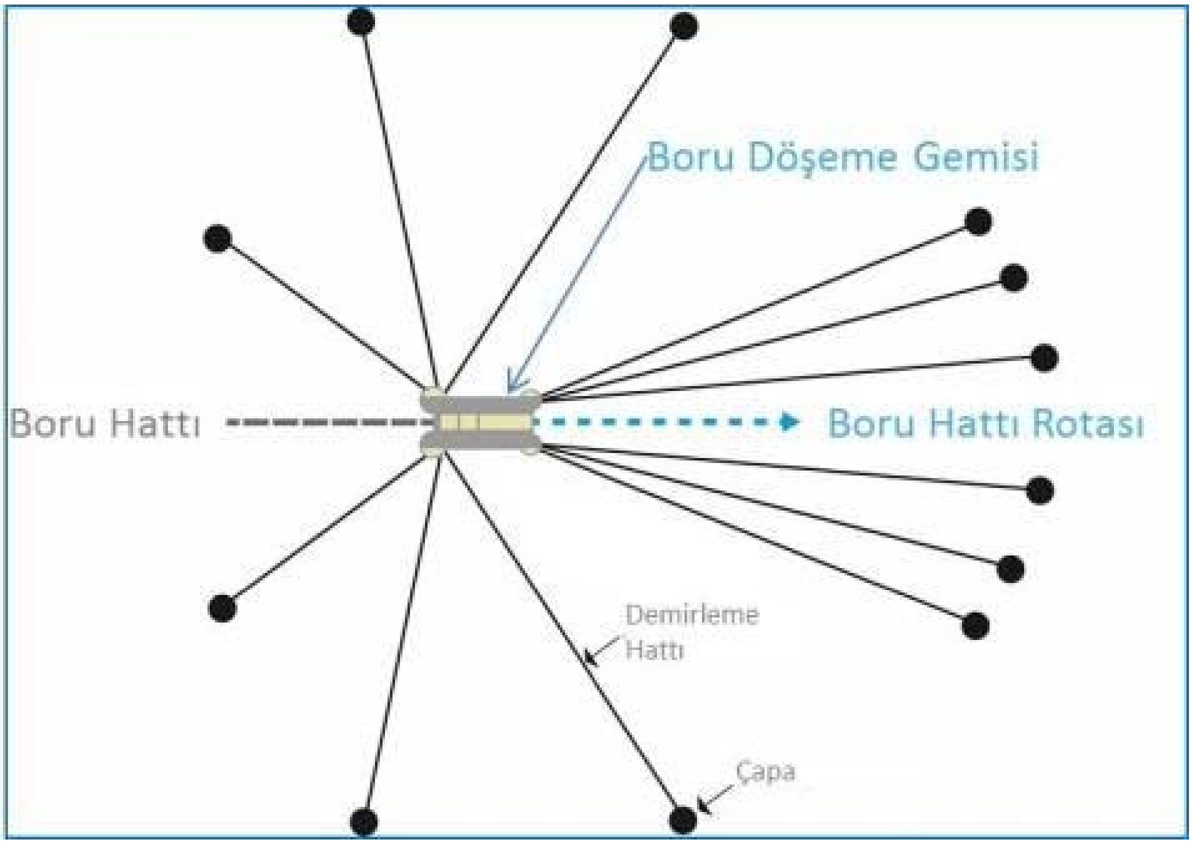


Figure 1.24: Typical Pipe-Lay Vessel Anchor Spread

During the pipe laying activities, a safety zone of around 1.5 km radius (0.8 nautical miles) shall be established for the vessels carrying out pipeline connections offshore to prevent accidents that may occur in the sea traffic during construction. However, it is estimated that the safety zone should be about 2.0 km radius (1.1 nautical miles) for vessels carrying out pipeline connections offshore if DP (dynamic positioning) vessels are used. Safety zones and restrictions related to these zones will have been approved by the competent Maritime authorities and identified operating procedures will be followed. Security zones and related restrictions will be negotiated and approved by the relevant authorities.

1.13.2.6.5 Protection of the Pipelines

For the protection of pipelines in shallow waters, pipelines will be buried and / or covered in concrete as a safety measure to ensure pipeline stability on the seabed as well as to prevent interference and damage due to any third party activity (trawl equipment or ship anchorage).

As mentioned above, the pipes in the Shore Crossing Section are planned to be buried in excavated trenches. From the trench exit, the pipelines will be laid directly on the seabed and protection will be provided by the concrete cover. The thickness of concrete coating protecting the pipelines will be either 50 mm or 80 mm. It is envisaged that pipes with concrete coating will be used up to a depth of about 90 m beyond the nearshore section.

1.13.2.7 Landfall Section Pipe-laying Process

Based on project design, the Landfall Section is estimated to be approximately 2.5 km long. In the Landfall Section, pipelines will be buried in trenches using the open-cut construction technique. The project will end at a connection point between the exit of the RT and the system exit of the Project.

Standard land construction technique shall be used for construction of the Landfall Section, which includes ROW preparation, pipe stringing, pipeline fabrication (e.g. welding/coating/inspections, etc.), trenching, lowering and backfilling.

The "construction sites" in the Landfall Section are defined in this EIA Report as follows:

- Permanent construction sites: areas where the Receiving Terminal and land pipelines are located;
- Temporary construction sites (worksite): Areas where the material storage area and workers' camps are located.

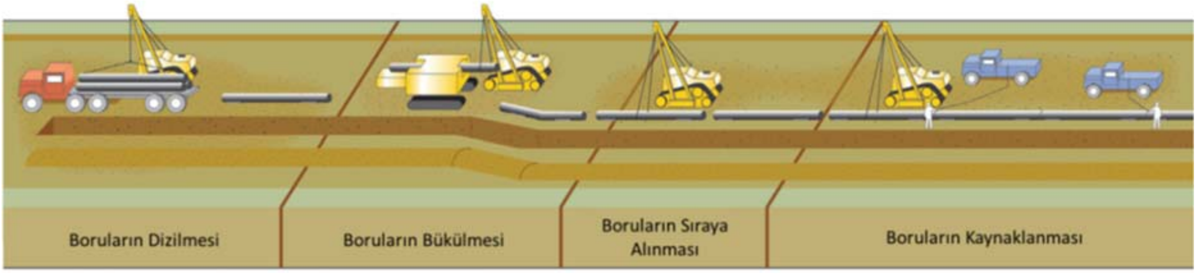
In order to avoid the impacts associated with separate construction periods, both pipelines can be built in sequence (one pipeline being constructed at a time) or simultaneously in a continuous construction period of approximately 12 months. There will be a separation distance of approximately 10m between the centreline of each pipeline. The RoW was calculated as 31 m according to the requirements of the BOTAŞ Technical Safety Environment Regulation. However, the final width of this RoW will be determined in accordance with the relevant legislation after negotiations with BOTAŞ.

The assigned contractor will carry out a preliminary survey, including topographic data and photographic records, prior to construction; reaching a consensus with the relevant parties, the contractor will record the existing conditions. These records will be used as a standard for the assessment of the quality of the restoration at any time during construction and at the end of the work. The preparation of the land required for temporary facilities to be used during the construction phase is predicted to last approximately 12 months, and post construction restoration is foreseen to last 6 months.

The overall process for the construction of the Landfall Section is shown in Figure 1.25 below and is explained in the following sections.

Phase 1: ROW (Construction corridor) preparation and Trenching

Phase 2: Stringing and Welding of Pipes



Phase 3: Lowering-in, Backfilling and Reinstatement

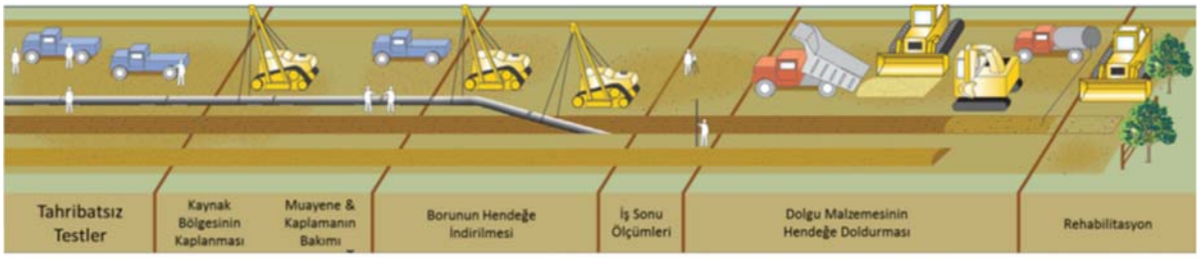


Figure 1.25: Phases of Typical Land Construction Technique for Pipelines

1.13.2.7.1 Construction Corridor Preparation

Although there aren't any important coastal structures near the site where the facility will be built, the route of each pipeline will be surveyed and the centreline along with the temporary construction corridor will be marked with markings that are clearly visible day and night and placed from seaside till the area which will be crossed by the pipes in a way to emphasize the importance of and draw attention to the site, as laid down in the opinion letter (Annex-5.A) of Directorate General of Shipyards and Coastal Structures of the Ministry of Transport, Maritime and Communications, dated 03.07.2017. It may be required to enclose the construction corridor with fences and fence wire (wire-net) barriers in areas with high risks of injury to animals. Specialists appointed by the contractor upon consultation with the Project Owner will organize survey teams and help mark the sensitive environmental and archaeological sites in a clear way.

Existing third party services will be located, marked, and either safeguarded or, if necessary, diverted in accordance with owner's agreements and relevant permits. During any works near any overhead power lines, the contractor shall use extreme care and take measures to prevent contact between personnel and equipment and the power line. Clear warning signs detailing the working height and nature of the danger will be displayed either side of the overhead power line and the danger will also be explained to workers on site during safety toolbox talks.

In case of encountering an unknown service infrastructure, the activities in the area shall stop until the nature and owner of this service are determined. Where diversions are necessary, works will be carried out in consultation with the service owners. Clear warning signs will be erected for overhead power line, and temporary crossing points will be clearly marked.

The pipeline route includes areas of trees that will be felled. The cut trees will be stacked on the construction corridor in line with the demands of the relevant official institution.

The topsoil will generally be stripped across the construction corridor by a flat backhoe dredger and then stored to be used when reinstating the construction corridor. In order to prevent the degradation of the topsoil quality, attention shall be paid to the following:

- It shall not be stored higher than 2 meters;
- It will be stored at a distance of at least 50 m to water beds, away from flow valleys and slopes;
- Special attention will be given to reduce the risk of physical damage, impingement or pollution;
- It will be stored separately from other soil types; and
- Soil piles, which need to be kept for a long time, will be covered and, if necessary, silt barriers will be placed on the bottom on the downward sloping side of the piles.

The careful storage of the topsoil is essential to protect the natural seed bank contained within the topsoil, which will aid the re-vegetation of the construction corridor during reinstatement works.

Some areas of the construction corridor may also be benched or graded to enable safe working, using typical construction site machinery to eliminate irregularities, large stones, tree stumps and other features.

Pipelines will be laid in trenches parallel to each other so that the distance between their nominal axes is 10 meters. The trenches will be excavated using mechanical excavators straddling or running alongside the pipeline route. The trenches will be excavated to a depth of usually 2.5 meters, allowing them to be covered with a minimum of 1.5 m soil layer. The excavated soil, which is extracted from the trenches, will be temporarily stored on the Project Site in a place separate from the topsoil (to prevent mixing with topsoil).

Although it is not considered a probable situation, it may be necessary from time to time to drain water (dewatering) in the trenches accumulated as a result of the infiltration of groundwater into the trenches, surface runoffs or direct rainfalls.

1.13.2.7.2 Transport of Pipe Sections and Stringing

The 12 m pipe pieces will be transported to the construction site from the Landfall Section construction site where they are stored. The pipe sections will be transported along the construction corridor using stringing trucks and tracked vehicles that can transport several pipe sections at once. All pipes will arrive in a pre-coated condition (externally with 3LPP anti-corrosion coating and internally with an epoxy flow coating). The process known commonly as ‘stringing’ includes placing the pipe sections end to end alongside the trench in preparation for welding.

1.13.2.7.3 Welding, Testing and Joint Coating

The pipe edges are bevelled by using a pipe facing machine in order to create a profile for welding. The pipe sections will then be aligned and welded together using automatic, semi-automatic or manual welding equipment that travels along the length of the pipeline. The process is carried out inside a mobile shelter (Figure 1.) that covers the pipe section that is being welded and the people carrying out the work, thereby controlling the environment under which the weld is made. Metal scraps from bevelling and weld flux will be collected and stored in containers in the temporary construction sites before being collected by licensed waste hauliers for disposal.

Once welded, the welds will be subject to visual inspection and NDE, and the weld will be approved before coating is applied to the welds on site. Any welds not meeting the required specification will be removed by cutting out a cylinder of pipe containing the weld and the pipeline re-welded and subject to full NDE. After the welds have been checked, tested and approved, the coating crew will clean the exposed steel section at the joint between the pipes, sand-blast the steel, and apply a protective coating to it.

Figure 1.26: Pipe Welding Shelter

1.13.2.7.4 Pipe Lowering and Backfilling

Following inspection of the weld coatings, the pipe will be carefully lowered into the trench in a continuous operation with the aid of side booms (Figure 1.). Once the pipe-lay is over, the pipe trench will be backfilled in the reverse order to which it was excavated. The backfill will consist of fine grained granular material, mechanically sieved and well graded with a maximum particle size of 6 mm and will contain no sharp edges or deleterious matter. The backfill material will be obtained, as far as practicable, using the same trench spoil that was taken from the trench originally. In rocky or uneven ground where the potential for pipe coating damage exists, the trench bottom will be given a protective 200 mm bed of soft earth or sand backfill material. Approximately 1.900 m^3 of material may be required to backfill the two pipeline trenches (wherever possible re-use of excavated material is essential).

Figure 1.30: Pipe lowering into the Trench

Backfill will be placed over the pipeline immediately after the pipeline has been lowered into the trench in order to protect the pipe coating and to stabilise the open trench. The backfill is carefully compacted around and over the pipeline up to the top of the trench, to ground level. Extreme care will be taken with the initial fill to avoid damage to the coating. During the burial process, a brightly coloured plastic warning tape will also be installed above the pipelines, along the entire length of the trench to provide warning for future excavations to be conducted in the area.

Initially, It may not be possible to return all the originally excavated trench spoil due to the volume of space taken up by the installed pipelines and removal of rock and other unsuitable backfill material, etc. It is estimated that in the open-cut excavation area, the volume of the excavation material left behind from the installation of the two pipelines may reach up to 14,400 m^3. For this reason, it will be necessary to dispose a part of the excavation surplus or use it in landscaping works. Excessive quantities or inadequate backfill material will be removed from the site and disposed of at a licensed waste facility operating in accordance with current waste management regulations.

1.13.2.7.5 RT (Receiving Terminal) Installation

The equipment, materials and offices, etc. required for the construction of the RT will be located in the RT Construction Site and Pre-commissioning Spread. During the construction of the RT, the following operations will be performed:

- Preparatory works, including surveying, site clearance, access roads and earthworks;
- Construction of internal roads;
- Preparation and construction of foundations;
- Installation of equipment;
- Construction of buildings (such as control room and administrative building);

- Piping and mechanical works, including NDE of all welds;
- Laying of cables and carrying out the electrical works;
- Construction of operational and instrumentation control systems; and
- Connection to auxiliary services (electricity, water, communication).

Preparatory works will include preparation of access to the RT construction site, site clearing, site levelling (including cut and fill of the site) and erection of perimeter fencing and access gates. It is not clear whether there is a need for an explosion in the site or not at this stage. However, if there is a need for an explosion, as laid down in the opinion letter (**Annex-5.A**) of Provincial Directorate of Public Health dated 03.07.2017, works will not be initiated before necessary precautions are taken for the safety of life and property of residents living nearby.

It is estimated that approximately 415,000 m^3 of material will be cut from the site and 430,000 m^3 of fill material will be required to form a level site for the RT. It is envisaged that much of the excavated soil can be re-used for filling and to create embankments in order to limit the overall construction traffic intensity. However, the possibility where some quantities of suitable fill material will need to be imported to site cannot be excluded.

Civil and structural engineering activities include excavation of foundations, surfacing of internal roads, car parking and paths, pouring of concrete foundations and slabs for buildings, foundations for equipment, vent stacks, valve pit and supports, erection of steel structures in the form of pipe bearings, supporting structures etc.

Fitting and connection of all communication equipment will allow the RT to be controlled locally from the buildings containing the E&I equipment, and remotely from the CCR (Central Control Room) and BUCR (Back-Up Control Room) in Amsterdam.

The main components of the RT are the metrology equipment for monitoring the operations (gas temperatures, pressures etc.), gas metering and monitoring, Coarse Particle Removal, gas heating, over pressure protection, electrical heating system, a venting system for pipeline depressurisation, and specifically designed buildings for the Project which will serve various purposes including providing office space, sanitary facilities and housing E&I equipment to monitor the operating conditions of the pipelines.

Construction of the RT will begin with vegetation clearance followed by topsoil removal and storage at appropriate areas on the temporary construction site. Topsoil will be stored on site in accordance with the relevant legislation as explained in the section above for soil reuse. The site will be levelled to obtain the base elevation specified during the engineering phase.

The site surface will be levelled to provide the basic slope specified in the detailed design. Excavated material will be re-used as fill wherever possible. Any excavated material that cannot be re-used as fill will be removed from site and sent to a licensed landfill via licensed vehicles. Depending on the percentage of excavated material that is found to be unsuitable for fill, it may be necessary to use appropriate aggregate (sand and crushed rock) as replacement material.

The construction site will be enclosed with a fence, after the placement of foundations and all concrete works to prepare the site for equipment installation, the construction will start. RT, including landfall facilities incorporating ESDs (Emergency Shutdown) and pipeline Inspection Gauge (PIG) Trap

Facilities will be constructed in an area of approximately 17.5 ha and the RT will primarily consist of equipment specified in the Section 1.11.1.2

The installation of mechanical and electrical equipment and of the tools will follow the completion of the construction. The layout of the planned landfall facilities is shown below in Figure 1..

For all work areas including the temporary ones, appropriate security measures such as access control, badges, CCTV, monitoring and recording of entry and exit of personnel and vehicles shall be provided 24 hours a day, 365 days a year including days off work all through the contract period. The security level will also be increased as the importance and sensitivity of the work carried out within the facility increases. The Project Owner will be informed by the construction contractor about the use of security forces and / or personnel and will ensure that these forces / personnel have appropriate training in respect of human rights and use of force in accordance with Good International Industrial Practices (GIIP). Firearms or unidentified dogs will not be used for security purposes.

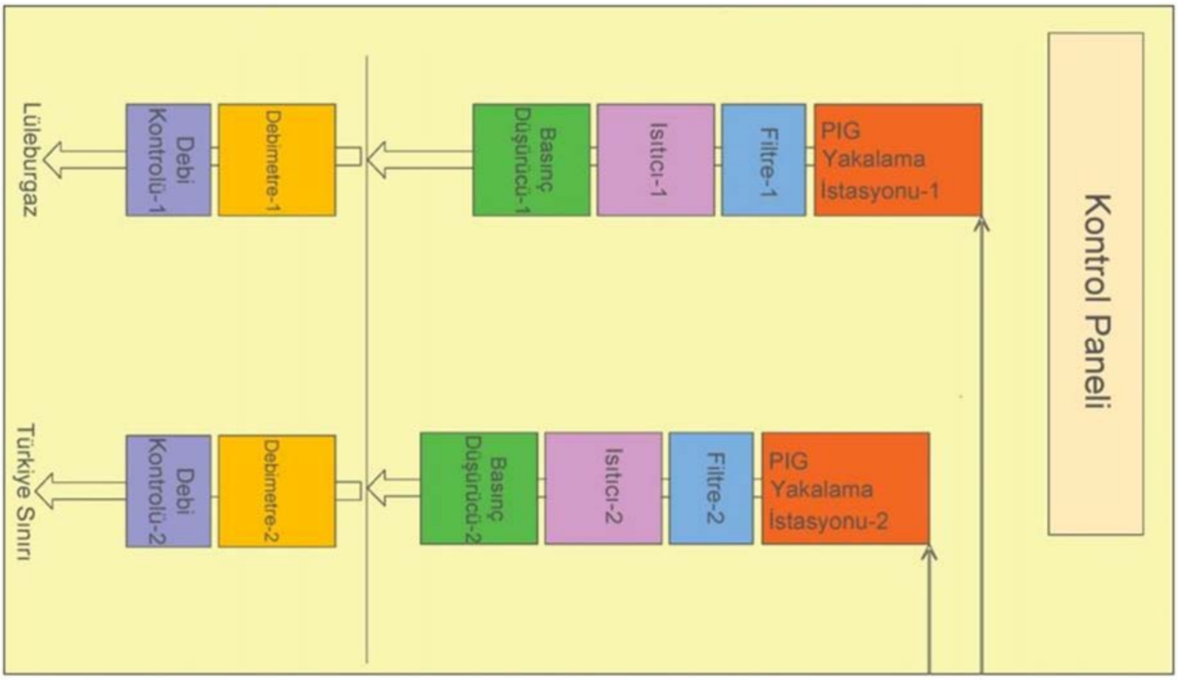


Figure 1.27: Layout of Landfall Facilities

1.13.2.7.6 Temporary Areas

Before construction and operation, it will be necessary to establish temporary facilities on land (construction sites), including pipeline, equipment and material storage areas, excavated material storage areas, a parking area, food and recreation facilities for workers and at least one labour camp. Estimated area required for these temporary facilities are summarized below in Table 1..

The amount of land required for labour camp(s) is based on an estimate. The location and the number of labour camps are unknown at this stage.

Table 1. 24: Estimated Area Required for Temporary Land Facilities

Temporary Area	Approximate Area (ha)
Pipeline Construction Corridor	26*
RT Construction Site	14
Labour Camps (estimate)	3.3
RT Construction Site (permanent Project area)	27
Access Roads on Site	1.700m length 15m width

*Approximately 5.4 hectares are located within the permanent RoW.

Approximately 50% of the sites where the RT construction site and other construction sites are located, will be excavated, and in order to obtain a hard floor and to secure the floor, stones and rocks will be laid on the surface.

The layout of the equipment in each construction site will depend on the design of the contractor. It is foreseen that a certain number of prefabricated buildings and/or containers will be needed on the construction sites for units such as offices, worker's cafeteria and recreation areas.

Pipe pieces will be temporarily stacked on the construction site before being transferred to the shit fleet for installation purposes. A temporary construction corridor will be required along the pipeline route in the Landfall Section from the RT to the Shore Crossing Section.

1.13.2.7.7 Landfall Section Special Crossings

The pipelines of the Project intersect with the roads, pipelines. An open-cut excavation technique or trenchless techniques will be used for the crossing. If an open excavation technique is used, transportation will be interrupted temporarily (several days) and then returned to its former state. In the case of using a trenchless method, ways of transportation will not be affected in any way.

The pipeline will intersect with Sazlıdere, a seasonal stream flowing through a valley approximately 500 m north of the planned Receiving Terminal. At the planned crossing point, the creek bed flows from the west to the east, towards the Black Sea, and the incline of the slope is about 15-20% in the north and about 10% in the south. The depth of the valley is expected to be 55 meters at maximum.

Sazlıdere, a seasonal stream, flows continuously only during periods of high rainfall, in a narrow creek bed. To ensure the continuity of the water flow, it may be necessary to install artificial water pipelines or diversion channels. As laid down in the opinion letter (Annex-5.A) of General Directorate of State Hydraulic Works (DSİ) dated 29.05.2017, the pipeline will pass 3 m below the thalweg level of the stream bed. It will be designed to reach this depth 10 m before and after the stream slope and warning signs will be placed at these points. In addition, the provisions specified in the Prime Minister's Office's Circular titled "Stream Areas and Floods" no 2006/27 will be respected and the work will be carried out under the supervision of Tekirdağ DSI 113. Branch Office. All the commitments made within this EIA Report will be fulfilled under the opinion letter **(ANNEX-5.A)** of Department of Survey Planning and Allocation of State Hydraulic Works dated 11.07.2017.

Appropriate mitigation measures will be implemented to ensure the continuity of the flow and to minimize the transport of sediments. The RoW will be prepared in a wide band to perform the valley crossing operations. Sloping areas shall be levelled to allow access to all the equipment necessary for opening the trench and for excavators to be used in backfilling and for arranging pipe parts. The two pipelines will cut the floor of the valley perpendicular to the direction of flow (and the valley in general), and the top of the pipeline will be about 2 m below the stream bed. A single trench will be dug for the two pipelines and the base width will be about 12-15 m and the incline of the slope will be about 25 degrees.

The trench will be excavated with standard hydraulic excavators, and the installation of the pipeline will be carried out by conventional methods using standard pipe laying equipment. During the installation, some pipe sections will be subjected to cold bending so that the pipe line can follow the elevation curves with a proper depth. This method allows for a relatively short time (approximately one to two weeks for each pipeline) of backfilling of the ground by laying the pipeline, cutting across the creek bed and side, and laying the preformed pipeline.

Fences and/or other suitable methods (sediment retaining mattresses or straw bales and sand bags) shall be applied along the creek and in adjacent areas to the silt entrance as required, even though no water flow is expected in the creek during the construction phase.

Following the installation of the pipeline onshore, along the valley slopes on both sides of the creek passage, restoration of the ground along this route will be carried out and soil stabilization techniques will be used in this process with filling compression, layering with geotextile blanket and geotextile sheeting.

1.13.2.8 Protection of the Pipelines

In order to ensure that the underwater pipelines in shallow waters remain stable against sea currents and to ensure that the pipelines and the outer surface are protected from any kind of damage due to a third party activity (trawl equipment or anchor), they will be covered and / or buried in reinforced concrete. The exact thickness of the concrete coating will be determined in line with future studies and the length of the section of the pipeline that needs to be covered with concrete. However, a thickness between 50 mm and 80 mm is estimated for the protective concrete coating of the pipeline. The section with reduced (50 mm) concrete coating will be the 300 m of pipeline either side of the AWTI (at a water depth of 30 m). The aim of the reduced thickness is to reduce the loads on the tie-in vessel and on the davit wires during the lifting and lowering of the pipelines. It is anticipated that the pipelines will be concrete coated beyond the edge of the Nearshore Section, to a water depth of approximately 100 m. No anti-corrosion or antifouling paint / chemicals will be used on the outer surface of the pipes.

1.13.2.8.1 Corrosion Protection

Offshore and Shore Crossing Section Pipelines-Cathodic Protection

To ensure the integrity of the Shore Crossing and Offshore (subsea) pipelines over their operational life, secondary anticorrosion protection will be provided by sacrificial anodes. Primary protection is provided during pipe production through the polypropylene anti-corrosion outer coating and the epoxy flow inner coating.

Landfall Section Pipelines – Cathodic Protection

An "Impressed Current Cathodic Protection" (ICCP) system will be installed to provide cathodic protection of the Landfall Section pipelines. With an ICCP system the current flow is “impressed” or forced by a power supply. The power source is designed to deliver a direct current (DC) through the ground-bed to provide the cathodic protection.

1.13.3 Pre-Commissioning Phase

After laying each pipeline, various activities known as "pre-commissioning activities" will be conducted to ensure that the pipeline meets operational requirements. The main purpose of these activities is to ensure that the line is faultlessly laid and that the gas can be transported under the proper conditions, at the expected pressure, and that it meets the requirements for gas delivery. The equipment required for the pre-commissioning activities will be used for cleaning, gauging, hydrotesting (where necessary) and drying of the installed pipelines.

The pre-commissioning approach for the Project involves hydrotesting of the landfall facilities and Nearshore and Landfall sections of the pipelines only. Hydrotesting (a hydrostatic test) involves filling each pipeline with water and pressurizing it in excess of the design pressure of the pipelines to test the strength of the pipeline and confirm that there are no leaks.

The pre-commissioning of the nearshore and landfall sections of each pipeline will be undertaken individually as each pipeline is completed. The pre-commissioning of each pipeline will take approximately 10 days to complete.

The section of the TurkStream Gas Pipeline – Offshore Section from 30 m water depth in Russia to approximately 30 m water depth in Turkey is planned not to be hydrotested. This is based on the following reasons:

- A traditional hydrostatic test pressure may cause lateral buckling all along the TurkStream Gas Pipeline and, as a result, the risk to the pipeline integrity may not be as low as reasonably practical. The potential adverse effects to the environment of lateral buckling (loss of containment) which may be caused by the relatively high hydrostatic test pressure will be eliminated, which will also result in elimination of the risk to pipeline due to this failure mode;
- The quantity of the hydrotest water, which will finally be required to be discharged into the sea will be minimised; and
- Absence of hydrostatic testing and accordingly absence of water discharge minimises and/or eliminates the volumes of water, fuel and chemicals required to be used by pre-commissioning equipment and consequently associated emissions and discharges to the environment.

Hydrotesting has been thoroughly investigated and intensively discussed with DNV (certified verification agency deployed for the materials pre-qualifications, verification of FEED and offshore installations for the Project) during the FEED for the TurkStream Gas Pipeline - Turkish EEZ Section in 2012. The hydrotest for the pipelines in more than 360 m water depth is allowed to be waived according to DNV-OS-F101 (2010), Section B204. This will also be the case for the current Project. In addition, a Concession Request was approved by DNV for pipelines in water depth between 30 m and 360 m in Turkish EEZ for the Turkey EEZ Section of the Pipeline system linked to the conservative pipeline design. Once the pipeline route design for the current Project is completed in FEED phase, a concession shall be validated for the section between 30 m and 360 m water depth in Turkey.

In order to undertake the pre-commissioning operations, a suitable offshore support vessel will be mobilised to the tie-in location. It is planned to establish an safety exclusion zone of 0,5 km radius around the vessels engaged in the pre-commissioning activities. As ships can be anchored at the point of connection, the exclusions zones and related restrictions will be coordinated with and approved by the Turkish Maritime Authorities, who will also define procedures for their implementation. The vessel will be equipped with a diving or ROV spread to deploy and connect a down line (hose) between the vessel and the subsea PIG launcher. Pre-commissioning operations of the Shore Crossing and Landfall sections pipelines will use seawater.

A flooding, gauging and hydrostatic testing spread will be installed onboard the support vessel. This pre-commissioning vessels will enable water supply, water filtering, flooding and hydro-testing of the pipeline. PIGs will also be launched from the subsea test head towards the PIG launcher/receiver located in the Landfall Section.

The terrestrial pre-commissioning equipment(compressors, water storage tanks etc.) will be located within the Landfall Construction Site and connected to the temporary PIG launcher/receiver via series of hoses.

1.13.3.1 Hydrotest Sections (Landfall and Shore Crossing)

Each pipeline will be hydrotested separately between a temporary PIG launcher / receiver fitted to the pipeline at the RT and the edge of the nearshore section at approximately 30 m water depth where a tie-in between the offshore and shore crossing pipelines will be made. During the installation of the nearshore section pipelines, a temporary subsea test head will have been welded to the ends of the pipelines to enable pre-commissioning tests to be undertaken. The temporary subsea test head will be designed to contain and launch flooding, cleaning and gauging PIGs towards the onshore PIG traps and to receive dewatering PIG(s) sent from the temporary PIG launcher/receiver located at the landfall facilities. The section extending from the Receiving Terminal to a depth of 30 m can be hydrotested as a single part or the onshore and sea segments can be tested separately if deemed necessary by the detailed engineering surveys.

The RT itself, downstream of the temporary PIG launcher / receiver location will be cleaned, hydrotested and dried separately from the shore crossing and landfall section pipelines in accordance with applicable standards and regulations.

The offshore section of the pipeline will not be hydrotested as described above. However, following the completion of pre-commissioning tests of the shore crossing and landfall sections in Turkey and in Russia, and pipeline tie-ins, the pipeline will undergo cleaning, gauging and drying between the temporary PIG launcher/receiver at the fence of the landfall facilities in Russia and a temporary PIG launcher/receiver located at the RT in Turkey.

1.13.3.2 Landfall and Shore Crossing - Cleaning and Gauging

In sections subject to hydrotest, typically, cleaning and gauging are performed as a single operation together with flooding. It is expected to take approximately 3 hours to flood a pipeline. Upon connection of the vessel based spread to the subsea PIG launcher, a PIG train(s) will be run through the pipeline to clean and gauge the pipeline and remove construction debris. The PIG trains are pushed through the pipeline to the onshore PIG receiver (test head) near the Landfall facility by pumped seawater (drawn from the Black Sea), which has been filtered.

Diesel-powered filling pumps for filling pipelines will draw water from the sea with a capacity of 25 m^3 / min with temporary water intake hoses of appropriate dimensions. These hoses will be connected to buoys suspended approximately 3-5 m below sea surface in a suitable offshore location near the tie-in location. Suction hoses will be equipped with filtering equipment to prevent the entry of coarse wastes and sea creatures (such as fish and plankton). In case of a delay in dewatering of the pipeline for some reason, oxygen scavenger (sodium bisulphite) [2]shall be injected into the test water at an injection rate of 250 parts per million (ppm) to prevent internal corrosion of the pipeline prior to dewatering. It is anticipated that approximately 500 litres of oxygen scavenger will be injected per pipeline. While flooding the pipeline, cleaning and gauging PIGs shall also be pushed towards shore.

A valve will be open on the onshore test head during the flooding operation, which will be connected to vents to vent air from the pipeline as it is filled with seawater. During the flooding operation, approximately 100 m^3 of seawater will initially be pumped into the pipeline followed by a cleaning and gauging PIG train. A further 1.900 m^3 (approximately) of seawater will then be pumped into the pipeline. The first 100 m^3 of water and debris (consisting of rust, coating and weld debris) in front and in-between the PIGs, will be captured in temporary onshore water storage tanks or in temporary ponds, which will later be pumped back into the pipeline during hydrotesting.

Upon receipt of the PIG train, the valves at both ends of the pipeline will be closed. The collected water will be stored for a sufficient length of time to allow the debris to settle to the bottom. It is expected that up to approximately 200 kg of debris may be produced per pipeline. Wastes will be collected and sent to licensed waste disposal facilities to be disposed of in accordance with the relevant legislation.

When all PIG trains for cleaning and measurement purposes are met on the PIG receiver onshore and the measuring plates are inspected for defects / damage in the pipeline, the cleaning and measuring operations will be completed. The total seawater volume required for flooding, cleaning, gauging and hydrostatic testing will be approximately 2.000 m^3 for each of the shore crossing and landfall section pipelines. Information on seawater intake for each pipeline is given below in Table 1..

Table 1. 25: Seawater Intake Information (per pipeline)

Subject	Value
Location (preliminary)	Offshore Section/ Nearshore pipeline tie-in location (approximately 30 m water depth)
Water Intake Depth	Approximately 3-5 m below the sea surface
Flooding Flow Speed	Up to 2 x 12.5 m^3 / min
Flooding Duration	3 hours
Flooding Fluid: Type Total volume	 Seawater 2.000 m^3
Intake Dimensions: Intake Hose Intake Mesh Size	 2 x 6-inch 2 mm
Chemical (only if necessary): Type Injection Rate Total volume	 Sodium Bisulphite (oxygen scavenger) 250 ppm 500 litres

1.13.3.3 Landfall and Shore Crossing - Hydrotesting

[2]Sodium Bisulphite is listed in OSPAR's PLONOR list of additives.

Upon confirmation of successful cleaning and gauging of the pipeline, the pipeline will be hydrostatically tested. By using hydrostatic test pumps located on the support vessel, pipeline pressure will be raised up to 339,1 bar (at +100 m reference elevation). The test pressure is based on the requirements set out in Det Norke Veritas (DNV) Offshore Pipeline Standard DNV-OS-F101 and applicable local standards. In line with applicable standards, the pipeline pressure test will have a hold period of at least 24 hours.

Once the results of the hydrotest have been validated and accepted, the pipelines will be depressurised to ambient pressure. In the event that the hydrotest fails, the contractor will be required to detect the leak and then propose a repair method to the Project Owner. The repair method will depend on the nature and location of the leak. Following agreement between the the Project Owner and the contractor, the repair will be undertaken and the hydrotest will be repeated following the steps described above.

1.13.3.4 Landfall and Shore Crossing - Dewatering and Drying

After a successful hydrostatic test, the pipeline will be dewatered and dried (by air), optionally filled with nitrogen (N2) or chemically conditioned (by using MEG –mono ethylene glycol). Dewatering and drying/conditioning will be undertaken from the temporary PIG launcher/receiver at the RT towards the temporary subsea PIG receiver. The PIG train will be propelled by oil free, dry, compressed air provided by an onshore based compressor spread. In case of chemical conditioning of the pipeline, in order to remove and treat residue seawater from the pipeline wall during dewatering, a pre-calculated amount of MEG will be sent through the pipeline. MEG mass volume is estimated to be 30 m^3 in the worst case conditions. It is expected that approximately 3 hours will be required to dewater each pipeline.

During the dewatering process, the amount of treated seawater to the sea from the subsea PIG receiver will be 12,5 m^3 / min. Seawater will be discharged to the sea at a height of about 1 meter above sea level, through a four or six-inch diffuser placed to reduce blur, seabed rubbing and sediment clouds. MEG will not be disposed into the sea but will be pumped to the support vessel via a down line but will be received and stored in suitable secure tanks onboard the vessel and will be shipped to a licensed coastal facility to be disposed or recycled by a licensed waste handling company. Table 1. presents the expected volume and location of discharges associated with cleaning and gauging, hydrotesting and dewatering of the shore crossing and landfall section pipelines.

Table 1. 26: Estimated Pipeline Flooding, Cleaning, Gauging, Hydrotesting and Dewatering Discharges

Activity	Substance	Discharge location	Estimated Discharge Volume per pipeline (m^3)	Total estimated discharge volume (m^3)
Flooding, cleaning and gauging	Filtered seawater and debris from cleaning PIGs	Temporary PIG launcher / receiver near the landfall facility	Up to 100 (temporarily stored in onshore tanks)	200 (temporarily stored in onshore tanks prior to injection back into pipeline)

Activity	Substance	Discharge location	Estimated Discharge Volume per pipeline (m^3)	Total estimated discharge volume (m^3)
Hydrotesting / dewatering	filtered seawater	Temporary subsea test head at approximately 35 m water depth	2,000	4,000
	MEG	It is stored in tanks on the support vessel for disposal on land	30	60

On completion of the drying operations, and prior to the introduction of gas, each pipeline will require purging with nitrogen to a pressure of 0,5 bar to avoid the formation of a potentially explosive gas / air mixture. Approximately 3,000m^3 (1.5 times the pipeline volume) of nitrogen will be injected to each pipeline from the temporary onshore PIG launcher / receiver.

The estimated equipment and vessels required for the pre-commissioning tests of the shore crossing and landfall section pipelines are presented in

Table 1..

Table 1. 27: Summary of Equipment and Vessels Required for Pre-Commissioning of the Landfall and Shore Crossing Sections per Pipeline

Equipment (per pipeline)	Number	Engine Power (kW)	Activity dB LAeq,T @10m	Indicative Duration of Use (Days)
Diesel water extraction pumps	2	1,000	87	1
Diesel flooding pumps	2	700	85	1
Diesel hydrostatic test pumps	2	700	85	1
Primary high pressure compressor	2 on land and 2 on pre-commissioning spread vessel (Maximum 2 on board or on land simultaneously)	440	72	4
Air drying unit	1	300	72	5
Nitrogen membrane unit	1	672	85	5
Pre-commissioning spread vessel	1	15,086	Located offshore	10 days and also another 10 days at 25% capacity for Mobilization / demobilization
Rescue vessel	1	9,548	Located offshore	Only in case of emergency

1.13.3.5 Testing of the RT and Pre-Commissioning Tests

The RT will undergo pre-commissioning tests separately from the landfall and shore crossing section pipelines. The different sized pipelines within the RT may undergo pre-commissioning simultaneously or separately. No PIGs are required for cleaning and gauging of the RT pipework. Checks for defects in the RT pipework are made during fabrication and construction. The internal pipework will be cleaned by the water used for the hydrotesting and collected during the dewatering process. Each pipeline part shall be fitted with a temporary test head on both ends, forming a valve system to allow the pipelines to be connected to the ventilation and hoses in pre-commissioning tests. The estimated equipment required for the hydrotesting activities at the RT are presented in Table 1. below.

Table 1. 28: Summary of Equipment Required for Pre-Commissioning Tests of the RT Pipework (for a single pipeline)

Equipment	Number	Engine Power (kW)	Activity dB LAeq,T @10m	Duration of Use (days)
Diesel flooding pumps	1	50	74	21
Diesel hydrostatic test pumps	1	10	67	21
Primary high pressure compressor	1	300	78	27
Air drying unit	1	300	78	21

1.13.3.6 Offshore Pipeline – Pre-Commissioning Tests

Cleaning, gauging and drying of each pipeline within the TurkStream Gas Pipeline will be undertaken between a temporary PIG launcher / receiver at the fence of the landfall facilities in Russia and a temporary PIG launcher / receiver located at the RT in Turkey. The temporary PIG launcher / receiver used in Turkey for each pipeline will likely be the same one used for the pre-commissioning of the shore crossing and landfall section pipelines. This cleaning, gauging and drying will be undertaken following completion of the pre-commissioning tests of the landfall and shore crossing sections of the pipelines in both Turkey and Russia and completion of the pipeline tie-ins between the shore crossing and offshore pipeline sections.

The base case, described here, assumes the cleaning and gauging PIGs will be transported through the pipelines from the temporary PIG launcher/receiver located at the Russian landfall facilities to the temporary PIG launcher/receiver located in Turkey. However, it is possible that the outcome of the detailed design process may result in the PIGs being transported from Turkey to Russia. Should the direction that the PIGs are transported through the pipeline change to the direction from Turkey to Russia, MoEU will be notified of this change. The operations to be undertaken and their respective durations are summarized below in Table 1..

Table 1. 29: Duration of pre-commissioning activities

Activity	Duration (days)
Pre-packing of pipeline with compressed air	20
Cleaning, gauging and drying (using MEG) of pipeline	24
Venting of air from pipelines (undertaken in Turkey)	6
Purging of pipeline with nitrogen	3
Total	**53**

Pre-packing of the pipeline from Turkey to a pressure of 30 bar would be undertaken using a compressor spread located at the RT. The compressor spread in Turkey would require approximately 20 combined compressor and booster units, which would operate in conjunction with approximately

10 air drying units for approximately 20 days. The compressor spread would be located in the RT Construction Site and Pre-commissioning Spread.

It is anticipated that approximately 800 m^3 of MEG may be used to clean and dry each pipeline. The MEG and debris from the pipelines collected in front and in-between the PIGs, will be captured in temporary onshore tanks located at the temporary PIG launcher/receiver in Turkey, to allow the debris to separate from the MEG. It is anticipated that approximately 18 tonnes of debris will be collected by the cleaning PIGs for each pipeline. MEG and debris will be shipped to a licensed coastal facility to be disposed of or recycled by a licensed waste handling company.

Drying of the pipeline will be undertaken as part of the single PIG train launched from Russia which will simultaneously clean, gauge and dry the pipeline. As per the cleaning process described above for the shore crossing and landfall section pipelines, the MEG will be collected in secure tanks within the RT Site and Pre-commissioning Spread and collected by a licensed waste disposal company for disposal.

As is the case with the Shore Crossing and Landfall Section pipelines, on completion of the drying operations of the entire pipeline from the Landfall Facilities in Russia to the RT in Turkey, and prior to the introduction of gas, the pipelines will require nitrogen purging to avoid the formation of a potentially explosive gas/air mixture. When the oxygen level is low enough, the nitrogen purging is terminated. Thus, the pipeline can be set into operation by supplying gas to the pipeline from Russia. Approximately 600.000 m^3 (at atmospheric pressure) of nitrogen will be injected into each pipeline at the Russian landfall facilities using two large electrostatic nitrogen membrane units. Each pipeline will take approximately three to five days to fill with nitrogen. Nitrogen in the pipelines will be replaced by natural gas without using a separator PIG. This operation is based on the following:

- Reducing the amount of time required for the entire operation;
- Minimising the amount of gas to be released into the atmosphere; and
- Minimising nitrogen consumption.

Another factor affecting the amount of time required for the commissioning phase is the capacity of the venting system. During the initial commissioning, venting systems that are available in the Receiving Terminal and scaled for this operation will be used. To minimise both the amount of nitrogen to be used and the amount of gas to be released from the venting, this operation will be carried out at the lowest possible pressure.

It is anticipated that all pre-commissioning activities for each pipeline, from the temporary PIG launcher/receiver at the Russian landfall facilities fence to the temporary PIG launcher/receiver at the fence to the Turkish RT, will take approximately seven weeks. On completion of all pre-commissioning tests, the remaining pipeline tie-ins will be undertaken. This includes tie-ins to the Russian gas network upstream of the landfall facilities in Russia (being developed by Gazprom) and tie-ins to the BOTAŞ Project.

1.13.3.7 Reinstatement

After completion of pre-commissioning tests of the shore crossing and landfall section pipelines, the restoration of the construction corridor will commence. All zones affected under the construction corridor will be tried to be brought back to their original state (in the original form of the land), in a reasonably feasible manner. The excavated topsoil layer will be placed back onto the construction corridor. The topography of the territory will be tried to return to its original state in the most reasonable way possible. The topsoil will be stone picked and cultivated to ensure re-vegetation of the area. The stored topsoil / seed bank will be laid back on the construction corridor. The topsoil must be free of stones and processed to re-grow the plant cover. All affected access roads will at least be brought back to their pre-construction state. Access roads and other areas will not be left in a worse shape than pre-construction.

All temporary roads will be removed and the surface layer will be laid out from the stored topsoil / seed bank. If there is any damage on the forest roads used to enter the Project Area in the pre-construction stage, they will be repaired. All temporary structures must be removable, including foundations and floor covering, so that all land can be restored after construction is completed.

Extra efforts will be made to ensure that the field drainage infrastructure, access roads and other networks and facilities that were displaced/degraded during construction are returned to their former state or replaced with a better quality system. Where necessary, route logs will be made before and after the work to document any changes to be made. The use of the stored topsoil (which preserves the natural seed bank and natural soil materials) will encourage natural processes and natural re-vegetation using only indigenous species found on the site, thus conserving genetic biodiversity and composition of the original plant communities. Re-planting will take into account the requirements to protect the pipeline from deep-rooted vegetation.

Following the completion of the reinstatement work, monitoring and maintenance works in the area will continue, as required, until normal growth patterns are re-established and confirmed by the Pipeline operator's environmental specialists.

1.13.4 Operation Stage (Maintenance of the Pipeline and Landfall Facility, etc.)

Permanent pipeline RoW will be marked clearly with signs visible on site. As laid down in the opinion letter (**Annex-5.A**) of Directorate General of Shipyards and Coastal Structures of the Ministry of Transport, Maritime and Communications, dated 03.07.2017, although there aren't any important coastal structures near the site where the facility will be built, markings will be placed in areas which will be crossed by the pipes starting from the seaside in such a way to emphasize the importance of the site within those areas and to draw attention day and night.

The Project will be brought into service, by the introduction of gas from the Russian gas network, only after all control and monitoring systems have been commissioned at both ends of the pipelines in Russia and Turkey. Each pipeline will be commissioned separately and come into operation separately.

Once the pipeline system is filled with gas, pressurisation will continue to reach operational conditions. At the RT in Turkey there will be tests that involve venting of the Landfall Section. After pressurisation, the pipeline will be ready for initial operations, involving performance tests, followed by normal operation and gas transportation.

TurkStream Gas Pipeline will have a maximum operating pressure of 283.3baraat at the inlet to the landfall facilities in Russia. However, when the gas makes landfall in Turkey the standard operating pressure of the pipeline will have fallen to between approximately 6.7 MPa and 9.9 MPa and the temperature of the gas will be approximately -5 °C.

The maximum daily capacity of each pipeline at normal conditions will be 47.9 MMSCM (Million Metric Standard Cubic Meters)per day and a maximum of 31.5 bcm of gas will be transported by the two pipelines each year. The pipelines will be operated seven days a week, 24 hours per day.

The flow, pressure and temperature of the gas during the operational stage will be determined at the Russkaya CS in Russia and at the RT in Turkey. In the operational phase of the Receiving Terminal, it is planned to connect the RT to the national electricity network through a sufficiently secure connection and meet the terminal's electricity need in this way. In case the terminal cannot be connected to the national electricity network (or the connection is not secure enough), a small-scale power plant will be installed for power supply. This situation is considered as the scenario of using hydraulic equipment. The power plant which is planned to have a capacity of 5 MW will include 3 gas engines.

A fire and gas detection system will also be installed at the Receiving Terminal. During the operation, about 20 personnel will work at the Receiving Terminal. The duties of the staff will include; Operational control and maintenance, management of facilities, fulfilment of security and ancillary service requirements. Additional staff will be required for larger maintenance activities, such as unforeseen maintenance activities, pipeline cleaning and gauging.

1.13.4.1 Parameter Monitoring

Pressure, temperature, flow, and gas composition (including water and hydrocarbon dew point) will be monitored at the RT and the relevant parameters' status will be monitored by continuous real-time monitoring of process conditions via the Supervisory Control and Data Acquisition (SCADA) system.

In addition to the alarm systems, emergency shutdown system will be installed at the RT. This system will be designed to automatically disable the pipeline if the operating parameters (for gas pressure, temperatures or flow characteristics) detected by the SCADA exceed the specified limits.

1.13.4.2 Leak Detection

TurkStream Gas Pipeline will be monitored by a Leak Detection System (as part of the Pipeline Performance System) that operates on the basis of real-time flow, pressure and temperature monitoring, thereby detecting any gas loss in the offshore pipeline automatically. These parameters are measured in continuous real time via the SCADA system. If the system detects changes in the aforementioned parameters it will automatically alert the operators of a potential leakage at the CCR and BUCR. However, it will not necessarily initiate an automatic shutdown. The location of a leak will be calculated using the flow, pressure and temperature data recorded at the RT. The accuracy of the calculation will depend on various factors including the instrumentation accuracy, leak size and pipeline-operating regime.

1.13.4.3 Pipeline Maintenance

1.13.4.3.1 External Pipeline Inspection

The external condition of the subsea pipeline, including the condition of the cathodic protection system, will be monitored on a regular basis as set out in Table 1., using ROV or Autonomous Underwater Vehicles (AUV), inspection technologies including sonar scans and visual (camera) inspections. Critical sections of the pipeline will initially be inspected annually and afterwards, the frequency of the inspections will depend on actual findings (eg, growth of free span). Critical sections of the pipeline route may include:

- Steep slopes;
- Continental shelf break;
- Buried or trenched sections of the pipelines; and

- Any areas where free spans or other seabed anomalies may occur (based upon earlier inspections).

Table 1. 22: Proposed External Inspection Surveys of the Offshore and Shore Crossing Section Pipelines

External Inspection	Inspection Method	Proposed Frequency of Inspection	Survey Duration per Pipeline (for the section within Turkish jurisdiction, after KP660)*
Critical Pipeline Sections Survey	ROV	Annually	Approximately five days **
Entire Pipeline Route Survey	ROV	Prior to the start-up or within one year of commencement of operation	Approximately 30 days
	AUV	Every five years thereafter	Approximately 11 days
Cathodic Protection Survey	ROV	Prior to the start-up or within one year of commencement of operation After five years of operation Every ten years thereafter	Approximately 30 days

* Durations allow for operational downtime and weather standby etc. but not for mobilisation and demobilization of equipment.

** The duration is based on an estimate regarding critical areas; the duration may change depending on whether the critical areas are more or less according to the the final examination results.

Onshore cathodic protection monitoring will be undertaken manually at pre-determined intervals, to be determined during FEED. The test stations will be located on each buried pipeline axis.

1.13.4.3.2 Internal Pipeline Inspection

It is foreseen that after completion of the pre-commissioning pipeline measurements, the internal inspection, planned to be carried out later on the pipelines using PIG, will not be necessary for about five years after the initial start-up and operation. The frequency of testing can be increased or decreased depending on the results of previous inspection runs, survey information and regulatory requirements. The recommended internal inspection frequency for pipelines is shown in

Table 1..

Table 1. 31: Proposed Internal Pipeline Inspection Surveys

Internal Inspection	Inspection Method	Proposed Frequency of Inspection
Wall thickness measurement	Intelligent PIG	Prior to the start-up or within one year of commencement of operation Every 5 years thereafter
Pipeline position	XYZ Mapping PIG	Prior to the start-up or within one year of commencement of operation Every 5 years thereafter
Pipeline geometry	Metering PIG	Prior to the start-up Prior to running calliper or intelligent PIGs.
	Pipeline Thickness Measurement PIG	Prior to the start-up Every 5 years thereafter

Internal pipeline cleaning is not anticipated to be required due to the composition of the dry gas that will be transported through the pipelines. However, any cleaning that may be required will be undertaken using cleaning PIGs transported using gas. Flow rate in the offshore pipeline is too high for inspection and measurement operations to be conducted efficiently and safely. The gas flow rates in the pipelines will be reduced to about 60% of the maximum gas flow rate during the inspection and measurement operations. Furthermore, a Pipeline Integrity Management System (PIMS) will be developed to control on-going monitoring / maintenance during system operation, with a specific focus on corrosion control. To ensure that inspection and measurement (PIG) operation is carried out under appropriate conditions (flow, pressure and velocity), the Russian Compressor Station, the Receiving Terminal, the offshore pipeline and the Russian landfall facilities must be in mutual interaction. Detailed operating procedures will have to be developed to ensure that the operators employed in the said facilities are knowledgeable about what needs to be done during inspection and measurement operation and in which order.

To ensure safe operation of the PIG trap, it will be mechanically interlocked to make sure that the valves and gate unit open and close in the right order.

1.13.4.3.3 Pipeline Repair

In case of planning, the necessary permits for major repair work on offshore pipelines will be taken, project-specific management plans and procedures will be applied.

1.13.4.3.4 Maintenance of the RT

The maintenance of the RT may be determined after the detailed design phase has been completed and the appropriate supplier for the equipment supply has been selected since it depends on the equipment/equipment supplier.

1.13.4.4 Pipeline Shut Down and Restart Process

1.13.4.4.1 Pipeline Shut Down

During the operation, it may be required to shut down the pipelines from time to time. The pipelines may be shut down in various ways. These are:

- Process shutdown (closure of external ESD valves), as indicated by the operator or via the process control system, corresponding to a stop of the gas flow; and
- Safety System (SGS), as specified in the Emergency Shutdown or Safety System (closure of external and internal ESD valves) that applies to fire and gas detection scenarios.

The shutdown philosophy is based on the following principles:

- A fixed gas inventory should be provided as much as possible to meet the conditions set out in the Agreement and to restart the gas transfer operations quickly;
- Shutdown procedures should be implemented in a way to reduce the need for personnel intervention to restart the flow;
- Efforts will be made to reduce maintenance and replacement shutdown requirements to a minimum; and
- Ventilation is only be carried out in emergency situations where the release of gas is absolutely necessary, or under safety requirements during maintenance.

1.13.4.4.2 Process Shut Down (PSD)

A PSD of the pipelines may be necessary to perform scheduled repairs or inspections during the operation of the project. Process shutdown is an operation whereby a process unit is isolated to allow for its safe shutdown conditions and it may be initiated to ensure safe operations in the event of loss of control or when operating conditions exceed appropriate values. This process unit becomes under pressure after the process shutdown. This shutdown is a planned event and will be undertaken under controlled conditions. The PSD will be carried out by operations at the Russkaya CS and at the RT.

1.13.4.4.3 Emergency Shut Downs (ESD)

Local emergency shutdown and security systems will be installed at the RT. Should there be an incident (unplanned event) the ESD system will be triggered and the pipelines will isolate themselves. The gas volume in the pipelines will then be automatically isolated from the RT, by closing the landfall facilities inlet and outlet ESD valves, thereby maintaining a constant gas inventory within the offshore pipeline. Emergency shutdown levels are as follows:

- Level 0- Shutdown of the entire Receiving Terminal: to protect the RT against gas entries and exits, entry and exit pipelines are completely isolated from the RT and closed off under pressure;
- Level 1- Section shutdown: involves the isolation and shutdown of a specific section/area located in the RT, taking into account zones/areas under different design pressures. In this case, the entire RT is not shut down; and
- Level 2- Partial section/unit shutdown: only the affected unit or part of unit is shut down and isolated.

The underlying principle is to stop the supply of gas which would feed a fire or gas leak (should there be one), and at the same time maintain a constant gas inventory within the pipeline. In the event that an unplanned process shutdown takes place in the RT, the personnel at the RT will primarily investigate the cause of the shutdown from the local control room or the central/backup control room before re-operating the system.

After an emergency shutdown, restarting procedure may be undertaken when the following conditions are met:

- Causes of the ESD should have been identified;
- Remedial activities including repair and valid testing should have been completed; and
- All conditions should have been met and more for safety.

1.13.4.4.4 Security of the Receiving Terminal

For all work areas including the temporary ones, appropriate security measures such as access control, badges, CCTV, monitoring and recording of entry and exit of personnel and vehicles shall be provided 24 hours a day, 365 days a year including days off work all through the contract period. The security level will also be increased as the importance and sensitivity of the work carried out within the facility increases. The Project Owner will be informed about the use of security forces and / or personnel and will ensure that these forces / personnel have appropriate training in respect of human rights and use of force in accordance with Good International Industrial Practices (GIIP). Firearms or unidentified dogs will not be used for security purposes.

1.13.5 Decommissioning Stage

The expected service lifetime of the project is 50 years. The decommissioning program will be developed during the Operational Phase of the Project. It is likely that the technological options and preferred methods for decommissioning of such gas transportation systems will be different in 50 years' time. The status of the Project at the time of decommissioning will also impact the choice of decommissioning methods.

Decommissioning activities will be undertaken in accordance with the international and national legislation and regulations prevailing at that time, including the Good International Industry Practices (GIIP), and in liaison with the relevant regulatory authorities and with the necessary permits.

Planned decommissioning activities will be carried out in line with GIIP (Good International Industrial Practices) and various surveys along with additional studies (if necessary) will be carried out at the operational stage to ensure that the most appropriate method for decommissioning is selected according to prevailing circumstances and future land use

1.13.5.1 Decommissioning of the Offshore and Shore Crossing Sections of the Project

Current practices for the decommissioning of pipelines in the Offshore and Shore Crossing Sections involve either removing the pipeline or leaving the pipeline on the seabed after cleaning and filling it with water. The second method is accompanied by a program for the planned monitoring of the pipeline to ensure the safety of other users of the sea. As the pipelines will integrate with the marine environment over time, this method will cause less impact on the environment as the pipelines are left in place. Removing the pipelines would damage the habitats that have formed near the pipelines. A summary of the activities involved in both options is described below.

Leaving the pipelines on the seabed will typically involve the following types of activities:

- Filling the pipeline with water;
- Pipeline cleaning by flushing with water and associated water displacement, collection and disposal;
- Sealing of the pipeline ends; and
- Monitoring surveys following decommissioning.

Removal of the pipelines from the seabed will typically involve the following types of activities:

- Vessel operations similar in nature to those required for construction of the pipeline;
- Seabed Intervention;
- Pipeline removal, onshore storage, recycling and disposal;
- Disturbance of the seabed and aquatic ecosystem as the pipeline is removed; and
- Logistics support offshore and onshore.

Factors to be considered when taking the decision on decommissioning method for the Project include:

- The potential for re-use of the pipeline in connection with further developments will be considered before decommissioning (such as hydrocarbon storage, deep sea discharge etc.). If re-use is considered viable, suitable and sufficient maintenance of the pipeline and necessary procedures will be investigated and ensured;

- All feasible decommissioning options shall be considered and a comparative assessment shall be made;
- Any removal or partial removal of a pipeline shall be performed in such a way as to minimise the potential for any significant adverse effects on the marine environment;
- Any decision that a pipeline may be left in place should have regard to the likely deterioration of the material involved and its present and possible future effect on the marine environment; and
- Other users of the sea shall be taken into account.

Where it is proposed that a pipeline should be decommissioned by leaving it on the seabed for natural degradation (referred to as in situ decommissioning), either wholly or in part, the decommissioning program will be supported by a suitable study that addresses the degree of past and likely future burial/exposure of the pipeline and any potential effect on the marine environment and other users of the sea.

Determination of any potential effect on the marine environment at the time of decommissioning will be based upon scientific findings. The factors to be taken into account will include the following:

- The effect on water quality and geological and hydrographical characteristics;
- The presence of endangered or threatened species;
- Existing habitat types;
- Local fishery resources, and
- The potential for pollution or contamination by residual products from the pipeline.

The above serves as an example of general principles that should be applied during the decision-making process for the decommissioning options. It is foreseen that more directly applicable international or national guidelines are likely to be developed before the end of the lifetime of the Project (approximately 50 years) and that these will specify additional options that may need to be considered. The applicable Turkish legislation at the time of decommissioning will be adhered to.

1.13.5.2 Decommissioning of the Landfall Section of the Project

During the Decommissioning Phase of the Landfall Section, activities on site associated with the removal of infrastructure will increase in intensity relative to those occurring during the Operational Phase of the Project. Of particular note are the potential environmental and social impacts associated with the following activities:

- The demolition of facilities and infrastructure;
- Equipment and vehicle movements; and
- Earthworks.

An environmental assessment may be required before decommissioning commences in order to confirm that the planned activities are the most appropriate to the prevailing circumstances. Potential impacts associated with decommissioning activities may include the following:

- Erosion and sedimentation;
- Dust generation;

- Capacity constraint at waste disposal facilities;
- Spills of hazardous substances;
- Damage to habitats, flora and fauna; and
- Noise disturbance.

The extent to which the following activities will be carried out will depend on the final use for development zones in the landfall section. This use shall be determined in consultation with the relevant national and local authorities:

- The RT will be removed;
- Access roads may be left in place depending upon the subsequent use of the land;
- Shallow structures for infrastructure will be removed and disposed of;
- Where piled foundations exist, these will be excavated to a depth of 1 m below the existing ground level and removed;
- Excavations resulting from the removal of foundations will be backfilled; and
- Landfall section pipeline sections may be cleaned and re-used in connection with the offshore pipeline sections. If re-use of the landfall section pipelines is not feasible then they will most likely be recovered and the steel recycled and the trenches backfilled and reinstated.

Prior to undertaking decommissioning activities, a review of historical monitoring data and incidents on site that might have caused contamination will be undertaken.

Depending on the final land use agreed with the authorities for the Landfall Section area, all or part of the site may need to be rehabilitated during the de-commissioning phase. In such circumstances, a monitoring programme will be developed for completion criteria to verify that the site is being returned to the state agreed in the Erosion, Rehabilitation and Landscaping Plan.

Completion criteria will be included to the rehabilitation process concerning issues such as vegetation community composition, extent of weed infestation, erosion control and visual amenity of the site. These completion criteria will be determined in consultation with the local and national authorities.

For the restoration of the areas in the Landfall Section and the RT, in the scope of the Project will prepare an erosion, reinstatement and landscaping plan.

1.13.6 Labour and Working Conditions

1.13.6.1 Construction Phase

At the time of preparing this EIA Report it was not possible to estimate the exact numbers of workers that will be employed during the construction of the Project. This information will be finalized after completion of the detailed design of the Project. However, the maximum numbers of workers anticipated to be working on the Project (at this present time) during the peak of construction activity are presented in Table 1. below.

Table 1. 32: Estimated Labour Levels during the Construction Phase

Project Section	Peak Labour Numbers (approximate)
Offshore	950
Shore Crossing	250
Landfall	600

Construction activities are projected to be carried out 24 hours per day, seven days per week upon the due approval of the relevant official institutions. Although much of the construction work will continue up to 24 hours a day with the due official approvals, the work will be managed by meeting the requirements in the scope of the relevant legislation on the night shift and if necessary legislation on the movement of trucks at night.

The majority of the construction work force required will need to be highly skilled and is anticipated to come from outside the local area. For the sheltering of workers, labour camp(s) will have to be established in the Landfall Section. The number of workers required in the Landfall Section is conservatively estimated to be up to 600 at the peak of the works.

Transportation from the accommodation camps to the site will be provided by buses or mini-vans. Temporary facilities for all necessary amenities will be installed as necessary, in line with all relevant legislation.

As laid down in the opinion letter (ANNEX-5.A) dated 03.07.2017 of Kırklareli Provincial Directorate of Public Health, healthy freshwater and tap water will be provided for the workforce to be employed under the Project within the Regulation Concerning Water Intended for Human Consumption. In the event that freshwater and tap water is obtained from a water resource such as wells, artesian, spring water apart from mains water, it will be ensured that a leak-proof cesspool will be located at least 15 m away from this water resource and necessary chemical and microbiological analysis will be carried out. Furthermore, necessary efforts will be ensured with competent authority, institution and firms in line with the provisions of Regulation Regarding Use of Biocidal Products for flies, bugs, rodents and insects that may emerge as a consequnce of the Project activities.

1.13.6.2 Operation Stage

There will be approximately 20 full time personnel employed during the Operational Phase of the Project to operate the RT. Other workers will be stationed permanently at the CCR and BUCR to monitor the Pipeline. In some periods, for example, during the PIG operations, more workers may work in the area. PIG operations will be carried out by specialized contractors. On the other hand, it is expected that the general maintenance operations of the electricity and monitoring systems will be carried out by the employees at the RT. The operational performance of the Project will be monitored in real-time using the SCADA system from the CCR and BUCR.

The Project will have in place management systems that are internationally recognized and compliant (for example OHSAS 18001 / ISO 45001). These management systems will ensure that the necessary company structures exist, that the defined responsibilities are clear, that the best practices are adopted, and that sound procedures and processes are implemented. The management systems will also ensure that appropriate resources are available so that the Project Owner can demonstrate leadership and transparency to prove the highest possible level of occupational health and safety. Furthermore, the Project Owner will also ensure that all of its contractors maintain the same high emphasis on occupational health and safety systems, with the rigid attitude displayed during contractor selection and contract signing processes.

Other OH&S procedures to be adopted by the Project include:

- Fitness-to-work Assessment;
- Management procedures; and
- First aid and medical emergency response

Within the scope of the Project, compliance with national Occupational Health and Safety Legislation will be ensured and implementations will meet the requirements of national legislation at minimum.

Labour and Working Conditions Management commitments included in the Project's Environmental and Social Construction Management Plan will be related to the following issues (mitigation, management and monitoring):

- Recruitment;
- Safe, equitable and healthy working conditions;
- Employment conditions;
- Non-discrimination;
- Complaint procedure; and
- General (i.e. not operation-specific) environmental and social training.

A Code of Conduct involving on-site behaviours and relationships with the local population shall be developed for the workforce and all individuals involved in the workforce shall be required to comply with these rules.

1.14 Other Issues

There are no other issues that can be addressed in this section.

Content

2 Environmental Impact Assessment Approach

This chapter aims to examine Environmental Impact Assessment (EIA) process and explain the objectives of this process. Furthermore, this chapter outlines how the requirements of EIA Regulation were met in the EIA process of the Project.

This chapter explains the impact assessment methodology applied to this Project elaborating on how the impacts were foreseen, assessed and how the mitigation measures were developed when needed. In addition, the impacts identified and assessed in the EIA report are also summarized.

EIA process is a systematic approach which entails identifying environmental and social impacts of a project and explaining mitigation, management and monitoring measures to be applied to a specific impact when needed. This approach provides the stakeholders who may potentially be affected by the Project with the opportunity to participate in EIA permit process and helps the relevant authorities take informed decisions about their proposals to further develop the project.

2.1 EIA Process in Turkey

EIA process is subject to the requirements of EIA regulation which regulates administrative and technical principles and procedures. The EIA regulation which was effective on the date of drafting this report (Official Gazette date: 25.11.2014, Number: 29186) covers the following:

- Assessing whether or not EIA Application file or Project Presentation File are necessary to be submitted for the project in question;
- Administrative and technical procedures and principles to be followed in EIA process;
- Holding the Scope and Special Format Determination Meeting (Chapter 2.1.3);
- Holding Public Hearing and setting up Review and Evaluation Commission (REC) (Chapter 2.1.1) and collecting stakeholders' views on the project;
- Drafting EIA report which complies with Special Format and minimizes adverse environmental impacts of the project as much as possible considering the stakeholders' views and
- Providing information about the progress made in the investment process at intervals to be decided by the commission within project inception and construction processes.

EIA has the following main goals:

- To define and assess potential impacts in a way to cover all adverse or positive environmental impacts of all phases of the project and
- To prevent potential adverse impacts if possible or to develop measures to minimize the impact if it is not avoidable.

2.1.1 Application

The projects included in the list of Annex I of the relevant EIA Regulation require an EIA Application File prepared in compliance with the Annex III of the EIA Regulation to be submitted to Ministry of Environment and Urbanization (MoEU).

When the EIA Application File is submitted, the relevant branch Office of the Directorate General of Environmental Impact Assessment, Permit and Inspection assigns an EIA coordinator for the relevant project. MoEU reviews the EIA Application File to identify if it is in compliance with Annex-III. The file which is decided to be non-compliant with the requirements is returned to the project owner to be re-submitted after compliance is achieved.

If MoEU decides that EIA Application File complies with the requirements, a Review and Evaluation Commission (REC) is set up to consider information presented in the EIA Application File. This commission consist of representatives of institutions and agencies whose opinion is required to be obtained regarding the project and those who can provide expert opinion about potential impacts and mitigating measures.

REC generally consists of those representing the following organizations:

- Relevant Directorates General of MoEU and relevant Provincial Directorate (Directorates) of Environment and Urbanization;
- Organizations and authorities relevant to project and assigned by MoEU and/or local offices of such authorities (e.g. Provincial Directorate of Culture and Tourism) and
- Municipalities and other relevant organizations and institutions.

MoEU may invite, if it deems necessary, representatives from universities, institutes, research or occupational organizations, professional associations, unions, business associations or Non-Governmental Organizations (NGOs) to the meetings to be member of REC.

MoEU submits the EIA Application File to members of the REC and sends an official letter indicating the date to submit opinion on Public Hearing (Chapter 2.1.2) and Scope Determination (Chapter 2.1.3) and the EIA Application File to members of the Commission.

2.1.2 Obtaining Public Opinion

The relevant EIA Regulation stipulates that public hearing/hearings is/are organized at the project site by the project owner and the organization which would draft EIA Report (or another area to be determined by the MoEU) before the Special Format is determined in order to inform the public of the planned project and receive their proposals and views. The date/dates of the meeting is/are fixed by the MoEU.

When deciding on the venue/venues of the public hearing, special attention is paid to make sure that the venue is easily accessible by the local people who may be affected by the project most.

Project owner has an announcement which should be in format determined by MoEU and indicate the date, hour, venue and subject of the Public Hearing be published in a national and local newspaper at least ten calendar days before the date of the meeting.

The public hearing/hearings is/are chaired by either the Director of Provincial Administration of Environment and Urbanization or an authorized person assigned by the Director. The minutes of the meeting are sent to the Ministry and one copy is kept by the Provincial Directorate of Environment and Urbanization.

An assessment needs to be carried out by reviewing the potential impacts of the project and identifying how the local people, relevant stakeholders and natural life can be affected. The negotiation to be conducted with the local people and other stakeholders involves the following steps:

- The selection of a venue/venues for public hearing;

- Obtaining the concurrence of the MoEU/Provincial Directorate of Environment and Urbanization for the venue/venues of the public hearing;
- Informing public and other stakeholders at the public hearing/hearings by using promotion materials such as brochures;
- Taking down notes during the public hearing/hearings;
- Deciding on a method to deliver an opinion/proposal (via phone or e-mail);
- Negotiations with other relevant stakeholders such as universities, academies and NGOs;
- Assessing the view and proposals gathered at public hearing/hearings while the Special Format is being identified (Chapter 2.1.3) and
- Incorporation of views obtained from the general public or other stakeholders into EIA Report.

2.1.3 Scope and Special Format Determination

This is the process in which the scope of EIA Report is determined by the Ministry in line with views and proposals of agencies/institutions who are members of the Commission, general public and other stakeholders.

Determining the scope of EIA is also called as Special Format and it is done in line with Annex III of the relevant EIA Regulation and potential significant environmental impacts are taken into account. The subjects to be included in the EIA Report are handled at the phase of Scope and Special Format Determination.

MoEU and/or Provincial Directorate of Environment and Urbanization informs the REC of the outcomes of the public hearing/hearings. Members of the REC provide their opinion and proposals concerning the project. Before the REC members give their opinion, they may demand more detailed information about the project from the project owner. In case of any REC member who does not provide his/her opinion within this process, they can submit it to MoEU later.

The Special Format determined in line with the demands and opinion of REC members is submitted by the MoEU to the project owner in the form of a list of all topics which need/are expected to be covered in the EIA report within seven (7) business days after the fee for Special Format is paid to the MoEU.

2.1.4 Submission of Report and Evaluating the Compliance of the Format

The project owner is obliged to submit the EIA Report to the MoEU within eighteen (18) months after the Special Format is identified. The MoEU reviews in five (5) business days after the submission of the report if the EIA report complies with the Special Format and drafted by the professionals who need to be part of the working group. If the EIA report is not submitted to MoEU in the defined schedule, the EIA application is deemed invalid.

If the EIA report is identified as a result of the review not to have been drafted by the relevant group of experts and/or not complying with the Special Format, the report is returned to the project owner to fix the issues. If the EIA report which is revised to eliminate non-conformities is not submitted again within three (3) months after the review, the EIA application is deemed invalid.

In cases where the EIA report complies with the Special Format, it is sent to the members of the Commission enclosed with an official letter indicating the date and venue of the REC meeting.

2.1.5 Review and Evaluation of the EIA Report

The Ministry and Governor's Office announce the general public that the review and evaluation process has started for the project and EIA report is now open to public opinion. The stakeholders who want to review the EIA Report may review the report within the announced time line at the premises of MoEU or Provincial Directorate of Environment and Urbanization to deliver their opinion. All the opinion submitted to the Provincial Directorate of Environment and Urbanization is then communicated to the Ministry and the views and opinions are incorporated into the EIA Report. The opinions delivered after the review and evaluation process is over are not taken into account. The MoEU holds a REC meeting in which REC members reveal the views of the organizations that they represent. The REC assesses the following before/during the review and evaluation meeting:

- Whether or not the EIA report and its annexes are adequate and compliant;
- Whether or not the potential environmental impacts of the Project are comprehensively examined;
- Whether or not measures needed to be taken to eliminate potential adverse impacts on the environment are included and
- Whether or not solutions are offered in relation to the views and proposals delivered at the Public Hearing and in the course of the process.

The chairperson of the meeting asks for written opinion regarding the minutes of the meeting. REC may request all the demands gathered about the impact assessment from the project owner during the whole EIA process. When needed and demanded for any subject, Project Site may be visited, samples may be collected and other experts may be invited to review the EIA Report. In cases where there are significant errors and shortcomings in the report, the REC may stop reviewing the report until incomplete information is provided or corrections are put in place. The review and evaluation process is completed in ten (10) business days following the review and evaluation meeting.

In cases where there is no deficiency in the report, the project owner submits the finalized EIA report to the MoEU in ten (10) calendar days after finalizing it upon receipt of final minutes of the review and evaluation meeting. The project owner commits through a commitment letter which should be a notary endorsed letter that the finalized EIA Report and its annexes are under their responsibility. In cases where the EIA report and the commitment letter are not submitted within the time line without any justification, EIA process ends.

2.1.6 EIA Decision

EIA Report is kept open to obtaining opinion and view by the Ministry and/or Provincial Directorate of Environment and Urbanization through bulletin boards and internet for ten (10) calendar days for the purpose of receiving view and proposals from the public. Such views and proposals are taken into account by the Ministry in the decision making process of the project. The Ministry may, in line with the views collected, request that the deficiencies are corrected, additional studies are carried out or the Commission convenes again. The commitment letter indicating that the finalized EIA report and its annexes are under the project owner's commitment as well as the notarized list of signatories are submitted to the Ministry in five (5) business days.

MoEU may take either "EIA Affirmative" or "EIA Negative" decision within ten (10) business days following the submission of the final EIA report considering the minutes of review and evaluation meeting which are drafted by the REC. The MoEU informs the project owner, REC members and relevant organizations and institutions of this decision in writing. The relevant Provincial Directorate of Environment and Urbanization publicizes this decision with its justification either through bulletin boards or internet.

It is obligatory to start the construction of projects for which "EIA Affirmative" decision has been taken in seven (7) years following this decision. Otherwise, the affirmative decision is deemed invalid. As far as projects for which the "EIA Negative" has been taken are concerned, re-application is possible if all shortcomings/limitations which cause the rejection of the project are eliminated.

2.2 EIA Scope for the Project

This EIA report has been drafted considering the requirements of "Turkish EIA Regulation" which became effective after being published in the Official Gazette no 29186 on November 25, 2014 and is based on the Turkish Environment Law no 2872 and dated August 11, 1983. This project is included in Annex 1 of the relevant EIA Regulation as follows:

"List of Projects to which Environmental Impact Assessment will be applied":

"29- Transporting oil, natural gas and chemicals with pipelines which are more than 40 km in length and have a diameter of 600 mm and more"

An Environmental Impact Assessment (EIA) study was already conducted in compliance with the national permit requirements which were effective at that time in Turkey for Turkey section of South Stream Offshore Pipeline which crosses Black Sea Exclusive Economic Zone of Turkey. The final EIA file was submitted to the Republic of Turkey Ministry of Environment and Urbanization (MoEU) (Directorate General of Environmental Impact Assessment, Permit and Inspection) on July 10, 2014 and an "EIA Affirmative Document" was obtained on July 18, 2014 which is still valid.

The Turkey Section of the South Stream Offshore Pipeline project which has already obtained EIA Affirmative Document starts with the boundaries of Russian and Turkish EEZs within the renewed Project (Turk Stream Gas Pipeline – Offshore Section) and covers the section extending till KP660 which is close to boundaries of Turkish and Bulgarian EEZs. Detailed review and design studies for this section of the project which is around 460 kilometres were already carried out in the Turkey Section of the South Stream Offshore Pipeline project. EIA scope of the project was determined in line with the relevant EIA process explained in Chapter 2.1.

For an effective impact assessment study, the EIA process in the project should be comprised of the following phases:

- **Preliminary Assessment** (Chapter 2.2.1): Predefinition of potential interaction between project activities and environmental and social recipients at the inception phase;
- **Scope Determination** (Chapter 2.2.2): Preparing the EIA application file which constitutes the basis of EIA Report drafted in consideration of the nature of the project and outcomes of preliminary assessment and applicable legal requirements as well as identification of Special Format. This phase is composed of the following steps:
    - Desk research: Reviewing the existing environmental and social data and conducting gap analysis to identify when it is needed to obtain more data about the baseline situation or to confirm the available data;
    - Recipients: Defining potential physical, biological and socio-economic recipients which may potentially be affected by the project; and
    - Alternatives: Evaluating technical alternatives for the project such as alternative routes and methods.
- **Baseline studies conducted on the site** (Chapter 2.3): Site studies were conducted before the Preliminary Assessment phase and following the gap analysis which is conducted as part

of Scope Determination phase. This assessment is carried out to complete existing information and define baseline conditions which would set a basis for impact assessment;

- **Impact Assessment** (Chapter 2.4): This phase includes the following:
    - Impact Assessment: Defining and assessing potential impact in a way to cover the type, nature and magnitude of the impact; and
    - Cumulative impacts: Carrying out a special assessment of potential impacts which may be extended till certain sections of the Turk Stream Gas Pipeline Offshore project falling under the jurisdiction both the Russian and Turkish authorities (Chapter 2.5.9), of the interaction with the Turk Stream Gas Pipeline Onshore section of the project as well as the potential of combining the Project impact with the impact of other existing or planned projects and other impacts related to South Stream Offshore Pipeline Project (Chapter 2.5.9) and the residual impacts.
- **Mitigation** (Chapter 2.5.7): Identifying measures following the determination of project impacts to eliminate or minimize/mitigate potential adverse impacts and enhance potential positive impacts;
- **Environmental and Social Management Plan (ESMP)**: Management plan and procedures developed by the project owner which should include measures to be implemented to mitigate all adverse impacts identified at the project development phase and should be part of Integrated Health, Safety, Environment and Security System (HSE-S). (These plans and procedures are explained in **Chapter 12** (Environmental and Social Management System);
- **Stakeholder Participation**: Negotiating the scope and content of EIA with the Project officer in MoEU, commission members, local people and other stakeholders in a way to help identification of potential project impacts (This phase involves Public Hearing and the details are given in **Chapter 5** (Relations with the Public (Stakeholders); and
- **Publicizing the EIA Report:** Following the submission of the EIA Report to MoEU in line with the requirements of EIA Regulation, making the report available to the public after the inception of review and evaluation process.

2.2.1 Preliminary Assessment

The preliminary assessment is the first phase of EIA process and carried out to identify potential interaction between the Project and existing physical, biological and socio-economic recipients. Having the preliminary assessment as one of the first phases of EIA process has made it easier to consider environmental and social issues which are considered while the project design is developed.

The preliminary assessment process is composed of the following basic steps:

- Completing the project activities; project activities cover the following 3 main project phases;
    - Construction and Pre-Commissioning Phase,
    - Commissioning and Operation,
    - De-commissioning.

For all of the above phases; routine (planned) activities, non-routine planned activities (such as maintenance) and incidents (such as breakdown and accidents) are defined:

- Taking the data on existing environmental and social conditions and expert opinion as the basis, identifying the potential physical, biological and socio-economic recipients;

- Examining the relevant national legal requirements and international guideline standards and
- Creating a preliminary assessment matrix which should show potential interaction among project activities having the highest possibility of creating impact on physical, biological and socio-economic recipients.

The preliminary assessment matrix can be found in Table 2.1.

Table 2.1: Preliminary Assessment Matrix – Impacts of Construction Phase

Impacts of Construction Phase	Project Sections		
	Offshore	Shore crossing	Onshore
Marine Ecology (flora and fauna)	√	√	
Terrestrial Ecology (flora and fauna)		√	√
Geology	√	√	√
Hydrogeology		√	√
Hydrology	√	√	√
Sediment	√	√	
Soil		√	√
Water	√	√	√
Air	√	√	√
Climatic Conditions	√	√	√
Ownership		√	√
Archaeological and Cultural Heritage	√	√	√
Landscape Features		√	√
Sensitive area	√	√	√
Socio-economy (fisheries, sea and land use etc.)	√	√	√

Pre-commissioning activities will cause adverse impacts similar to those which may be faced at the construction phase. However, potential impacts will be defined, examined and assessed in a very detailed manner in this EIA report in relation to potential mitigation measures and legislation in practice.

Components which may be affected by the project at the operational phase are given in Table 2.2 for each of the phases. These impacts will be limited to maintenance activities and of short term duration.

Table 2.2: Preliminary Assessment Matrix – Impacts of Operational Phase

Impacts of Operational Phase	Project Sections		
	Offshore	Shore Crossing	Onshore
Marine Ecology (flora and fauna)	√	√	
Terrestrial Ecology (flora and fauna)		√	√
Soil		√	√
Water	√	√	√
Air	√	√	√
Sensitive area	√	√	√

Following their definition, project activities have been evaluated to determine their potential of interaction with the environment such as emission and discharge. The summary of project phases and relevant activities is given in Table 2.3.

Table 2.3: Project Phases and Project Activities

Phase	Activity
Construction and Pre-Commissioning Phase (Offshore and Shore Crossing)	Vessels entering and exiting the construction site, vessel mobility in the construction corridor and using Dynamic Positioning equipment while pipes are being laid.
	Surveys conducted before and after the pipe laying and using Remotely Operated Underwater Vehicle (ROV) for inspection
	Delivering fuel, pipe and other materials from the supply vessels to pipe laying vessels (Aligning pipes on the deck with pipe carrying cranes is included in this activity.)
	Storing fuel and other hazardous substances
	Discharging hydrotest fluid
	Bunkering to vessels, facilities and machinery
	Using helicopter for personnel shift change
	Maintenance for the facility and the machinery
	Vessel operations: waste generation
	Vessel operations: Fresh water generator/desalination unit and using the water as vessel cooling system (As it is the case in every vessel, cooling water is generated as a result of the process of decreasing the heat of vessel engine and this water does not come from any heat treatment or process.)
	Vessel operations: Night work
	Vessel operations: Welding, welding inspection and coating pipe segments
	Excavating trenches for shore crossing and laying the pipes to the trenches
	Temporary storage of dredged material
	Crossing over the existing pipeline
	Raising/lowering the pipeline (Bottom dropping and rescue operations (when necessary depending on air and emergency conditions))
Construction and pre-commissioning (Onshore)	Land supply
	Topsoil stripping and temporary storage
	Applying hydrostatic test to pipes
	Constructing Integrated Gas Receiving Terminal
	Bio-restoration studies
	Pipeline drying
	Carrying and storing pipes and other material
	Non-hazardous and hazardous liquid and solid waste generated out of construction activities
	Personnel accommodation and management
Operation (including commissioning)	Routine pipeline check at offshore and shore crossing sections and vessels would enter and exit the pipeline route to repair pipeline when necessary and move along the pipeline route
	Operating Integrated Gas Receiving Terminal
	Inpecting, maintaining and when needed repairing the pipeline (e.g. width correction)
	Operating the pipeline

Phase	Activity
De-commissioning (the option to leave the pipeline in the ground/in situ)	Washing up the pipeline to clean it, discharging and disposal of water used for cleaning purposes
	Filling up the pipeline with sea water and closing it
	Monitoring the pipeline after decommissioning
	Removing the Integrated Gas Receiving Terminal and waste generation as a result
De-commissioning (the option to remove the pipeline)	Removing the pipeline from the sea bed and onshore section,
	Vessel mobility and operations and waste generation as a result (these activities will be similar to construction activities)
	Waste generation stemming from onshore removal activities (removing pipes and Integrated Gas Receiving Terminal) (these activities will be similar to construction activities)

When the project phases which are defined in Table 2.3 are put into practice, it is possible for the following incidents to appear (like emergency situations):

- Chemicals or fuel released from vessels;
- Penetration of alien and invasive species into ecosystems;
- Sea accidents;
- Emergency situations/accidents which may be caused by construction activities during the onshore pipe laying;
- Emergency situations/accidents which may appear during the construction and operation of Integrated Gas Receiving Terminal and;
- Gas leakage which may appear at the pipeline during operation.

2.2.2 Scope Determination

Following the preliminary assessment, the process of scope determination has defined the environmental and social impacts of the Project. Both baseline data and engineering studies which are more detailed than those carried out at the preliminary assessment phase were taken into account to determine the scope. This process of identifying the scope aims to define impacts more consistently and properly.

Scope determination phase as part of EIA involves preparing an EIA Application File which should be in compliance with the relevant EIA Regulation. The EIA Application File was submitted to the MoEU through “e-ced” online system of the Ministry on June 18, 2015. Both the “e-ced” system and the “announcement” section of the official web site of the Ministry publicized that the EIA process has started as a result of the assessment by the Ministry and the EIA Application File was officially opened to public opinion.

Public hearing notice was published in two newspaper; one being a national daily (Hürriyet) and another local (Vize Haber); on July 10, 2015 to ensure stakeholder engagement (Detailed information about stakeholder engagement can be found in Chapter 5). The public hearing held in Vize District of Kırklareli on July 21, 2015 complied with the requirements of EIA regulation. Since the settlement area closest to the project site is Kıyıköy Municipality which is part of Vize district and Kırklareli province, MoEU decided that the venue of the public hearing must be Vize district of Kırklareli.

The Special Format was provided by the MoEU to the project owner on September 16, 2015 which is comprised of main chapters to be included in the EIA report in line with EIA Regulation.

The opinion of participants, REC members and other stakeholders which was obtained during the public hearing process is assessed in the relevant chapters of EIA report.

2.2.2.1 Desk Research and Assessment of the Baseline Information

One of the significant components of scope determination process involves definition of baseline conditions (e.g. environmental and social features which constitute baseline conditions to which potential project impacts can be compared and assessed). Baseline conditions have primarily been defined following the assessment of existing environmental and social data. The baseline information and data have been obtained using the following sources of information:

- Site specific data requested from REC members and other relevant official organizations (e.g. archaeological data, land use and ownership);
- Statistics and reports drafted by government bodies and other official sources and groups (e.g. TURKSTAT/TUIK, NGOs);
- Data requested from universities and other relevant stakeholders;
- Scientific journal/publication and printed sources ; and
- Secondary data based on research findings obtained as a result of field studies conducted by OAO Gazprom since 2009 in the area between Russian EEZ and KP660 as well as expert reports produced as part of EIA Report.

The site surveys to be conducted within the scope of this Project are as follows;

- For offshore and shore crossing:
    - Hydrographic, oceanographic, bathymetric, seismic and geological (conducted via the remote sensing method) measurement;
    - Hydro-chemical analyses, sea water and sediment quality;
    - Marine ecology;
    - Underwater archaeology; and
    - Investigating sonar findings and geological abnormalities using Remotely Operated Underwater Vehicles.
- For onshore section:
    - Geological, seismic investigation;
    - Hydrology and hydro-geology (surface water and ground water quality);
    - Ecology (flora and fauna) and bird watching;
    - Archaeology and cultural heritage objects;
    - Noise measurement;
    - Air quality;
    - Traffic study;
    - Forestry;
    - Agricultural activities;
    - Land use;
    - Socio-economy research and
    - Visuals.

The above mentioned baseline data and their sources constitute the basis of the EIA report and are presented in the relevant chapters.

2.2.2.2 Defining Receptors

Receptors are environmental components (ecosystem) which may negatively or positively be affected by the project; land and marine species, people or cultural heritage objects. Potential receptors have been identified through desk research, baseline studies conducted on the site and definition of potential impacts of the project. Three main categories of receptors were identified based on the baseline data and site work:

- Physical (environmental components like air and water quality, sediments and geology);
- Biological (flora and fauna); and
- Socio-economic (fishing ground, forestry, tourism and settlement areas, cultural heritage).

2.2.2.3 Assessment of Alternatives and Project Optimization

The process and results of assessing alternatives are explained in detail in **Chapter 4** (Reasons for Route Selection and Assessment of Alternatives).

2.3 Collecting Baseline Data

The gap analysis helped identification of the secondary data which are considered either insufficient or impractical (e.g. out of date, narrow scoped etc.) for the purposes of this report and created the need to conduct detailed site investigation to collect primary data in addition to already existing ones (Chapter 2.2.2.1). Such studies involve investigating the Project Site geo-physically, geo-technically, hydrologically and hydro-geologically; carrying out ecology research, air and noise measurement as well as socio-economic research and understanding the situation regarding the land use. Additional research included the examination of published data, information obtained from the research of aquaculture expert, assessment of the fish species and fisheries as well as archaeological data.

All the details (time, location, methods and results) concerning the already conducted site and data examination have been explained in the relevant chapters of the this EIA Report in addition to data obtained as a result of desk research.

2.4 Impact Assessment Method

Impact assessment covers impacts of the Project which may affect the receptors in the environment within the Project phases of construction, commissioning and de-commissioning based on scientific data and expert opinion with a view to defining potential impacts of the Project on the environment. Impact definition was done in a way to consider all control measures which are part of Project design and such control measures were defined as “design controls”. Other mitigating measures have been identified to mitigate or control impacts when needed and/or appropriate (apart from “design controls”). This methodology was applied to all impacts which may appear at the phases of construction, pre-commissioning, operation (including commissioning) and de-commissioning.

EIA processes handled impacts related to planned situations as well as those related to incidents (including emergency). The impacts of planned situations cover both impacts stemming from routine project activities or routine incidents and impacts of non-routine impacts which may appear as a result of project activities. These unplanned impacts have been defined as “unexpected incidents”. Unplanned impacts are caused by incidents which are not foreseen or expected to be seen in the ordinary course of project activities (such as occupational accidents which may take place at the construction phase as well as gas leakage which may appear at the operational phase).

After the current baseline data are compiled and project activities are defined, potential impacts related to the Project have been identified and assessed. The results of such an assessment are given in the relevant chapter of this EIA report.

The process followed when assessing the impacts is the following methodology which considers the following steps as shown in Figure 2.1:

- ***Impact Prediction*** – What kind of impacts may the project create on environment? (Definition of project activities)
- ***Assessment*** – Are the impacts which are generated beneficial or adverse (harmful)? What is the expected magnitude of environmental change which will appear as a result of the impacts? What is the level of significance of these impacts for the receptors affected by the impact?
- ***(Adverse) Impact Mitigation*** – Is it possible to do anything to prevent, minimize or remedy high level adverse impacts? Or is it possible to do anything to enhance the potential benefits?
- ***Assessment of residual impacts*** – Are adverse impacts still effective after they are mitigated?

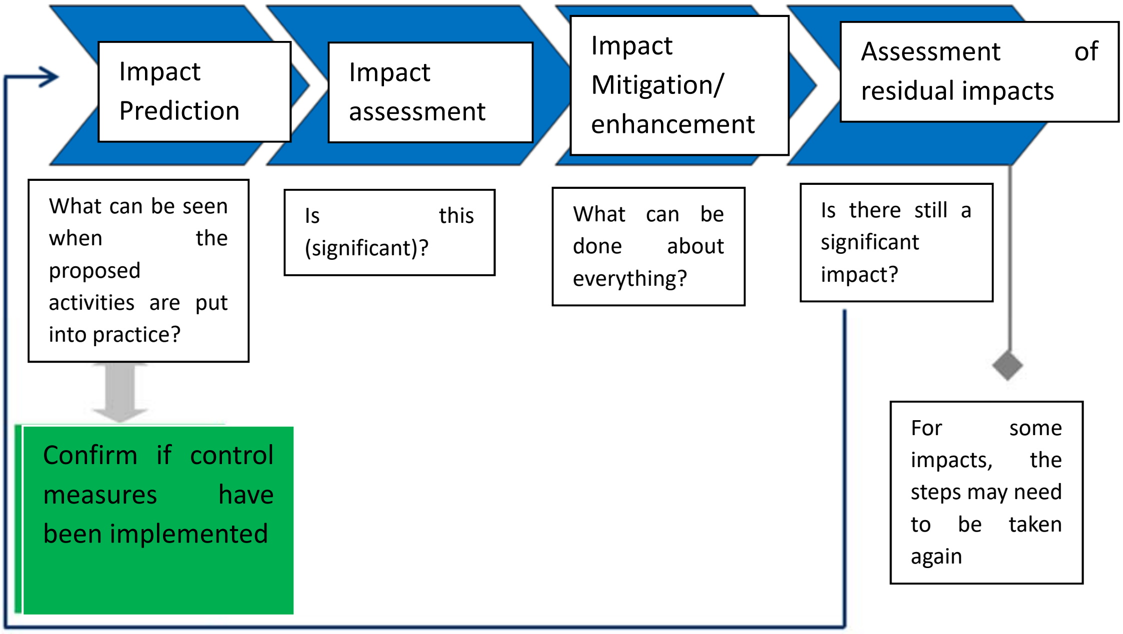


Figure 2.1 Impact Definition and Assessment Process

For some types of impacts, experimental and objective criteria are employed when identifying the significance of potential impacts (e.g. violation of a standard). Furthermore, if assessment criteria are specific to the project, expert opinion must be obtained. The criteria used in impact assessment are explained in Chapter 2.5.

The methodology of the impact assessment takes into account nature, type and magnitude of the impact.

The assessment considers if an impact should be accepted as positive or adverse (the nature of the impact) and how it is related to the project (type of the impact, e.g. direct and indirect). How an adverse impact can be managed or changed through mitigation measures depends on the type of the impact.

In addition to type and nature of the impact, its magnitude is taken into consideration. The magnitude of an impact is measured to what extent baseline conditions change as a consequence of project activities. The classification of the type, nature and magnitude of the impact is given in Table 2.4.

Table 2.4: Impact Assessment Classification

Term	Definition
Nature of the impact	
Adverse impact	The impact which is thought to cause an adverse change or undesired situation under existing conditions
Beneficial impact	The impact which is thought to lead to an improvement or desired situation under existing conditions
Type of the impact	
Direct *impact*	The impact induced by a direct interaction between a project activity and the receptor
Indirect *impact*	Impact caused by other activities planned to be conducted by the nature of the Project
Secondary impact	The impact which appears as a result of interaction in the ongoing processes following the primary interaction between the project and receptors
Magnitude of the impact	
Extent	The spatial definition/size (e.g. affected area) of the impact or the number of receptors reached out (e.g. ratio of affected population)
Duration	The time slot that the impact interacts with the receptor
Frequency	The period of impact actualization

2.5 Impact Definition (Significance Criteria)

2.5.1 Environmental Impacts (Sea Bed Geology, Sea Water, Surface Water, Ground Water Resource, Soil, Air Emissions and Air Quality, Noise and Vibration, Traffic and Transportation, Cultural Heritage Objects, Landscape and Visual Impacts)

This chapter provides a preliminary assessment of the potential impacts of the Project and explains how the impacts are assessed in this EIA report.

2.5.1.1 Significance Criteria for Environmental Impacts

Criteria applied to physical environment take the current national and international legislation as basis when available.

These criteria have been considered in compliance with the relevant national and international legislation handled in **Chapter 3** (Legal, Political and Administrative Framework) and the relevant guidelines and standards. In cases where there is no current legislation/standard, expert opinion was resorted to.

Impacts were defined and assessed considering the phases of the Project. Properties of the area/areas where the project would be realized are explained in **Chapter 6** (Assessing Baseline Environmental

Properties), **Chapter 7** (Assessing Biological Environment), **Chapter 8** (Assessing the Lands which will be disposed of in the scope of the Project) and **Chapter 9** (Assessing Socio-Economic Environment). Identification and assessment of impacts on such properties and mitigation measures are explained under various sections in the relevant chapters. Project Activities are explained in **Chapter 10** (Assessing Activities in the scope of the Project), their impacts are identified and mitigation measures are also given in the same chapter. The following chapters provide examples of how impacts are defined and of mitigation measures.

2.5.1.2 Impacts on Baseline Environmental Properties

2.5.1.2.1 Offshore and Shore Crossing Sections

Placing the pipeline on the sea bed during construction may potentially cause sediment transport and the existence of vessels may have an impact on water and air quality. The construction activities may potentially disrupt water and soil quality as a consequence of waste generation or accidental release of hydrocarbon or chemicals. The construction activities may have temporary and short term impacts on the physical environment such as air emissions, noise and vibration. The existence of construction vessels in the Shore Crossing Section may restrict the mobility of other vessels (like fishing boats) sailing in this area. All such impacts and all the mitigation measures are assessed in line with the relevant national and international legislation mentioned in **Chapter 3** (Legal, Political and Administrative Framework); furthermore mitigations measures are explained in detail in the relevant chapters.

The operational phase is not expected to have any activity which may cause sediment transport. Other impacts are foreseen to be of short term and temporary since the activities would be limited to the investigations (measurement and monitoring) carried out on the pipeline every 5 year.

2.5.1.2.2 Onshore Section

The construction phase of the onshore section (including the Receiving Terminal) may lead to potential degradation of the land structure as well as adverse impacts on flora and fauna. Furthermore, impacts such as dust and noise formation may also be seen because of tools and equipment used for construction. The construction of the Receiving Terminal may also cause non-hazardous and hazardous liquid and solid waste.

The impact assessment took the current national or international legislation, expert opinion, opinion of relevant organizations (such as commission members) and other stakeholders (like local people and non-governmental organizations) as basis. The construction activities may have temporary and short term impacts on the physical environment such as air emission, noise and vibration. All such impacts and all the mitigation measures are assessed in line with the relevant national and international legislation mentioned in **Chapter 3** (Legal, Political and Administrative Framework); furthermore mitigations measures are explained in detail in the relevant chapters.

The operational phase is not expected to have any activity which may affect the physical environment of the onshore section other than the existence of the Receiving Terminal. The impacts at the operational phase may include air emission, waste generation caused by routine activities of the Receiving Terminal as well as visual impacts.

2.5.2 Ecological Impact

2.5.2.1 Significance Criteria for Ecological Impacts

2.5.2.1.1 Offshore and Shore Crossing Sections

Operating construction vessels and machinery may create impacts of noise and vibration which have the potential to affect the vicinity of the sea. The impact of underwater noise may go beyond the Project Site depending on the activities and the machinery used. The significance of underwater noise is connected to the existence of fish and sea mammals in the area. The noise may potentially disrupt communication skills of the fish species and sea mammals found near the noise source and have an impact on such species. The operations of vessels may have impacts on other sea animals (benthic organisms, fish, mammals and sea birds etc.).

The existence of the construction site may keep the species at the sea away in the course of construction and commissioning activities and the physical existence of investigation vessels may do the same at the operational phase. Additionally, discharge from the vessels may affect the water quality. Therefore, it has the potential to affect the sea ecology in a limited manner. The impacts on sea ecology and the proposed mitigation measures are assessed in line with the relevant national and international legislation mentioned in **Chapter 3** (Legal, Political and Administrative Framework); furthermore mitigations measures are explained in detail in the relevant chapters.

It is foreseen that noise and vibration impacts related to the operations would be limited to periodical maintenance and repair of vessels.

2.5.2.1.2 Onshore Section

Placing the pipeline in the trenches using the open cut method as well as the construction of the Receiving Terminal may potentially lead to habitat degradation and ecological (flora and fauna) losses. The current national or international legislation and the relevant expert opinion have been taken as basis. When the operational (including commissioning) phase starts, it is not expected to have any activity, other than the lighting, stack gas emission and noise caused by the operation of the Receiving Terminal, which may lead to habitat degradation and losses of living organisms. Construction activities may lead to short term and temporary air emissions and environmental impacts such as noise and vibration. All such impacts and all the mitigation measures are assessed in line with the relevant national and international legislation mentioned in **Chapter 3** (Legal, Political and Administrative Framework); furthermore mitigations measures are explained in detail in the relevant chapters.

2.5.3 Social Impacts

Social impacts have been assessed on the basis of the impacts of construction and operational activities on sea users, economy, fishery industry and tourism in the vicinity of Project Site. The access of sea users to marine resources in the region where the construction will take place and the use of routes may potentially be restricted. Socio-economic impacts and the mitigation measures are assessed in line with the relevant national and international legislation in **Chapter 3** (Legal, Political and Administrative Framework); furthermore mitigations measures are explained in detail in the relevant chapters.

2.5.4 Economic Impacts

Economic impacts have been assessed on the basis of impacts of construction and operational activities on the local people who live in the vicinity of Project Site and whose main source of revenue includes forestry, fishery industry and tourism. Construction sites have the potential to limit sources of revenue such as forestry, fishing industry and tourism (sea users, same-day visitors etc.). Economic impacts and all the mitigation measures are assessed in line with the relevant national and international legislation mentioned in **Chapter 3** (Legal, Political and Administrative Framework); furthermore mitigations measures are explained in detail in the relevant chapters.

2.5.5 Impacts on the other Projects in the Region

The project implementation may prevent activities in the Project Site such as oil and gas exploration, mineral extraction. Therefore it may have the potential to restrict activities of organizations such as

TPAO, MTA and other official users in the Project Site. Impacts on other projects and the proposed mitigation measures have been handled considering the frequency, seasonality, activities of other projects and their potential interaction with the Project. Relevant details are given in **Chapter 11** (Assessing Cumulative Impacts).

2.5.6 Impacts which may appear as a result of unexpected incidents

The unexpected incidents have the potential to be seen in all phases of the project (accidents and emergency etc.). As far as offshore and shore crossing sections are concerned, such incidents may be listed as cases such as accidental penetration of alien and invasive species into the sea environment, spill or leakage from vessels or puncture/tear which may lead to loss of safety on the pipeline. The vessels entering the Black Sea have the potential to transport in their keels (hulls) or ballast water alien and invasive species which can constitute threat to the sea habitat of the Black Sea to this region. Spills or leakage may affect the whole marine environment. When it comes to Onshore Section, impacts such as air, water and soil pollution and loss of habitat may appear due to accidents or incidental situations caused by the equipment used in the construction phase.

Impacts caused by incidents and all the mitigation measures are assessed in line with the relevant national and international legislation mentioned in **Chapter 3** (Legal, Political and Administrative Framework); furthermore mitigations measures are explained in detail in the relevant chapters.

2.5.7 Mitigation Measures and Enhancing the Benefits

A hierarchy of mitigation measures was created to reduce potential adverse impacts and enhance positive impacts of a proposed activity. The aim of this hierarchy is to show that the impacts are mitigated through mitigation measures as much as possible. When implementing mitigation measures to reduce adverse impacts, all the relevant national and international legislation is taken into consideration.

When developing the mitigation measures for an adverse impact identified for the project, the following hierarchy of options has been taken into consideration:

- **Prevention at source** – eliminating the source of the impact;
- **Reduction at source** – reducing the source of the impact;
- **Mitigation** – reducing the impact before it reaches out the receivers;
- **Mitigation at receivers** – reducing the impact after it reaches out the receivers;
- **Remediation** – remedying the impact after it occurs and
- **Compensation** – replacing with a different place or a different source of equal value.

Developing feasible measures to mitigate potential impacts was done as a consequence of impact assessment process and the measures were included in the Project. When deemed necessary, mitigation measures will be supported with monitoring activities. All mitigation measures are explained in detail in the relevant chapters depending on their topic.

2.5.8 The Residual Impacts After Implementation of Necessary Mitigation Measures

The residual impact is the impact which remains or is reduced after all prevention, design controls and management measures are applied. The process the outline of which is explained in Chapter 2.3 was followed when it was necessary to assess the levels of impacts which could remain after all proposed mitigation measures were implemented.

2.5.9 Cumulative Impacts

To define the cumulative impacts, the following definition which is explained below and within the EU Guidelines (Ref. 2.1) has been adopted.

"Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project."

Cumulative impacts may occur when the residual impacts remained after mitigation measures as well as impacts caused by other actions in the Project site are combined with the Project impacts. In other words, cumulative impacts can also be defined as combined impacts which can lead to a significant impact when the Project impacts and other present and planned projects and actions within the Project footprint are combined. Cumulative impacts have been assessed in line with the relevant national and international legislation and the details are given in **Chapter 11** (Assessing Cumulative Impacts)**.**

The cumulative impact assessment was conducted to study the present or planned actions within the Project footprint and to identify the cumulative impact potential which may be caused by the interaction of these actions with the Project. Additionally, Russian segment of the TurkStream Gas Pipeline System, the segment of the pipeline from Russian EEZ till KP660 and the one which crosses Turkish EEZ (South Stream Project) have also been assessed in combination with Project activities .

2.6 Other Issues

2.6.1 Transboundary Impacts

Transboundary impacts are defined as environmental or social impacts which can stem from the Russian section of the TurkStream Gas Pipeline and reach the boundaries of areas under the authority and/or at the disposal of Turkey. The details are given **Chapter 11** (Assessing Cumulative Impacts).

Content

3 Regulatory, Policy and Administrative Framework

This chapter provides a general assessment of the regulatory, policy and administrative framework of the Project. The current legal requirements relevant to the Project are listed below and the relevant details are given in the following sections:

- International (including the Intergovernmental agreement (IGA)) legislation, standards and guidance document: are all handled in Chapter 3.1;
- National legislation, standards and guidance documents: are all handled in Chapter 3.2;
- Standards and guidance documents for international finance organizations: are all handled in Chapter 3.3;
- Project Standards for the Offshore Section of Turk Stream Gas Pipeline are handled in Chapter 3.4 and
- Institutional requirements of the country are explained in Chapter 3.5.

Turkish national legislation, standards and guidance documents are applied to the section of the Project which crosses Turkish Exclusive Economic Zone (EEZ). This Project is subject to the legal requirements covered by the “Resolution on Turkish Exclusive Economic Zone” which became effective as an annex of the Council of Ministers’ Decree no. 86-11264 and dated December 5, 1986.

The rights granted to Turkey regarding the Turkish EEZ are regulated in the second article of the Council of Ministers’ Decree mentioned above. According to this article:

“Article 2 - 2) Turkey shall also have exclusive rights and jurisdiction in the same zone with regard to: conducting, authorizing and regulating marine scientific research; establishing regulations and control procedures necessary to preserve and protect the marine environment and to prevent, reduce and control, marine pollution.

3) The arrangements concerning the exercise of the rights and jurisdiction enumerated above shall be subject to the rules and procedures set out in this decree and relevant Turkish Legislation. Rights of other states are regulated in Article 3 of the Council of Ministers’ decree. This article stipulates that:

Article 3 - In the Turkish exclusive economic zone in the Black Sea vessels of other States shall enjoy the freedom of navigation and the aircraft of other States shall enjoy the freedom of overflight. Likewise, other States shall enjoy the freedom of the laying of submarine cables and pipelines in this zone. However, in the exercise of these freedoms the legislation of Turkey and general practice shall be complied with.”

Turkish national legislation is applicable to the landfall section of the pipeline which crosses Turkish EEZ and continues its way in Turkish terrestrial waters to reach the land near Kıyıköy in Kırklareli by the Black Sea part of Turkey.

In addition to national requirements, the Project Owner undertakes to abide by the Good International Industrial Practices (GIIP) in relation to the environmental and social performance of all the phases of the Project.

3.1 International (including IGA) Legislation, Standards and Guidance Documents

3.1.1 Agreement between the Government of the Republic of Turkey and the Government of the Russian Federation concerning the TurkStream Gas Pipeline Project (IGA)

The government of the Russian Federation and the government of the Republic of Turkey signed International Gas Agreement (IGA), the introduction of which is given below, on October 10, 2016 (**Annex-1.A**) concerning the TurkStream Gas Pipeline Project the offshore section of which is covered by this EIA Report:

"in conformity with the principles of equitable and mutually beneficial cooperation aimed at expanding trade and economic relations between the two countries,

on the basis of the Treaty on the Principles of Relations between the Republic of Turkey and the Russian Federation dated May 25, 1992,

taking into account the Agreement between the Government of the Republic of Turkey and the Government of the Russian Federation for the avoidance of double taxation with respect to taxes on income dated December 15, 1997 and the Agreement between the Government of the Republic of Turkey and the Government of the Russian Federation on the promotion and reciprocal protection of investments dated December 15, 1997,

taking into account the Joint Declaration between the Republic of Turkey and the Russian Federation on deepening friendship and multidimensional partnership dated December 6, 2004 and the Joint Declaration between the Republic of Turkey and the Russian Federation on progress towards a new stage in relations and further deepening of friendship and multidimensional partnership dated February 13, 2009,

seeking to further enhance comprehensive economic partnership and strategic cooperation between the Republic of Turkey and the Russian Federation, as well as to strengthen cooperation in the energy sector between the Parties and provide for energy security by diversifying the routes of supply of Russian natural gas,

confirming that the supply of gas from the Russian Federation to the Republic of Turkey works towards energy security,

supporting the construction of a new gas pipeline system running from the Russian Federation across the Black Sea and further across the territory of the Republic of Turkey, in order to supply natural gas from the Russian Federation to the Republic of Turkey and other countries,

seeking to create favourable conditions for the design, construction and operation of the said gas pipeline system in the Black Sea area and in the onshore territories of the Republic of Turkey and the Russian Federation, and to transport natural gas using the same,

recognizing the successful cooperation between the Parties in the construction and operation of the Blue Stream gas pipeline running from the Russian Federation across the Black Sea to the Republic of Turkey,

hereby agree on this Agreement the details of which are given in the IGA text."

3.1.1.1 The definition of the Project in the text of IGA

The whole text of IGA can be found in **Annex-1.A** and its first article defines the sections of the TurkStream Gas Pipeline system as follows;

"TurkStream Gas Pipeline" means a new gas pipeline system with a maximum technical design capacity of 31.5 billion cubic meters per annum for two lines with technical design capacity of 15.75 billion cubic meters per annum per each line, running from the Russian Federation (from the Russkaya compressor station in the Krasnodar Region of the Russian Federation) across the Black Sea to the receiving terminal on the coast of the Republic of Turkey and further across the territory of the Republic of Turkey up to the border of the Republic of Turkey with its neighbouring countries, constructed in order to supply natural gas from the Russian Federation to the Republic of Turkey, as well as to ensure transit of Russian gas across the Republic of Turkey into the countries bordering the Republic of Turkey, with **the offshore section 1, the offshore section 2, the onshore section 1** and **the onshore section 2;**

- "offshore section 1" means a section of the TurkStream gas pipeline constructed for the purpose of delivering natural gas from the Russian Federation to the Republic of Turkey with a route running across the Black Sea from the coast of the Russian Federation up to the first weld after the exit side fencing the downstream of the receiving terminal;
- "offshore section 2" means a section of the TurkStream gas pipeline constructed to ensure transit of natural gas via the onshore section 2 located in the territory of the Republic of Turkey to the neighbouring countries of the Republic of Turkey with a route running across the Black Sea from the coast of the Russian Federation up to the first weld after the exit side fencing downstream of the receiving terminal;
- "offshore section" means, jointly, the offshore section 1 and the offshore section 2 including the respective parts of the receiving terminal;
- "receiving terminal" means facility on the Black Sea coast of the Republic of Turkey for the offshore section operation and isolation, gas conditioning, which comprises of the following sections:
  - The offshore pipeline section consisting of the offshore pipeline control, isolation and emergency shutdown functionality, the offshore pipeline pigging/cleaning system and the offshore pipeline operational metering;
  - The gas conditioning section consisting of manifolding, gas filtering, gas conditioning (temperature control, pressure control) and downstream pressure protection system;
- "onshore section 1" means a section of the TurkStream gas pipeline constructed for the purpose of delivering natural gas from the offshore section 1 from the Russian Federation to the Republic of Turkey with a route running from the first weld after the exit side fencing downstream of the receiving terminal and further across the Republic of Turkey up to the connection thereof with the existing gas transmission system of the Republic of Turkey;
- "onshore section 2" means a section of the TurkStream gas pipeline constructed to ensure transit of natural gas from the offshore section 2 across the Republic of Turkey to the neighbouring countries of the Republic of Turkey with a route running from the first weld after the exit site fencing downstream of the receiving terminal and further across the Republic of Turkey up to the border of the Republic of Turkey with its neighbouring countries.

The sections which are covered by this EIA Report consist of **offshore section 1** and **offshore section 2** as defined above (therefore in IGA) and are called "**TurkStream Gas Pipeline Project – Offshore Section**". The expression of "**Project**" used in this EIA Report means "**TurkStream Gas Pipeline Project – Offshore Section**".

3.1.1.2 Cooperation between the Parties

IGA, the whole text of which is given in **Annex-1.A**, handles the issue of cooperation between the Parties in Article 6, which is one of the articles emphasizing on the cooperation, as follows;

1. The Parties shall provide all necessary conditions for unhindered implementation of the project and shall render assistance in obtaining all permits, approvals and licenses to implement the project separately for the offshore section, the onshore section 1 and the onshore section 2.

2. The Parties shall use their best endeavours to streamline the procedure of and shorten the time for obtaining permits and licenses required for the implementation of the project.

3.1.2 Other International Conventions and Agreements

The Republic of Turkey has either ratified or signed various international conventions on the protection of environment and sustainable development. Information regarding the international conventions relevant to the Project is given in Table 3.1.

Table 3.1: International Conventions (Ref. 3.1 & Ref. 3.2)

Convention	Objective	Status (Turkey)
Air quality		
United Nations Economic Commission for Europe Convention on Long-range Transboundary Air Pollution (CLRTAP) (Geneva, 1979) (Ratification date: 18 April 1983)	The convention aims to limit and, as far as possible, gradually reduce emission of long-range transboundary air pollutants in order to protect man and his environment against air pollution	Ratified
United Nations Framework Convention on Climate Change (1992) (Ratification date: 24 May 2004)	Any legal instrument adopted by the Convention and Conference of Parties has the final objective of achieving to stop greenhouse gas accumulation in the atmosphere at a level which would prevent hazardous anthropogenic impact on the climate system and to reach such a level in a timeline which would allow the ecosystem to naturally adapt itself to climate change, prevent food production from being harmed and help economic development continue in a sustainable manner.	Ratified
Kyoto Protocol to United Nations Framework Convention on Climate Change (1997) (Ratification date: 26 August 2009)	To ensure that parties included in Annex-I take necessary measures to promote sustainable development while achieving its quantified emission limitation and reduction commitments under Article 3.	Ratified
Convention for the Protection of the Ozone Layer (Vienna, 1985) (Ratification date: 20 September 1991)	To identify measures that need to be taken globally and create the framework to implement those measures which aim to prevent the harm affecting the ozone layer.	Ratified
Montreal Protocol on Substances that Deplete the Ozone Layer (1987) (Ratification date: 19 December 1991)	To control production and consumption of ozone depleting substances, to eliminate the use of substances in question by identifying depletion programme and ratio, to research and develop alternative substances and technologies which may replace them and provide technical and financial assistance through Executive Bodies considering the need of developing countries for such substances	Ratified
Biological Diversity		
Convention on Biological Diversity (Rio, 1992) (Official Gazette Date: 27 December 1996)	The Convention promotes conservation of biological diversity and sustainable use of its components.	Ratified
Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 1979) (Official Gazette Date: 20 February 1984)	To ensure conservation of wild flora and fauna species and their habitats. Special attention is given to endangered and vulnerable species, including endangered and vulnerable migratory species specified in appendices.	Ratified
Convention on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS, 1996) (Ratification date: 13 January 2016)	A cooperative tool for the conservation of marine biodiversity in the Mediterranean and Black Seas. Its purpose is to reduce threats to cetaceans in Mediterranean and Black Sea waters and improve our knowledge of these animals	Ratified

Convention	Objective	Status (Turkey)
International Convention for the Protection of Birds (Paris, 1950) (Official Gazette Date: 17 December 1966)	To protect birds in the wild state, considering that in the interests of science, the protection of nature and the economy of each nation, all birds should as a matter of principle be protected.	Ratified
The Black Sea Biodiversity and Conservation Protocol (2009) (Official Gazette Date: 6 July 2004)	To maintain the Black Sea ecosystem in the good ecological state and its landscape in the favourable conditions, to protect, to preserve and to sustainably manage the biological and landscape diversity of the Black Sea in order to enrich the biological resources	Ratified
Marine Pollution Prevention		
Convention on the Protection of the Black Sea against Pollution (Bucharest Convention, 1994) (Ratification date: 15 January 1994)	To protect the marine environment of the Black Sea and to conserve its living resources; to prevent and control the pollution; to prevent impairment of water quality and reduction of biological diversity caused by intense use of resources in the Black Sea; to improve water quality, sea and coastal ecosystem in the Black Sea; to ensure sustainable development in the region and to protect the marine environment of the Black Sea and its living resources through joint efforts. Convention Protocols include; Protocol on the Protection of the Marine Environment of the Black Sea from Land-Based Sources and Activities (1992) Protocol on Cooperation in Combating Pollution of the Black Sea Marine Environment by Oil and other Harmful Substances in Emergency Situations (1992) Black Sea Emergency Action Plan was adopted in the scope of this protocol. (2003) Protocol on the Protection of the Black Sea Marine Environment against Pollution by Dumping (1992) The Black Sea Biodiversity and Landscape Conservation Protocol (2002)	Ratified
Protocol on the Protection of the Marine Environment of the Black Sea from Land-Based Sources and Activities (LBS Protocol) (1992) (Ratification date: 1994)	To achieve recovery of the ecosystem of the Black Sea and to restore natural resources; to prevent, reduce and control marine environment pollution in the Black Sea; to develop legal instruments which promote sustainable use of natural resources and environment friendly activities in the coastal areas and to initiate inter-sectoral interaction at the regional and national levels.	Ratified
The Black Sea Biodiversity and Landscape Conservation Protocol (2004) (Ratification date: 12 August 2004)	To maintain the Black Sea ecosystem in the good ecological state and its landscape in the favourable conditions, to conserve, to protect, to preserve and to sustainably manage the biological and landscape diversity of the Black Sea in order to enrich the biological resources	Ratified
Protocol on the Protection of the Black Sea Marine Environment against Pollution by Dumping (1992) (Ratification date: 29 March 1994)	To prevent dumping by vessels and to take necessary measures	Ratified
Protocol on Cooperation in Combatting Pollution of the Black Sea Marine Environment by Oil and Other Harmful	To combat pollution of the marine environment by oil and other harmful substances in emergency situations and to cooperate to prevent and reduce this pollution	Ratified

Convention	**Objective**	**Status (Turkey)**
Substances in Emergency Situations (Emergency Protocol) (1992) (Ratification date: 29 March 1994)		
International Convention for the Prevention of Pollution from Ships (MARPOL-73 Convention), as modified by the Protocol (MARPOL-78 Protocol) (1983) (Ratification date: 24 June 1990) Annexes to the MARPOL; Annex I, Annex II and Annex V (Ratification date: 24 June 1990) Annex III and Annex IV (Ratification date: 14 January 2015) MARPOL 1997 Protocol – Annex VI (Ratification date: 4 February 2014)	MARPOL Convention has the objective of prevention of pollution of the marine environment by ships from operational or accidental causes. Annex I – Regulations for the Prevention of Pollution by Oil: It entered into force on October 2, 1983. It covers prevention of pollution by oil from operational measures as well as from accidental discharges. It regulates the conditions to issue “International Oil Pollution Prevention Certificate” (IOPP) as an indication of compliance of the ships with the rules. There are specific and aggravated regulations for oil tankers. Some of these requirements include making it obligatory for oil tankers to have double hulls, crude oil washing systems, segregated ballast tanks and inert gas systems. It defines special sea areas to prevent oil pollution. Strict rules were introduced to regulate discharging waste water or bilge water which is fed with oil into the special sea areas. Annex II - Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk: It entered into force on October 2, 1983. It includes rules developed to prevent chemical liquid substances from being discharged into marine environment due to operational or accidental reasons. It regulates 4 categories of noxious liquid substances on the basis of the level of hazard. The basic regulation about noxious liquid chemicals in bulk requires any waste of such substances to be discharged to reception facilities at ports. Some exceptions may be provided; however, in any case, no discharge of residues containing noxious substances is permitted within 12 miles of the nearest land. The annex to the Convention evaluated hundreds of noxious chemical substances and identified the level of hazards. When new liquid chemical substances are formulated, the relevant transportation rules are created by the IMO. Annex III - Regulations for Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form: It contains general requirements and principles on classification, packing, marking, labelling, documentation and stowage of packaged harmful substances (substances identified as harmful to marine environment, marine pollutants). This annex has made it obligatory to use “International Maritime Dangerous Goods Code” (IMDG Code). The IMDG Code which is updated every 2 years is the most important international legislation regarding shipment of harmful-dangerous goods in packaged form with the continuously added new harmful substances and amended shipment rules. Since this section is an optional annex, it came into force on July 1, 1992. Annex IV- Regulations for Prevention of Pollution by Sewage from Ships: This section contains requirements to control pollution of the sea by sewage. Sewage means wastes from toilets on the vessel, medical premises and spaces containing living animals. Discharging sewage from the vessel into the sea is prohibited in this Annex or certain rules such as discharging at least 12 nautical miles from the land were introduced. Special areas for prevention of pollution by sewage are defined. The conditions of the document to be issued as an indication of the compliance of the ships with the rules and the form are created. Since this section is an optional annex, it came into force on September 27, 2003.	Ratified

Convention	Objective	Status (Turkey)
	Annex V – Regulations for Prevention of Pollution by Garbage from Ships: This section aims to prevent pollution by garbage from ships. Garbage in this section has been divided into categories of plastics, food waste, glass, metal and packing materials. Disposal into sea of plastics and garbage containing plastics is totally prohibited. Disposal of many categories of garbage into the sea has either been prohibited or very strict rules regarding exceptions have been introduced. Food waste may be disposed into the sea in certain areas and offshore. However, the main principle remains to be disposal of all garbage and shipment waste into the receiving facilities. Since this section is an optional annex, it came into force on December 31, 1988. Annex VI – Regulations for Prevention of Air Pollution from Ships: The Annex VI which is called "Regulations for Prevention of Air Pollution from Ships" has been introduced into the Convention with the Protocol dated 1997 modifying MARPOL 73/78 Convention and came into force on May 19, 2005. MARPOL 1997 Protocol sets new regulations about prohibiting emissions of ozone depleting substances and setting limits on sulphur oxide (SOx) and nitrogen oxide (NOx) emissions from ship exhausts.	
International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM, 2004) (Ratification date: 14 October 2014)	The Ballast Water Management Convention, adopted in 2004, aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments.	Ratified
International Convention on Civil Liability for Bunker Oil Pollution Damage (BUNKERS, 2001) (Ratification date: 26 February 2013)	The Convention was adopted to ensure that adequate, prompt, and effective compensation is available to persons who suffer damage (costs related to measures to be taken to compensate for the environmental damage and loss caused outside the ship resulting from bunker oil) caused by spills of oil, when carried as fuel in ships' bunkers (any hydrocarbon mineral oil, including lubricating oil, used or intended to be used for the operation or propulsion of the ship, and any residues of such oil). This Convention applies to damage caused on the territory, including the territorial sea, and in exclusive economic zone of a State Party (Ref. 3.3).	Ratified
International Convention on the Establishment of an International Fund for Compensation of Oil Pollution (FUND 1992) (Ratification date: 17 August 2002)	To establish a compensation fund for environmental pollution damage resulting from oil spills from tankers.	Ratified
The 2003 Protocol to the International Convention on the Establishment of an International Fund for Compensation of Oil Pollution (FUND 2003) (Ratification date: 25 November 2011)	This protocol contributes to establishing more comprehensive and efficient international compensation regime than the one introduced by FUND 1992 agreement on the pollution damage to the sea.	Ratified
International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC 1990) (Ratification date: 11 June 2003)	Mindful of the importance of precautionary measures and prevention in avoiding oil pollution in the first instance, and the need for strict application of existing international instruments dealing with maritime safety and marine pollution prevention, particularly the International Convention for the Safety of Life at Sea, 1974, as amended, and the International Convention for the Prevention of Pollution from Ships,	Ratified

Convention	Objective	Status (Turkey)
	1973, as modified by the Protocol of 1978 relating thereto, as amended, and also the speedy development of enhanced standards for the design, operation and maintenance of ships carrying oil, and of offshore unit and mindful also that in the event of an oil pollution incident, prompt and effective action is essential to minimize the damage which may result from such an incident, the Convention emphasizes the importance of effective preparation for combatting oil pollution incidents and the role which the oil and shipping industries have in this regard.	
Protocol on Preparedness, Response and Cooperation to Pollution Incidents by Hazardous and Noxious Substances (OPRC-HNS 2000), (Ratification date: 27 June 2013)	Adopted on March 15, 2000, this protocol extended the scope of OPRC 1990 Convention to include hazardous and noxious substances. This protocol, just like the case of OPRC 1990, aims to create national systems for sea pollution preparedness and response and introduce a global framework for international cooperation in response against sea pollution threats and it extended the scope of preparedness and response regimes regulated by OPRC 1990.	Ratified
International Convention on Civil Liability for Oil Pollution Damage (CLC 1992) (Ratification date: 27 July 2001)	To create compensation fund for environmental pollution damage resulting from oil spills involving oil tankers	Ratified
International Convention on Salvage (SALVAGE 1989), (Ratification date: 24 May 2014)	The CLC 92 and FUND 92 Conventions which Turkey is a party to ensure coastal states to prevent the pollution resulting from tanker accidents and compensate for the damages. The most significant difference between Salvage 1989 Convention and these two Conventions is the fact that the Salvage Convention encourages the salvor to respond to sea pollution and sea accidents such as fire and compensate for their damages (Ref.3.4).	Ratified
Safety at Sea		
International Convention for the Safety of Life at Sea (SOLAS, 1974) (Ratification date: 31 July 1980) Protocol of 1978 relating to the International Convention for the Safety of Life at Sea 1974 (Ratification date: 03 September 2013)	To specify minimum standards for the construction, equipment and operation of ships, compatible with their safety. Flag States are responsible for ensuring that ships under their flag comply with its requirements, and a number of certificates are prescribed in the Convention as proof that this has been done.	Ratified
International Convention on Maritime Search and Rescue (SAR, 1979) (Ratification date: 27 March 1985)	The Convention gives the Parties, either individually or in cooperation with other States, the responsibility to install the capacity of providing adequate and effective search and rescue services and to provide such services on a 24-hour basis. The Convention also imposes the relevant authorities with the obligation to immediately relay the distress stress to the search and rescue centres and to start search and rescue operations as soon as possible.	Ratified
International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978 (STCW, 1978) (Ratification date: 27 June 2013)	It establishes basic requirements on training, certification and watchkeeping for seafarers on an international level. The Convention prescribes minimum standards relating to training, certification and watchkeeping for seafarers which countries are obliged to meet or exceed.	Ratified

Convention	Objective	Status (Turkey)
1972 Convention on International Regulations for Preventing Collisions at Sea (COLREG, 1972) (Ratification date: 23 May 2014)	This convention is applicable to all vessels at sea to prevent the collision risk.	Ratified
International Convention on Load Lines (Load Lines 1966) (Ratification date: 28 April 1968) and 1988 Protocol (Ratification date: 04 June 2008)	It establishes principles and rules with respect to the limits to which ships on international voyages may be loaded having regard to the need for safeguarding life and property at sea;	Ratified
Cultural Heritage		
European Convention on the Protection of the Archaeological Heritage (Valletta Agreement, 1992) (Ratification date: 05 August 1999)	It explains the legal system for the protection of the archaeological heritage which should be applied by the governments.	Ratified
Convention concerning the Protection of the World Cultural and Natural Heritage (Paris, 1972) (Ratification date: 14 February 1983)	This Convention confirms the protection of the world cultural and natural heritage.	Ratified
Transboundary impacts		
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel, 1989) (Ratification date: 22 June 1994)	To regulate transboundary movement of hazardous wastes and to impose obligations to the relevant Parties to manage and dispose of such wastes in an environmentally appropriate manner. To protect the human health and environment against adverse impacts resulting from generation, management, transboundary movement and disposal of hazardous and other wastes.	Ratified
Other		
United Nations the Stockholm Convention on Persistent Organic Pollutants, POPs (Stockholm, 2001) (Ratification date: 12 January 2010)	To protect human health and the environment from persistent organic pollutants. The convention has introduced the obligations of developing a national implementation plan on persistent organic pollutants, updating this plan periodically, taking measures which will reduce or eliminate the stocks and emissions of the chemicals in question, registering specific exemptions set forth by this Convention, submission a regular report of data to the Convention Secretariat, informing the public and raising its awareness and conducting training activities.	Ratified
Energy Charter Treaty (ECT, 1994) (Ratification date: 12 July 2000)	This Treaty provides a multilateral framework for energy cooperation and is designed to promote energy security. Member States are expected to promote energy efficiency and minimize adverse impacts of energy use on environment. – (Due to the ”Polluter pays” principle and the need to reduce potential impacts, this Treaty is applicable to the Project).	Ratified

Convention	Objective	Status (Turkey)
European Landscape Convention (Florence, 2000) (Ratification date: 10 June 2003)	To promote the protection, management and planning of European natural and cultural landscape.	Ratified

3.2 National Legislation, Standards and Guidance Documents

The assessment of this Project in the scope of EIA Regulation is explained in detail in Chapter 1.3.

Important environmental standards and requirements applicable to the Project have been identified based on national legislation and international agreements which Turkey is a party to and all the legal requirements mentioned will be met.

The national legislation which concerns this Project is given in Table 3.2 in a way which divided the legislation into thematic areas.

Table 3.2: National Legislation concerning the Project

Theme	Relevant National Legislation
General	Environment Law no 2872; Natural Gas Market Law no 4646; Law on Ports no 618; Decree No. 7/16349 of the Council of Ministers on the Law on Ports; Coastal Law no 3621; Law no 3194 on Land Development and Zoning; Law no 2942 on Expropriation; Law no 1738 on Navigation and Hydrography Services; Law no 2873 on National Parks; Maritime Traffic Regulations for the Turkish Straits; Regulation on Environmental Impact Assessment (EIA); Natural Gas Market License Regulation; Natural Gas Market Facilities Regulation; National Parks Regulation; Regulation on Enforcement of Coastal Law; Regulation on Military Forbidden Zones and Security Areas; Regulation on Enforcement of Law no 1738 on Navigation and Hydrography Services; Regulation for Starting up and Operating a Work Place; Regulation on Environmental Permit and License; Environmental Auditing Regulation; Regulation on hydrographic survey of sea and inland waters; Technical Safety and Environment Regulations for BOTAŞ Crude Oil and Natural Gas Pipeline Facilities Construction and Management; Regulation for Taking, Operating and Controlling Sand, Pebble Stone and Other Similar Materials; Resolution on the Turkish Exclusive Economic Zone Annexed to the Decree by the Council of Ministers no. 86/11264 dated 5/12/1986; Regulation on the Protection of Buildings from Fire; Regulation on Notification pursuant to SOLAS and MARPOL Conventions.
Water Quality	Law no 167 on Ground Water; Law no 1380 on Aquaculture; Aquaculture Regulation; Water Pollution Control Regulation; Surface Water Quality Management Regulation;

Theme	Relevant National Legislation
	Regulation for the Quality of Bathing Water; Regulation Concerning Protection of Ground Waters against Pollution and Deterioration; Regulation on the Control of Pollution of Water and its surrounding by Hazardous Substances; ISKI Regulation Regarding Drinking Water Catchment Basins; Regulation on Water Intended for Human Consumption; Notification on administrative procedures regarding water pollution.
Air Quality	Regulation on Ozone Depleting Substances; Regulation on Reduction of Sulphur Ratio in Some Types of Fuel Oil; Regulation on Control of Air Pollution from Industrial Sources; Regulation on Control of Air Pollution from Heating; Regulation on Assessment and Management of Air Quality; Regulation on the Control of Exhaust Emissions and Diesel Quality; Regulation on the Control of Exhaust Emission; Regulation for the Follow-up of the Greenhouse Gas Emissions; Notification on Monitoring and Reporting of the Greenhouse Gas Emissions; Notification on the verification of greenhouse gas emission reports and authorization of verifying institutions.
Soil Pollution	Regulation on the Control of Soil Pollution and Polluted Areas by Point Sources.
Noise and Vibration	Regulation on the Assessment and Management of Environmental Noise; Regulation on the Environmental Noise Emission caused by Equipment used Outdoors.
Waste Management	Regulation on Waste Management; Regulation on the Control of Excavation Materials, Construction and Demolition Wastes; Regulation on the Control of Waste Oils; Regulation on the Control of Waste Batteries and Accumulators; Regulation on the Management of Packaging Waste; Regulation of Medical Waste Control; Regulation on the Control of Waste Electrical and Electronic Equipment; Regulation on the Control of Waste Tyres; Regulation on the Control of Waste Vegetable Oils; Regulation on Waste Collection from the Ships and Control of Waste; Regulation on dredging and environmental management of dredged material (draft) Regulation Concerning the Incineration of Wastes.
Biological Diversity	Forest Law no 6831; Law on Pastures no 4342; Law on Soil Preservation and Land Utilization no 5403; Law on Terrestrial Hunting no 4915; Regulation on the Implementation of Article 16 of the Forestry Law; Regulation on the Implementation of Articles 17/3 and 18 of the Forestry Law; Law no 1380 on Aquaculture and relevant regulations; Aquaculture Regulation; Regulation on the Protection of Wetlands; Regulation on Wildlife Protection and Wildlife Development Areas; Notification on the Illegal Hunting of Wild Animals.

Theme	Relevant National Legislation
Cultural Heritage	Law on the Conservation of Cultural and Natural Assets no 2863 and relevant regulations; Regulation on Research, Drilling and Excavation of Cultural and Natural Assets; Directive on Surface Survey, Drilling and Excavation Works regarding Cultural and Natural Assets; Council of Ministers Decree on Protection of Cultural and Natural Assets Under Water.
Chemical Substances, Hazardous and Noxious Substances	Regulation on the Inventory and Control of Chemicals; Regulation on Restriction and Prohibition of Noxious Substances and their Preparations; Regulation Concerning the Classification, Packaging and Labelling of Substances and Preparations; Regulation for the Safety Data Sheets of Noxious Substances and Preparations. Regulation on Procedures and Principles of Biocidal Products
Unexpected Incidents	The Code no 4536 pertaining to the principles to be applied to the explosives and dubious substances that are detected on the seas and on land; Law on the Protection of Life and Property at Sea; Law on Emergency Response to Pollution of Marine Environment with Petroleum and Other Harmful Substances and Compensation of Damage and Its Principles no 5312; Regulation Implementing Law on Emergency Response to Pollution of Marine Environment with Petroleum and Other Harmful Substances and Compensation of Damage and Its Principles; Regulation on the Prevention and Reduction of Impacts of Large Scale Industrial Accidents; Regulation on Protection against Sabotage; Insurance Tariff and Instruction on Obligatory Financial Liability for Sea Pollution of Coastal Facilities.

3.3 Standards and Guidance Documents of Finance Organizations

This project will be run in compliance with the relevant national, international standards and Good International Industry Practices (GIIP).

International agreements and conventions which Republic of Turkey is a party to have also taken into consideration in addition to the national legislation. The international agreements and conventions which have been taken into account are given in Table 3.1.

However, in cases where these international standards and agreements do not have an impact on impact assessment methodology and its findings, the requirements of particularly those mentioned in this document will not be taken into account in a detailed manner in line with the objectives of the EIA Report and the EIA process in Turkey.

Chapter 12 (Environmental and Social Management System) includes more information about environmental standards to be applied to develop Environmental and Social Management Plans for the Project.

3.4 (Project) Standards for Offshore Section of TurkStream Gas Pipeline Project

Project standards are employed to provide information to continuously improve the Project, guide the Project and to achieve compliance with national regulations particularly when the EIA report is being developed. Furthermore, international agreements and guidelines are used to obtain finance (credits).

The Project Owner has Health, Safety, Environment and Security – Integrated Management System (HSSE-IMS) which is part of Project Standards. Project Standards can be amended and updated in compliance with legal and project requirements.

Table 3.3-Table 3.8 provide information about all the standards which will be considered as per the objectives of this EIA Report including the national legislation and international standards to be followed in the Project as well as quantified standards and other standards to be applied by the Project Owner.

3.4.1 Air Quality

The ambient air quality in Turkey is regulated by two pieces of legislation: Regulation on Assessment and Management of Air Quality and Regulation on Control of Air Pollution from Industrial Sources. Both regulations introduce a gradual system of reducing air quality limits over time (general air quality limits and limit values for industrial facilities. In addition, both regulations generally define same air quality limit values for ambient air quality. The annexes to these regulations identify target values for air quality as summarized in Table 3.3. Other issues which are important for air quality include ozone depleting substances and greenhouse gas. Table 3.3 which is below provides a general assessment based on the relevant national and international legislation of how the potential dust and gas emissions which may occur during the Project may have an impact on air quality.

Table 3.3: National and International Legal Standards on Air Quality

Theme	National Legislation	International Standards	Project Standard
Ambient Air Quality Standards	**Regulation on Assessment and Management of Air Quality**; ANNEX 1. Limit values, target values, long-term objectives, assessment thresholds, notification and alert thresholds, ANNEX- I A. Long and Short-Term Limit Values and Alert Thresholds for the Transition Period. **Regulation on Control of Air Pollution from Industrial Sources**; Article 5. Installations which are assessed based on air emissions, ANNEX 1. Legal basis and limit values for air emissions of installations, ANNEX 2. Principles of the Value of Contribution to Air Quality (HKKD), ANNEX 3. Emission Identification. **Regulation on Control of Air Pollution from Heating;** Article 9 - General Rules for Combustion Plants fired with Liquid and Gaseous Fuels, ANNEX -3 A. Requirements and rules on measurements on site. **Regulation on Reduction of Sulphur Ratio in Some Types of Fuel Oil;** Article 4 – Maximum sulphur content according to types of fuel oil, Article 5 – Maximum amount of sulphur. **Regulation on the Control of Exhaust Emissions and Diesel Quality;** *(This regulation will be abolished on 01.01.2018 when the Regulation on the Control of Exhaust Gas Emission comes into force.)* Article 5 – Categories of vehicles, Article 7 – Frequency range for exhaust emission measurements, Article 8 – Principles and limit values for exhaust emission measurements.	*[EU Directive (2008/50/EC) – Ambient Air Quality and Cleaner Air Quality for Europe]*	*Compliance with national legislation will be ensured.*

Theme	National Legislation	International Standards	Project Standard
	Regulation on Control of Exhaust Emissions; Article 5 – Exhaust emission measurements, Article 6 – Motor Vehicles subject to Engine Exhaust Emission Measurement and the Duration of the Measurement, Article 7 – Vehicles not subject to Exhaust Emission Measurement.		
Emission of Substances that Deplete Ozone Layer	**Regulation on Ozone Depleting Substances;** Article 6. Restrictions on substances which are under control, Sixth Section, Provisions regarding the use of substances under control and final users, ANNEX 5. Substances under control, ANNEX 8. New substances.	*[MARPOL 73/78 Annex VI, Regulation 12]* Deliberate emissions of ozone depleting substances are prohibited. New installations containing ozone-depleting substances are prohibited on all ships. But new installations containing hydro-chlorofluorocarbons (HCFCs) are permitted until 1 January 2020. (Revision in July 2010) All ships above 400 gross tonnage (grt) shall maintain on board an Ozone Depleting Substances Record Book which shall have entries recorded in terms of mass (kg) of substances recharged, lost, removed, supplied and discharged and a list of equipment containing ozone depleting substances.	*National legislation and MARPOL are both valid* – Use of ozone depleting substances will be avoided.
Greenhouse gas emissions	**Regulation for the Follow-up of the Greenhouse Gas Emissions;** Second Chapter, Procedures and principles for monitoring, verification and reporting emissions, ANNEX 1. Activity Categories, ANNEX 2. Greenhouse Gas Emissions, **Notification on Monitoring and Reporting of the Greenhouse Gas Emissions;** Article 5 –Completeness, Article 6 –Consistency, comparability and transparency, Article 7 –Accuracy, Article 8 – Integrity of monitoring and reporting method,	*[EP III]* EPIII, requires projects emitting over 100,000 tonnes of CO2 equivalent GHG emission levels annually during the operational phase to publicly report the emissions. [OECD Common Approaches] OECD Common Approaches require reporting to OECD only when the projected annual emissions exceed the threshold during the operations phase of projects. Public reporting is encouraged for projects where annual emissions are projected to be in excess of 25.000 tonnes of CO2.	*Compliance with national legislation will be ensured.*

Theme	National Legislation	International Standards	Project Standard
	Article 10 – General obligations, Article 11 – Content and submission of monitoring plan. **Notification on the verification of greenhouse gas emission reports and authorization of verifying institutions;** Article 5 – General requirements, Article 6 – Basic principles.		

3.4.2 Water Quality

This section explains the legislation related to water quality which will be followed in the construction and operational phases of the Project. The EU Directives related to water quality criteria have also been taken into account which are included in the Table 3.4 in addition to Project Standards. The relevant legislation covers environmental quality standards to be met by surface water bodies as defined by the Regulation on Surface Water Quality and coastal water quality standards, standard values to be complied with coastal and transitional waters used for recreational purposes as well as eutrophication values for Black Sea and Marmara coastal and transitional waters which are all explained in the Annexes of this Regulation. Furthermore, sea water quality criteria as identified by the Water Pollution Control Regulation, national and international criteria for quality of bathing water and ground water have been considered as part of the relevant legislation.

Table 3.4: National and International Legal Standards on Water Quality

Theme	National Legislation	International Standards	Project Standard
Environmental quality standards for some parameters applicable to surface water bodies and their intended use	**Regulation on Surface Water Quality**; Article 5. Principles and basis, Article 6. Protection of receiving waters, ANNEX-2 Classification of surface water bodies' quality status, Table 2. Quality criteria for classification of intra-continental surface water resources according to general chemical and physico-chemical parameters, Table 3. Quality criteria for coastal receiving waters based on general chemical and physico-chemical parameters Table 6. Standard values to be met by coastal and transitional waters used for recreational purposes,	*EU Water Framework Directive (2000/60/EC)* *EU Drinking Water Directive (98/83/EC)* *WHO Drinking Water Quality Guidelines – Table A3.3* *MARPOL 73/78 – Annex-V*	*The management of discharges of ship generated waste will follow the provisions of MARPOL 73/78 and Regulation on Water Pollution Control.* *National legislation will be followed on land.*

Theme	National Legislation	International Standards	Project Standard
	Tables 8a and 8b Eutrophication values for Black Sea and Marmara coastal and transitional waters, Table 9. Limit values for trophic classification of lakes, ponds and reservoirs.		
Sea water quality criteria	**Water Pollution Control Regulation**; Article 4 – Principles related to protection of water, Table 4. General quality criteria for sea water. **Regulation on Reception of Waste from Ships and Waste Control;** Article 5. Protection of Sea and its Vicinity.	*EU Water Framework Directive (2000/60/EC)* *MARPOL 73/78 – Annex-V*	*The management of discharges of ship generated waste will follow the provisions of MARPOL 73/78, Regulation on Reception of Waste from Ships and Waste Control and Regulation on Water Pollution Control. Whereas the requirements of the Regulation on Control of Water Pollution and other pieces of national legislation are applicable to Turkish territorial waters (6 miles away from the coast), the requirements of MARPOL 73/78 will be followed in the Turkish EEZ beyond the Turkish territorial waters.* *National legislation will be followed on land.*
Bathing water quality	**Regulation for the Quality of Bathing Water**; Article 5 –Principles related to protection of waters used for bathing and recreational purposes, ANNEX 1. Table of quality criteria to be met by waters used for bathing and recreational purposes.	*EU Water Framework Directive (2000/60/EC)* *EU Bathing Water Quality Directive (2006/7/EC)*	*National legislation will be followed.*
Ground water quality	**Regulation Concerning Protection of Ground Waters against Pollution and Deterioration**; Article 5 –Principles, ANNEX 2. Ground Water Quality Standards.	*EU Water Framework Directive (2000/60/EC)* *EU Nitrates Directive (91/676/EEC)* *EU Groundwater Directive (2006/118/EC) – Annex 1*	*National legislation will be followed.*
Criteria on domestic waste water discharge	**Water Pollution Control Regulation**; Article 32 –Discharge Standards for Domestic Wastewater,	*EU Water Framework Directive (2000/60/EC)*	*The management of discharges of ship generated waste will*

Theme	National Legislation	International Standards	Project Standard
	Table 21.1. Standards for discharging domestic wastewater into receiving environment. **Regulation on Reception of Waste from Ships and Waste Control;** Article 5. Protection of Sea and its Vicinity	*EU Urban Waste Water Treatment Directive (91/271/EEC)* *MARPOL 73/78 – Annex-V*	*follow the provisions of MARPOL 73/78, Regulation on Reception of Waste from Ships and Waste Control and Regulation on Water Pollution Control. Whereas the requirements of the Regulation on Control of Water Pollution and other pieces of national legislation are applicable to Turkish territorial waters (6 miles away from the coast), the requirements of MARPOL 73/78 will be followed in the Turkish EEZ beyond the Turkish territorial waters.* *National legislation will be followed on land.*
Protection of production sites and crustaceans	**Aquaculture Regulation**; Article 11- Substances forbidden to be discharged into production sites. ANNEX -5 List of harmful substances forbidden to be discharged into inland waters and production areas in the sea and acceptable threshold values to discharge into receiving environments.	*EU Water Framework Directive (2000/60/EC)*	*National legislation will be followed.*
Protection of the quality of surface water	**Regulation on the Control of Pollution of Water and its surrounding by Hazardous Substances;** Article 5 – Principles about reducing water pollution caused by hazardous substances, Article 9 – Principles for discharging hazardous substances, Article 11 – Environmental permit for organizations, institutions and enterprises which discharge hazardous substances into receivers, Article 12 – Discharge control and auditing of hazardous substances.	*EU Water Framework Directive (2000/60/EC)*	*National legislation will be followed.*
Drinking water quality	**ISKI Regulation Regarding Drinking Water Catchment Basins;** ARTICLE 6 – (1) Annex 1 shows basins and creeks which currently, and will in the future, supply drinking water to Istanbul.	*EU Water Framework Directive (2000/60/EC)* *EU Drinking Water Directive (98/83/EC)*	*National legislation will be followed.*

Theme	National Legislation	International Standards	Project Standard
	ARTICLE (8) – c) Long distance protected sites	*WHO Drinking Water Quality Guidelines – Table A3.3*	

3.4.3 Noise and Vibration

Environmental noise is assessed considering the Regulation on Assessment and Management of Environmental Noise. This regulation determines noise limits applicable to various areas (for instance industrial sites, settlement areas or both combined) for three time slots (daytime, evening and night). The noise limit values for construction sites and for industrial facilities as well as maximum permissible ground vibration limits for piling and construction machinery are given in Table 3.5 which also lists international standards and project standards.

Table 3.5: National and International Legal Standards on Noise and Vibration

Theme	National Legislation	International Standards	Project Standard
Limit values for noise and vibration Environmental noise limit values for construction sites	**Regulation on Assessment and Management of Environmental Noise;** Article 8. Measures to be taken by organizations, institutions and enterprises, Article 9. Conditions to be met by road vehicles, Article 12. Conditions to be met by waterways transport vehicles, Article 13. Conditions to be met by outdoor equipment, Article 15. Conditions to be met by devices, equipment and machinery used in industrial facilities, Fourth Section, Principles and criteria for environmental noise, Article 25. Environmental vibration criteria for construction, Article 28. Criteria to be met in planning phase, Table 1. Environmental noise limit values for roads, Table 4. Environmental noise limit values for industrial facilities, Table 5. Environmental noise limit values for construction sites, Table 7. Maximum permissible values of ground vibration caused by piling and other similar vibration emitting construction operations and construction machinery except for the vibration caused in the closest	EU Environmental Noise Directive (2002/49/EC) EU Directive relating to the Noise Emission in the Environment by Equipment for Use Outdoors (2000/14/EC)	*National legislation will be followed.*

Theme	National Legislation	International Standards	Project Standard
	very sensitive and sensitive areas (within the frequency band between 1 Hz and 80 Hz) **Regulation on the Environmental Noise Emission caused by Equipment used Outdoors;** ARTICLE 5- Permissible sound power levels and noise marking, ARTICLE 8- EC declaration of conformity.		

3.4.4 Soil Pollution

In cases where pollution and the need to take measures against potential soil pollution which may affect the receiving environment within the project's area of influence are identified at the preparation, construction and operational phases, the provisions of the "Regulation on the Control of Soil Pollution and Polluted Areas by Point Sources" will be taken as basis to clean and monitor contaminated sites. Table 3.6 provides information about international standards and project standards in addition to the domestic legislation.

Table 3.6: National and International Legal Standards on Soil Pollution

Theme	National Legislation	International Standards	Project Standard
Activities with the potential to contaminate soil and list of contamination indicators specific to activities	**Regulation on the Control of Soil Pollution and Polluted Areas by Point Sources;** Table 2. Activities which may contaminate soil and list of contamination indicators specific to activities	Dutch Standards	*National legislation will be followed.*
Concentration of polluters which are calculated or determined based on the assumption that people are exposed to polluters at a maximum level for a reasonable period of time and are included in the Annex-1 List of Limit Values for Generic Contaminants	**Regulation on the Control of Soil Pollution and Polluted Areas by Point Sources;** Annex 1. Concentration values of contaminants included in the list of limit values for generic contaminants	Dutch Standards	*National legislation will be followed.*

3.4.5 Waste Management

Table 3.7 which is below explains the scope of domestic legislation, the international standards and project standards which should be followed when managing the waste which may potentially be generated as a result of activities conducted during the construction, operation and decommissioning phases of the Project.

Table 3.7: National and International Legal Standards on Waste Management

Theme	National Legislation	International Standards	Project Standard
General	**Regulation on Waste Management;** Article 5. General principles of waste management Article 9. Obligations of waste producer and waste holder. Notification on road transport of wastes; Article 8. Obligations of waste producer. **Regulation on Environmental Permit and License;** Article 5. Businesses subject to environmental permit or environmental permit and license. **Regulation on the Control of Pollution of Water and its surrounding by Hazardous Substances;** Article 5. Principles of reducing water pollution caused by hazardous substances. **Regulation on Waste Collection from the Ships and Control of Waste;** Article 5. Protection of Sea and its Surrounding.	*International Convention dated 1973 for the Prevention of Pollution from Ships, as modified by the Protocol of 1978 (MARPOL 73/78) Annex I – VI* *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel Convention), 1992* *EU Waste Framework Directive (2008/98/EC)*	*Among the requirements of the Environment Law, Regulation on Control of Water Pollution, Regulation on Reception of Waste from Ships and Waste Control, MARPOL 73/78 and other requirements of the relevant legislation in force, those which cover the area where the ship is located will be applicable.* *National legislation will be followed on land.*
Hazardous Waste Management	**Regulation on Waste Management;** Article 5. General principles of waste management, Article 9. Obligations of waste producer and waste holder. **Water Pollution Control Regulation;** Article 4. Principles of water conservation, Article 23. Pollution prohibition for seas, Article 24. Controlling sea bottom dredging activities, Table 19. Standards for discharging mixed industrial waste water into receiving environment, Table 20. Standards for discharging other industrial waste water into receiving environment.	*Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention), 1992* *EU Waste Framework Directive (2008/98/EC)*	*Among the requirements of the Environment Law, Regulation on Control of Water Pollution, Regulation on Reception of Waste from Ships and Waste Control, MARPOL 73/78 and other requirements of the relevant legislation in force, those which cover the area where the ship is located will be applicable.* *National legislation and requirements of Basel Convention will be*

Theme	National Legislation	International Standards	Project Standard
			simultaneously implemented on land.
Non-Hazardous Waste Management	**Regulation on Waste Management;** Article 5. General principles of waste management, Article 9. Obligations of waste producer and waste holder. **Notification on Recovery of Certain Non-hazardous Waste;** Article 5. General Principles, Article 8. Obligations of non-hazardous waste producers. **Water Pollution Control Regulation;** Table 21. Standards for discharging domestic wastewater into receiving environment, Article 32. Standards for discharging domestic wastewater.	*EU Waste Framework Directive (2008/98/EC)* *EU Directive on the Landfill of Waste (1999/31/EC)*	*Among the requirements of the Environment Law, Regulation on Control of Water Pollution, Regulation on Reception of Waste from Ships and Waste Control, MARPOL 73/78 and other requirements of the relevant legislation in force, those which cover the area where the ship is located will be applicable.* *National legislation will be followed on land.*
Special Waste Management	**Regulation on the Control of Waste Oils;** Article 5. General principles, Article 9. Obligations of waste oil producers. **Regulation on the Control of Waste Batteries and Accumulators;** Article 13. Consumers' Obligations. **Regulation on the Control of Waste Tyres;** Article 5. General principles, Article 14. Transporting waste tyres. **Regulation on the Control of Waste Electrical and Electronic Equipment;** Article 5. General principles, Article 11. Consumers' Obligations. **Regulation on the Control of Waste Vegetable Oil;** Article 5. General principles, Article 10. Obligations of waste vegetable oil producers/holders.	*EU Waste Framework Directive (2008/98/EC)* *EU Directive on the Disposal of Waste Oils (75/439/EEC)* *EU Directive on Batteries and Accumulators (91/157/EEC)* *EU Directive on Waste Electrical and Electronic Equipment (2002/96/EC)*	*Among the requirements of the Environment Law, Regulation on Control of Water Pollution, Regulation on Reception of Waste from Ships and Waste Control, MARPOL 73/78 and other requirements of the relevant legislation in force, those which cover the area where the ship is located will be applicable.* *National legislation will be followed on land.*

Theme	National Legislation	International Standards	Project Standard
Medical Waste Management	**Regulation of Medical Waste Control;** Article 5. General principles, Article 9. Obligations of medical waste producers.	*EU Waste Framework Directive (2008/98/EC)*	*National legislation will be followed.*
Management of Excavated Materials and Demolition Wastes	**Regulation on the Control of Excavated Materials, Construction and Demolition Wastes;** Article 5. General principles, Article 9. Obligations of producers of excavated materials and construction/demolition wastes.	*EU Waste Framework Directive (2008/98/EC)*	*National legislation will be followed*.
Packaging waste management	**Regulation on the Management of Packaging Waste;** Article 5. General principles.	*EU Waste Framework Directive (2008/98/EC)* *EU Directive on Packaging and Packaging Waste (94/62/EC)*	*National legislation will be followed*.

3.4.6 Offshore Activities

The scope of legislation for offshore activities which will involve construction preparation, construction and operational activities to be conducted in the Turkish Exclusive Economic Zone, territorial waters and landfall sections is explained below. Table 3.8 which is below lists requirements of national legislation as well as those of international legislation.

Table 3.8: National and International Legal Standards on Offshore Activities

Theme	National Legislation	Internaional Legislation	Project Standard
Ship generated waste, **Waste covered by Marpol 73/78 Convention**	Regulation on Control of Water Pollution**;** Regulation on Reception of Waste from Ships and Waste Control; Environment Law no 2872, Article 8 of the Law "Prohibition on Pollution", Regulation on Aquaculture Products; And provisions of other pieces of legislation in force.	**MARPOL 73/78**	*Among the requirements of the Environment Law, Regulation on Control of Water Pollution, Regulation on Reception of Waste from Ships and Waste Control, MARPOL 73/78 and other requirements of the relevant legislation in force, those which cover the area where the ship is located will be applicable.*

3.5 National Institutional Requirements

The Project Owner develops Environmental and Social Management Plans to meet minimum national requirements in the Project. Detailed information about such management plans is given in Chapter 12 (Environmental and Social Management System) .

All permits needed for the Project as per the Law on Environment and other relevant legislation in force will be obtained.

EIA Regulation includes detailed information about the description of projects which require EIA report, EIA process and relevant procedures and principles.

At various points, the Project will cross pipe/cable lines which are on the project route. Protocols with relevant organizations and institutions will be signed and necessary permits will be obtained for such crossings after the EIA process and prior to the construction phase.

The need for drinking water and domestic water will be met at the construction phase in compliance with the requirements of the Regulation on Water Intended for Human Consumption and Public Health Law. Permits to drill a well in places where water cannot be supplied from municipal water supply system will be obtained from Directorate General for State Hydraulic Works (DSI).

Recyclable waste and non-recyclable waste will be separated from each other and hazardous waste in places where it is applicable. Hazardous waste which may be generated in all phases of the Project will be collected separately in covered and impermeable containers depending on their characteristics and types. The project will make use of existing landfill sites which are licensed by the Ministry of Environment and Urbanization, recycling, storing and disposal facilities.

In cases where the land to be acquired in the Project is of forest quality, permits which are needed to use such land will be obtained in accordance with Article 17 of the Forestry Law no 6831 as elaborated on in Chapter 8 (**Assessment of the Lands which will be disposed of in the Project) and** relevant instructions of the General Directorate of Forestry will be followed to obtain the permits and to apply the permit procedures. In cases where there are pasture lands to be crossed by the Project Area, an application will be filed to Ministry of Food, Agriculture and Livestock to change the status of the pasture land in question.

Furthermore, although there is no agricultural activity within the Project Area, permits needed for using agricultural lands in the scope of project for purposes other than agricultural production will be obtained when needed in compliance with the Law on Soil Preservation and Land Use no 5403.

In cases where there are surface water bodies which are available on the Project route, an application shall be filed in compliance with the relevant legislation in cases where the provisions of the Law on Aquaculture no 130 are applicable and the opinion of the Provincial Directorate of Food, Agriculture and Livestock in Kırklareli will be sought.

Boru hattı ve kalıcı yer üstü yapılarının, ÇED sürecinden sonra Çevre Düzeni Planlarına ve diğer ilgili imar planlarına dâhil edilebilmesi için gerekli başvurular yapılacaktır

Applications which are needed to incorporate pipe line and permanent ground facilities into Environmental Plans and other relevant land development plans following the EIA process will be filed.

The buildings will be constructed by the Project in compliance with the relevant land development plans and relevant legislation and their licenses will be obtained.

Applications needed for protected areas on the Project route will be filed to Directorate General of Cultural Assets and Museums and Regional Directorate for Edirne Board of Conservation of Cultural Assets. In cases where any cultural asset is discovered on the Project route as defined in the Law on Conservation of Cultural and Natural Assets, all the works and construction in this field will stop in compliance with the Chance Find Procedures developed by the Project Owner and the closest administrative Office and Museum Directorate will be informed of such a situation in accordance with the requirements of the relevant legislation.

In cases where there is any mining site within the Project Area, Directorate General of Mining which reports to Ministry of Energy and Natural Resources and Special Provincial Administrations will be contacted. Protocols will be signed with the license holders of those mining sites and permits needed in such a case will be obtained.

Building construction in this Project will comply with Specification for Buildings to be Built in Seismic Zones.

Areas with the risk of having landslides, flood, avalanche and rockfall will be avoided as much as possible in determination of the route of the Project. The Project route will also be identified taking seismic risks and active fault line crossings into account.

The application for environmental permit which may be needed for the Receiving Terminal will be filed before the operational phase and in compliance with Environmental Permit and License Regulation and the opinion submitted by the Ministry of Environment and Urbanization will be followed. The current regulation stipulates that natural gas pipelines are not subject to environmental permits; however, the Project may need to obtain environmental permits due to the activities of ground facilities such as gas fired facilities.

3.6 Other Issues

There are no other issues which must be explained in this Chapter.

4 GROUNDS FOR THE ROUTE SELECTION and ASSESSMENT OF ALTERNATIVES

The following section presents an assessment of technically and financially feasible alternatives to the Project, and provides the rationale for selecting each particular option. The purpose of the alternatives assessment is to improve decisions on design, construction and operation of the Project in order to mitigate potential adverse environmental and social impacts.

The following alternatives have been considered:

- “No Project” Alternative
- Alternative gas transportation methods across the Black Sea;
- Alternative pipeline routes across the Black Sea;
- Alternative locations for the landfall (Options 1, 2 and 3 in the EIA Application File).
- Optimisation of landfall layout as a result of surveys and stakeholder engagement (Options 1B, 2B and 3B)
- Alternative techniques for shore crossing (open-cut versus microtunnel)

4.1 Project Alternatives

4.1.1 ”No Project” Alternative

The ”No Project” Alternative is the situation where the Project does not proceed. Under the “No Project” Alternative, there are no negative environmental or social impacts in Turkey, on land, in Turkish waters or EEZ, as there is no construction or operation of the Project.

The “No Project” Alternative would also mean that Turkey would not benefit economically from sourcing some of the employment, goods and services in Turkey to support the construction of the pipeline in Turkish waters and the landfall facilities of the Project. Additionally, the “No Project” Alternative would mean the loss of the contribution of the first gas line to the Turkish domestic energy grid overall reducing the supply of gas to the Turkish domestic market. In view of Turkey's dependence on natural gas imports and the estimates of future natural gas requirements, the Project could contribute as much as 20% of the Turkish gas market by 2030 (see Chapter 1 for more information

4.1.2 Alternative Gas Transportation Methods

The main alternative to the Project purpose (i.e. transporting natural gas across the Black Sea to Turkey and Europe) is the liquefaction of natural gas at a Black Sea port in Russia, and transportation of Liquefied Natural Gas (LNG) using carriers to either a port on the Turkish Thracian coast or a port in Turkey beyond the Turkish Straits.

The following factors have been taken into consideration in the assessment of this alternative:

- Liquefaction and transportation of LNG to gas markets by tankers is usually undertaken for ‘stranded gas’ deposits where the source of gas is so distant and isolated from its markets as to make transportation by pipeline uneconomic. This is not the case for the natural gas beds in Russia and the recommended Turkey and Europe markets;
- This alternative would require the presence of an unloading jetty or offshore buoy and a regasification plant in Turkey. In view of the sensitivity and often designated protected status

and recreational value of Turkish Black Sea coastline it was considered undesirable to develop a large scale regasification plant;

- In order to achieve LNG, gas is cooled to 161°C at 1 atmosphere pressure until it is liquefied and as a result the volume is reduced by about 600 times. When LNG transport is compared with the natural gas pipeline the energy needed to transform the natural gas to LNG and the fuel used for the carriers will result in a significant consumption of energy and release of carbon emissions;
- Liquefaction would require the construction of a liquefaction plant on the Russian coastline. The onshore environmental impacts associated with the construction and operation of an LNG plant would be greater than those of a pipeline and associated compressor station (CS). Given that a CS and associated pipeline that can be used for the Project have already been constructed in Russia as part of the Southern Corridor, it less environmentally, socially and financially impactful to use the existing facilities; and
- Transportation of LNG would require approximately 600 to 700 LNG carrier movements per year to export 31.5 bcm of natural gas per year. This would equate to approximately one LNG carrier movement per day. If passing through the Turkish Straits, this would involve passing the densely populated areas of Istanbul. In view of the hazardous nature of the cargo, the existing high density of maritime traffic through the Turkish Straits and the population density, this number of vessels movements would introduce an additional and potentially unacceptable safety risk.

In the framework of the above assessments, the alternative of LNG transport has been ruled out.

4.1.3 Alternative Route Options across the Black Sea

The route of the TurkStream Gas Pipeline from Russia across the Turkish EEZ was previously approved as part of the South Stream Offshore Pipeline. The approved "South Stream route" had already been comprehensively surveyed, designed in detail and optimized to avoid engineering, environmental and cultural heritage constraints. KP660 was chosen as the deviation point from the previously approved route ~~(see~~ Figure 4.1). No alternative route options across the Black Sea from Russia up to the point of KP660 within the Turkish EEZ were further assessed.

Sections of the TurkStream Gas Pipeline route, which starts from Russian Federation and passing through EEZ of Turkey (as defined in Chapter 1, **Russian Section** and **EEZ of Turkey Section** of the TurkStream Gas Pipeline) have been approved. Routes passing through currently approved sections have been analysed comprehensively and optimized by realizing the design in detail in a way that may remove cultural heritage and engineering constraints. Therefore, it has been determined that it is more practical to use currently approved route as much as possible by minimizing length of the new route, approvals of which will be obtained with surveys. KP660 referring 660th km of the route has been selected as deviation point of the aforementioned approved route (

) and no other route alternatives, in the section starting from Russian to KP660 point across the EEZ of Turkey, have been reviewed under this EIA study. Several analyses have been conducted by the Project Owner in pre-design stage and under former South Stream Offshore Pipeline Project.

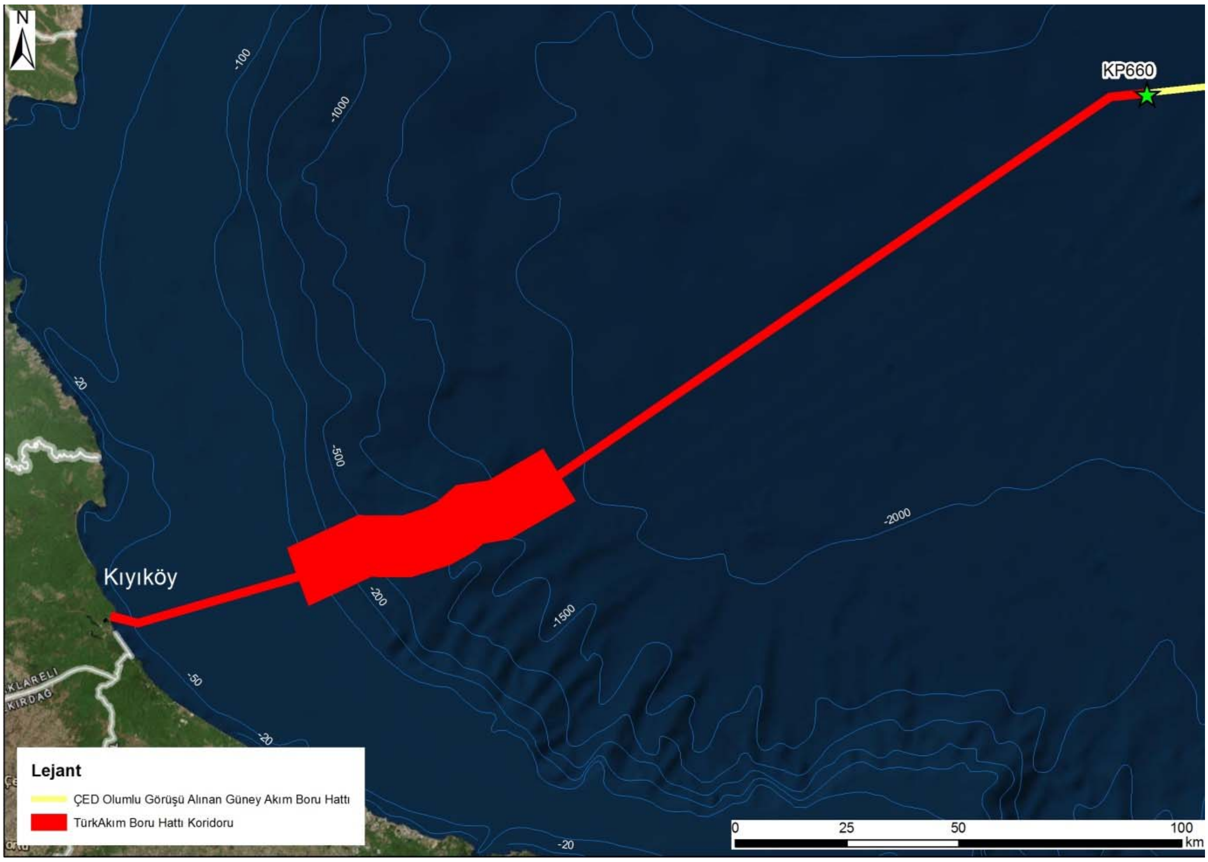


Figure 4.1: Junction Point of Approved (South Stream) Pipeline Route with the Project: KP660 and TurkStream Gas Pipeline Offshore Section

Following the choice of KP660 as the deviation point, the next most important aspect of the routing was to find the safest route up the continental slope. The continental slope is a steep section of the seafloor that rises from the abyssal plain to the continental shelf, and it is important to choose a location that is considered stable for the pipelines.

The methodology for choosing the crossing was to assess existing survey information to determine locations where a crossing would be technically feasible. There were a number of factors influencing the routing choices, including the avoidance of the relatively steep and gravity-flow prone channels just west of the Bosphorus and the avoidance of an area of mud volcanoes on the continental shelf. The factors considered were primarily engineering-based as there are no known environmental constraints on the section of the Turkish continental slope. The chosen route up the slope as shown in Figure 4.1 (point of the pipeline for three alternative route assessment) was considered to be the least likely to be affected by mass gravity flows or slope failure. Three alternatives shown in **Error! Reference source not found.** have been reviewed for the pipeline route aftere this point:

- **A northern route:** due to the morphology of the seabed along this route it was not certain that the 2 pipelines could cross the continental slope at this location, therefore this option was discarded.
- **A central route:** no significant engineering or other constraints were determined and therefore, subject to optimisation following further geophysical and geotechnical surveys, the central route was selected.

- **A southern route:** at the time of the routing, there were uncertainties regarding potential TPAO activities in the proximity of the route, therefore this option was discarded.

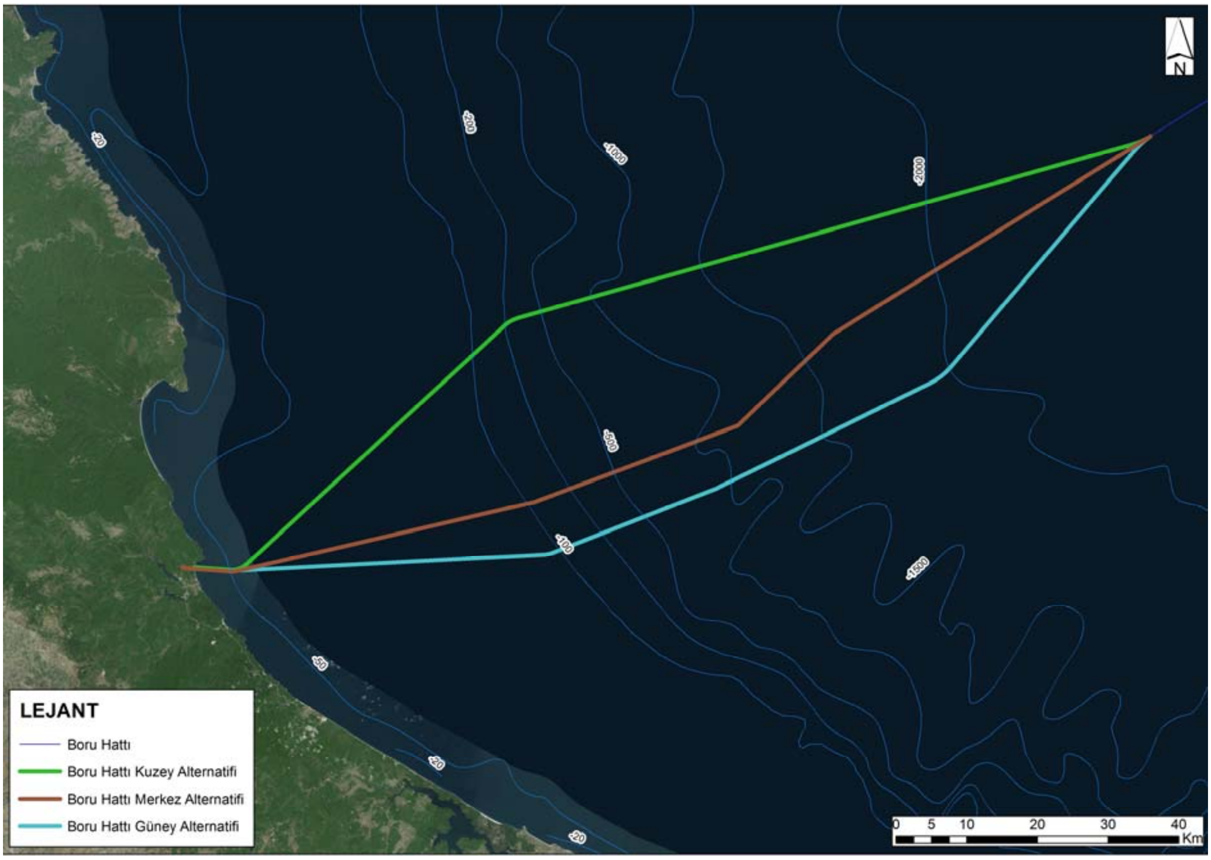


Figure 4.2: Offshore Routing Alternatives

4.2 Project Area

Following selection of the location for crossing the continental slope, the Project area onshore was determined by the following technical and environmental considerations:

- the preference to continue offshore routing in a south-western trajectory,
- the ruggedness of the inland topography close to the Bulgarian border;
- the need for suitable access routes for construction traffic,
- proximity to existing BOTAS infrastructure at Luleburgaz,
- avoidance of environmentally protected areas.

This resulted in the area of the town of Kıyıköy in Kırklareli Province being chosen to locate the Landfall Section.Following selection of the Kıyıköy area, it was necessary to determine options for locating the Shore Crossing Section and the Receiving Terminal (RT). Various sites within the Kıyıköy area were selected for consideration. The selection of the potential sites was initially based on available desktop data (e.g. aerial photography, topographic information for the area, etc.). The selection took into consideration many factors, including distance from a populated areas, presence/absence of existing constraints (e.g. protected areas) and suitable topography. As a result, three locations were chosen for further investigation as presented in the EIA Application File and as shown in **Error! Reference source not found.**:

- Option 1: Poliçe;
- Option 2: North Kıyıköy; and
- Option 3: South Kıyıköy.

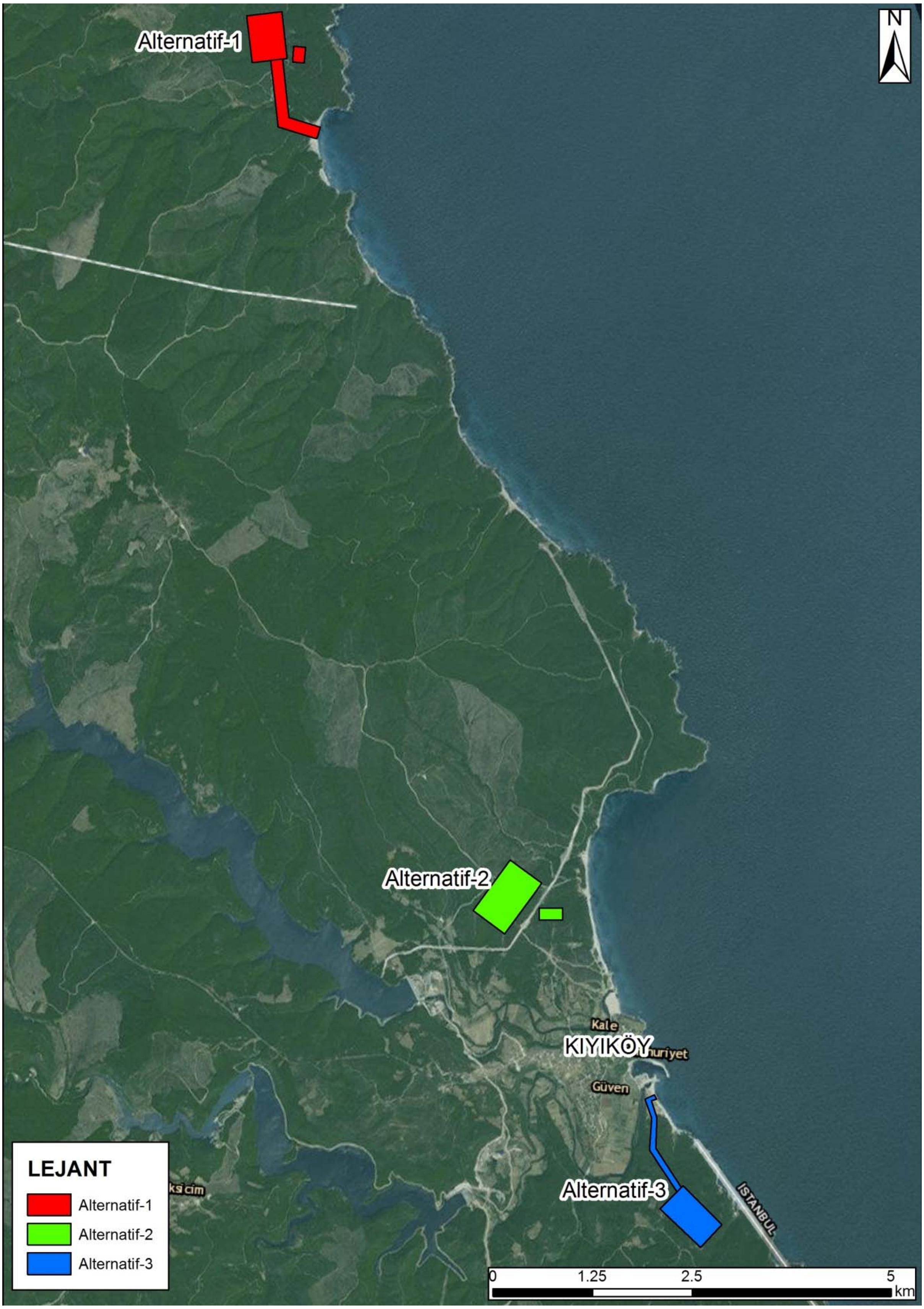


Figure 4.3: Locations of Options 1A, 2A, 3A

This further investigation involved site visits by specialists, including engineers, geologists, environmental and social experts, and engagement with stakeholders/public. Factors given below have been considered under the methodology used to choose the location of the shore crossing, onshore pipelines and RT (Landfall Section) considered a combination of the following:

- Accessibility;
- Constructability of Shore Crossing;
- Constructability of Landfall Section;
- Environmental constraints;
- Cultural Heritage constraints;
- Land ownership and land use constraints;
- Socio-economic constraints.

As a result of the site visits and engagement with stakeholders the most eligible locations were determined and Options 1B, 2B and 3B given in **Error! Reference source not found.** were also considered in this process. The Options 1, 2 and 3 given in the TurkStream EIA Application File are herein referred to as Options 1A, 2A and 3A to avoid confusion.

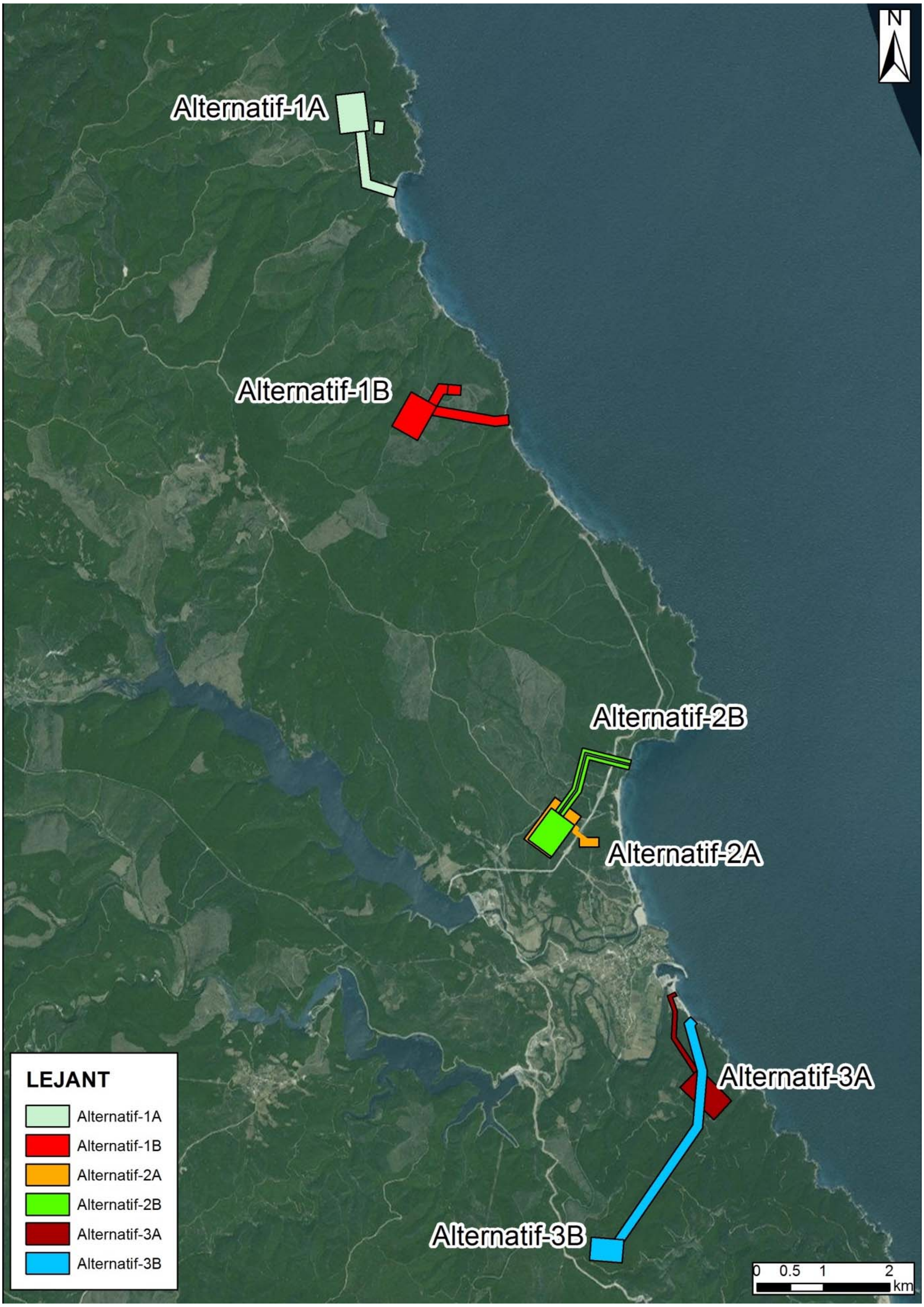


Figure 4.4: Locations of Options 1B, 2B, 3B

4.3 Information on Alternative Shore Crossing and Landfall Sections

Six alternatives were considered when determining the Shore Crossing and Shore Sections (options 1A, 1B, 2A, 2B, 3A, 3B) and assessed against the following technical, environmental and socio-economic indicators (Table 4.).

Table 4.1: The Indicators Considered in the Assessment of the Options

Indicator	Reason
Accessibility	Access roads should be durable against high traffic volumes and heavy loads of 50 tons/trucks and over. Given the long lead time for implementing road upgrades, and the additional impacts generated by such road work, the necessity for such upgrades should be minimised wherever possible by selecting a location with the highest percentage of existing construction-standard road network.
Constructability of Shore Crossing	The regional geology is relatively geodynamically complex, with a mixture of potentially very hard metamorphic and igneous rocks, and limestone with karstic features in places which makes both open-cut and microtunnelling technically challenging or infeasible, with open-cut being the least risky. In the open-cut technique a coastal area (at least 50 m width and 100 m span) with sufficient dimensions for heavy machinery (pile-plank equipment, excavators, bulldozers, upright cranes, etc.) will be preferred. Additionally the parameters related to air and sea conditions and sediment properties will determine the extent of trench protection measures. In the trenchless (microtunnel) technique the tunnel boring machine (TBM) will be greatly hindered at uniaxial compressive rock strengths approaching 250 MPa, and any strengths encountered greater than this will likely halt any TBM progress.
Constructability of Landfall Section	Land that has gentle topography limits the amount and scale of preparation activities such as levelling and filling of land. In addition, the underlying geology of the area must be assessed in order to ensure that the land can physically support the RT. An area with an abundance of karstic features can make it technically challenging or infeasible to construct the RT. The availability of utilities in the area of the operational phase of the RT is also assessed.
Land Ownership/ Protection Status	The areas under protection and the type of land ownership are taken into account.
Environmental Constraints	The sensitivity of land in terms of overall ecology, biodiversity and hydrology is taken into account. The section covers key environmental features, protected species, overall biodiversity, forest loss and surface-water features.
Cultural Heritage Objects	Known cultural heritage objects (registered for protection) and potential for cultural heritage are also taken into account. It is noted that with exception of Option 2A and 2B no formal consultations with the competent cultural heritage authorities have been undertaken and no options have been subject to a formal detailed cultural heritage identification study. It is therefore possible that unrecorded and/or unknown cultural heritage, particularly archaeological sites, may exist on or adjacent at all options. No cultural objects have been found during the site researches carried out by official authorities in Option 2A site. Similarly, no marine cultural heritage objects have been found during official researches carried out in Shore Crossing Section of the Option 2A.
Socio-economic Constraints	The sensitivity of land in terms of socio-economic livelihoods (tourism, fishing, forestry etc.) and potential community impacts (such as noise, traffic, visual etc.) are taken into account for the location of both the shore crossing and the RT and for the access routes that will be used by construction related traffic.

The assessment of the six options against the above indicators has been provided below. The assessments have been made according to public information, primary data and preliminary surveys. The surveys conducted to date are as follows:

- geological mapping of the area around the options and feasibility of future onshore geophysical/geotechnical surveys, and validating MTA geological maps

- survey of logistical and terrain difficulties that may occur on the pipeline route, Integrated Onshore Receiving Terminal (RT), micro tunnel (MT) or open cut (OC) trench route, and on or along access roads.
- topographic surveys of Options 1B, 2A, 2B and 3A;
- onshore geophysical surveys of Options 2A, 2B and 3A;
- environmental walkovers at Options 1A, 1B, 2A, 2B and 3A;
- stakeholder engagement with authorities and local communities.

4.3.1 Option 1A: Poliçe

Receiving Terminal to be located in Option 1A is located approximately 14 km north of the town of Kıyıköy and 8.5 km northeast of Kışlacık Village. This site is located in a remote area and the open-cut shore approach would cross Poliçe Beach.

The coordinates of Option 1A are shown in Table 4. and the location in

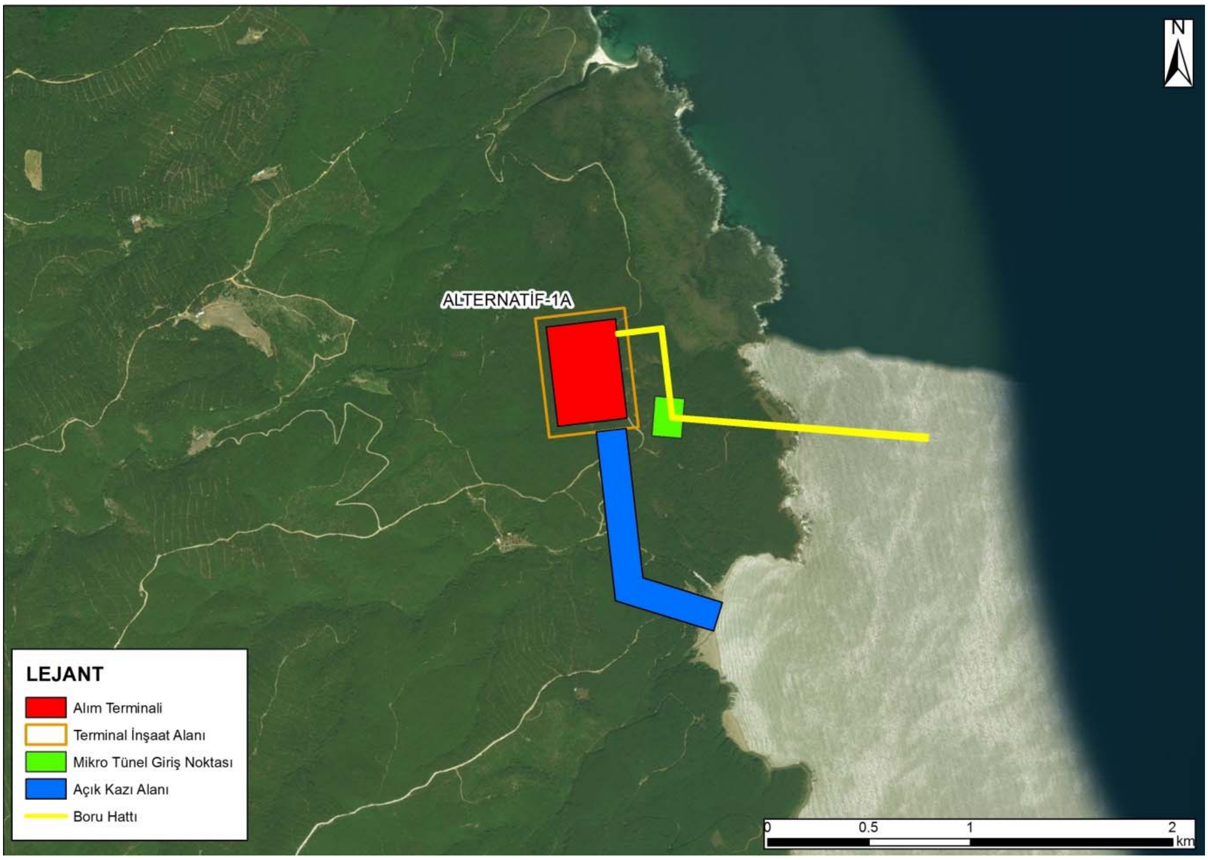


Figure 4.5.

Table 4.2: Indicator Coordinates of the Shore Approach and Onshore Section (Option 1A)

Datum	WGS-84 (UTM)	WGS-84 (Geographical)
Zone Medium Meridian	33.0	-
Zone	35T	-
Coordinates of Open-Cut Site	X :Y 585830.28E, 4621891.41N 585974.11E, 4621189.26N	Longitude, Latitude 28°1'56.089"E, 41°44'39.154"N 28°2'01.945"E, 41°44'16.326"N

Datum	WGS-84 (UTM)	WGS-84 (Geographical)
Coordinates of Recieving Terminal	X :Y	
	588568.82E, 4612359.73N	28°1'55.157"E, 41°45'02.765"N
	588289.30E, 4612066.35N	28°1'36.983"E, 41°44'59.873"N
	588803.59E, 4611576.40N	28°1'43.374"E, 41°44'37.315"N
	589083.94E, 4611871.36N	28°2'01.284"E, 41°44'39.828"N

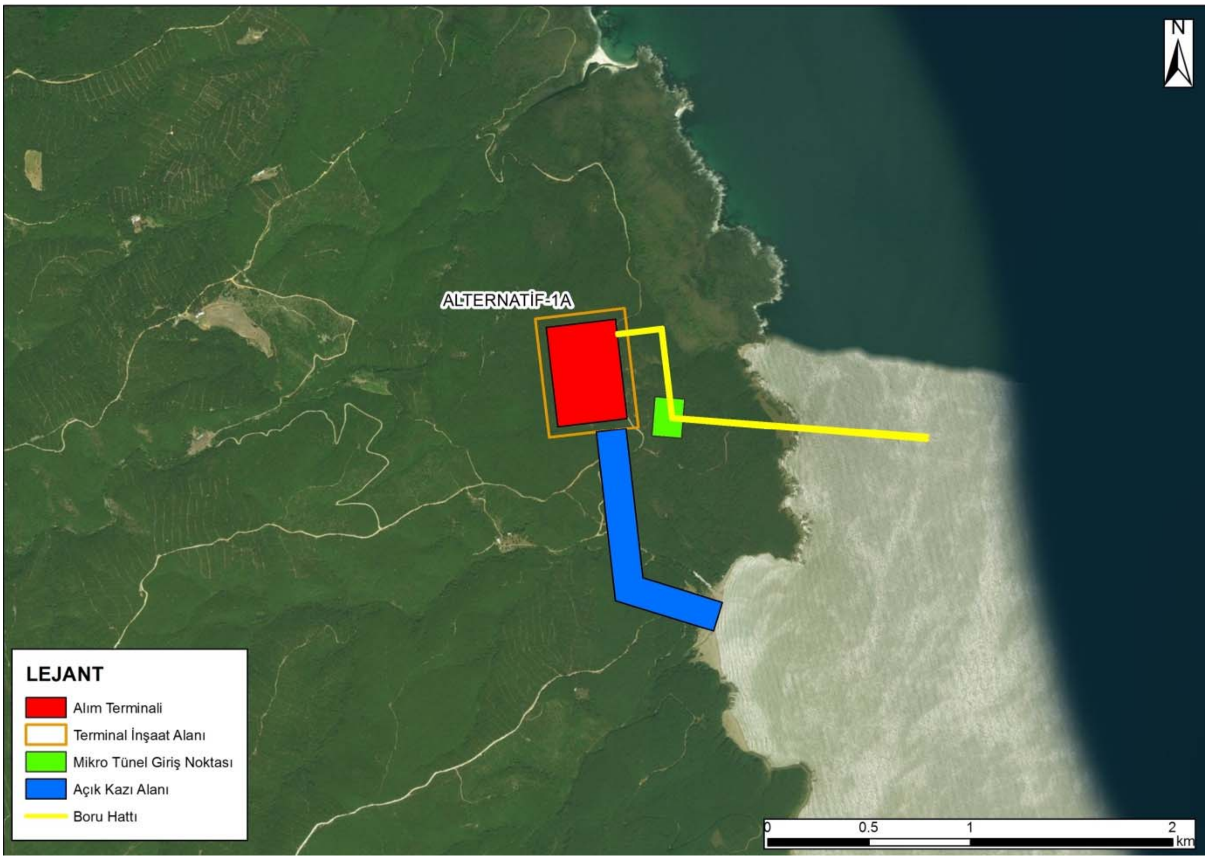


Figure 4.5: Option 1A Location

Table 4.3: Information on Option 1A

Indicator	Explanation
Accessibility	Positioned in a remote area; Vize is accessed by diverting to dirt roads after proceeding in asphalt road. According to the studies conducted; • Approximately 17 km of the access route needs minor adjustment (shown in green in **Error! Reference source not found.**); • Approximately 25 km of road must be improved significantly needing base and surface treatment, road widening and infrastructure (shown in orange in **Error! Reference source not found.**); • Approximately 2.5km of new road needed to by-pass the village of Komurkoy including a bridge (shown in red in **Error! Reference source not found.**).Homes, businesses and social facilities extend along with the main road through the center of Kömürköy.
Constructability of Shore Crossing	The area is characterised by metamorphic units, igneous rocks and recent deposits. Areas of hard metaquartzite rock with possible Granodiorite intrusions are also present. Open cut and microtunnel are considered feasible at this location but technically challenging due to the hardness of the rocks.
Constructability of Landfall Section	The location has gentle topography and requires minimal preparation of the land thereby reducing the amount of excavation and filling to level the land for construction. The amount of

	excavation required to construct an RT at this location is estimated to be 415,000 m^3. The underlying geology is considered to be able to support the RT. No potential energy and water supply sources have been identified in the close vicinity.
Land Ownership/ Protection Status	The location is completely within State Forest Land. According to the desktop studies, no protected zones have been identified; the closest protected zone is the İğneada National Park, which is 3 km north. Due to the significant road upgrade required, it appears likely that there will be a need for additional.
Environmental Constraints	The environmental site visits determined the area to have low significance in terms of biodiversity. Two small streams pass through the area where the RT will be constructed.
Cultural Heritage Constraints	Limited desktop studies indicate that there are no known protected cultural heritage objects in the area. The site visit for geological researches resulted in the identification of a modern cemetery located 15 m southwest of an road and 50 m northeast of Line 1.
Socio-economic Constraints	The nearest town to Option 1, Kislacik village, is approximately 8.5km to the north-east. Only a single permanent structure is within the 500 meter area surrounding the RT. It has observed that Poliçe beach has some touristic features and semi-permanent structures, however, tourism does not appear to be a significant source of income or economic industry for the nearby communities. Other livelihood activities, such as animal husbandry. Fishing is also known to occur along this coastline, although fishermen from Kıyıköy have indicated that this region is not a significant fishing ground and/or fish spawning / breeding area.

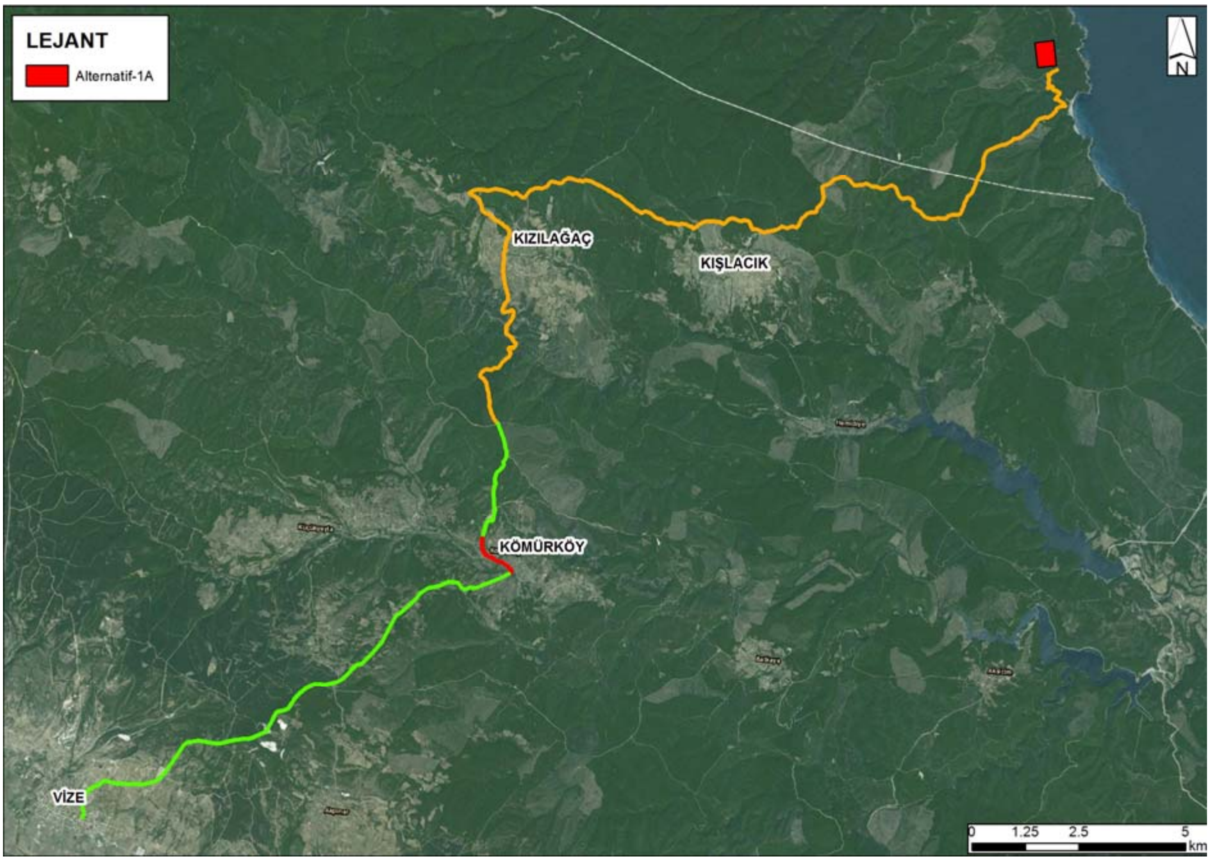


Figure 4.6: Access Route to Option 1A

4.3.2 Option 1B

Given the important improvement requirements regarding the access route summarized above and land use needs identified at Option 1A, further studies were undertaken in the wider vicinity to determine if there was a more optimal location in this area. Option 1B located 4 km to the south was selected for further investigation.

The coordinates of Option 1B are shown in **Error! Reference source not found.** and the location in **Error! Reference source not found.**’.

Table 4.4: Indicator Coordinates of the Shore Approach and Onshore Section (Option 1B)

Datum	WGS-84 (UTM)	WGS-84 (Geographical)
Zone Medium Meridian	33.0	-
Zone	35T	-
Coordinates of Open-Cut Site	X :Y	Longitude, Latitude
	588426.836,4617797.672	28°03'46.3022"E,41°42'25.4060"N
	588453.690,4617650.157	28°03'47.3852"E,41°42'20.6128"N
	588227.060,4617608.901	28°03'37.5586"E,41°42'19.3658"N
	587742.670,4617650.633	28°03'16.6247"E,41°42'20.9117"N
	587261.929,4617699.355	28°02'55.8521"E,41°42'22.6816"N
	587328.764,4617843.289	28°02'58.8195"E,41°42'27.3216"N
	587742.670,4617804.610	28°03'16.7063"E,41°42'25.9036"N
	588219.943,4617760.009	28°03'37.3312"E,41°42'24.2676"N
Coordinates of Receiving Terminal	X :Y	Longitude, Latitude
	587262.384,4617819.007	28°02'55.9348"E,41°42'26.5606"N
	587051.889,4617365.695	28°02'46.5896"E,41°42'11.9471"N
	586734.570,4617513.041	28°02'32.9392"E,41°42'16.8489"N
	586945.065,4617966.353	28°02'42.2837"E,41°42'31.4627"N

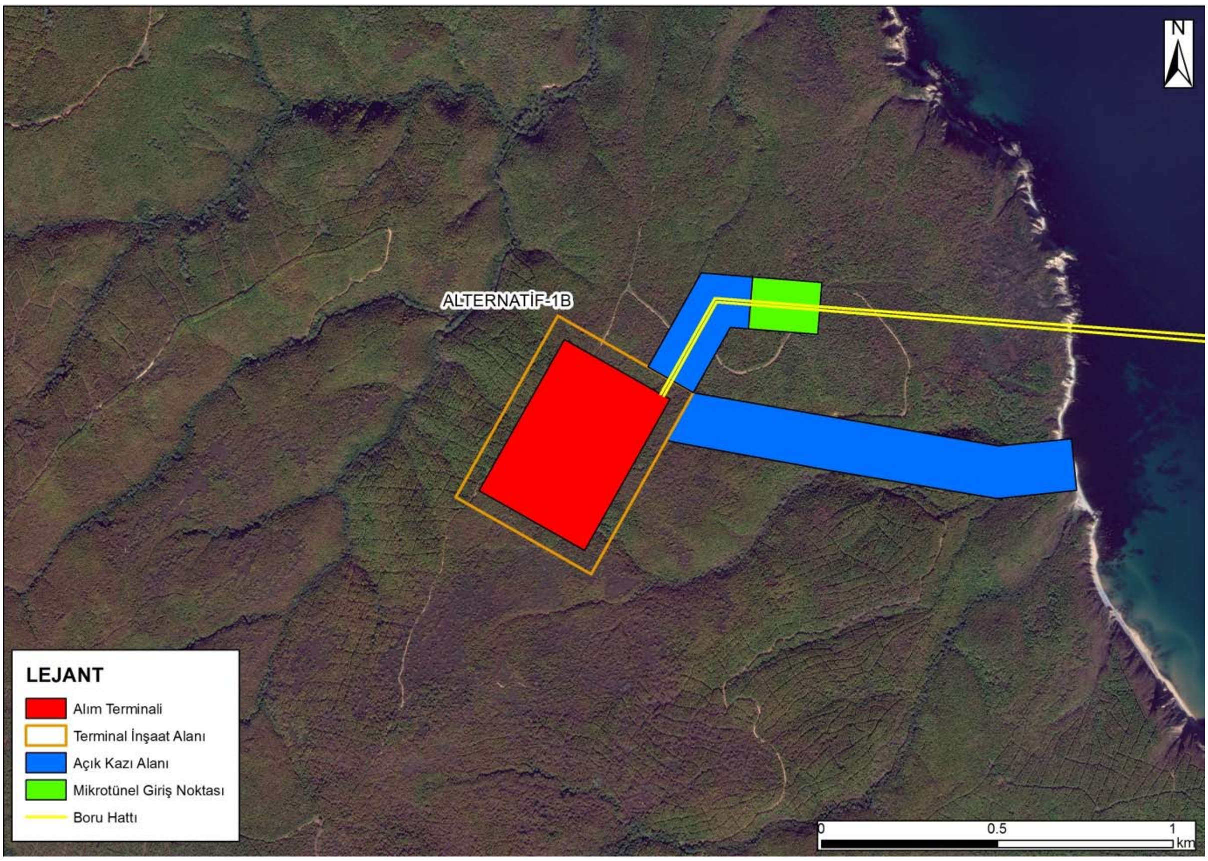


Figure 4.7: Option 1B Location

Table 4.5: Information on Option 1B

Indicator	Explanation
Accessibility	Positioned in a remote area; access is from dirt roads and in poor conditions. There are two feasible access routes to Option 1B: from Vize or from Saray as shown in **Error! Reference source not found.** and **Error! Reference source not found.** **Option 1B Acces Roads** ***Vize:*** • Approximately 17 km of the access route is asphalted road so requires minimal upgrade (shown in green in (**Error! Reference source not found.**) • Approximately 27 km of road must be improved significantly needing base and surface treatment, road widening and infrastructure (shown in orange in **Error! Reference source not found.**); • This new route may pass center (shown in red in **Error! Reference source not found.**). Homes, businesses and social facilities extend along with the main road through the center of Kömürköy. ***Saray:*** • Approximately 24 km of the access route, is asphalted road so requires minimal upgrade (shown in green in **Error! Reference source not found.**) • Approximately 20 km of road must be improved significantly needing base and surface treatment, road widening and infrastructure (shown in orange in **Error! Reference source not found.**);This route may pass though the center of Gungormez and Bahcekoy (shown red in **Error! Reference source not found.**) Homes, businesses and social facilities extend along with the main road through the center of every village.
Constructability of Shore Crossing	There are several lithologies in the area, including hard/very hard rocks such as Gabbro, Granodiorite as well Granite and Quartzite. The RT lies mostly on a bed of sedimentary gravelstone and sandstone, with incursions of metapelitic rock. Due to the hardness of the rocks identified in the area microtunneling is not considered feasible and open-cut technically challenging.
Constructability of Landfall Section	The location has gentle topography and requires minimal preparation of the land thereby reducing the amount of excavation and filling to level the land for construction. The amount of excavation required to construct an RT at this location is estimated to be approximately 380,000m^3. The underlying geology is considered to be able to support the RT. No potential energy and water supply sources have been identified in the close vicinity.
Land Ownership/ Protection Status	The location is completely within State Forest Land. No protected zones have been identified in the vicinity. Due to the significant road upgrade required, it appears likely that there will be issues concerning land use. There are no permanent structures close to the location.
Environmental Constraints	The environmental site visits determined the area is considered to have low significance in terms of biodiversity. There are no surface-water bodies nearby. There aren't any assessments conducted regarding ecology of the Shore Crossing Section.
Cultural Heritage Constraints	Limited desktop studies indicate that there are no known protected cultural heritage objects on or adjacent to the Project area.
Socio-economic Constraints	The closest village to Option 1B is Hamidiye Village (approximately 6km to the north-east) and the site is made up of predominantly forestry woodland, with narrow tracks traversing it. There are no permanent structures close to the location.. Police Beach is located approximately 3km north-east therefore. Other livelihood activities, such as forestry and animal husbandry, are known to occur in the vicinity; although it appears that these livelihoods are mostly concentrated near to Selves beach, located in the south of the Project. Fishing is also known to occur along this coastline, although fishermen from Kıyıköy have indicated the area is less significant fishing ground and/or fish spawning / breeding area.

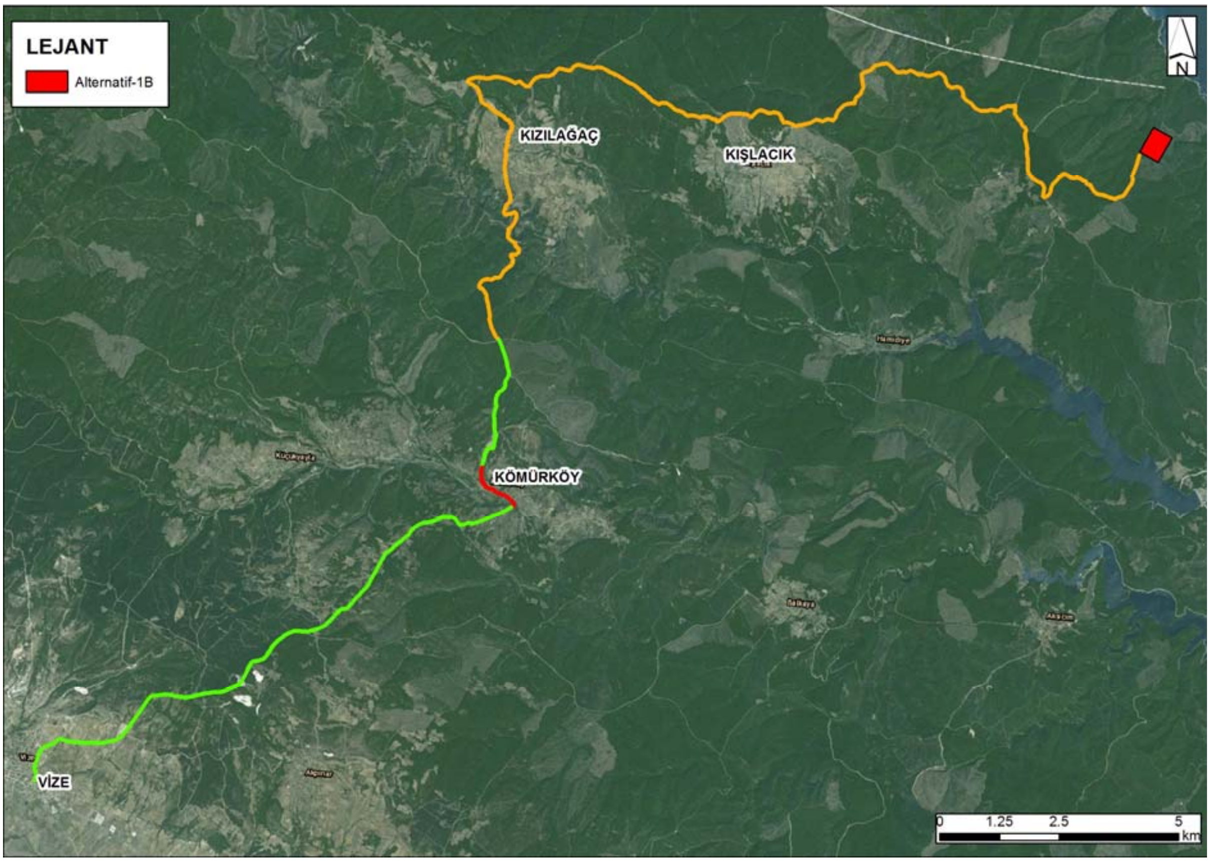


Figure 4.8: Access Routes to Option 1B from Vize

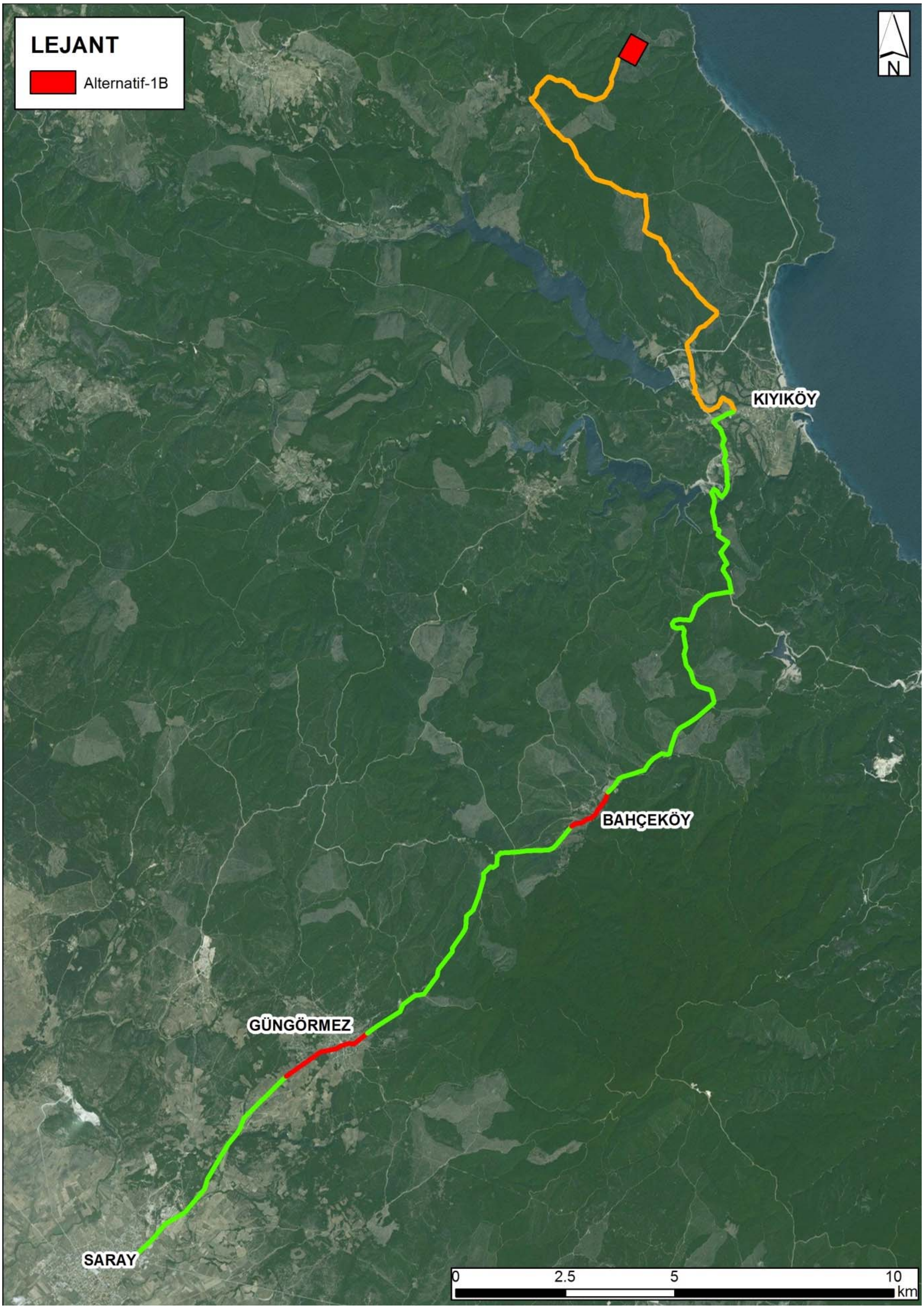


Figure 4.9: Access Routes to Option 1B from Saray

4.3.3 Option 2A (North of Kıyıköy)

Receiving Terminal to be located in Option 2A is located approximately 3 km north of Kıyıköy town on the access road that was constructed for Kıyıköy Wind Power Plant project owned by Borusan EnBW Enerji Yatırımları ve Üretim A.Ş.. The wind plant and the electrical transformer that serves the plant are north of the proposed project site. The site is in a valley and fairly close to a high voltage line. The site is also north of the Pabuçdere dam lake operated by the Istanbul Water and Sewage Authority (İSKİ) to provide drinking water to the Istanbul area. In this option the shore crossing is passes through the center of Selves Beach.

The coordinates of Option 2A are shown inTable 4. and the location in **Error! Reference source not found.**

Table 4.6: Indicator Coordinates of the Shore Approach and Shore Section (Option 2A)

Datum	WGS-84 (UTM)	WGS-84 (Geographical)
Zone Medium Meridian	33.0	
Zone	35T	
	X :Y **Landfall Facility Area** 589621.132E, 4611954.076N 589960.948E, 4611743.295N 589591.477E, 4611148.993N 589251.661E, 4611359.773N **Micro Tunnel Entry Trench** 590012.352E, 4611436.097N 590211.503E, 4611453.831N 590224.804E, 4611304.465N 590025.652E, 4611286.734N **Micro Tunnel Onshore Pipeline Route** 590193.824E, 4611377.928N 590183.869E, 4611376.995N 589953.941E, 4611519.615N 590024.855E, 4611633.942N 589929.670E, 4611692.983N **Micro Tunnel Offshore Pipeline Route** 816241.274E, 4749926.964N 808186.574E, 4748379.325N 679412.399E, 4652887.203N 666810.502E, 4638646.982N 638548.498E, 4625342.467N 596345.572E, 4611955.583N 591046.740E, 4611458.007N	Longtitude, Latitude **Landfall Facility Area** 28°04'34.8131"E, 41°39'15.4750"N 28°04'49.3885"E, 41°39'08.5036"N 28°04'33.0968"E, 41°38'49.3860"N 28°04'18.5221"E, 41°38'56.3568"N **Micro Tunnel Entry Trench** 28°04'51.4440"E, 41°38'58.5233"N 28°05'00.0619"E, 41°38'59.0172"N 28°05'00.5557"E, 41°38'54.1693"N 28°04'51.9379"E, 41°38'53.6755"N **Micro Tunnel Onshore Pipeline Route** 28°04'59.2565"E, 41°38'56.5636"N 28°04'58.8257"E, 41°38'56.5374"N 28°04'48.9644"E, 41°39'01.2547"N 28°04'52.0917"E, 41°39'04.9324"N 28°04'48.0092"E, 41°39'06.8852"N **Micro Tunnel Offshore Pipeline Route** 30°52'09.8205"E, 42°50'11.4697"N 30°46'12.7384"E, 42°49'33.2346"N 29°09'59.6064"E, 42°00'27.2461"N 29°00'37.5851"E, 41°52'55.7774"N 28°40'00.7061"E, 41°46'04.2087"N 28°09'25.4933"E, 41°39'12.6995"N 28°05'36.1672"E, 41°38'58.8107"N

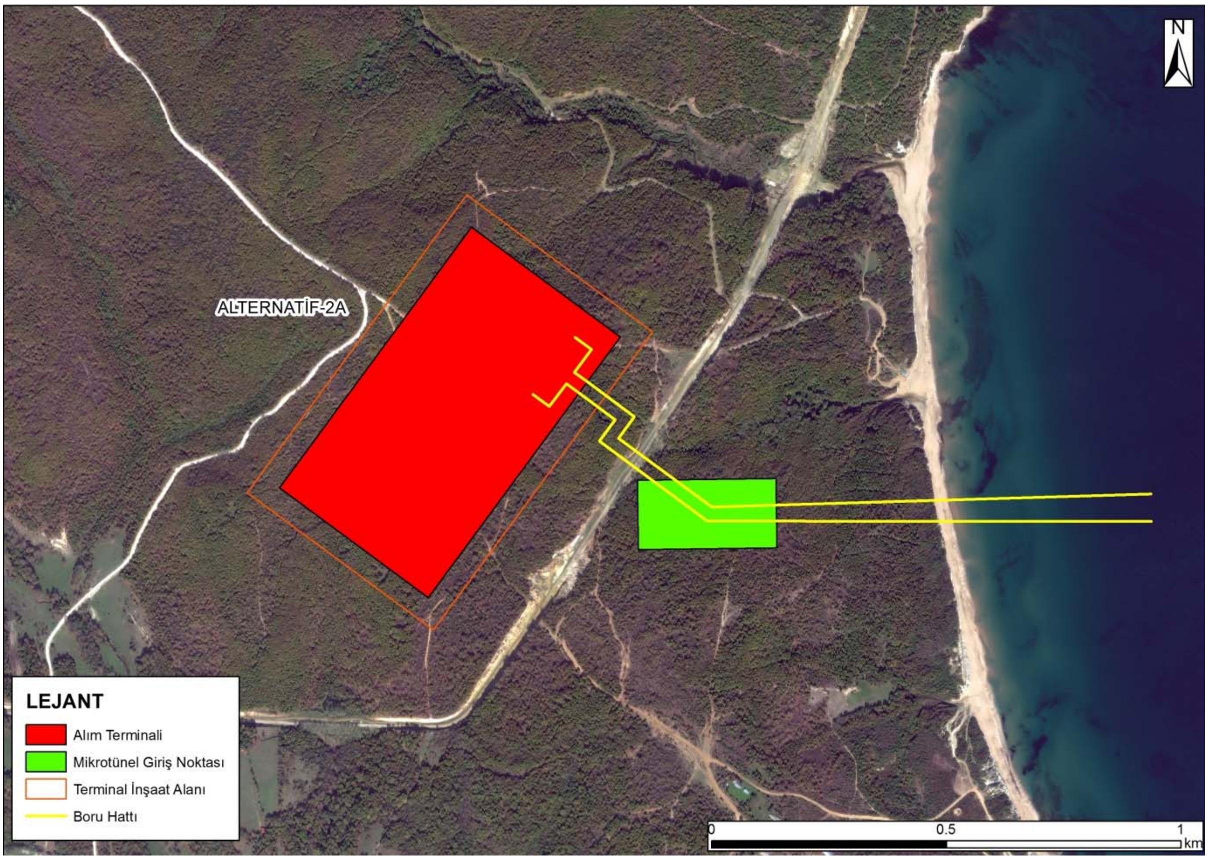


Figure 4.10: Option 2A Location

Table 4.7: Information on Option 2A

Indicator	Reason
Accessibility	Good accessibility - there are two feasible access routes: from Vize or from Saray as shown in **Error! Reference source not found.** and **Error! Reference source not found.**. **Option 2A Access Routes** ***Vize:*** • Approximately 36 km of the access route is asphalted road so requires minimal upgrade (shown in green in **Error! Reference source not found.**) • Approximately 6 km of road must be improved significantly needing base and surface treatment, road widening and infrastructure (shown in orange in **Error! Reference source not found.**); • This route needed to by-pass the center of village of Komurkoy including a bridge (shown in red in **Error! Reference source not found.**). ***Saray:*** • Approximately 24 km of the access route is asphalted road so requires minimal upgrade (shown in green in **Error! Reference source not found.**), • Approximately 11 km of road must be improved significantly needing base and surface treatment, road widening and infrastructure (shown in orange in **Error! Reference source not found.**); • Route passes through Güngörmez and Bahçeköy (shown in red in**Error! Reference source not found.**). Homes, businesses and social facilities extend along with the main road through the center of every village. ***Kıyıköy:***

	In order to reach the site, construction traffic will be routed through Kıyıköy. Although the access route will avoid Kıyıköy town itself, several households along the access road will potentially be significantly affected by construction traffic. Construction traffic may also cause congestion and lead to increased disruption to users of Selves Beach, especially during the tourism high season.
Constructability of Shore Crossing	The area is characterised by medium bedded, very weak, slightly weathered siltstone and sandstone alternation with gravel interbeds (Unit-3 of Soğucak Formation and Belgrat formation) as well as limestone, sandy limestone, silty limestone alternation with marl intercalations (Unit-2 of the Soğucak Formation). Due to the nature of the geology of this area there is the potential for karstic features which mean that microtunnelling is not considered a preferable alternative at this location. The open-cut method appears to encounter minimal risk in this type of ground, however the existence of karstic and other features will be investigated by further subsurface studies to fully confirm its feasibility.
Constructability of Landfall Section	The location is gradually sloped requires minimal preparation. The amount of excavation required to construct an RT at this location is estimated to be approximately 420,000m^3. The underlying geology is considered to be able to support the RT. Potential energy and water supply sources have been identified close to the site.
Land Ownership/ Protection Status	The physical footprint of the RT is completely within the State Forest Land, however the exclusion zone of the RT may include some agricultural, privately owned land, imposing (limited) restrictions on the use of this land related to habitation. The shore approach crosses a first degree Protected Area of Kıyıköy. It is outside of the buffer zone for the Pabuçdere drinking water reserve operated by ISKI which is located in the near vicinity. The onshore pipeline will pass under the existing İSKİ (unused) Ø2200 mm steel pipeline. The RT is located in the vicinity of the Wind Power Plant area. Option 2 is located approximately 1.9 km north-west of Kıyıköy village and there are several structures within 1 km of the proposed RT location.
Environmental Constraints	Site researches carried out in RT area has showed that there is no significant ecological constraint. Sazlıdere is located where the RT will be established.
Cultural Heritage Constraints	Authority consultations indicate no known protected cultural heritage sites on or within the Option area. There is a registered site, a tumulus, located +/- 1 km to the southeast of the Project area. A site visit carried out by competent authorities in 2015 has shown that there aren't any cultural heritage objects in the area. A survey undertaken by the competent authorities in the nearshore section did not result in the identification of any marine cultural heritage.
Socio-economic Constraints	Selves beach is located approximately 1 km east of the RT. Selves beach is used for recreational tourism and given that businesses provide accommodation and other services, tourism is very important for local economy as a livelihood.. Forestry and animal husbandry activities appear to be predominantly concentrated within this area. Beekeeping, hunting and trekking are also known to occur in and around Selves Beach. as it is purportedly a significant fish breeding and spawning ground. Rocky outcrop areas where the pipline will pass through is important fish spawning / breeding habitat and they are located in the bay in front of the Selves Beach..

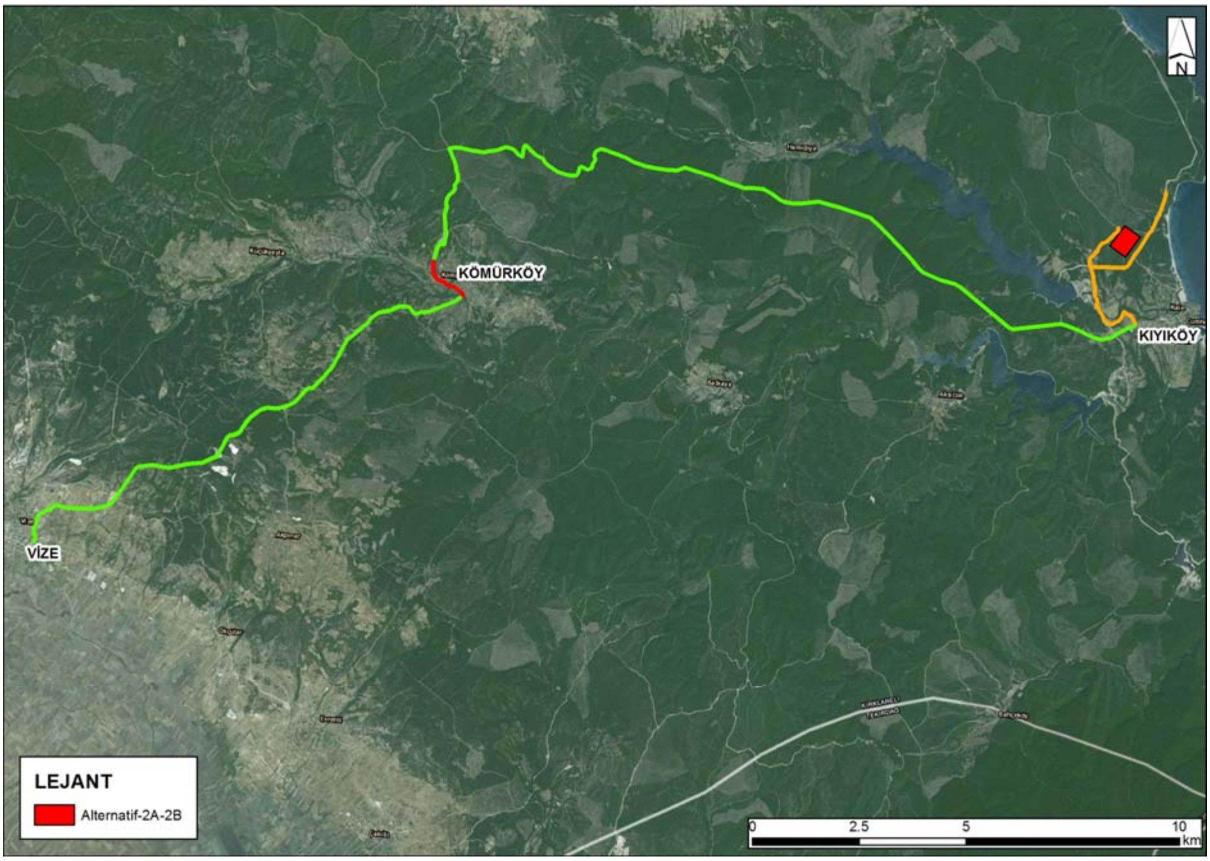


Figure 4.11: Access Routes to Option 2A and 2B from Vize

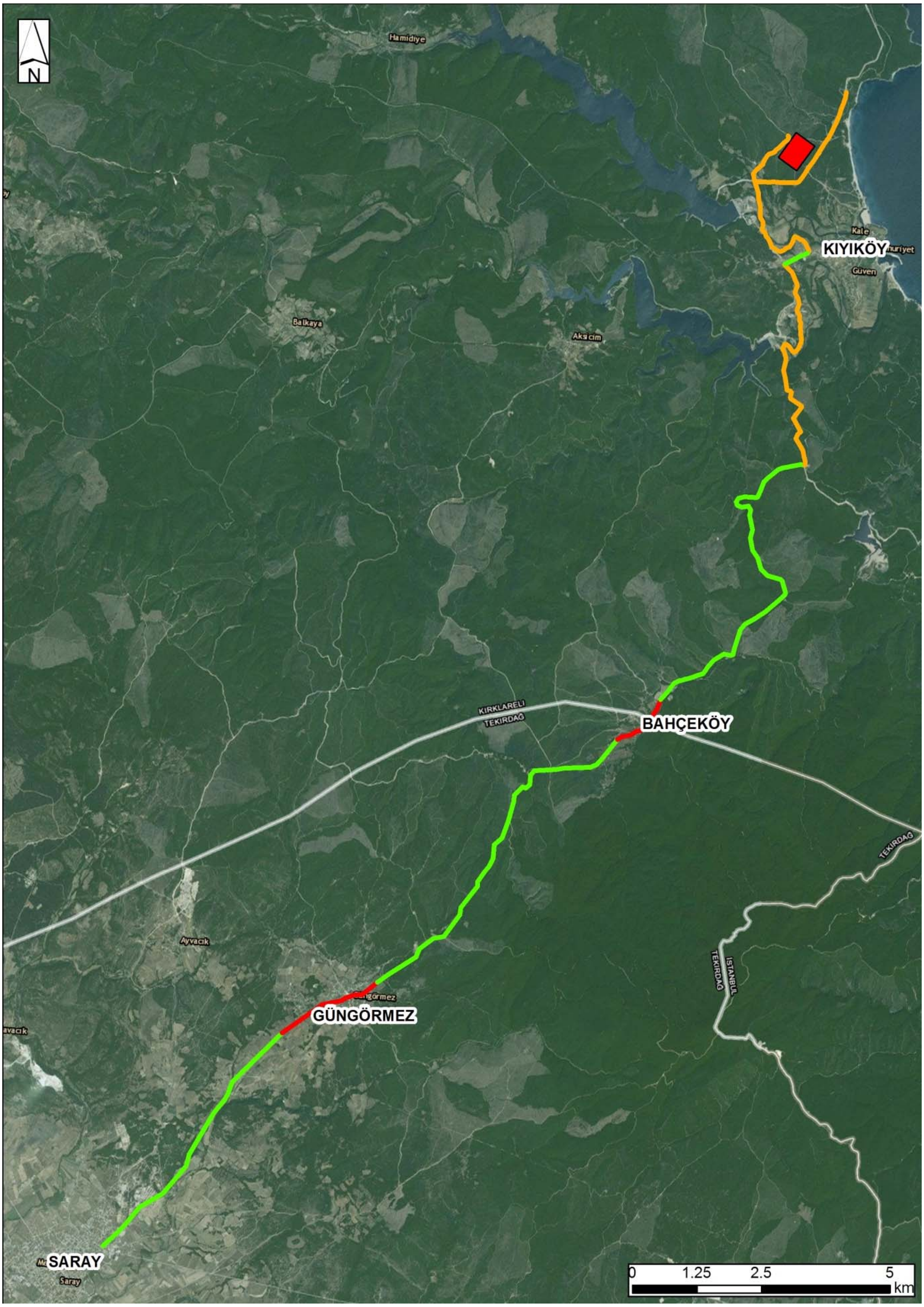


Figure 4.12: Access Routes to Option 2A and 2B from Saray

4.3.4 Option 2B

Given the above constraints identified at Option 2A, further studies were undertaken in the vicinity to determine if there was a more optimal location. Option 2B with a shore-crossing 1km to the north but RT of which is located in the same area as that of Option 2A was selected for further investigation (Figure 4.13)

The coordinates of Option 2B are shown in Table 4. and the location in **Error! Reference source not found.**

Table 4.8: Indicator Coordinates of the Shore Approach and Shore Section (Option 2B)

Datum	WGS-84 (UTM)	WGS-84 (Geographical)
Zone Medium Meridian	33.0	
Zone	35T	
Coordinates of Open Cut	X :Y 589751.944 4611733.588 589624.526 4611812.623 589854.436 4612183.279 589961.050 4612805.963 590723.837 4612675.362 590698.533 4612527.572 590083.536 4612632.870 589997.285 4612129.120	Longitude, Latitude 28° 04' 40.3487" E 41° 39' 08.2737" N 28° 04' 34.8834" E 41° 39' 10.8877" N 28° 04' 45.0224" E 41° 39' 22.8112" N 28° 04' 49.9688" E 41° 39' 42.9555" N 28° 05' 22.8750" E 41° 39' 38.4100" N 28° 05' 21.7003" E 41° 39' 33.6290" N 28° 04' 55.1703" E 41° 39' 37.2939" N 28° 04' 51.1684" E 41° 39' 20.9974" N
Coordinates of Receiving Terminal Construction Site	X:Y 589558.127 4611853.809 589940.382 4611616.703 589624.241 4611107.030 589241.986 4611344.135	Longitude, Latitude 28° 04' 32.0354" E 41° 39' 12.2498" N 28° 04' 48.4309" E 41° 39' 04.4078" N 28° 04' 34.4903" E 41° 38' 48.0123" N 28° 04' 18.0955" E 41° 38' 55.8537" N

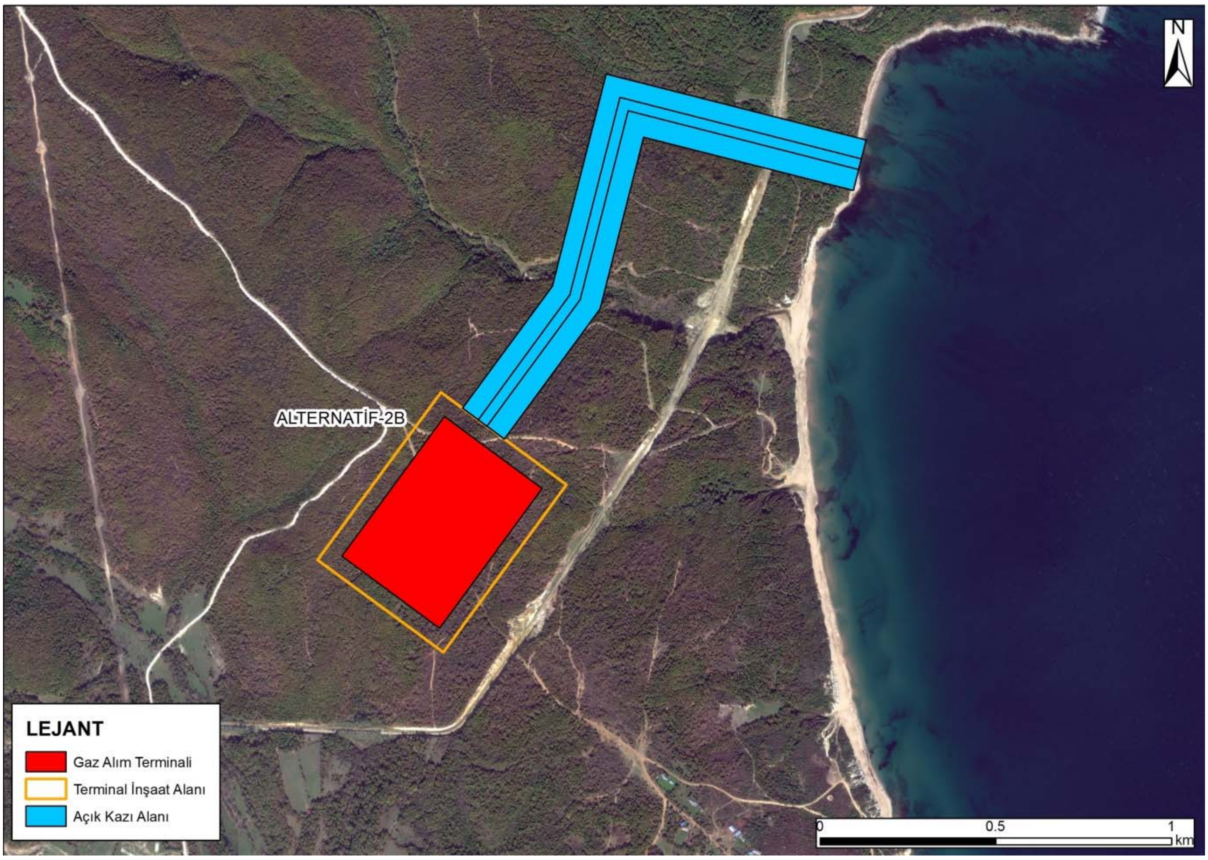


Figure 4.13: Option 2B Location

Table 4.9: Information on Option 2B

Indicator	Reason
Accessibility	As for Option 2A
Constructability of Shore Crossing	The route is located on the lower part of Soğucak formation and recent beach deposits composed of carbonated mudstone and silty-sandy limestone, covered by Belgrat formation. It is weak to medium strength rock with potential for karstic features. As for Option 2A microtunnelling is not considered a preferable alternative at this location. The open-cut method appears to encounter minimal risk in this type of ground however, the existence of karstic and other features will be investigated by further studies.
Constructability of Landfall Section	The location is gradually sloped and requires minimal preparation of the land. The amount of excavation required to construct an RT at this location is estimated to be approximately 420,000m^3. This option will necessitate a long length of onshore pipeline running between the shore crossing and the RT; about 1,500 m. It is foreseen that the geological structure of the land can support the RT. Potential energy and water supply sources have been identified close to the site.
Land Ownership/ Protection Status	The physical footprint of the RT is completely within the State Forest Land, however the exclusion zone may include some agricultural, privately owned land, imposing (limited) restrictions on the use of this land (related to habitation). The shore crossing passes outside the first degree Protected Area of Kıyıköy. It is outside of the buffer zone for the Pabuçdere drinking water reserve operated by ISKI which is located in the near vicinity. The onshore pipeline will pass under the existing İSKİ (unused) Ø2200 mm steel pipeline. Part of the onshore pipeline will be located at a distance of 600 meters from the nearest Borusan Wind Power Plant.

Environmental Constraints	It is similar to Option 2A in terms of land ecology. The environmental site visits determined that this area has low significance in terms of biodiversity against other options. Sazlıdere is located where the RT will be established.
Cultural Heritage	Authority consultations indicate no known protected cultural heritage sites on or within the onshore and offshore sections of this Option. There is a registered site, a tumulus, located +/- 1 km to the southeast of the Option. An official site visit carried out by Edirne Regional Board for Conservation of Cultural Assets in 2017 identified an archaeological area located 100 m north of the pipeline and stated that Project needed to avoid that area. A survey undertaken by the competent authorities in the nearshore section did not result in the identification of any marine cultural heritage.
Socio-economic Constraints	Option 2B would avoid any construction activities on Selves Beach, however, the small area to the north of Selves Beach may be closed during the construction period The potential socio-economic impacts of Option 2B are similar to Option 2A. However, even though route has not been confirmed yet, the nearshore pipeline routing of Option 2B will pass through nearshore rocky outcrop which is believed to be an important fish breeding and spawning area for fishermen.

4.3.5 Option 3A (South of Kıyıköy)

Option 3A RT is located approximately 2 km southeast of the town of Kıyıköy. The open-cut shore approach will be located at Kıyıköy's south beach, about 500 m southeast of the town and 300 m south of the Kıyıköy port entrance.

The coordinates of Option 3A are shown in **Error! Reference source not found.** and the location in **Error! Reference source not found.**

Table 4.1: Indicator Coordinates of the Shore Approach and Shore Section (Option 3A)

Datum	WGS-84 (UTM)	WGS-84 (Geographical)
Zone Medium Meridian	33.0	
Zone	35T	
Coordinates of Open Cut	X :Y	Longitude, Latitude
	591830.91E, 4609233.24N	28°6'08.833"E, 41°37'46.361"N
	591595.15E, 4609113.95N	28°5'58.580"E, 41°37'42.591"N
	591707.41E, 4608893.30N	28°6'03.309"E, 41°37'35.385"N
	591712.59E, 4608510.88N	28°6'03.322"E, 41°37'22.994"N
	592072.28E, 4608000.06N	28°6'18.580"E, 41°37'06.284"N
Coordinates of Receiving Terminal	592122.59E, 4608061.78N	28°6'20.788"E, 41°37'08.259"N
	591860.55E, 4607747.20N	28° 6' 9.293"E, 41°36'58.173"N
	592421.11E, 4607287.70N	28°6'33.255"E, 41°36'43.043"N
	592663.29E, 4607605.13N	28°6'43.894"E, 41°36'53.225"N

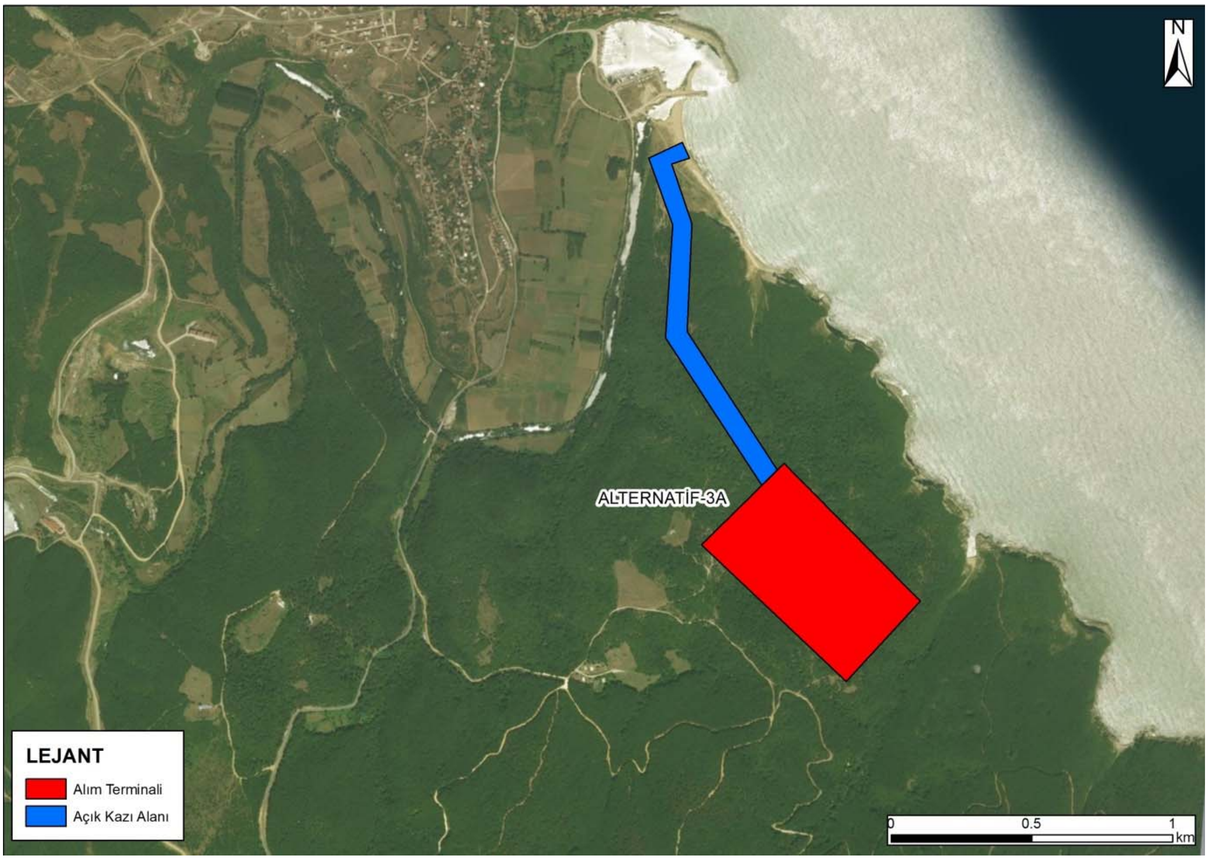


Figure 4.14: Option 3A Location

Table 4.11: Information on Option 3A

Indicator	Explanation
Accessibility	**Access from Saray as follows** • Approximately 25.5 km of the access route is asphalted road so requires minimal upgrade (shown in green in Figure 4.15), • Approximately 4 km of road must be improved significantly needing base and surface treatment, road widening and infrastructure (shown in orange in Figure 4.15); • the route will pass through Gungormez and Bahcekoy (shown in red in Figure 4.15). Homes, businesses and social facilities are located on this route. Construction traffic won't pass near center of Kıyıköy or its vicinity.
Constructability of Shore Crossing	The local geology is limestone with significant karstic features (Figure 4.16), therefore microtunnelling is considered technically infeasible and open-cut is technically challenging.
Constructability of Landfall Section	Construction of the RT is considered infeasible due to the presence of significant karstic features in the underlying geology. The location has steep topography and requires more significant preparation. The amount of excavation required to construct the RT at this location is estimated to be approximately 650,000m^3. It has been determined that potential energy and water sources are relatively close to the site in this option.
Land Ownership/ Protection Status	The physical footprint of the RT is within State Forest Land however the exclusion zone includes some privately owned land, imposing restrictions on the use of this land in relation to habitation; about 5 summer homes have been observed within less than 500 meters of the RT area.. Additionally, this option is close to the Kasatura Natural Preserve. It is possible that the shore crossing and new access roads are within the Kıyıköy First Degree Natural Preservation Zone. This alternative may limit extension plan for Kıyıköy Port.

Environmental Constraints	In the limited site and desktop studies carried out for the site of RT, it has been seen that the black pine which is an important ecological factor for determination of conservation status for Kasatura Bay Natural Conservation Site located in the east of the site, exists in the site of RT. It has been acknowledged in the studies carried out that the site could have high biodiversity. There are limited hydrological elements, i.e. streams, in the area.
Cultural Heritage	Limited desktop studies indicate that there are no known protected cultural heritage sites or objects on or adjacent to the Option area. The nearby town of Kıyıköy contains both archaeological and architectural cultural heritage sites under protection and visits in 2015 and 2016 have identified artefact scatters and possible archaeological features along with evidence of illegal excavation and looting.
Socio-economic Constraints	Forestry, animal husbandry and other livelihoods and recreational activities are carried out less compared to Option 2A and 2B. It is expected that the topography of the area would conceal any visual effects during the construction of RT.. The shore nearshore is on one of the touristic beaches of Kıyıköy; however this beach is less used than both Selves and Belediye beach and is considered to be less significant to Kıyıköy's tourism industry from an economic perspective. During the construction of the Project the local fishing port, which is significant for the local economy in Kıyıköy, may need to be temporarily closed whilst nearshore construction occurs.

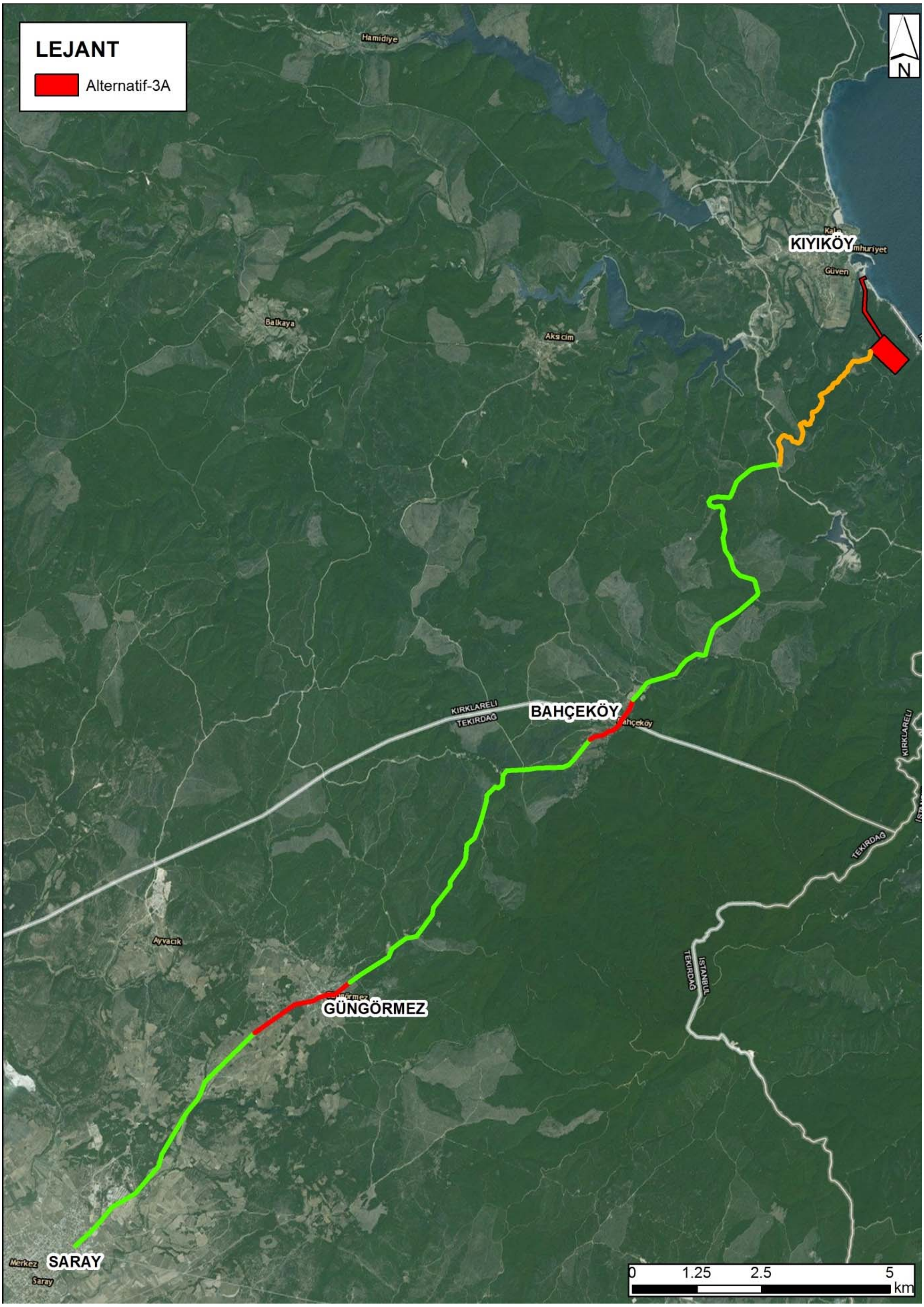


Figure 4.15: Access Routes to Option 3A

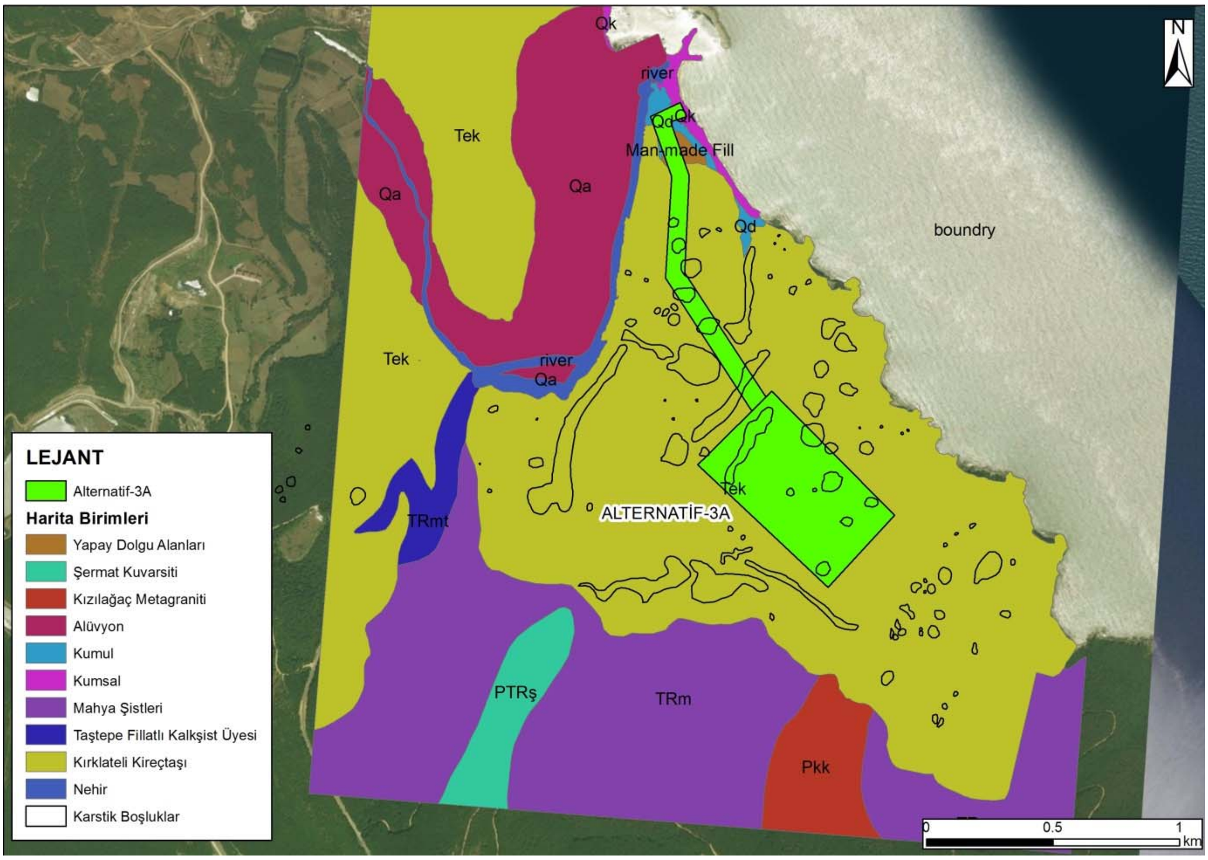


Figure 4.16: Geology of Option 3A

4.3.6 Option 3B

Given the above geotechnical constraints identified at Option 3A, further studies were undertaken in the vicinity to determine if there was a more optimal location. Option 3B located 500 m to the south of the Option B and considered to be located outside of the karstic area was selected for further investigation.

The coordinates of Option 3B are shown in **Error! Reference source not found.** and the location in **Error! Reference source not found.**

Table 4.12: Indicator Coordinates of the Shore Approach and Shore Section (Option 3B)

Datum	WGS-84 (UTM)	WGS-84 (Geographical)
Zone Medium Meridian	33	
Zone	35T	

Coordinates of Onshore Pipeline	X,Y 592051.051,4608741.180 592017.095,4608701.642 592257.844,4608031.779 592256.485,4607157.078 591190.057,4605320.639 591190.057,4605362.550 591041.007,4605362.550 592106.607,4607197.564 592107.863,4608005.766 591846.461,4608733.094 591937.302,4608838.869	Longitude, Latitude 28° 06' 18.0733" E,41° 37' 30.3159" N 28° 06' 16.5842" E,41° 37' 29.0481" N 28° 06' 26.6148" E,41° 37' 07.2310" N 28° 06' 26.0711" E,41° 36' 38.8737" N 28° 05' 38.9967" E,41° 35' 39.7769" N 28° 05' 39.0196" E,41° 35' 41.1357" N 28° 05' 32.5824" E,41° 35' 41.1969" N 28° 06' 19.6190" E,41° 36' 40.2486" N 28° 06' 20.1207" E,41° 37' 06.4501" N 28° 06' 09.2288" E,41° 37' 30.1386" N 28° 06' 13.2124" E,41° 37' 33.5302" N
Coordinates of Receiving Terminal	X,Y 591190.057,4605012.690 590690.257,4605012.690 590690.257,4605362.550 591190.057,4605362.550	Longitude, Latitude 28° 05' 38.8280" E,41° 35' 29.7931" N 28° 05' 17.2436" E,41° 35' 29.9980" N 28° 05' 17.4342" E,41° 35' 41.3406" N 28° 05' 39.0196" E,41° 35' 41.1357" N

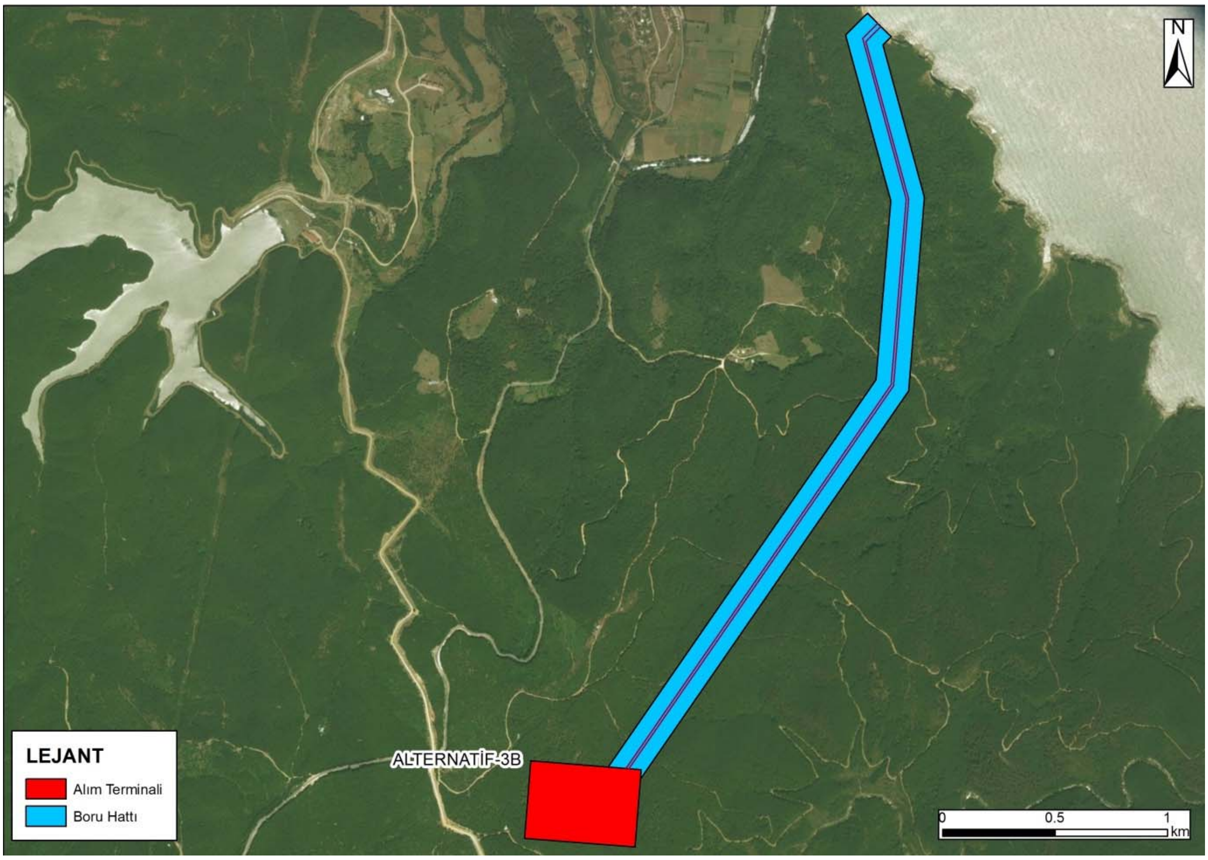


Figure 4.17: Option 3B Location

Table 4.13: Information on Option 3B

Indicator	Explanation
Accessibility	**Access from Saray as follows** • Approximately 25.5 km of the access route is asphalted road so requires minimal upgrade (shown in green in Figure 4.18), • Approximately 2 km of road must be improved significantly needing base and surface treatment, road widening and infrastructure (shown in orange in Figure 4.18); • the route will pass through Gungormez and Bahcekoy (shown in red in Figure 4.18). Homes, businesses and social facilities are located on this route.
Constructability of Shore Crossing	As for Option 3A, given the presence of karstic features, microtunnelling is not considered a feasible alternative at this location. Investigations have been carried out to determine the feasibility of the open-cut technique for this area and it is considered technically challenging
Constructability of Onshore Section	It is considered that as it is located outside of the karstic area, construction of the RT will be less challenging. However, as the geology of the site is composed of hard rocks, explosions may be needed. For this reason, number of excavations and amount of filling will increase significantly in order to level the site. The amount of excavation is estimated to be approximately 1,300,000m^3. It has been determined that potential energy and water sources are relatively close to the site in this option.
Land Ownership/ Protection Status	The physical footprint of the RT is within State Forest Land. It is close to the Kasatura Natural Preserve. According to the preliminary investigations there isn't any private property within the site or its vicinity. As the construction for the route of the pipeline gets closer to the summer houses, residents in these summer houses may feel disturbed during the construction. However, the impacts are expected not to be permanent on these private properties. Shore Crossing and nearshore roads are outside of the First Degree Natural Preservation Zone. As shore crossing is located 500 m away from the Kıyıköy Port, it is to be

	clarified that whether this option will create a constraint regarding the extension plan for Kıyıköy Port.
Environmental Constraints	As for Option 3A.
Cultural Heritage	There are no known protected cultural heritage sites or objects on or adjacent to the Option area. Site visits in 2015 and 2016 have identified artefact scatters and possible archaeological features along with evidence of illegal excavation and looting.
Socio-economic Constraints	As for Option 3A, forestry, animal husbandry and other livelihoods and recreational activities are carried out less compared to Option 2A and 2B. Location of the RT is more distant than that of Option 3A, therefore, it is considered that visual impacts will be less compared to Option 3A. Although nearshore is located on one of the touristic beaches of Kıyıköy, compared to the Option 3A, it is located 500 m away from Kıyıköy, in less used part of the beach.

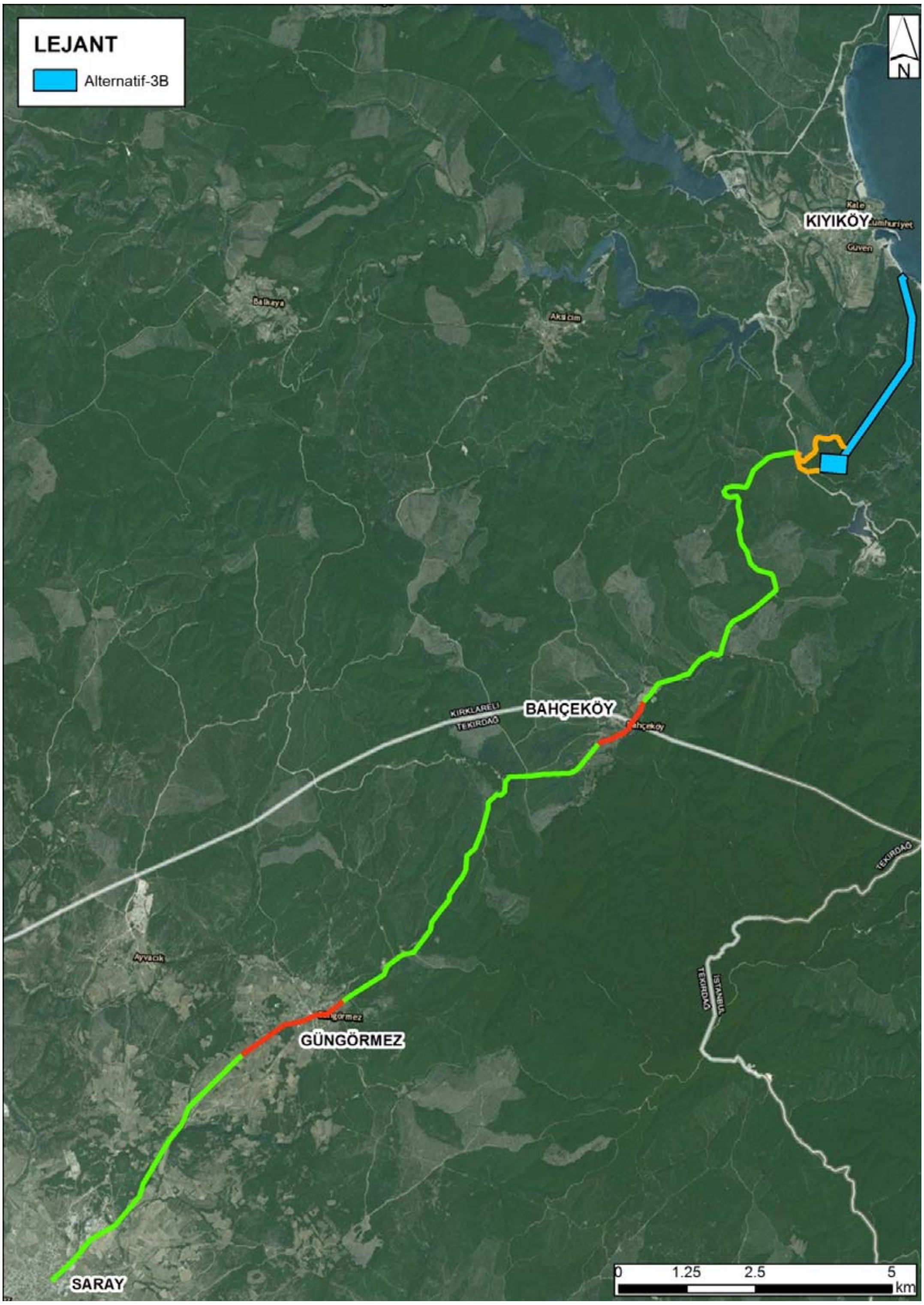


Figure 4.18: Access Routes to 3A

4.4 Assessment of Alternative Shore Crossing and Landfall Sections

Based on the assessments given in Section 4.3, all of the location Options are considered not feasible or preferable for microtunnelling, either due to the hardness of rock or the confirmed or potential presence of karstic features. Therefore, in the assessments to be conducted thereon, impacts resulting from RT, open cut method and access roads have been taken into consideration.

Option 2A and Option 2B contains fewer risks for RT construction, compared to the other Options, in terms of geology or topography. From a socioeconomic perspective, Option 2B is considered as a better alternative as users of Selves Beach will be affected less by the Project.

As road coming from Vize and passing through Kömürköy or road coming from Saray and passing through Bahçeköy and Güngörmez villages in all options for construction traffic, similar impacts will occur. Homes, businesses and local community will be affected due to noise, visual impacts and dust in both routes. Traffic of these routes will increase because of construction traffic. Some houses located on the main access route may be potentially affected due to access routes to pass from Options 1B, 2A and 2B, sides of Kıyıköy.

All alternatives share similar characteristics in terms of cultural heritage. Therefore, impacts to occur on cultural heritage objects have not been addressed as a distinctive factor in assessment for options.

Hydrologic factors are located in sites of Options 1A, 2A and 2B but it is considered that potential impacts on these factors can be reduced by using appropriate construction techniques. When compared to other sites, it is considered that Option 3A and Option 3B contain higher biodiversity.

In line with the summarized evaluation given above, Option 2A and Option 2B are considered as the most appropriate options for the construction of the Project due to their technical eligibility for open cut and construction of Rt as well as lower biodiversity and less constraints.

However, Option 2B is preferred as it will further limit potential impacts on livelihood activities such as fishing and tourism and also places the shore crossing further away from the nearest community of Kıyıköy. Option 2B is considered technically feasible based on site surveys to date and any environmental, cultural heritage and socio-economic impacts can be adequately mitigated with proper design controls and mitigation measures.

4.4.1 Shore Crossing Techniques for Option 2B

Two alternatives are available for the shore-crossing construction technique; open-cut and microtunnelling. The open-cut technique is the traditional method for pipeline installation that involves excavating a trench along the pipeline route, installing the pipeline and then backfilling the trench. The microtunnel technique involves installing the pipeline underground via a tunnel to minimise or eliminate the need for open-cut excavation.

Microtunnelling inherently has more construction risks than the open-cut method. In addition, the potential for karstic features or very hard geology is considered too high a risk factor to make microtunnelling a feasible technique at any of the Options. Therefore microtunnelling has not been considered preferable as a shore crossing technique and open-cut is chosen for the Project.

4.5 Issues to be Considered in Selecting a Route

The previously approved route up to KP600 has already been designed to address any hazards or constraints and there was no need to consider any alternatives as other options have been discussed under former South Stream Offshore Pipeline Project . This section therefore addresses the route from KP660 onwards to onshore in the area of Kıyıköy.

4.5.1 Abyssal Plain

A straight-line routing between these two points is optimal from both an engineering and an environmental standpoint. If further surveys identify a new constraint on the current route (from KP660) it is possible the route may be optimized. If research results are requested, the detailed research results will be shared with relevant authorities after the completion of the Pre Engineering and Design stage.

4.5.2 Sea Traffic

According to the data collected on the sea traffic in the route corridor it has been concluded that no significant constraint concerning the route selection exists in connection to the sea transportation in the Turkish EEZ.

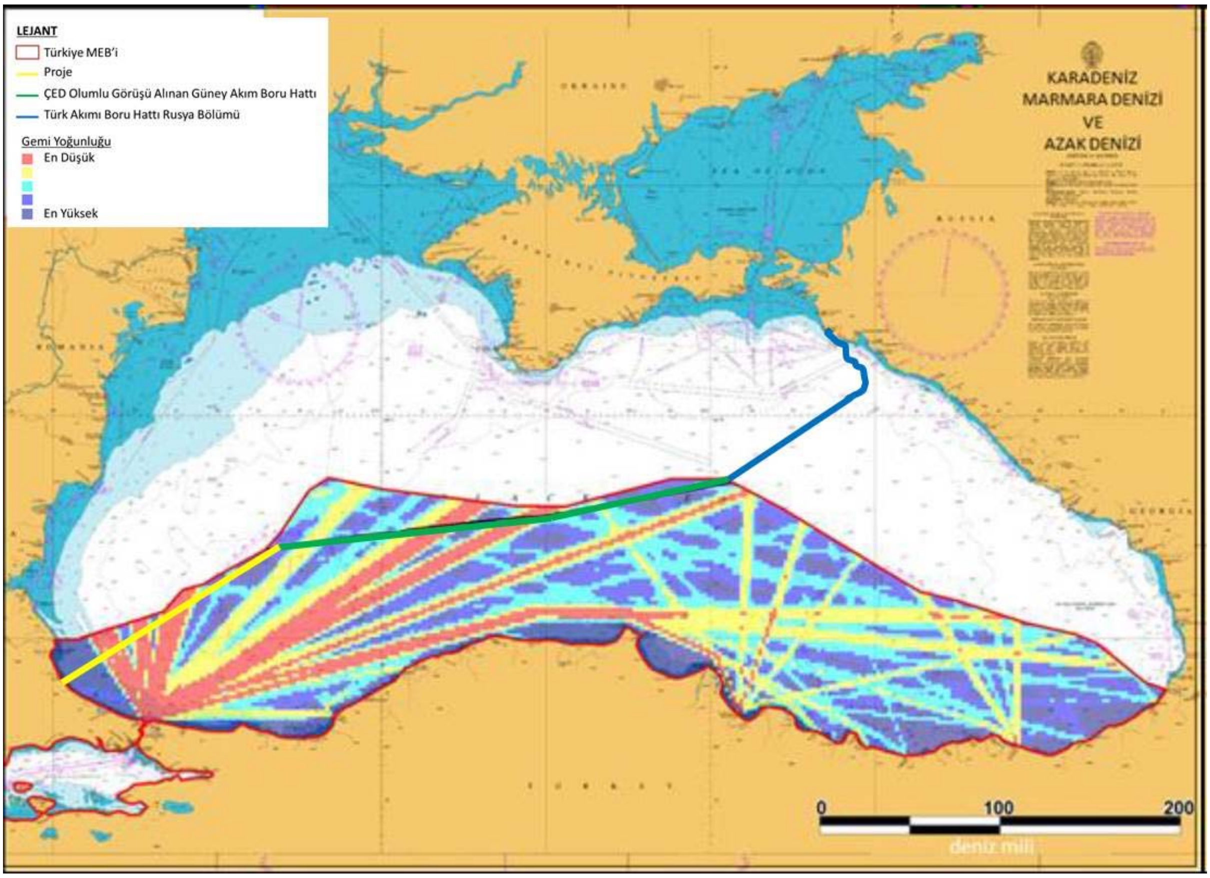


Figure 4.19: Sea Traffic map with route

4.5.3 Deep Sea and Onshore Cable Systems

Several international and regional fiber-optic cables run through the same section of the Turkish EEZ that the Project runs through (Figure 4.20, Table 4.24). The offshore pipeline route will cross four existing cables; two of which are active and the other two are inactive. These cable systems are Italy-Turkey-Ukraine (ITUR) underwater fiber optic system operated by Rostelecom, Black Sea Fiber Optic Cable System (BSFOCS) operated by Vivacom, Telegraph Cable (Kilia-Odessa) and CAUCASUS underwated fiber optic cable system operated by Caucasus Networks. At this time, the exact locations of the cables given in Table 4.14 are unknown, however, approximate distances from the Turkish Coast have been provided (rounded to the nearest 10 km). Exact locations of active cables will be determined during Pre Engineering and Design stages.

Italy-Turkey-Ukraine-Russia Telecom cable line (ITUR) and Kilia-Odessa telegraph cable are inactive, they don't provide any service.. Data regarding the location of the Kilia-Odessa telegraph cable, one of the two cable system currently inactive, has been obtained from Global Marine Systems cable data base. ROV surveys conducted under Pre Engineering and Design stages did not locate it but research activities still continue. It is known that cable line is located between Turkey and Kilia-Ukraine. According to the database the telegraph cable was laid in 1874 and was ceded to Turkish authorities in 1934.

There are also plans to develop a High Voltage Direct Current (HVDC) cable between Constanta in Romania and Istanbul in Turkey. It is know that the said project is under feasibility stage.

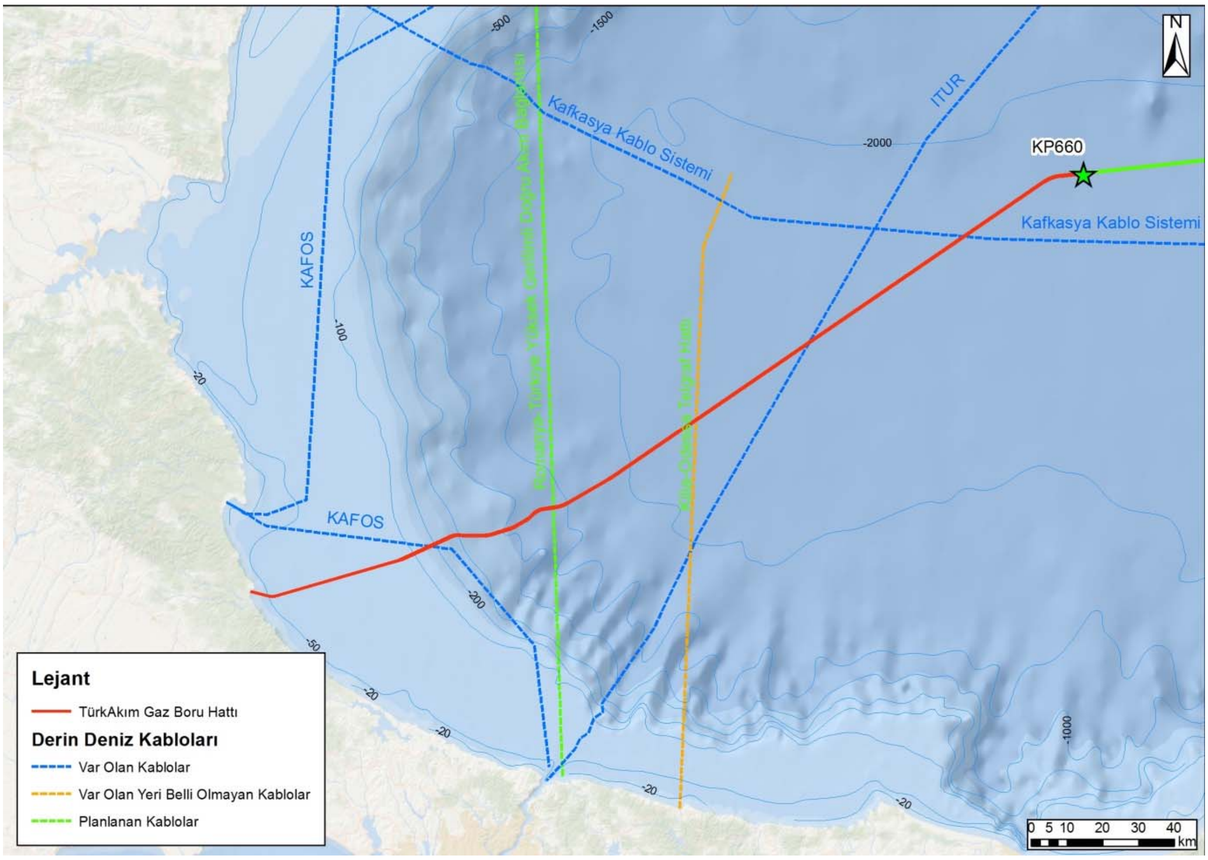


Figure 4.20: Deep Sea Cable Systems

Table 4.24: Deep Sea Cable Systems Information

Name	Cable Type	Status	Location	Operator	Approximate Distance from Turkish Coast (km) (Measured along the Pipeline Route)
Italy-Turkey-Ukraine-Russia (ITUR)	Telecom/LWP	Inactive	Abyssal Plain	Rostelecom	190
Kilia-Odessa Telegraph Cable	Telegraph	Inactive		Unknown	140

Caucasus Cable System	Unknown	Active		Caucasus Online	230
Black Sea Fiber Optic System (BSFOBS)	Telecom/ Double shielded		Active Continental Slope	Vivacom	-60
Romania-Turkey HVDC Interconnection Link	HVDC	Plannig Phase	Turkish Territorial Waters	Transelectrica S.A.	Unknown

It should be noted that the owners of active cables, and the water pipeline if present, will be approached with the aim of reaching mutual crossing agreements covering liabilities and procedures for crossing methods. According to the agreements, crossing designs and installation procedures to the satisfaction of the cable/line owners will be required, prior to installation of the pipelines. The crossing agreements with the cable operators will be based on the guidelines prepared by the International Cable Protection Committee (ICPC), which are used worldwide for telecom cables.

Furthermore, some work might be required on the overhead lines so as to facilitate the crossing of vehicles, in which case a crossing agreement shall be signed with TREDAŞ/TEİAŞ.

4.5.4 Existing Offshore Pipelines and Land Pipelines

There is no existing offshore pipeline passing through the preferred pipeline corridor. Therefore, no existing offshore pipelines have been considered in the selection of this route.

4.5.5 Drilling Zones and Exploration Blocks

The Turkish Petroleum Corporation (TPAO) is responsible for the exploration of petroleum and natural gas in Turkey. The TPAO have identified a large area of the Turkish EEZ in the Black Sea that could potentially be utilized for petroleum exploration and defined several exploration areas, some of which might overlap with the offshore construction corridor. Detailed information on TPAO's Exploration and Drilling zones is provided in **Section 6** (Assessment of Existing Environmental Conditions).

Turkish Petroleum Corporation (TPAO), as specified in the letter (ANNEX-5.A) of Directorate of Environmental Protection dated July 4 2017, TPAO's 3D seismic data collection activity (Tuna 3D) which will concentrate on the area ofthe Western Black Sea and to be launched in November 2017 covering an area of 7.500 km^2 with an offshore license numbered 3921, is planned to last nearly for 6 months. Tuna 3D location hasn't been finalized yet. Furthermore, although exact location of the exploratory shaft (Riva-1) located in Western Black Sea with an offshore license numbered 3920 which is planned to be drilled in 2019, has not yet been determined, it is foreseen that it will not deviate much from its determined location. Continuous coordination between Project Owner and TPAO will be ensured in order to prevent any overlaps between these works which are planned to be carried out in the future and construction activities of this Project.

Since there will be future interaction with TPAO's oil and natural gas exploration and development activities, during the operation phase of the Project, a buffer zone around both pipelines inside theTurkish EEZ and Turkish territorial waters shall be established. In the event of any overlaps with the TPAO facilities (i.e. pipelines, etc.), the Project Owner shall cooperate with the TPAO on such issues as proximity and/or crossing agreements.

4.5.6 Military Zones, Unexploded Ordnance Zones and Other Restricted Zones

The Turkish Naval Forces utilise the EEZ waters for a variety of purposes. In compliance with the information to be provided by the Black Sea Training and Shooting Range Zones Map (**Error! Reference source not found.**) included in the "Announcements to Seafarers Almanac 2015" published by the Turkish Naval Command Navigation, Hydrography and Oceanography Department, offshore pipeline route pass through the drill zone defined as "Area 20" (Figure 4.22) (Ref. 4.1). In line with the opinions obtained from Navigation, Hydrography and Oceanography Department and other concerning authorities, coordination between respective authorities shall be ensured regarding the performance of Project Activities in observance of official assessments concerning military restricted and drill zones.

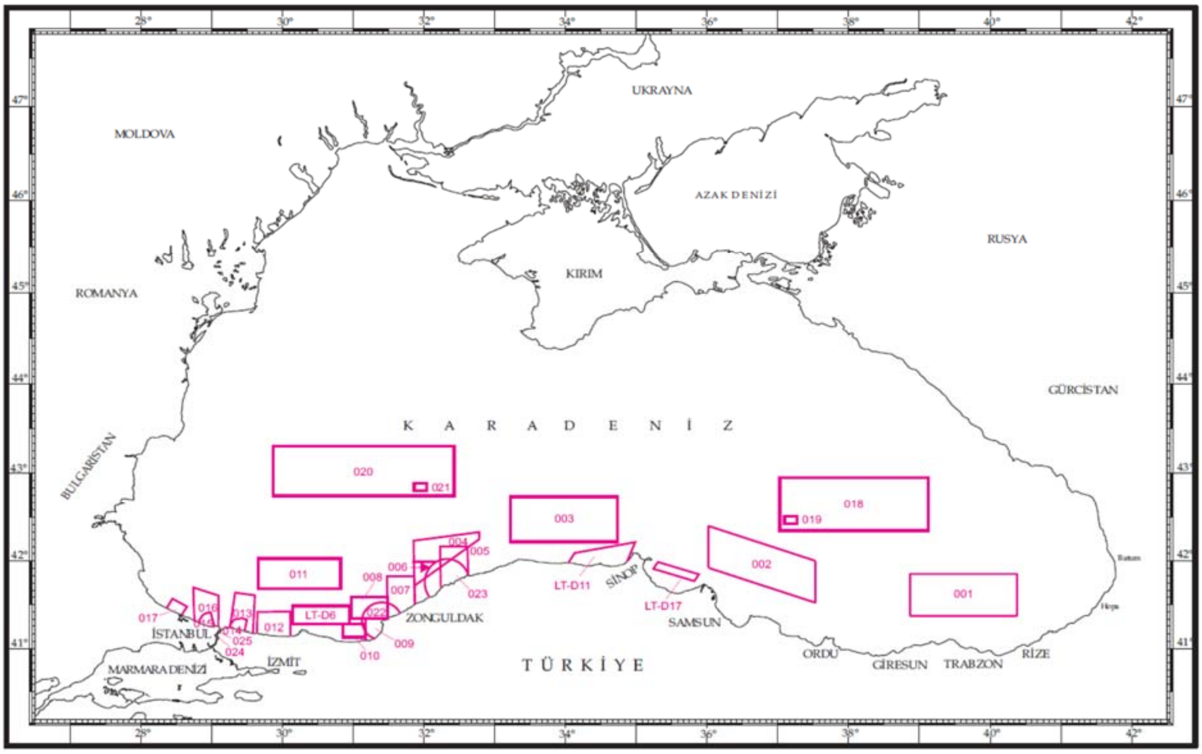


Figure 4.21: Black Sea Training and Shooting Ranges Map

Moreover, the coordinates of known unexploded ordnance according to the "Announcements to Seafarers Almanac 2015" mentioned above, are as follows per announcement 139 (Ref. 4.2) and do not coincide with the Project Area

4.5.7 Protected Areas

Proximity of the Options to the protected areas and known constraints, if any, are summarized in the comparative evaluation tables given under Section 4.3 above. Evaluation of the selected Project Area regarding the protected areas is given in **Chapter 6.13** (Protection Areas) in detail.

4.5.8 Other

There is no other issue to be discussed in this section.

4.6 Route Changing Procedure

In this stage of the Project, the land route corridor that was recommended in the previous stages of the project was confirmed as the “preferred route corridor”.

The final decision of the route corridor will be made after many route corridor alternatives have been developed, as a result of qualitative assessment. The Preferred Route has been confirmed taking into account large scale limit maps and corridor alternatives.

The route optimization process fot the preferred route corridor was carried out during the preliminary engineering stage, taking into account the following factors:

- Determining shore crossing suitability;
- Minimizing the total pipeline length;
- Minimizing the environmental impacts;
- Minimizing passage through cultural/archaeological areas;
- Avoiding areas with geological risk;
- Avoiding heavily populated areas;
- Minimizing security risks;
- Minimizing total cost; and
- Limitations of Third Parties and Official Agencies (presence of existing infrastructure facilities, plans, etc.).

All of the activities in the Preliminary Engineering Design stage have been carried out in parallel with the requirements and obligations of the process and the results of baseline studies.

4.6.1 Detailed Engineering Stage

After determining and confirming the “Preferred Route Corridor”, a “Construction Corridor” 150 m in width was determined. Studies have been done for the purpose of showing the final route on small scale maps setting out from the Preferred Route. Also detailed design drawings have been done for intersections (rivers, roads, etc.). The following factors have been taken into consideration in this detailed study:

- Aerial photographs and topographic surveys;
- Geological, geotechnical and hydrogeological field studies;
- Site studies to determine environmental issues (for example ecological site studies);
- Archaeological site studies and communication with competent authorities (such as, the Regional Directorates of the Preservation of Cultural Assets Organization);
- Correspondence with and opinions of authorized institutions, requirements and restrictions;
- Negotiations with local stakeholders; and
- Determining a construction corridor.

All of the activities in the detailed engineering stage have been carried out in parallel with the requirements and obligations of the EIA process and the results of baseline studies.

4.7 Determination of Construction Corridor for Land Acquisition

Ownership status of alternatives and restrictions acknowledged, if any, have been summarized in the comparative tables provided hereinabove, under Section 4.3. The selected Project Area qualifies as a government forest area, a detailed assessment of which has been provided under **Chapter 6.1** (Land Use and Ownership Status) and **Chapter 8** (An Assessment of Project Discarded Areas).

4.8 Definition of the Impact Area of the Project

In the Environmental Impact Assessment Regulation, the "Impact Area" is defined as the area that is positively or negatively impacted by a planned project before, during and after operations in terms of environmental conditions. The "impact" in Environmental Impact Assessment Regulation means the probable environmental impacts which affects environmental factors directly or indirectly, in short term or long term, temporarily or permanently, negatively or positively during preparation, construction and operation or post-operation stages of a project to be planned for implementation.

If the project includes physical elements in particular, issues and facilities that are likely to create an impact the environmental and social risks and impacts are determined within the project's impact area. This impact area, depending on the situation, includes the following factors:

An area that has the potential to be impacted by the following:

- Facilities that are directly operated or managed as a part of the project;
- Impacts that may occur later or in a different location and are caused by the Project that are not planned but can be predicted or;
- Project impacts on biodiversity and environment by which the income of the local population may be impacted indirectly; and
- The cumulative impacts that have resulted from other existing, planned or reasonably defined developments which are directly impacted by the project or cause residual impacts on the used area or resources.

The impact area concerning the project activities has been defined in the scope of EIA as an area in which a direct or indirect impact on the physical, biological, social or cultural setting could occur. The size of the impact area can vary according to the feature of the impact and the different type of the components described above.

The impact area includes the following:

- Direct impacts that result from an action and occur at the same time in the same place;
- Indirect impacts that result from an action and occur later or in a further location and are reasonably predictable; and
- The project's increasing impact when joined with existing, planned and reasonably predictable projects and developments and/or cumulative impacts that result from combined impacts in connection with the project in the same geographical location.

Some impacts can be directed at the Project's trace region directly or be relevant to a limited buffer region. This area is defined as the "local impact area". Some of the impacts that are possible to see within the local impact area have been provided below:

- Short-termed, temporary impacts on air quality caused by the dust emissions from removing the topsoil, excavation, storage of topsoil, etc.;
- Permanent impact on soil caused by changes in the land use as a result of activities such as building/infrastructure construction;

- Temporary and permanent impacts on flora and fauna caused by clearing out the plant cover in the construction corridor;
- Temporary impact caused by noise emissions in connection with construction activities; and
- Permanent impact on access to forestry and herding due to the decrease of land in connection with permanent land acquisitions during building/infrastructure construction and operation phase; and

As specified below some impacts can go beyond the local impact area:

  - Temporary or permanent visual impact resulting from the presence of building/infrastructure materials,
  - Temporary and permanent impacts on underground and surface water during the construction and operation stage,
  - Temporary impact on people, flora and fauna from construction traffic along access routes used; and
  - Temporary impact on economic conditions resulting from the demand for products, supplies and services in connection with construction activities.

In the baseline studies the area across the Route Corridor of the Project and surrounding all land components which are defined as the shore facility (RT), including the construction facilities, camps, pipe stock pile areas and access roads has been focused on. RT location has been determined according to the Project route selection studies and includes the Pipeline System, Construction Corridor and other components connected to the Project.

During the determination of the Project impact area, noise modelling, air quality modelling and sediment dispersal modelling results have been considered for the Construction Phase whereas, in addition to the given modellings, risk maps which are an output of the Risk Assessment developed have been taken into consideration for the Operation Phase.

4.8.1 Logistic Options

Existing roads will be improved for use and access as much as possible. When such improvement is not possible, temporary additions can be made to existing roads in line with permits issued by relevant authorities. The logistics, coordination and management of traffic flows and traffic and transport impacts resulting from transporting pipe and equipment to the site will be included in the Onshore Contractors' Transportation Plan prior to construction. Detailed information about the plan is given in **Chapter 12** (Environmental and Social Management System).

The following principles shall be applied in determining the Landfall Section access routes

- The environmental, social and economic constraints will be taken into account in selecting the most suitable transport routes for the pipes/construction supplies;
- The environmental and social impacts resulting from the increased sea and road traffic will be taken into account; and
- Works won't be commenced before permits are obtained from local competent authorities.

A laydown area and a workers accommodation area were selected based on their proximity to the RT site and to the access routes. It is possible that additional laydown areas may be identified during detailed design (e.g.private property parcels distant from the Project Area).

4.8.2 Design Options for Above Ground Facilities

Established best practice design principles are employed from the beginning of the design process of the RT to create an outline design. The outline design becomes more detailed as the design work proceeds. Some changes that have been made to the design as this work has progressed include:

- changing the RT and landfall section pipelines from a four pipeline design to a two pipeline design;
- adding a second vent stack to the RT, originally only one vent stack was planned in the conceptual design. (The addition of the second vent stack allows more flexibility in lowering pressure in different parts of the system and also means the pressure in the system can be regulated more quickly); and
- adding an earth wall between the two pipelines. This measure was taken for safety reasons in case of fire or similar hazard.

A laydown area and a workers accommodation area (Construction Site) were selected based on their proximity to the RT site and to the access routes. It is possible that additional laydown areas may be identified during detailed design. During construction and pre-commissioning phases, temporary facilities including pipe, equipment and material laydown areas, excavation laydown areas, parking lot, food and resting facilities for workers and at least one workers accommodation area will be required to be established.

Settlement plan for the facilities in each construction site will be subject to the preference of the contracting firm. It is foreseen that a certain number of prefab and/or container will be needed in construction sites for office, cafeteria, etc. Pipe parts (before referred to the construction fleet for installation with an aim for mounting) will be temporarily stored in shore supply establishments

4.9 Other Matters

There are no other matters to be assessed under this heading.

5 PUBLIC RELATIONS (WITH STAKEHOLDERS)

This chapter discusses the participation activities of the public and other stakeholders conducted within the context of the Environmental Impact Assessment (EIA) work conducted for the Project. These activities cover the following processes: initiating the public participation process, identification of the Project related stakeholder groups, and communication with these stakeholders. The chapter also explores the Public Participation Meeting (PPM) as well as the methods that are used to receive and evaluate the opinions of the stakeholders.

Participation of stakeholders is important regarding the planning, development and implementation of a Project (including communication, sharing information and receiving opinions). An efficient process of shareholder participation contributes to an effective Project design as well as developing relations with locals and also support the determination of potential risks and problems in advance to minimize the factors that could result in delays in Project schedule.

For this Project, the participation of stakeholders includes various benefits that stakeholders gain from the Project as well as a number of activities designed for stakeholders to get into touch with the Project using methods which take into account their locations, languages, cultures, means of accessing to information and different participation opportunities. Within the scope of the Project, the approach to participation of stakeholders includes;

- maximum effort to ensure that stakeholders are informed of their opportunities to participate in the process,
- ensuring that all stakeholders have access to clear information on the EIA process of the Project,
- ensuring that stakeholders can ask questions about the Project and receive informative responses,
- and ensuring that they can present their opinions and suggestions on the Project. and
- the integration of insights and proposals of the stakeholders, concerning the prevention and reduction of the impacts, into the EIA planning and application.

In this context, the public's participation, which is a requirement of the EIA process, aims to involve the Project related stakeholders, which may be potentially affected by the Project, in the process and to enable them to share their opinions and suggestions about the Project. The opinions and suggestions of the public have also contributed to the process of the Ministry of Environment and Urbanisation regarding the determination of a special format. Throughout the EIA process, stakeholders are granted the opportunity to express their questions or concerns about the Project and to share their opinions and suggestions on the potential impacts of the Project and the measures to reduce the impacts of the Project. These opinions contribute to the measures to reduce environmental and social impacts during the preparation phase of the EIA report. In the context of the EIA works conducted for the Project, the public's participation has been conducted in accordance with the requirements of the national legislation.

Regarding the public's participation activities, there is a statement in the 9th Article of the Regulation on Environmental Impact Assessment' dated November 25, 2014 and numbered 29186: "A Public's Participation Meeting aiming to inform the public about the related investment and to receive their opinions and suggestions shall be held on a date to be determined by the Ministry and with the attendance of institutions/organisations accepted as competent by the Ministry and the Project owner at a central location to be determined by the Governor's Office and at a reasonable time to ensure easy access of the cummunity that is expected to be mostly effected by the Project." Accordingly, the 'Public's Participation Meeting' has been planned in order to receive the opinions and suggestions of the local community and stakeholder groups that have the potential to be affected by the Project.

The participation activities of the public and stakeholders have been organised with an approach to include the Project's preparation, construction and operational phases in a manner that covers the section that will start from KP660 in the Exclusive Economic Zone of Turkey, pass through the Exclusive Economic Zone of Turkey, continue in the Turkish territorial waters and go ashore in the territory of Kıyıköy town of Kırklareli province on Turkey's Black Sea coast on the European side, and the social environment in the coastal area where the shore facilities will be located. Detailed information about the phases of the Project is given in Chapter 1.

In addition to the participation activities of the public and other stakeholders that are being conducted in line with the EIA work conducted for the Project, a social impact assessment by expert sociologists has been carried out in October 2015 and January/March 2017 (by the Project Owner and in cooperation with socio-economy experts) in order to assess socio-economic impacts particularly related to fishery, tourism, forestry and husbandry. The results of social impact assessments have been provided under Chapter 9 (Socio-economic Impact6 Assessment) A seperate stakeholder participation program, supported by the participation of the people and the other stakeholders, allowed the relevant parties to express their concerns and give their insights. In the scope of this program, through participation activities such as face to face meetings and group meetings, meetings were conducted with the Project stakeholders. The relevant authorities and joint operations were informed about the ongoing technical studies and research in order to prevent the negative impacts and health and security risks.

5.1 Initiation Of Public’s (Stakeholders) Participation Process

Following the publishing of the below announcement on the website of the Provincial Directorate of Environment and Urbanisation under the Ministry of Environment and Urbanisation on July 1, 2015 in the context of the EIA work conducted for the Project, the process enabling the public to share their opinions and suggestions was officially started.

“Planned to be built by South Stream Transport B.V. in KIRKLARELI Province, VIZE District, Kiyikoy location, the EIA Application File related with Black sea Offshore Sea Pipeline Extending from Russian Federation to the Republic of Turkey Project submitted to our Ministry was examined in accordance with the Article 8 of the Environmental Impact Assessment Directive, and found appropriate, thus the EIA Process regarding the Project has been initiated. Until the EIA process is completed, any kind of information related with the process and opinions, questions and suggestions regarding the Project can be forwarded to

KIRKLARELİ Governorship (Provincial Directorate of Environment and Urban Development) or the Ministry of Environment and Urban Development. Announced to those concerned and the public."

The Wedding Hall that belongs to the Municipality of Kıyıköy was selected as the venue of the Public Participation Meeting due to the fact that the hall is big enough for the stakeholders to comfortably receive information about the Project and due to the hall's proximity to the centre in terms of easy transport.

Kırklareli Provincial Directorate of Environment and Urbanisation was visited on July 6, 2015 in order to inform the officials about the meeting hall. Following the receipt of their written opinion stating that the location of the planned venue is appropriate for the meeting, the venue, date and time of the meeting were published on July 10, 2015 in two newspapers, one national and one local, in line with the format given by the Ministry of Environment and Urbanisation:

- Hurriyet- national newspaper; and
- Vize Haber – a local newspaper in Kırklareli Vize.

A copy of the announcement published in both newspapers is given in **Figure 5.1.** The announcement text was also displayed on the billboard of Kırklareli Provincial Directorate of Environment and Urbanisation, on the billboard of Kiyikoy Town and at the entrance of the meeting hall 10 days before the meeting.

Also, the official announcement by the Provincial Directorate of Environment and Urbanization under the Governorate of Kırklareli No. 97823509/220.01-3064 dated July 9th, 2015, acknowledging the venue, date and time of the Public Participation Meeting has been distributed to agencies below:

- District Governorate of Vize/Kırklareli;
- 11th Regional Directorate of the DSİ/Edirne;
- Vize Municipality/Kırklareli;
- Kıyıköy Municipality/Kırklareli;
- Special Provincial Administration/Kırklareli;
- Provincial Directorate of Health/Kırklareli;
- Provincial Directorate of Disaster and Emergency Management/Kırklareli;
- Forestry and Water Affairs Department/Kırklareli;
- Provincial Directorate of Food Agriculture and Livestock/Kırklareli; and
- İSKİ (Water and Sewage Administration of İstanbul).

REPUBLIC OF TURKEY

MINISTRY OF ENVIRONMENT AND URBANISATION

By South Stream Transport B.V.; In Turkey Black Sea Exclusive Economic Zone, Turkish Territorial Waters and Turkey's Thrace Region, "Offshore Pipeline Extending From Russian Federation to the Republic of Turkey on the Black Sea" is planned to be built. For the Project in question, in accordance with the Article 8 of the Environmental Impact Assessment Directive, in order to inform Public regarding the activity and receive their opinions and suggestions "Public Participation Meeting" will be held at the undermentioned date and time.

Announced to the public respectfully.

Figure 5.1: Public's Participation Meeting Newspaper Announcement

5.2 IDENTIFICATION OF THE PROJECT GROUPS (STAKEHOLDERS)

All individuals, groups or organisations that could be affected negatively and positively by activities conducted during preparation, construction, operation and decommissioning of the Project and that could influence the course of these processes are identified as the stakeholders of the Project. In this sense, the most important stakeholder for the planned EIA process of the Project is the public. Especially the people living in the close proximity to the Project's area of influence should be informed and their opinions received. Each member of the community could convey his opinions at the Public Participation Meeting directly, and also has the chance to share their opinions and suggestions by examining the EIA Application File released on the websites of the Ministry of Environment and Urbanisation and Kırklareli Provincial Directorate of Environment and Urbanisation .

Stakeholders may also include non-governmental organisations as well as governmental organisations. As a requirement of the EIA process, the Ministry of Environment and Urbanisation has established a Review and Evaluation Comission (REC) comprised of official institutions contributing to the determination of the special format by expressing opinions in line with the commission members' respective areas of expertise.

If required by the Ministry of Environment and Urbanisation or Kırklareli Provincial Directorate of Environment and Urbanisation, experts from educational institutions, non-governmental organisations (NGOs), associations or international organisations, in addition to the institutions that have already been identified as commission members, may also be invited to become members of the REC.

The REC established by the Ministry of Environment and Urbanisation for the Project consists of representatives from the following institutions:

- Ministry of Environment and Urbanisation, Directorate General of Environmental Management (Department of Marine and Coastal Area);
- Ministry of Energy and Natural Resources, Directorate General of Petroleum Pipeline Corporation (BOTAŞ);
- Ministry of Energy and Natural Resources, Department of Transit Petroleum Pipelines;
- Ministry of Food, Agriculture and Livestock, Directorate General of Fishery and Aquaculture;
- Ministry of Environment and Urbanisation, Directorate General of Spatial Planning;
- Ministry of Environment and Urbanisation, Directorate General of Protection of Natural Resources;
- General Directorate of Mineral Research and Exploration (MTA);
- Ministry of Forestry and Water Affairs, General Directorate of Nature Protection and National Parks;

- Ministry of Forestry and Water Affairs, General Directorate of State Hydraulic Works (SHW);
- Ministry of Forestry and Water Affairs, General Directorate of Forestry;
- Turkish Petroleum (TPAO), Department of Occupational Safety and Environmental Protection;
- Ministry of Transportation, Maritime and Communications; Directorate General of Shipyards and Coastal Structures;
- Ministry of Transportation, Maritime and Communications; Directorate General of Coastal Safety;
- Ministry of the Interior, Coast Guard Command, Black Sea Regional Directorate;
- Turkish Naval Forces, Office of Navigation, Hydrography and Oceanography;
- Kırklareli Governorship, Provincial Directorate of Food, Agriculture and Livestock;
- Kırklareli Governorship, Provincial Directorate of Public Health;
- Kırklareli Governorship, Provincial Directorate of Culture and Tourism;
- Kırklareli Governorship, Provincial Directorate of Environment and Urbanisation;
- Kırklareli Governorship, Secretariat General of the Provincial Special Administration;
- Ministry of Culture and Tourism, Edirne Directorate General of Protection of Culture Assets;
- Ministy of Culture and Tourism, Directorate General of Cultural Assets and Museums; and
- General Directorate of Istanbul Water and Sewage Administration (İSKİ).

In addition to the Public Participation Meeting and REC meeting, local community representatives were identified for the additional participation program in the future. These representatives are determined to be; local authorities, municipality, fishery, forestry and husbandry associations which represent the main economic sectors in Kıyıköy, and the presidents and administration of tourism associations.

5.2.1. Communication with Stakeholders

The Public Participation Meeting, which grants all stakeholders of the Project the opportunity to be informed about the Project and share their opinions and suggestions, was announced through the advertisements published in a national newspaper and a local newspaper. Detailed information is given in Chapter 5.1.

The Ministry of Environment and Urbanisation shared with members of the Review and Evaluation Commission a letter stating the date of the Public Participation Meeting and the date of determining the scope of the EIA and Special Format, along with the EIA Application File. In addition, a mechanism, which is detailed in the following chapters, has been developed in order to enable stakeholders to share their opinions and suggestions about the Project in all phases of the Project.

5.2.1.1 Project Owner’s Meetings with the Locals in Kıyıköy and Other Stakeholders

Although the Public Participation meeting could not be held, establishing communication with ths stakeholders is crucial in terms of the realization of the following:

- Providing stakeholders with correct information so that their opinions about the Project are well-grounded and accurate;

- Providing stakeholders with ample opportunity tos hare their views and concerns concerning the progress of the Project;
- Taking stakeholders' priorities, opinions and concerns into consideration while making Project-specific decisions whereby such priorities, opinions and concerns shall be incorporated into the environmental and social impact assessments, development of mitigation methodologies and, whereever possible, into decisions regarding Project management; and
- Establishing positive relations with stakeholders throughout the Project.

The Project Owner has designed the public participation scheme to meet the above objectives. Public Participation scheme in terms of its objectives, has been specifically developed, pursuing a gradual approach. As a first step, local stakeholders in Kıyıköy and those at the provincial level (Kırklareli), who are considered to be in relation with the Project have been contacted so as to establish dialogue and to understand their opinions and concerns about the Project as well as to share Project-related information. In line with the objectives of the EIA report, meetings with stakeholders and respective Government agencies in Kıyıköy have been organized both to assess Project's socio-economic impacts on such livelihoods as fishing and tourism and to collect existing socio-economical data to assess possible socio-economic impacts. Stakeholders who have been interviewed until the date of completion of this EIA Report (July 2017) has been provided in Table Error**! No text of specified style in document.**.1. Some of the meetings and interviews hereinbelow have been conducted by the Project Owner and the representatives thereof whereas some by the experts to facilitate the dialogue between the Project Owner and the locals in Kıyıköy. Findings from these meetings are evaluated under Chapter 9 (Assessment of Socio-economic Impacts).

Table Error! No text of specified style in document.**.1 Meetings with Local Stakeholders Completed until July 2017**

Stakeholder/Stakeholder Group	Type of Meeting	Aim	Date
Municipality/Mayor of Kıyıköy	Vis-a-vis.	To provide information on the Project, collection of feedback	July 2015
Kıyıköy fishermen	Vis-a-vis	To collect information on fishing industry	July 2015
Mukhtars in Kıyıköy and surrounding districts	Group meeting.	To provide information on the Project, collection of feedback.	July 2015
Municipality/Mayor of Kıyıköy	Vis-a-vis.	Discussion about the Project to understand more about local concerns/issues	August 2015
Kıyıköy Aquaculture Cooperative	Group meeting.	To provide information on the Project and to collect feedback on fishermen's concerns/issues	August 2015
Central Body of Aquaculture Cooperatives (SUR-KOOP)	Vis-a-vis.	To provide information on the Project, to discuss fisheries-related concerns and issues as well as to obtain recommendations	September 2015
Mukhtars in Kıyıköy, community representatives and business owners	Series of vis-a-vis meetings.	To collect feedback on the concens and issues of stakeholders	September 2015

Stakeholder/Stakeholder Group	Type of Meeting	Aim	Date
Local civil society organizations and local community leaders	Series of vis-a-vis meetings.	To collect feedback on concerns and issues of stakeholders	September 2015
Business owners in Kıyıköy	Series of vis-a-vis meetings.	To collect data on local economy and tourism	October 2015
Kıyıköy fishermen	Series of vis-a-vis meetings.	To collect information on fishing industry	October 2015
Kıyıköy Livestock Cooperative, locals, teachers and doctors	Series of vis-a-vis meetings.	To collect feedback on concerns and issues of stakeholders	November 2015
Mayor and mukhtars in Kıyıköy, the District Governor of Vize	Series of vis-a-vis meetings.	Sharing of information on the Project and environmental and social management	November 2015
Kıyıköy mayor and the District Governor of Vize	Vis-a-vis.	To provide an update regarding the resumption of Project activities	December 2016
Kıyıköy mukhtars, Fisheries Cooperative, Forestry Cooperative and Livestock Cooperative	Series of vis-a-vis meetings.	To provide an update regarding the resumption of Project activities	January 2017
Kıyıköy Municipality, Kıyıköy mukhtars, Fisheries Cooperative, Forestry Cooperative, business owners	Series of vis-a-vis meetings.	To collect socio-economic data	January 2017
Mayor and mukhtars in Kıyıköy, Forestry Cooperative, Kırklareli Gendarmerie, Fisheries Cooperative	Series of vis-a-vis meetings.	Sharing of information on the Project	February 2017
Mayor of Tekirdağ Metropolitan Municipality,Governor of Tekirdağ, Tekirdağ Mayor, Governor of Kırklareli	Series of vis-a-vis meetings.	To provide information on the Project and to collect initial feedback	February 2017
Kıyıköy Fisheries Cooperative	Group meeting.	To update about the Project and to collect feedback on concerns and issues of stakeholders	February 2017
Kıyıköy mukhtars, Kıyıköy Gendarmerie, Kıyıköy Association of Culture and Tourism	Series of vis-a-vis meetings.	Sharing of information on the Project	March 2017
Kıyıköy Municipality; Kıyıköy Tourism Association, mukhtars, Livestock Cooperative, Fisheries Cooperative, Development Agency of Thrace, Employment Agency of Turkey (İŞKUR), Kıyıköy Gendarmerie	Series of vis-a-vis meetings/group meetings.	To collect socio-economic data	March 2017
Kıyıköy mukhtars, Kıyıköy Fisheries Cooperative, Kıyıköy Association of Culture and Tourism,	Series of vis-a-vis meetings/group meetings.	To update about the Project and to provide information on the Community Investment Program	April 2017
Kıyıköy Livestock Cooperative, Kıyıköy Community Health Center, Kıyıköy mukhtars, Kıyıköy Forestry Cooperative, Kıyıköy Municipality, teachers and students in Kıyıköy	Series of vis-a-vis meetings/group meetings.	To update about the Project and to provide information on the Community Investment Program	May 2017

Stakeholder/Stakeholder Group	Type of Meeting	Aim	Date
Saray Mayor, District Governor of Saray, Vize Mayor	Series of vis-a-vis meetings.	To provide information on the Project and to collect initial feedback	May 2017
Kıyıköy Mayor	Series of vis-a-vis meetings/group meetings.	To share Project-specific information and to introduce authorities from BOTAŞ	May 2017
Kıyıköy Municipality; Kıyıköy mukhtars, Kıyıköy Fisheries Cooperative, Kıyıköy Forestry Cooperativei, Kıyıköy Association of Culture and Tourism	Series of vis-a-vis meetings/group meetings.	Community Investment Program follow-up meeting and to respond to questions regarding the Project	May 2017
Kıyıköy Municipality; Kıyıköy mukhtars, Kıyıköy Fisheries Cooperative, Kıyıköy Forestry Cooperativei, Kıyıköy Association of Culture and Tourism	Series of vis-a-vis meetings.	Informing the stakeholders about the publishing of draft EIA Report	June 2017
Kıyıköy Municipality; Kıyıköy mukhtars, Kıyıköy Fisheries Cooperative, Kıyıköy Forestry Cooperative, representetives of Kıyıköy Association of Culture and Tourism;Kıyıköy Livestock Cooperative	Group meeting.	Briefing meeting in order to present the technical details of the project: The social and environmental aspects of the project were explained and feedbacks were received from stakeholders and their questions were answered	July 2017
Kıyıköy Fishers (troll vessel fishers and small shore fishers); representetives of Kıyıköy Association of Culture and Tourism	Series of group meetings.	Briefing meeting in order to present the technical details of the project: The social and environmental aspects of the project were explained and feedbacks were received from stakeholders and their questions were answered	July 2017

Public participation is a continuous process and as part of the later stages of the public participation program activities the details of which are provided in Chapter 5.5 to gradually expand the scope of public participation will be carried out from the second half of 2017 onwards.

5.2.1.2 Stakeholder Participation Activities Planned

The Project Owner plans to expand the scope of participation activities which are already ongoing with respective NGOs (Non-governmental organizations) and communities to face outfall from construction traffic to include other stakeholders and Kıyıköy locals. The next stage of participation activities involves basic activities below:

- Development and sharing of information material. Setting-up of an information contact as well as to improve Kıyıköy locals' level of Project-specific information through other tools;
- To expand channels of communication so as to facilitate locals' contact and communication eith the Project;
- To contact local stakeholders and other communities to face the impacts ofthe Project;
- Appointment of a publiic relations officer, and

- Sustaining existing relations with stakeholders who have been already contacted and to obtain further socio-economic details, obtain stakeholder views and to determine other stakeholders to be contacted in order to better grasp environmental as well as social impacts.

The Project Owner, on the basis of the EIA Report and other Project efforts, aims to implement a consultative process focusing on environmental and social impacts envisaged. At this stage of the Stakeholder Participation process, the aim is to provide the stakeholders with opportunities below:

- Access to information on the Project and the potential impacts thereof (non-technical and in local language);
- Provide information and feedback on the proposed impact assessment and mitigation methodologies as well as management and follow-up measures; and
- Provide information on plans on future participation events including preferred methodologies, materials and schedule

Additional and supporting information material that will be prepared shall be made accessible in an appropriate locality in Kıyıköy, which shall be accessible to other stakeholders on the Internet, who will be asked to provide their feedback and recommendations thereupon. Consultative meetings to provide stakeholders first-hand information on both the Project and the envisaged impacts of the Project as well as with a face-to-face opportunity with the representatives of the Project. Such meetings are planned at local, regional and national levels and envisaged to include roundtable as well as other types of meetings in addition to group-focused consultations.

The aim of the consultative process at this stage is to verify the assessment of the potential environmental and social impacts and to reinforce mitigation, management and follow-up measures that will be implemented so as to ensure that potential impacts and stakeholders' concerns are addressed.

Feeadback will be taken into consideration during the preparation of the ESMP (Environamental and Social Management Plans). ESMPs are basic tools to manage environmental and social impacts and to streamline with Project Standars. ESMPs will be inclusive of the mitigation, managemen and follow-up activities as well as all TurkStream Offshore Pipeline undertakings in relation with the Construction Phase, hence a basic tool to ensure that the Project Owner and contractors perform their guarantees. Detailed information on the ESMPs is provided in Chapter 12 (Environmental and Social Management Plan).

A report dwelling on the details of these consultations and the outcomes thereof will be made accessible to stakeholders as well as accessible on the Internet, including issues below:

- Particulars of the stakeholder engagement carried out;
- Responses to stakeholders' concerns and feedback;
- Responses to queries for additional information; and
- Details of new undertakings within the scope of the Project.

The Project Owner shall negociate the proposed consultation schedule with respective partners before notification of all stakeholders.

As the Project proceeds with the construction phase, negociations for purposes below shall continue:

- Information of Kıyıköy locals and other communities who will be potentially impacted by the construction traffic regarding construction activities;
- Continuing to inform the Fishers about the activities and security measures which will ocur on the sea in scope of the Project;
- Dealing with the concernes and possible complaints by answering questions;
- Ensuring cooperation to secure public support for mitigation and monitoring measures; and
- Taking initiative to develop and implement a Community Investment Program.

In order to determine the development requirements and preferences of locals, potential job opportunities, business partners and capacities as well as to identify a series of potential programs focusing on public development objectives targeting environment, economic development, expansion of livelihoods, public health and security, public welfare and cultural heritage, and the Project the development of the Community Investment Program shall include a Public Needs Analysis.

5.2.2 Monitoring Stakeholders

It is important to share information with the public and locals during Project activities. The communities affected/potentially affected by Project activities or other stakeholders have been engaged in accordance with the information provided in Section 5.3.1. These stakeholders can submit comments to the Project Owner in accordance with the information provided in Section 5.4 and the Project Owner will continue to engage with them as outlined in Section 5.5.

There is a Feedback and Grievance Procedure that the Project owner shall follow during Project activities in line with the notifications to be obtained from stakeholders. Within this scope, transparent and objective communication channels with stakeholders shall be provided, which shall also ensure that the public, non-governmental organizations, entrepreneurs, official institutions, industrial groups and other stakeholders can present their complaints and concerns, if any, in terms of the effects on the environment and society. The feedback of stakeholders may include questions, comments, requests for information, suggestions, concerns, and complaints. These can be provided in person, over the phone, or in writing by email, fax or post. The feedback obtained from stakeholders shall be documented and a any complaints will be responsed to with suggested solutions. All the feedback obtained by the Project owner from stakeholder shall be treated with professional consideration and respect, and base our responses on open and honest communication. The process of stakeholder participation shall be managed within the framework of the Project Owner’s Feedback and Grievance Procedure(TON-EIA-05-03).

The Feedback and Grievance Mechanism is a management procedure which ensures that the communities, individuals and other stakeholderss affected/likely to be affected project activities submit their questions, opinions, concerns and complaints in an official way and that mutually acceptable solutions among shareholders can be generated. During the process of Project activities, a grievance might be related to a specific incident, or an impact on the environment or community, or the behaviours of people working on the Project. The Project Owner is sensitive about establishing a reliable and constructive relation with the stakeholders and pays attention to an active and open communication. Furthermore, the Project Owner aims to implement the principles of responding to complaints on time and generating solutions via the Grievance Procedure. The main objectives of the Grievance Procedure are:

- to ensure that the concerns, issues and complaints are determined early and the measures to address them are taken by the Pproject Owner on time and proactively;
- to ensure the improvement of Project performance; and
- to demonstrate the commitment of the Project Owner to stakeolders and to take into account the opinions and concerns of locals about the Project.

The Greivance Procedure is implemented as follows:

Stage 1 Receiving feedback: Questions and comments are received and analysed as a part of Standard Feedback Process. All feedback is subjected to the Feedback Process which ensures the recording and combining the feedback and when necessary a response to feedback. In some cases a complaint might be detected during this process. In such case, the 2nd Stage of Compliance Procedure gets started;

Stage 2: Logging and Classifying Griviences. When a grievance is identified, it is officially registered and given a unique identification number. It is categorised based on the type of complaint and its severity. An initial response is sent to the person(s) who raised the grievance, acknowledging their feedback and describing the next steps in the grievance process, time estimates for these steps and a contact person.

Stage 3: Investigation and resolution. The Project Owner will investigate grievances and their surrounding circumstances. These investigations will be undertaken in a timely manner. The results of these investigations will be reviewed and a resolution will be proposed. The development of the resolution may involve consultation with the person(s) involved. The proposed resolution will then be formally communicated to all parties;

Stage 4: Resolution accepted (or not accepted). If the resolution is accepted by all parties, it is implemented and the grievance is closed. If the resolution is not accepted, it will be reconsidered and a revised resolution may be proposed. The affected person(s) may choose to pursue external remedies (e.g. through legal proceedings) at any time, including if an agreed resolution cannot be found.

Stage 5: Monitoring & Evaluation. After the accepted resolution has been implemented, it will be monitored and its effectiveness will be evaluated. All parties will be notified that the resolution has been implemented and will have the opportunity to provide feedback on the grievance process and its implementation.

The schematic diagram of the phases of Grievance Mechanism is provided below.

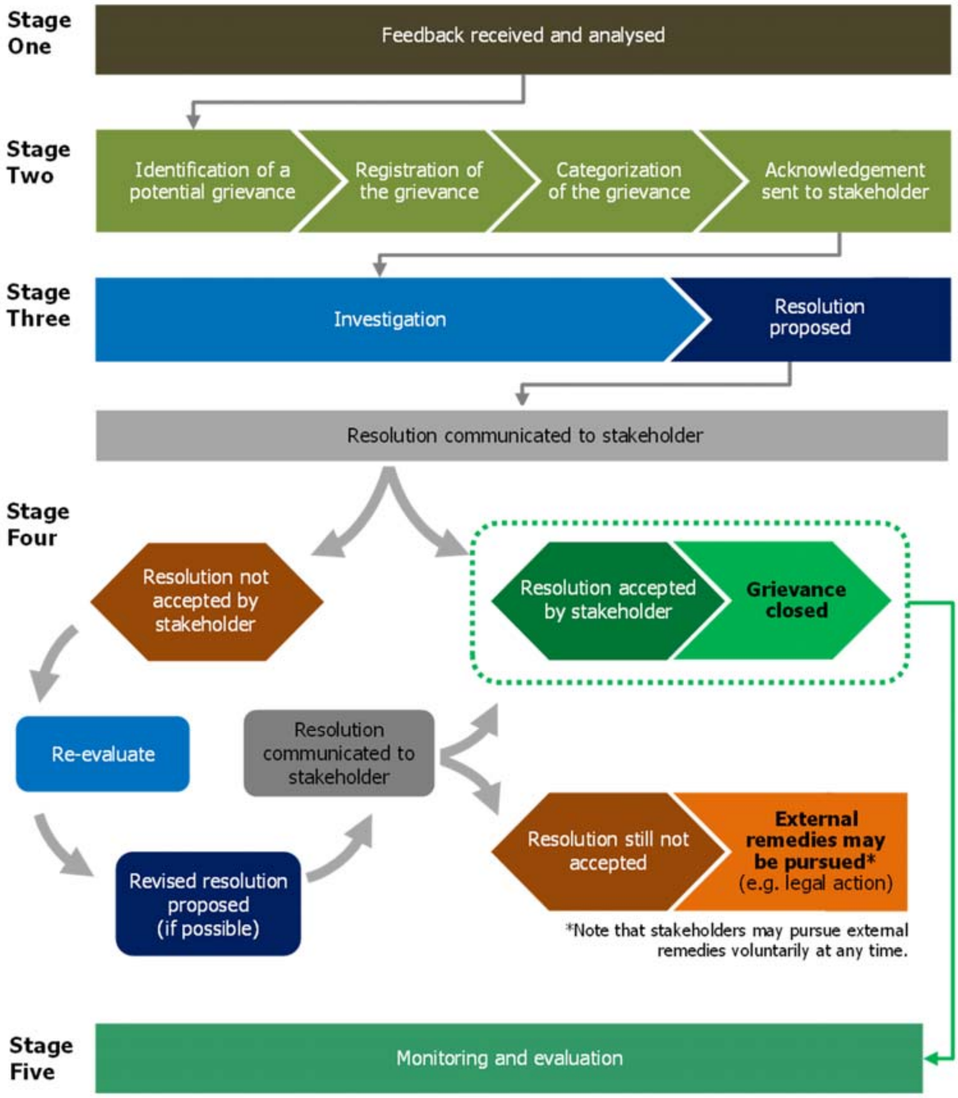


Figure Error! No text of specified style in document.**.1: The schematic diagram of the phases of Grievance Mechanism**

5.3 PUBLIC'S PARTICIPATION MEETING

With the purpose of informing the public about the Project and for receiving their opinions and suggestions, a Public Participation Meeting was planned to be held at the wedding hall of the Town Municipality of Kiyikoy in Vize district on July 21, 2015 at 11 am. Officials from Kırklareli Provincial Directorate of Environment and Urbanisation, some members of the commisson, the Project Owner and the officials of the company carrying out the EIA works were present at the mentioned address, on the mentioned date and at the mentioned time. As laid down in the letter (ANNEX-5.A) dated 23 July 2015 of Kırklareli Provincial Directorate of Environment and Urbanization, public didn't want to unjoy their right to be informed.

5.3.1 COMPANY Consultations with Kiyikoy Community and Other Stakeholders

Despite the cancellation of the Public Participation meeting, the Project Owner recognizes the importance of engaging with stakeholders in order to ensure:

- stakeholders receive accurate Project information on which to base their views and opinions;
- stakeholders are provided with suitable opportunities to express their opinions and concerns in relation to potential impacts and Project development;
- Project decisions consider stakeholder priorities, views and concerns and that these are reflected in the assessement of environmental and social impacts, the development of mitigation and management measures, and Project management decisions where appropriate; and
- meaningful and positive relationships with stakeholders are established throughout the lifecycle of the Project.

To this effect, the Project Owner's stakeholder engagement programme has been established to meet the above objectives. The stakeholder engagement programme takes a phased approach, that is tailored in terms of its objectives and intensity. As an initial step, engagement has occured with key stakeholders at local community (Kiyikoy) and Kirklareli level to establish dialogue, understand their interests and concerns in relation to the Project and to share information regarding Project activities. Interviews with Kiyikoy community stakeholders and relevant public institutions have also taken place to collect socio-economic baseline information in order to assess potential Project socio-economic impacts on livelihoods in Kiyikoy (such as fisheries and tourism) for the purposes of this EIA Report (see Chapter 8). Consultations held to date are summarized in Table 5.2. Note that some of the meetings below were performed by the Project Owner or its representatives, whilst others were performed by external parties tasked with facilitating dialogue between the Project Owner and members of the local Kiyikoy community,

TABLE 5.2. Non-EIA Stakeholder Consultations, up to February 2017

Stakeholder / Stakeholder Group	Meeting Type	Purpose	Date
Kiyikoy Mayor / Municipality	One-on-one meeting	Introduce Project and receive initial feedback	July 2015
Kiyikoy fishermen	Walk and talk	Fish and fisheries data collection	July 2015
Muhtars in Kiyikoy and surrounding communities	Group meeting	Introduce Project and receive initial feedback	July 2015
Kiyikoy Mayor / Municipality	One-on-one meeting	Discuss Project and understand local concerns / issues	August 2015
Kiyikoy Fisheries Cooperative Union	Group meeting	Introduce Project and receive feedback on concerns / issues of fishing communinity	August 2015
National Union of Fisheries Cooperatives (SUR-KOOP)	One-on-one meeting	Introduce Project, discuss concerns / issues related to fisheries, and receive recommendations	September 2015
Kiyikoy Muhtars, Community Representatives and Business Owners	Series of one-on-one meetings	Receive feedback on stakeholder concerns / issues	September 2015
Regional Non-Governmental Associations and Regional Figures	Series of one-on-one meetings	Receive feedback on stakeholder concerns / issues	September 2015

Kiyikoy business owners	Series of one-to-one interviews	Local economy and tourism data collection	October 2015
Kiyikoy fishermen	Series of one-to-one interviews	Fisheries industry data collection	October 2015
Kiyikoy Animal Husbandry, residents, teachers and doctors	Series of one-to-one interviews	Receive feedback on stakeholder concerns / issues	November 2015
Kiyikoy Mayor, Kiyikoy Muhtars, Vize Governor	Series of one-to-one interviews	Information sharing about the Project and environmental and social management	November 2015
Kiyikoy Mayor, Vize Governor	One-to-one meetings	Inform about restart of Project activities	December 2016
Kiyikoy Muhtars, Fishing Cooperative, Forestry Cooperative, Animal Husbandry Cooperative	Series of one-to-one interviews	Inform about restart of Project activities. Receive feedback on stakeholder concerns / issues	January 2017
Kiyikoy Municipality, Muhtars, Fishing Cooperative, Forestry Cooperative, Business Owners	Series of one-to-one interviews	Socio-economic data collection	January 2017
Kiyikoy Mayor, Fishing Cooperative, Muhtars	Series of one-to-one / group meetings	Project information sharing.	Febraury 2017

Stakeholder engagement is an ongoing process, and efforts will be made to gradually expand engagement activities from Q2 2017 onwards as part of the next phases of the stakeholder engagement programme. This is further described in Section 5.5.

5.4 METHODS OF RECEIVING OPINIONS OF THE STAKEHOLDERS

The Feedback and Grievance Procedure will be available for all stakeholders, without any restribution. The Feedback and Greivance Mechnaism is aimed to be a reliable, transparent and objective mechanism that takes into consideration the concerns and complaints of the stakeholders about the Project. The Project owner shall respect the confidentiality of the personal or corporate information of stakeholders and shall also take into consideration any other requests for confidentiality (TON-EIA-05-04). While the complaints can be about the Project Owner and contractors, they can also be submitted to express concerns about other activities related to the Project .

The communication channels that may be used in order to contact the Project Owner are as follows:

- **In person:** during a meeting, or request a meeting with a representative of the Project Owner, South Stream Transport B.V.
- **Turkey:** (+90 (0) 531 733 66 28)and
- Headquarters in Amsterdam (+31 20 262 4500) .

- **Online:** contact by email (feedback@turkstream.info) or through the website (www.turkstream.info).
- **By post or fax:** send comments in writing to:
  - *Turkish PO Box:*
    PK 16, Kavacik 34813
    Beykoz / Istanbul, Turkey
  - *Headquarters:*
    South Stream Transport B.V.
    Parnassusweg 809
    1082 LZ Amsterdam, The Netherlands
    Fax: +31 20 524 1237

Any of the three Project languages -Turkish, English and Russian- may be used for communication.

In addition, voiced questions, opinions and suggestions are taken into consideration by the Ministry of Environment and Urbanisation to determine EIA Report's scope and content (the Special Format). This prepared EIA report will be published on the website of the Ministry of Environment and Urbanisation for people's review and forwarding their opinions and suggestions (www.csb.gov.tr).

Another method that enables stakeholders to provide feedback on the Project is to apply in writing to the Ministry of Environment and Urbanisation. Members of the REC are also obliged to inform the Ministry of Environment and Urbanization officially. The opinions of the REC members and other official and unofficial stakeholders selected by the Ministry of Environment and Urbanisation are given in Annex 5.A.

Updates about the Project can be found online at www.turkstream.info. The website will be periodically updated and includes reports, press releases and other documents as they become available, as well as basic information about the Project design, planning and schedule.

In addition, as the Project progresses, information materials such as leaflets and brochures will be prepared and communicated within Kiyikoy and among other stakeholders to support the stakeholder engagement process. These materials will provide general information about various aspects of the Project, and will include details of how to contact the Project Owner and submit comments. Moreover, field visits were conducted in order to meet with local stakeholders by the stakeholder participant experts via creating a stakeholder participation program. This program also allows representatives of the stakeholders to provide insights on any subject.

5.5 Other Issues

No further issues to discuss under this heading.

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6 Assessment of the Existing Environmental Features

This Chapter provides information concerning the existing environmental features of the Project Area identified in **Chapter 1** (General Characteristics of the Project). Impacts on the physical environment in relation to the construction stage of the project, the operation stage and the decommissioning stage and, where appropriate, measures to reduce or eliminate these effects are explained in detail. Assessments made in this chapter are made in line with the methods explained in **Chapter 2** (Environmental Impact Assessment Approach) as they were in the other parts of the EIA report and the data derived from fieldworks conducted by expert and/or certified authorities as well as reports containing the results of fieldworks commissioned by the Project Owner have been utilized with the permission of the Project Owner. These data are supported by the literature studies and confirmed to be in line with the literature.

As detailed in Section 1.12 (Definition of Environmental and Engineering Surveys and their Goals), it was concluded that the micro tunnel option as a shore crossing technique was not feasible as a result of the preliminary assessments made in 2015, thus, as the final decision of the Project Owner, open-cut construction technique was chosen in February 2017. All of the surveys and expert assessments/reports conducted for the preparation of this EIA Report in 2015 have been updated, according to the 2017 construction method change, to the open-cut technique and have been included in this EIA Report.

6.1 Land Use and Ownership Status

An Intergovernmental Agreement (IGA) was signed by the Republic of Turkey and the Russian Federation on 10 October 2016 regarding the TurkStream Gas Pipeline. In Paragraph 3 of Article 7 of the IGA, the approach regarding land use is as follows:

“The Turkish Party shall facilitate grant to or acquisition by the companies of rights to use land plots required for the implementation of the project, on fair, transparent and legally enforceable conditions. Such facilitation shall in particular include appointment of a state entity empowered to manage the process of acquisition of rights to use land plots in an accelerated manner, as well as issuance of a public interest decision for acquisition of such land rights”.

In addition, as per the national legislation, the assessment of ownership status for the areas within the scope of the Project is presented in the following sections.

6.1.1 Offshore Section

The pipeline route reaching the Turkish coasts starting from the KP660 point, which is the beginning of the Offshore Section of the Project, is located in the sea area, which is completely under the sovereignty and disposal of the state. For the Offshore Section, where the project passes through the Turkish Exclusive Economic Zone (EEZ); national legislation, standards and guideline documents are applied. The project is subject to the legal requirements set out in the "Decree on the Turkish Exclusive Economic Zone", which entered into force as Decree of the Council of Ministers dated December 5, 1986, No. 86-11264. No land acquisition by the Project Owner will be necessary for this area.

The Decree of the Council of Ministers dated 5/12/1986 and numbered 86/11264 on the declaration of an EEZ extending 200 nautical miles in the Black Sea was published in the Official Gazette dated 17 December 1986 and numbered 19314 and relates to the Offshore Section of the Project. According to the Decree; the Turkish EEZ in the Black Sea established for the purpose of exploring and exploiting, conserving and managing the living and non-living resources of the waters superjacent to the seabed and of the seabed and its subsoil of maritime areas adjacent to the Turkish territorial sea and protecting other economic interests in the Republic of Turkey, extends to a distance of 200 nautical miles from the baseline from which the breadth of the territorial waters of Turkey in this sea is measured.

Turkey's rights in this zone are regulated in Article 2 of the above-mentioned Council of Ministers Decree. According to this article;

“1) In its exclusive economic zone in the Black Sea Turkey, among other rights, shall have sovereign rights:

a) For the purpose of exploring, exploiting, conserving and managing the living and non-living natural resources of the waters superjacent to the seabed and of the seabed and its subsoil, and

b) With regard to other activities for the economic exploration and exploitation, including the production of energy from waters, currents and winds.

2) Turkey shall also have exclusive rights and jurisdiction with regard to:

a) The establishment and use of artificial islands, installations and structures for the economic purposes and for the purposes of marine scientific research and the protection and the preservation of the marine environment as well as exclusive rights to construct and to authorize and regulate their construction, operation and use including jurisdiction with regard to customs, fiscal, health, safety and immigration laws and regulations;

b) Conduct, authorize and regulate, marine scientific research; and

c) Establish regulations and control procedures necessary to preserve and protect the marine environment and to prevent, reduce and control, marine pollution.

3) The arrangements concerning the exercise of the rights and jurisdiction enumerated above shall be subject to the rules and procedures set out in this decree and relevant Turkish Legislation. Fishing by foreign vessels in the Turkish exclusive economic zone in the Black Sea shall be regulated on the basis of agreements between Turkey and the foreign States concerned. The rights of other States are regulated in Article 3 of the Council of Ministers Decree. According to this article; "In the Turkish exclusive economic zone in the Black Sea vessels of other States shall enjoy the freedom of navigation and the aircraft of other States shall enjoy the freedom of overflight. Likewise, other States shall enjoy the freedom of the laying of submarine cables and pipelines in this zone. However, in the exercise of these freedoms the legislation of Turkey and general practice shall be complied with.”

In the Offshore Section of the project, no land acquisition will be necessary in the Turkish EEZ, but there will be a temporary right of usage.

6.1.2 Shore Crossing Section

The Shore Crossing Section of the Project is located in the sea area which is under the sovereignty and disposal of the state. The right of usage of Turkish waters is determined by the Law on Territorial Waters. No land acquisition by the Project Owner will be necessary for this area.

The Law on Territorial Waters is applicable for the Shore Crossing Section, which begins where the pipelines of the Project leave the Turkish EEZ and enter Turkish waters in the Thrace Region arriving on mainland Turkey via Kiyikoy shores. According to this act;

Article 1- Turkish territorial waters are a part of the Turkish state. The breadth of the Turkish territorial seas is six nautical miles.

Article 3- The breadth of the territorial seas is measured on the basis of baselines determined by the Council of Ministers.

Article 4- The waters on the land side of the baselines and the waters of the bays are Turkish internal waters. The permanent harbor works are regarded as a part of the coast and the waters on the land side of those outermost harbor works and outer ports shall be internal waters.

According to the Regulation on implementation of Coastal Law, on the approval and written permission of the governorship the excavations that do not modify the natural structure of the coast can be performed per the permission provisions. According to this regulation;

Article 4- Constructions to be built on the coastal lines can be no more than 50 meters to the shoreline. Areas within the building approach distance, by the authorization of development plans, can be arranged as leisure areas, recreational areas and pedestrian paths defined by this Regulation.

Article 5- Coasts and the lands acquired by filling and reclamation are under the provision and protection of the State. The coasts are open to use of everyone on free and equitable basis. In the utilization of the coasts and shores, public interest is considered first.

The coast is open to the use of everyone on free and equitable basis, no construction is allowed to be built and walls, hedges, bars, yarns, trenches, piles or similar blocks cannot be used here.

Soil, gravel, etc. cannot be taken or carried away from the coasts. The excavations that can modify coast or damage its natural structure cannot be allowed. On the approval and written permission of the governorship the excavations that do not modify the natural structure of the coast can be performed per the permission provisions. In the case of violation of the permission conditions the permission is revoked and criminal action is taken according to the Article 21 of the regulation.

Polluting wastes and remnants such as rubble, soil, slack and garbage cannot be poured into the coasts. Besides, the provisions of the Regulation for Water Pollution Control are valid.

The provisions made in compliance with Law No 1380 Fishery Law, Law No 2872 the Environment Code and the same act are reserved. The existence of approved shore edge line is compulsory for planning and practices along the coast and shore lines.

Article 13 - The following constructions and facilities can be built if the all measures for the prevention of environmental pollution are taken and they comply with the approved application zoning plan in the shore.

a) Infrastructures and facilities to use the coast for public- interest and to protect the coast: wharf, harbor, port, berth, wave-breaker, bridge, culvert, supporting wall, lantern, slip area, boat yard, boat house, saline, stake-net, salvage and pumping stations.

b) Structures and facilities that cannot be constructed elsewhere due to the characteristics of the activity: shipyard, workshop for separating ships apart, water products production and raring facilities, slipway, yacht port, cruiser port, fisher shelter and boat yard.

The complementary and obligatory infra- and superstructure and facilities for the structure and facilities listed in sub-clauses (a) and (b) can be built. Daily tourism structures and facilities cannot be constructed. The conditions of construction and height of the maintenance and technical infrastructures like hangar, workshop, control tower and lantern are determined by the zoning plans which comply with technical conditions and international standards.

No treatments, which belong to private use in the second section of the shoreline and at the back of shoreline, are allowed to be built in the coast. These areas are only open to the treatment facilities for the public service.

The constructions and facilities along the coasts can only be used for their purposes.

The structures registered in accordance with the Law No. 2863 on the Protection of Cultural and Natural Assets shall be protected; the decisions on the use of these structures and the conditions for the construction are determined by the Council for the Protection of Cultural and Natural Assets, and these decisions are taken as the basis when implementing development plans.

Article 16- The obstacles that can prevent the access to the coasts (e.g. walls, hedges, bars, yarns, trenches, stakes or similar blocks) cannot be built along the shore strip. No waste and remnant (e.g. rubble, soil, slack, garbage, etc.) can be poured, no excavation is allowed.

No new vehicle roads can be open in the first section of shoreline. Yet, the necessary revisions regarding the areas in which no partial construction exists on the approval of zoning plan prior to 11 July 1992 are to be made in one year in accordance with the act and the provisions of this regulation. No license can be granted for the wastelands and the lands without partial construction, unless those procedures take place.

As it is not a signatory, Turkey is not obliged to act in the framework of United Nations Convention on the Law of the Sea.

Project will not acquire land in the Offshore Section of the Turkey's EEZ and Shore Crossing Section of Turkish territorial waters, but it will have a temporary right of usage.

6.1.3 Onshore Section

The Onshore Section of the Project is located between Kırklareli Province, Vize District, Kurt Hill and Kaz Port and is under the responsibility of Directorate General of Forestry, Istanbul Regional Directorate of Forestry, Vize Forestry Management Directorate, and Midye (Kıyıköy) Forest Sub-district Directorate (Figure 6.1).

In compliance with the opinion letter received from The Planning Sub-directorate Marmara and Mediterranean Basins under the Directorate General of Spatial Planning, The Ministry of Environment and Urbanization (MoEU) on 05.08.2015 (The opinion letter received on 13.04.2017 also approves the current opinions):

i. The plan sheet (in its original size), the legend sheet and related plan provisions with the official stamp of "true copy of the original" from the related institution that includes the maps "1/100 000 Scaled Revision Environmental Plan of Ergene Basin sub-region Thrace" and "1/ 25 000 Scaled Environmental Plan of Kırklareli" of the project area (**Annex-6.A**); and

ii. The Kıyıköy Municipality script No 304 dated 05.04.2017 asserted that the Project Area is within the municipality borders and its adjacent areas but does not fall into the zoning plan and plan approval borders (**Annex-6.B)**.

Regarding the project, approval for two different zoning plans is required. The plan proposals for the Onshore Section shall made to Kıyıköy Municipality, while for the Shore Crossing Sections the plan proposals shall be made to Directorate General of Spatial Planning of MoEU.

During the project, in compliance with the opinion letter of the Directorate of Development and Urban Improvement, Kırklareli Provincial Special Administration issued on 24.07.2015 and the opinion letter of The Ministry of Environment and Urbanization, Directorate General of Spatial Planning issued on 01.08.2017, the provisions of the "2.11.5.1 Transit Area of Petroleum and Natural Gas Transmission Lines, Energy Transmission Lines" title of the 1/100.000 scaled Environmental Plan and the provisions of the "3.3.5 Energy Transmission Lines" title of the Kırklareli Province 1/25.000 scaled Environmental Plan and the other related legislations will be complied with.In the Forestry Report submitted in the **Chapter 8** (The Assessment of Areas to be Dismissed for the Project) prepared for the Project on May 2017, it is indicated that there is no private property in the Onshore Section and the whole area is forest area. Construction will not be started until all unrestricted use rights and/or special rights on forest areas planned to be used within the scope of the project have been obtained and all permissions relevant to Article 17 of the Forest Law No. 6831 have been obtained before the construction stage. After the construction in the temporary areas to be used within the scope of the project is completed, all applicable land rehabilitation and restoration works will be carried out.

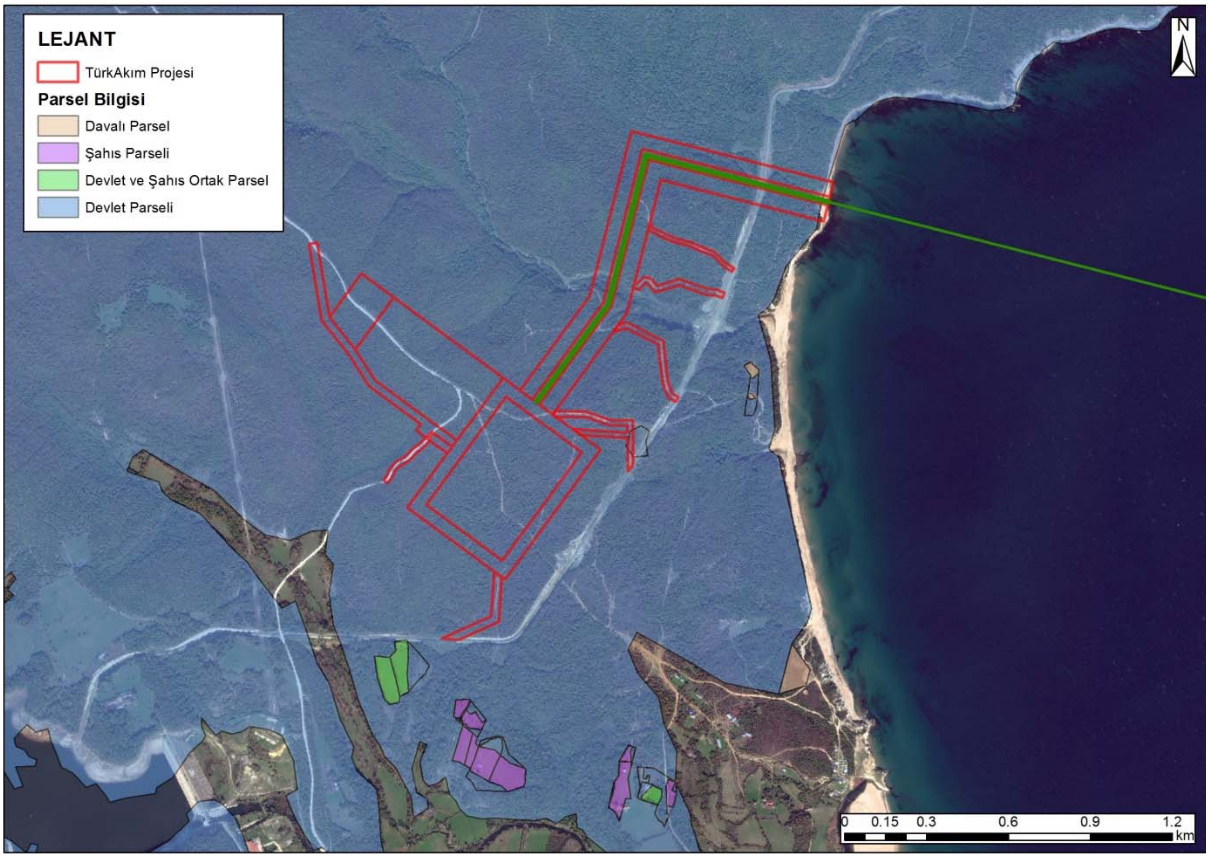


Figure 6.1: Project Area Land Use Map

Although it is not planned under current conditions, in accordance with the relevant articles of the Soil Protection and Land Use Law No. 5403, in the case of any enlargement projected in the Land Section of the Project within the next period projections, in order to use agricultural land for non-agricultural purposes; the maps and the cadastral documents marked with agricultural land shall be submitted to the Kırklareli Municipality or the Provincial Special Administration and the Kırklareli Provincial Directorate of Food, Agriculture and Animal Husbandry and the necessary permission shall be obtained for the non-agricultural use of agricultural land. In the same way albeit the inability to foresee, in order to change the assignment purpose of the pasture areas that can be located within the Onshore Section of the Project Area boundaries the necessary procedures shall be carried out within the framework of the provisions of Article 8-f of the Law on the Transit of Petroleum Transit (Law No: 4586).

6.1.3.1 Agriculture and Animal Husbandry

Within the scope of the project, experts from department of Agriculture at Ankara University prepared the Agriculture Report (May 2017). According to this report, the size and characteristics of the fields planned to be used are presented via the official soil maps and the findings identified are summarized. The detailed assessments about the agricultural lands are provided in Section 8.2 (The Size of Disposable Agriculture and Pasture Fields).

6.1.3.1.1 The Size of Irrigated and Dry Agricultural Fields

The status of the land cover of the Onshore Section of the Project and surrounding areas according to CORINE (2012) map, of which Ministry of Forestry and Water Affairs is a shareholder, is provided in Figure6.2. The land area planned to be worked under the project is 785.505,00 m^2 and all of the lands which will be used are state forests. Thus, the land, as a matter of the quality thereof, under the jurisdiction of the Directorate General of Forestry whereby any and all disposition authority belongs to the latter. The forest in the area is defined as a forest of broad leaved trees.

Since there is no land except for state forest in the Onshore Section of the Project, no expropriation as per the Expropriation Law No. 2942 shall be carried out.

According to the agricultural parcel map (Figure6.3) based on the basis of data retrieved from Directorate General of Agricultural Reform, Ministry of Food, Agriculture and Livestock, the numerical data retrieved from the current satellite image, national land cover database and the data (Figure 6.4) retrieved from the CLU (Current Land Use) maps via the Soil Maps Database 1982, Directorate General of Agricultural Reform, the Ministry of Food, Agriculture and Livestock, the nearest agricultural land to the Onshore Section of the Project Area is located approximately 320m south, and the nearest pastoral area is 290m southwest. No agricultural and pasture fields exist in the Onshore Section of Project area.

The alluvial plains, formed by Pabuçdere River, are home to the agriculture in Kıyıköy. According to the data from Ministry of Food, Agriculture and Livestock, dry agricultural fields without fallowing constitutes the majority of the agricultural fields in Kıyıköy.

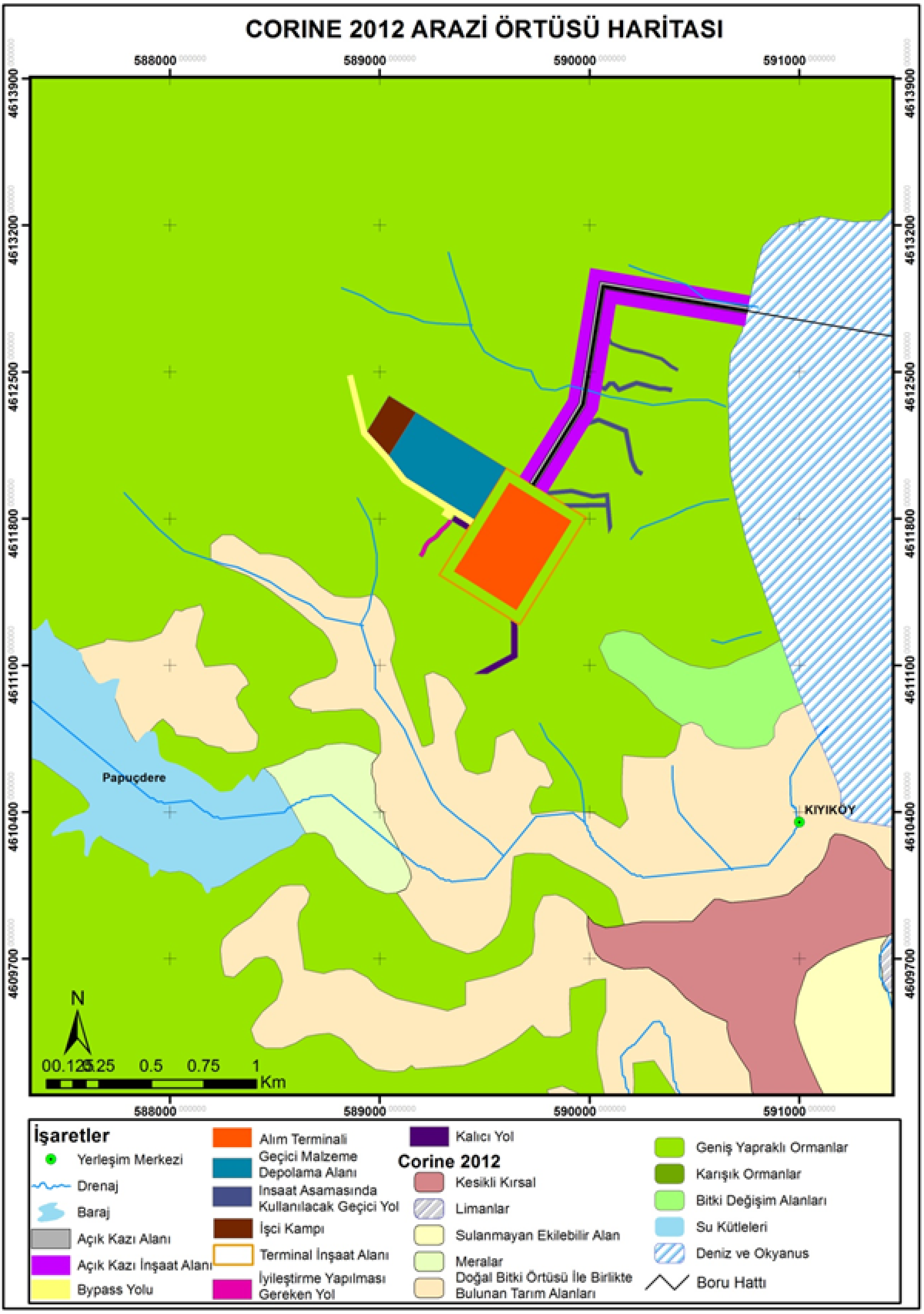


Figure6.2: Onshore Sectionof the Project and Surrounding Area Cover Map (Ref 6.1)

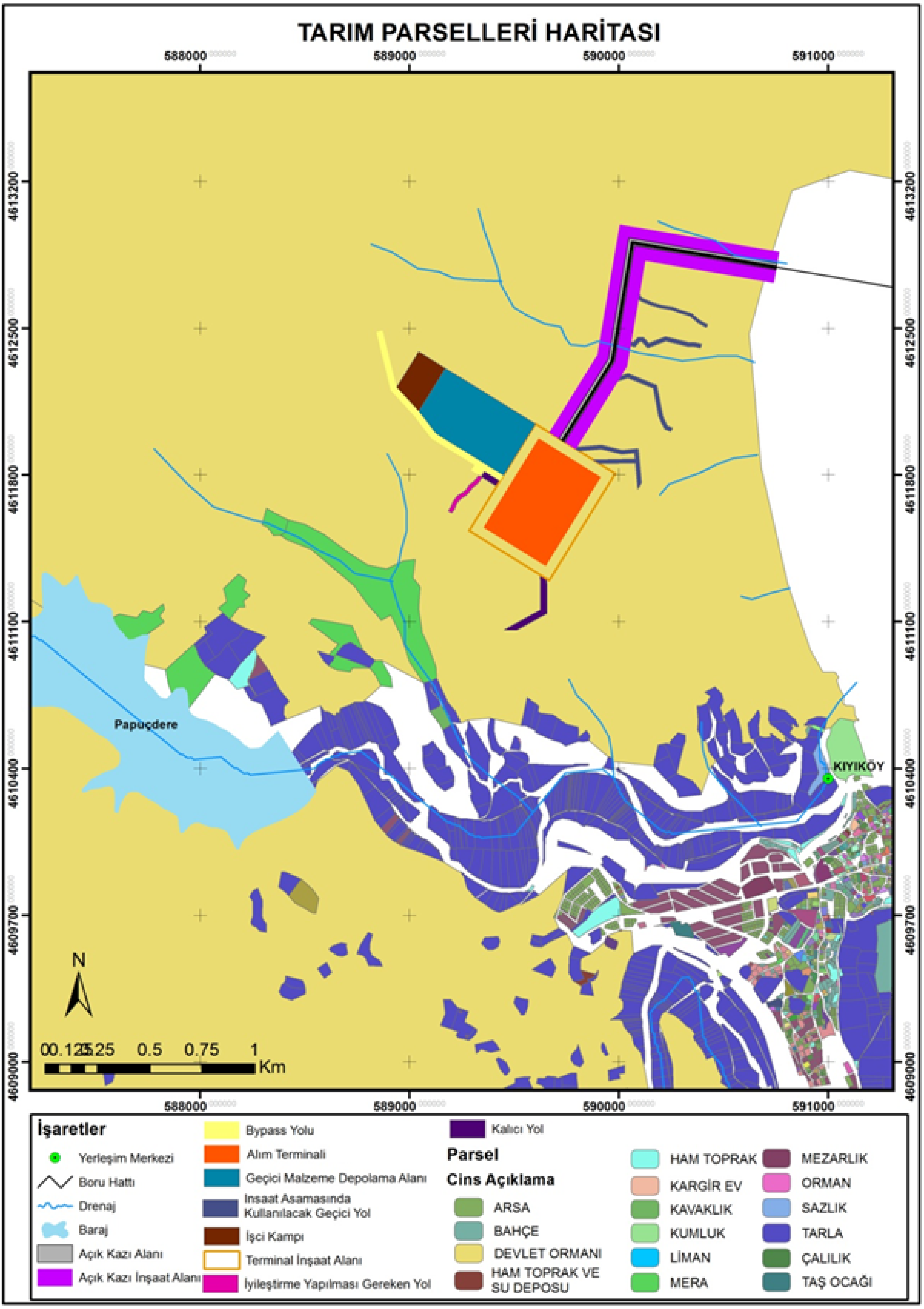


Figure6.3: Map of the Agricultural Parcels in theOnshore Section of the Project and Surrounding Area (Ref 6.1)

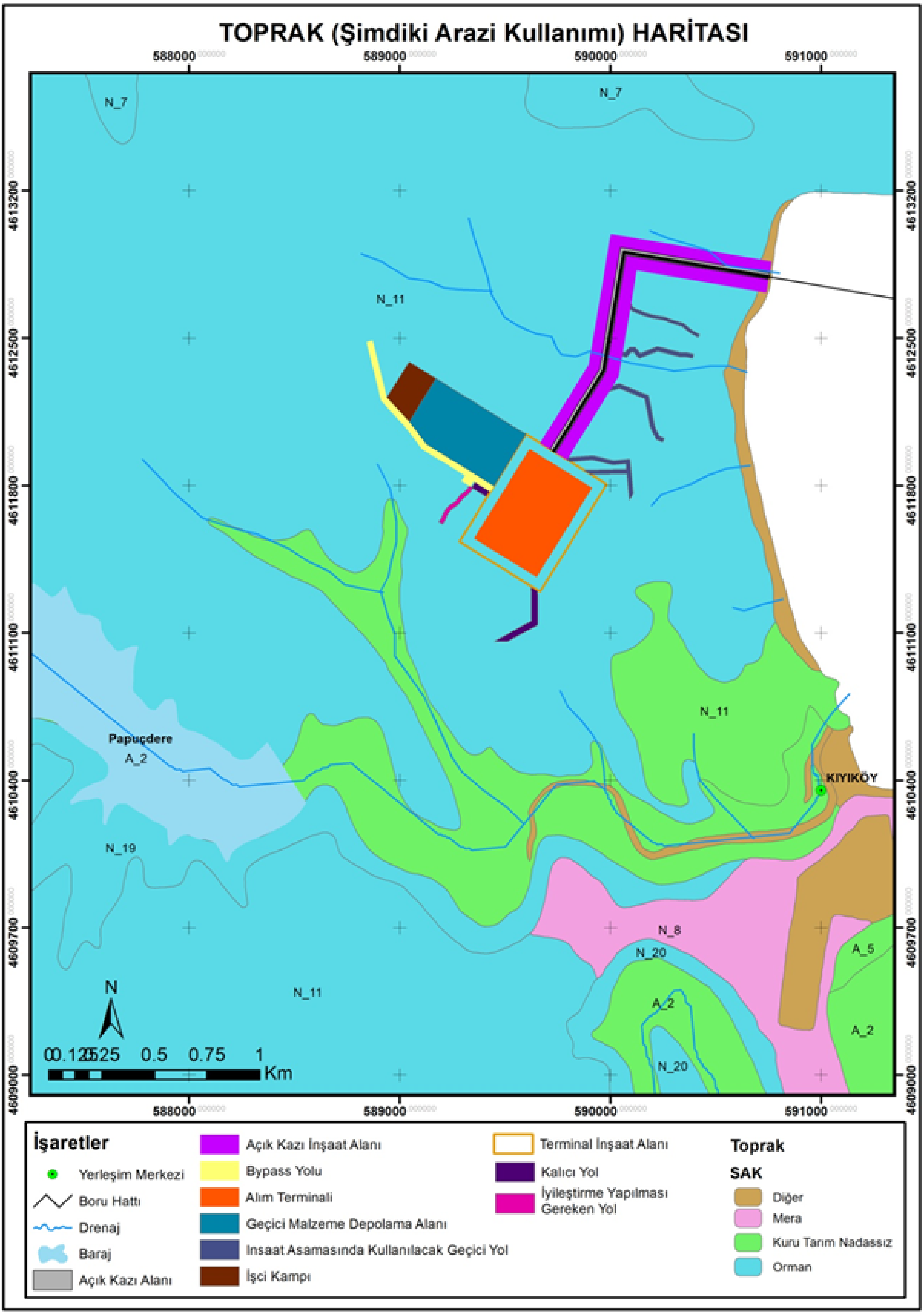


Figure6.4: Map of Current Use of the Field (Ref 6.1)

6.1.3.1.2 The Product Line and Their Annual Production Volumes

According to the data gathered from the Agricultural Report prepared for the project on May 2017, all of the agricultural lands consist of dry agricultural fields, and the crops such as wheat, barley and oats, and oil crops such as sunflower and canola are also cultivated.

According to the 1 / 25.000 Scaled Stand Map (Figure 6.5), the slope of the agricultural areas located in the south of the Project Area Onshore Section and of the pasture area in the south west is approximately 1% and those areas, according to the classification of land use ability are Class 1 Dry Agricultural Land. The assessment of cultivated products and their characteristics reveals that those products will not be affected following the construction of the Project. However, due to the erosion and particularly dust, some short-term and temporary effects may occur during the land works in the construction stage.

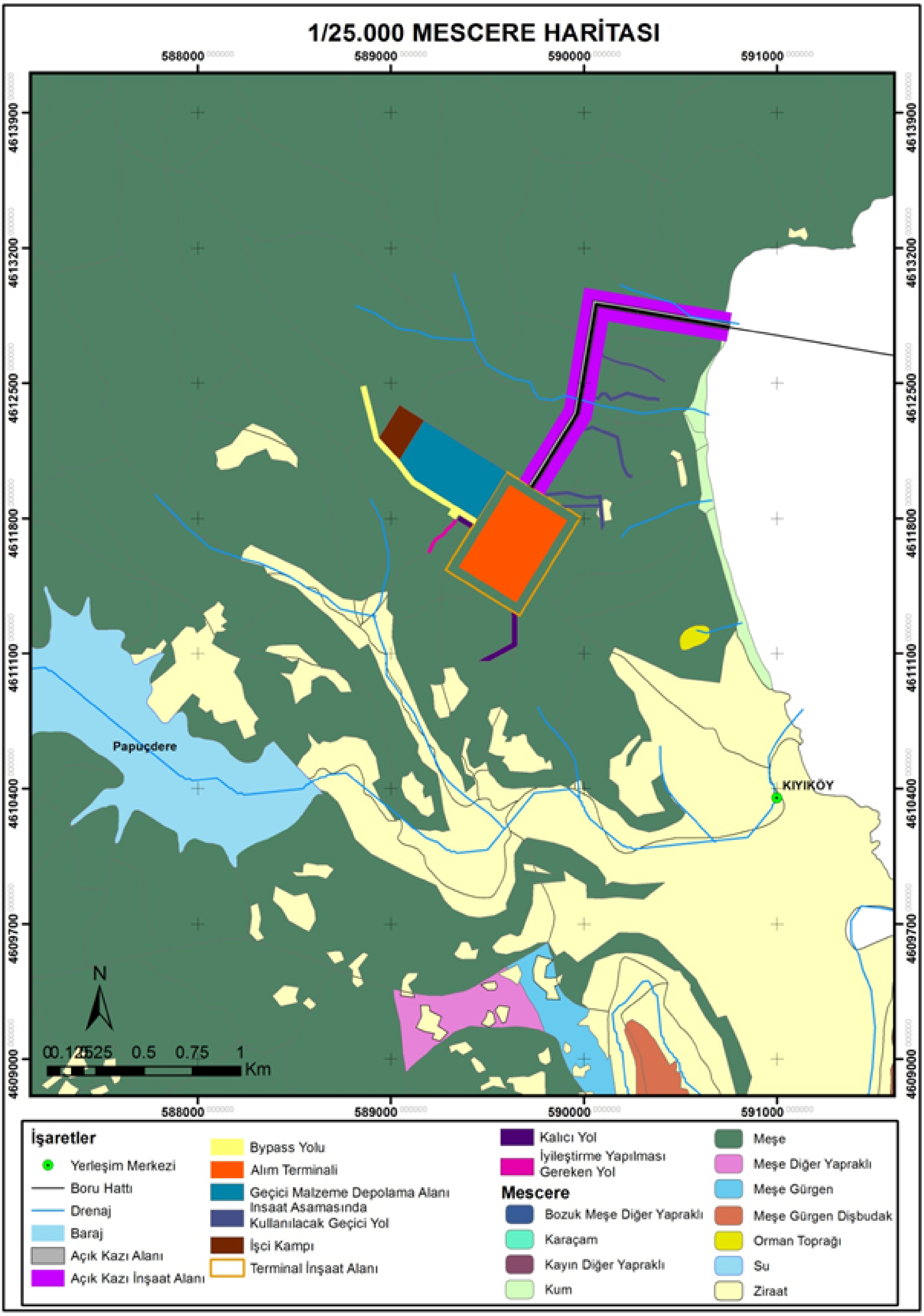


Figure 6.5: 1 / 25.000 Scaled Stand Map (Ref. 6.1)

6.1.3.1.3 Types of Livestock, Numbers and Nutrition Areas

Animal husbandry has an important place in Vize district of Kırklareli province. While all of the bovines are cultivated in the plains of the province; the indigenous breed preserves its importance in the forest villages (Ref. 6.2). By 2016, it is known that 12.552 bovine, 29.800 ovine and 9.280 poultry were produced in the district (Ref. 6.3). The number of livestock by species for the Central and Vize districts of the province of Kırklareli are provided in Table 6.1.

Table 6.1: Kırklareli Province, Central and Vize Districts Number of Animals at Each Age, 2016 (Ref 6.3)

Animal Name	Kırklareli	Central	Vize
Small Cattle	285.908	92.661	29.800
Bovine	143.224	37.088	12.552
Odd-toed (horse, mule, donkey)	1.787	997	53
The number of poultry	295.103	25.383	9.280
Apiculture- Total Hive Number	49.306	8.583	5.098

The number of bovine, ovine and poultry and their production volumes for each age in Vize District Kırklareli Province for 2016 are provided in Table 6.2, Table 6.3, Table 6.4.

Table 6.2: Kırklareli province Vize District, Number of Bovines and Animal Production Volume, 2016 (Ref.6.3)

Animal Species	Mature	Juvenile	Total	Number of Milked Animals (Head)	Milk (tons)
Buffalo	959	243	1.202	605	571.914
Cattle (Cultivated)	5.180	1.320	6.500	3.182	12.432,074
Cattle (Hybrid)	3.180	1.620	4.800	1.806	5.078,472
Cattle (Domestic)	45	5	50	26	33.592

Table 6.3: The Number of Cattles and the Volume of Production in Vize District Kırklareli Province, 2016 (Ref. 6.3)

Animal Species	Mature	Juvenile	Total	Number of Milked Animals (Head)	Milk (tons)	Wool Hair Mohair (tons)
Goat (Hair)	9.700	900	10.600	4.316	410.020	9.520
Sheep (Domestic)	17.400	1.800	19.200	7.280	611.520	30.144

Table 6.4: The Number of Poultry and the Volume of Animal Products in Vize, Kırklareli, 2016 (Ref. 6.3)

	Animal Species	Current Number	Number of Butchered	Coop Meat (tons)	Number of Eggs (1000 Pieces)
Vize	Turkey	450	-	-	-
	Goose	640	-	-	-
	Duck	740	-	-	-
	Laying hen	7.450	-	-	-

Animal husbandry is an important economic income source in the Kıyıköy town. According to the information received from the Kıyıköy Livestock Cooperative, among the socio-economic activities carried out in January-March 2017, animal husbandry activities constitute an economic income source for approximately half of the people in the town. It has been reported that these activities are a side business for a large part of the people who are engaged in animal husbandry activities. According to the information received from the Vize District Food, Agriculture and Livestock Directorate, there are 70 livestock enterprises in Kıyıköy and 24 in Selves region.

Kıyıköy Animal Husbandry Cooperative reported that the vast majority of enterprises operating in the livestock sector throughout the city were engaging with animal husbandry instead of producing animal products.

6.1.3.2 Forest Areas

For the assessment of forest areas within the scope of the project, Forestry Report (May 2017) is prepared by expert Forest Engineers. In this report the findings related to the size and characteristic of the forest areas planned to be used are summarized. The detailed assessments about the forest areas are provided under **Chapter 8** (The Assessment of Areas to be dismissed for the Project).

6.1.3.2.1 Tree Species and Their Amounts or the Area They Cover

The parts of Onshore Section of the Project which falls within the boundaries of the "Midye Forest Ecosystem Based Functional Forest Management Plan", prepared and approved by the Midye Forest Management Chamber to cover the years 2013-2022, involves the plan units 216, 217, 218, 219, 220, 247, 248, 249, 250, and 253. The location of the Onshore Section of the Project on the map of 1/25.000 scaled Midye Forest Management Plan is given in **Annex-8.E**.

The Onshore Section's 783.378,00 m^2 falls within the borders of Kerpice State Forest and there is no property dispute. The ownership of the site belongs to the State Treasury and all disposition authority on these areas rests with the Directorate General of Forestry. The locations of the facilities in the Onshore Section of the Project on Vize/Kıyıköy 1/10.000 scaled Kerpice Forest Cadaster Map are in **Annex-8.C**, details related to the topic are given in Section 8.1.4.

The business functions in the Onshore Section that are mentioned above are defined as "Economic Functional Forests". The definition of the features of the forests included in this function, according to the notes of the Midye Forest Management Plan Notes, are given in detail in the Section 8.1 (Types and Number of Trees to be Cut, Forest Fires and Precautions to be Taken).

According to the plan notes, the forest areas in the Onshore Section that has economic function are in the A and B business class. In summary, in the Onshore Section of the Project, it is observed that there is no stand type to protect and all of the forested parts within the area are allocated for the wood production. Which parts and with which ratios (m^2) the Onshore Section of the Project coincides with the related parts of the Forestry Section of Midye (216, 217, 218, 219, 220, 221, 222, 247, 248, 249, 250 and 251) and the distribution of those areas by stand types can be found in Section 8.1 (Types and Number of Trees to be Cut, Forest Fires and Precautions to be Taken).

6.1.3.2.2 Technical Features of Forest (Closure, Current Increase, Volume per Hectare)

The proscribed Onshore Section of the Project is located between Kırklareli Province, Vize District, Kurt Tepe- Çingene wharf and Kaz Port and is under the responsibility of Forestry General Directorate, Istanbul Regional Directorate of Forestry, Vize Forestry Management Directorate, and Midye (Kıyıköy) Forest Sub-district Directorate.

In the detailed calculation given in the map of Stand Distribution in the Onshore Section of the Project (Section 8.1.4 - Table 8.2), the tree species remaining in the subject area, the total number of trees in the area, and the total volume in the area and the increments by m^3 are given on a division basis. The closure rates according to the types of stands in the Onshore Section of the Project are shown in Stand Distribution Table provided in the Section 8.1 (Types and Number of Trees to be Cut, Forest Fires and Precautions to be taken).

According to the forest management data prepared for the Onshore Section of the Project, there are 57.709 trees with a total volume of 3.691 m^3. The trees in the field are oak and ash species.

In the areas where the actual land density ratios, quantity, closure and volume information are given for the tree species with only economic functions, according to the calculated volume data after the required permissions are given in accordance with the Implementation Regulation of Articles 17/3 and 18 of Forestry Law No. 6381 the valuable asset can be retrieved by the Forest Administration. For the integrity of permission field and facilitation of necessary construction structures, the retrieval of the volume and the evacuation of the area in the Onshore Section of the Project are necessary. All responsibility and disposition related to the forestry products retrieved from the Onshore Section of the Project rests with the Forest Administration. The process of deforestation and how the obtained assets will be assessed will be determined by the Forest Administration. The Project Owner shall provide technical support to the Forestry Administration for the completion of these works and operations and for the evacuation of the site, as well as at least one authorized personnel in the office and planning, on the field of business and operations without the request of the administrator.

6.1.3.2.3 Project Area Stand Map and Interpretation

In the areas in the Onshore Section of the Project, it was seen that there is not any type of stand to protect and all woodland areas within the area were allocated to operate for the requirement of wood raw materials. Which parts and with which ratios (m^2) the Onshore Section of the Project coincides with the related parts of the Forestry Section of Midye (216, 217, 218, 219, 220, 221, 222, 247, 248, 249, 250 and 251) and the distribution of those areas by stand types can be found in Table 8.1 in the Section 8.1 (Types and Number of Trees to be Cut, Forest Fires and Precautions to be Taken). Stand map with 1/25.000 ratio is given above in Figure 6.5.

In the detailed calculation given in the Stand Distribution Table for the Onshore Section of the Project (Section 8.1.4- Table 8.2), the tree species remaining in the subject area, the total number of trees in the area, and the total volume in the area and the increments by m^3 are given on a division basis.

6.1.3.2.4 Whether the scene has seen fire

No fire cases have been found to date in the forested area in the Onshore Section of the Project. The most significant disadvantages of forest areas are resulted from the fact that forest areas are subject to permits and altitudes for non-forestry activities. Continuous intensive and ongoing coastal and natural tourism activities near the forests located in Kıyıköy increase the pressure and threats on the forests and this necessitates a higher level of protection for the natural resources in the region.

Local people living in this area and the people who use the forest area due to various projects (and occasionally those who are in the area for tourism purposes) need to be informed and raise their awareness about forest fires.

Fire sensitive areas and areas of activity will be identified in fighting with forest fires. Necessary measures will be taken in these areas and a "Emergency Action Plan for the Construction Stage of the

Onshore Section Onshore and a Fire Action Plan for the Operation Stage" will be prepared and applied by the Contractor in case of an emergency and the Fire Brigade and the Forestry Administration will be involved in the action plan.

Fire warning systems, wired and wireless communication systems, and observation and recording systems for the surrounding areas will be established for any kind of fire likely to occur within the scope of the Project and these data will be shared instantly with the Forest Administration.

The Forest Administration is the primary attendant in the protection of forests against fires. Yet, in the Onshore Section of the Project and its surrounding areas, the whole responsibility rests with the Project owner. In this regard, all staff working within the scope of the project will be provided with regular training sessions on on-site fire and forest fires.

No uncontrolled burning of any material during the progress will not be permitted in order to avoid any forest fire in the Onshore Section of the Project. Mobile fire extinguishing equipment will be available on construction sites. This equipment shall be procured in accordance with the relevant articles of the "Occupational Health and Safety Law" and routine checks shall be carried out. Additionally, the personnel will be educated on this topic. In spite of these precautions, if a fire breaks out, the fire will be intervened immediately and the nearest fire brigade will be notified.

6.1.3.3 The Assessment of the Fields to be Disposed in the Project Area

6.1.3.3.1 The Current Status, Size and Land Use Ability of Areas to be Disposed

The status of the land cover of the Onshore Section of the Project according to CORINE map (2012), of which Ministry of Forestry and Water Affairs is a shareholder, is provided in Figure 6.2. As stated in the EIA Review Evaluation Form prepared in 05.06.2017 by Vize Forestry Management Directorate and approved by Directorate General of Forestry, Branch Directorate of Permits and Easement (Europe) of Istanbul Regional Directorate of Forestry, the land planned to be used in scope of the Project is 785.505,00 m^2 in total and 783.378,00 m^2 of which is forest area and 2.217,00 m^2 of which is non-forest area and all of these lands are state forests and treasury lands. Thus, the land, as a matter of the quality thereof, under the jurisdiction of the Directorate General of Forestry whereby any and all disposition authority belongs to the latter. The forest in the area is defined as a forest of broad leaved trees.

Since there is no land except for state forest in the Onshore Section of the Project, no expropriation as per the Expropriation Law No. 2942 shall be carried out.

According to the agricultural parcel map (Figure 6.3) based on the basis of data retrieved from Directorate General of Agricultural Reform, Ministry of Food, Agriculture and Livestock, the numerical data retrieved from the current satellite image, national land cover database and the data (Figure 6.4) retrieved from the CLU (Current Land Use) maps via the Soil Maps Database 1982, the nearest agricultural land to the Onshore Section of the Project Area is located approximately 320m south, and the nearest pastoral area is 290m southwest. No agricultural and pasture fields exist in the Onshore Section of Project area.

Lands are categorized according to their ability to be used on agricultural purposes on a scale of one to eight, corresponding the agricultural lands which are cultivated in the best, easiest and most economical manner without erosion, and the lands can be utilized as resting place and a national park by people who cannot be used as grasslands or forests but cannot be used as agricultural landscapes, respectively. The map of Onshore Section of the Project and vicinity major land groups, which is based on data of Ministry of Food, Agriculture and Livestock, Turkey Land Map 1982 data, is presented in Figure 6.6; while the map for the land use ability class of Onshore Section of the Project and its close vicinity, which is formed on the basis of data from Ministry of Food, Agriculture and Livestock, Directorate General of Agricultural Reform, is presented in Figure 6.7.

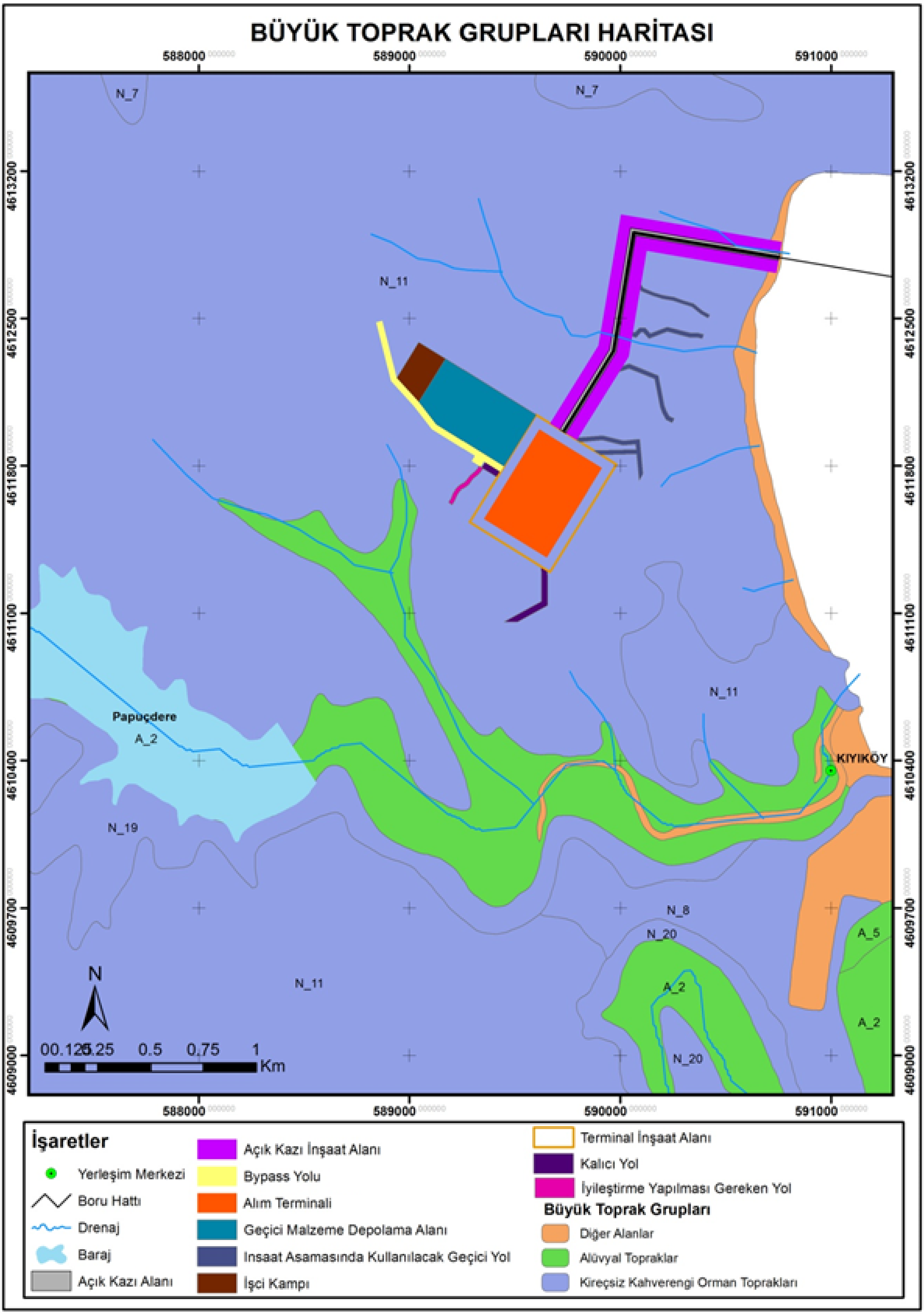


Figure 6.6: Project Onshore Section and Surrounding Major Land Groups Map (Ref. 6.1)

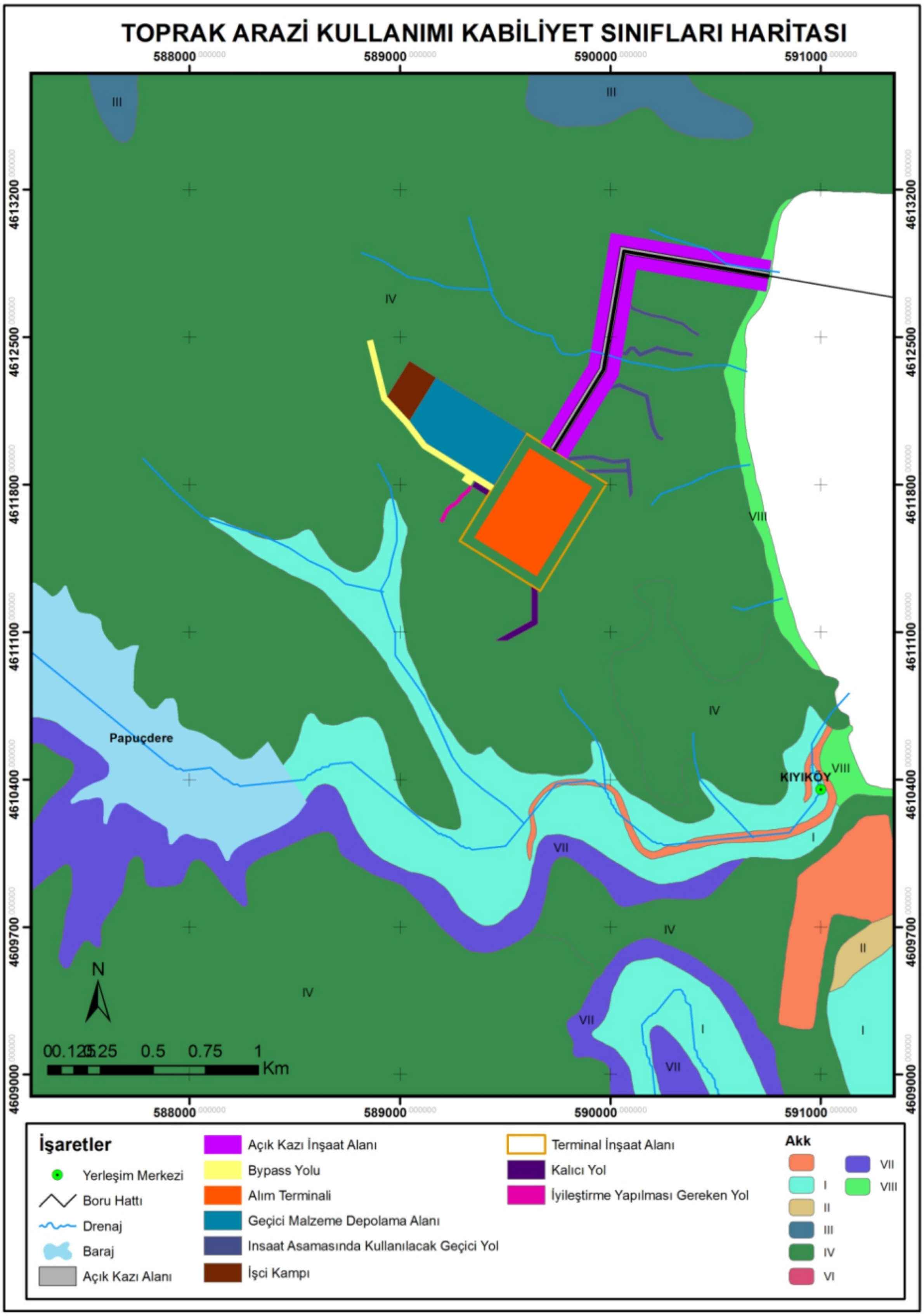


Figure 6.7: The Map for the Land Use Ability Project Onshore Section and Its Vicinity (Ref. 6.1)

6.1.3.3.2 Types and Number of Trees to be Cut During the Project, Forest Fires and Precautions to be Taken (Firstly, alternatives for the transportation of the trees in the project area will be evaluated, if not possible detailed reasons will be given and the deforestation work will be undertaken in line with the opinions of the relevant institution) (***)

The net number of trees to be removed from the Onshore Section of the Project is calculated separately for permanent and temporary areas. The net number of trees to be removed due to the activities to be carried out in the Onshore Section of the Project is 57.709. The number of trees to be cut as a result of activities in the Onshore Section of the Project is 33.867, whereas the number of trees to be cut down for temporary areas (workers' camp, temporary material storage and temporary roads for construction) has been calculated as some 23,842. Detailed information about the trees to be cut in the sections where the temporary areas of Onshore Section of the Project overlaps with the temporary areas are given in Table 8.3 in Section 8.1 (Type and Number of Trees to be cut during the Project, Forest Fires and Precautions to be Taken).

In the areas where the actual land density ratios, quantity, closure and volume information are given for the tree species with only economic functions, according to the calculated volume data after the required permissions are given in accordance with the Implementation Regulation of Articles 17/3 and 18 of Forestry Law No. 6381 the valuable asset can be retrieved by the Forest Administration. For the integrity of permission field and facilitation of necessary construction structures, the retrieval of the volume and the evacuation of the area in the Onshore Section of the Project are necessary. All responsibility and disposition related to the forestry products retrieved from the Onshore Section of the Project rests with the Forest Administration. The process of deforestation and how the obtained assets will be assessed will be determined by the Forest Administration. The Project Owner shall provide technical support to the Forestry Administration for the completion of these works and operations and for the evacuation of the site, as well as at least one authorized personnel in the office and planning, on the field of business and operations without the request of the administrator.

No fire cases have been found to date in the forested area in the Onshore Section of the Project. The most significant disadvantages of forest areas are resulted from the fact that forest areas are subject to permits and altitudes for non-forestry activities. Continuous intensive and ongoing coastal and natural tourism activities near the forests located in Kıyıköy increase the pressure and threats on the forests and this necessitates a higher level of protection for the natural resources in the region.

Local people living in this area and the people who use the forest area due to various projects (and occasionally those who are in the area for tourism purposes) need to be informed and raise their awareness about forest fires.

In fight with the forest fires, fire sensitive areas and areas of activity will be circumscribed, necessary measures will be taken in these areas and a "Emergency Action Plan for the Construction Stage of the Onshore Section and Fire Action Plan for the Operation Stage will be prepared and applied by the Contractor Onshore in case of an emergency, and the Fire Brigade and the Forestry Administration will be involved in the action plan.

Fire warning systems, wired and wireless communication systems, and observation and recording systems for the surrounding areas will be established for any kind of fire that may occur due tothe Project activities and these data will be shared instantly with the Forest Administration.

The Forest Administration is the primary attendant in the protection of forests against fires. Yet, in the Onshore Section of the Project and its surrounding areas, the whole responsibility rests with the

Project Owner. In this regard, all staff working within the scope of the Project will be provided with regular training sessions on on-site fire and forest fires.

No uncontrolled burning of any material during the progress will not be permitted in order to avoid any forest fire in the Onshore Section of the Project. Mobile fire extinguishing equipment will be available on construction sites. This equipment shall be procured in accordance with the relevant articles of the "Occupational Health and Safety Law" and routine checks shall be carried out. Additionally, the personnel will be educated on this topic. In spite of these precautions, if a fire breaks out, the fire will be intervened immediately and the nearest fire brigade will be notified. During the Construction and the Operation Stages of the Project, it is necessary to take all the necessary measures to minimize the damage to the forested area and the surrounding area. For this purpose, during the protection action, not only the Forest Law, but also the Environmental Law, the Coastal Law, the Labor Security Law and all the related regulations and the provisions of the legislation shall be complied with.

The Vize Forest Management Directorate and the Plan Units (Forestry Management Conservancy), to which the Onshore Section of Project is affiliated, are signatories of the International Certification Program (FSC). Thus, all activities are carried out in accordance with the international standards which take into account the nature of least damage and prioritize the social participation. It will be ensured that the standards are followed and the working conditions determined by the Forestry Administration are not violated in the forested areas.

In the mentioned areas relating the activities in the Onshore Section of the Project, the necessary permissions will be taken in accordance with the Article 17 of Forest Law No. 6831 and the permissions taken from the Directorate General of Forestry will not be violated. During the operation stage, when the inspections are made by the Forest Administration to ensure the lands are used on their permitted purpose and no unauthorized use within the permission bounds is taking place, the documents requested, plans and opinions of the other institutions, if any, will be delivered to the Forest Administration at the requested times.

6.1.3.3.3 Natural Plant Species to be Affected and the Size of Area to be Used

As a result of the ecological studies carried out in the Onshore Section of Project, the flora of the area has been determined and an assessment has been made of the potential effects on flora species. The findings of ecological studies are given in detail in **Chapter 7** (Assessment of Biological Environment).

The land planned to be used in scope of the Project is 785.505,00 m^2 in total and 783.378,00 m^2 of which is forest area and 2.217,00 m^2 of which is non-forest area and all of these lands are state forests and treasury lands. - Thus, the land, as a matter of the quality thereof, under the jurisdiction of the Directorate General of Forestry whereby any and all disposition authority belongs to the latter. The forest in the area is defined as a forest of broad leaved trees. According to the forest management data prepared for the Onshore Section of the Project, there are 57.709 trees with a total volume of 3.691 m^3. The trees in the field are oak and ash species.

6.1.3.3.4 Status of Cultural and Natural Assets in the Project Area

Thrace is considerably rich in historical structures and stone houses. Edirne, Enez, Ereğli on Marmara, central Kırklareli and the district of Vize are the foremost locations regarding archaeology-tourism in the area.

According to the information obtained from the "Kırklareli Cultural Assets Inventory" web site prepared by Kırklareli Provincial Culture and Tourism Directorate with the Project Support of Thrace

Development Agency, detailed information about the archaeological sites and monuments in and around the Shore Crossing and Onshore Sections of the Project Area is given in Section 9.6 (Cultural Heritage and Archeology). The locations of archaeological sites and monuments according to the Project Area are given in Figure 6.8. According to E20-d4 numbered sheet of 1/25.000 scaled Environmental Plan provided by the formal letter dated 30.01.2017, numbered 81158300 and issued by Sub-directorate Responsible for the Protection of Natural Assets, Kırklareli Provincial Directorate of Environment and Urbanization, there are areas identified as historical site, archaeological site and mixed site within the immediate proximity of the Project (Figure 6.9). Regarding these areas, in the opinion letter dated 25.05.2017, which contains the findings of the field trip of the Kırklareli Provincial Culture and Tourism Directorate and Edirne Regional Council for the Preservation of Cultural Assets (**Annex-5.A**); "*Outside of the pipeline route, the necropolis area and the church remains were found in the project area. It is for this reason that no interventions are deemed required in the area the coordinates of which have been specified in the attachment to this letter. No immovable cultural assets have been found outside of the said coordinates, inside the Project site, which need to be protected. Thus, there are no concerns regarding the implementation of the 'TurkStream Gas Pipeline - Offshore Section' Project under the condition that activities are halted in the event of encountering any artifacts or remains during activities, which fall in the scope of the Law No. 2863, and that the closest Administrative Office or the Museum Directorate is notified (Article 2863 of the Law No 2863).*"

In the opinion letter issued by Ministry of Forestry and Water Affairs, Directorate General for Nature Conservation and National Parks on 27.05.2017, it is stated that the Project Area is not within any statutory area declared by the General Directorate and that it is appropriate for the General Directorate to carry out the Project within the specified coordinates.

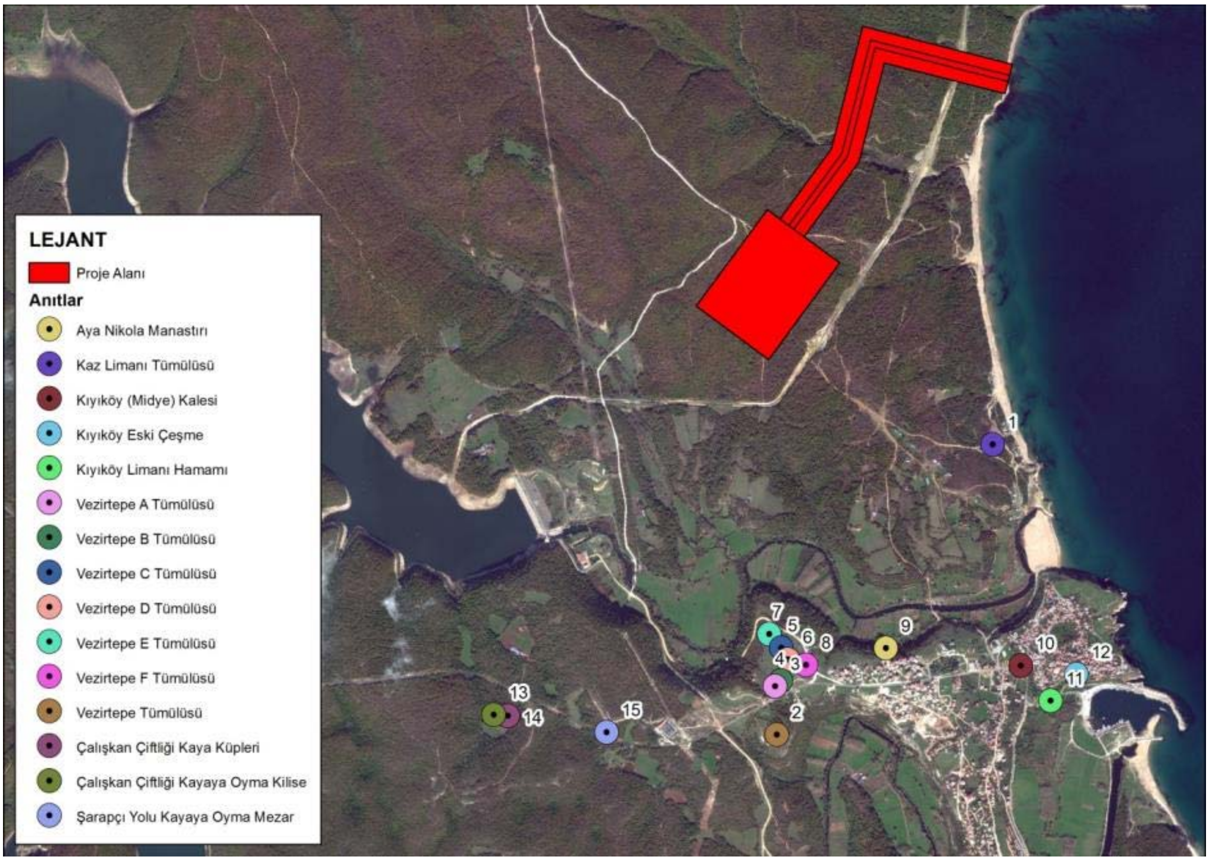


Figure 6.8: Archaeological Sites and Monuments in the Onshore Section and Surrounding Area

In addition, in the opinion letter issued on 03.07.2017 by the Ministry of Environment and Urbanization, Directorate General for Preservation of Natural Heritage, it is stated that "According to the studies conducted concerning the Project, the Project area does not fall under the boundaries of the Specially Protected Environment Areas. It is stated in the letter, dated 30.06.2017 and 2570 numbered, of the Kırklareli Governorate (Provincial Directorate for Environment and Urbanization) that there are no registered Natural Sites and Landscapes inside the coordinates given in the EIA Report. In this scope, there are no subjects to be added by our Ministry (Directorate General for Preservation of Natural Heritage)".In the opinion letter on the existence of the natural assets or natural protected areas, issued by Provincial Directorate of Environment and Urbanization in Kırklareli on 24.05.2017, it is stated that no records are found in the archives of the Directorate that the Project Area is within the boundaries of natural assets or natural protected areas in Kırklareli province.

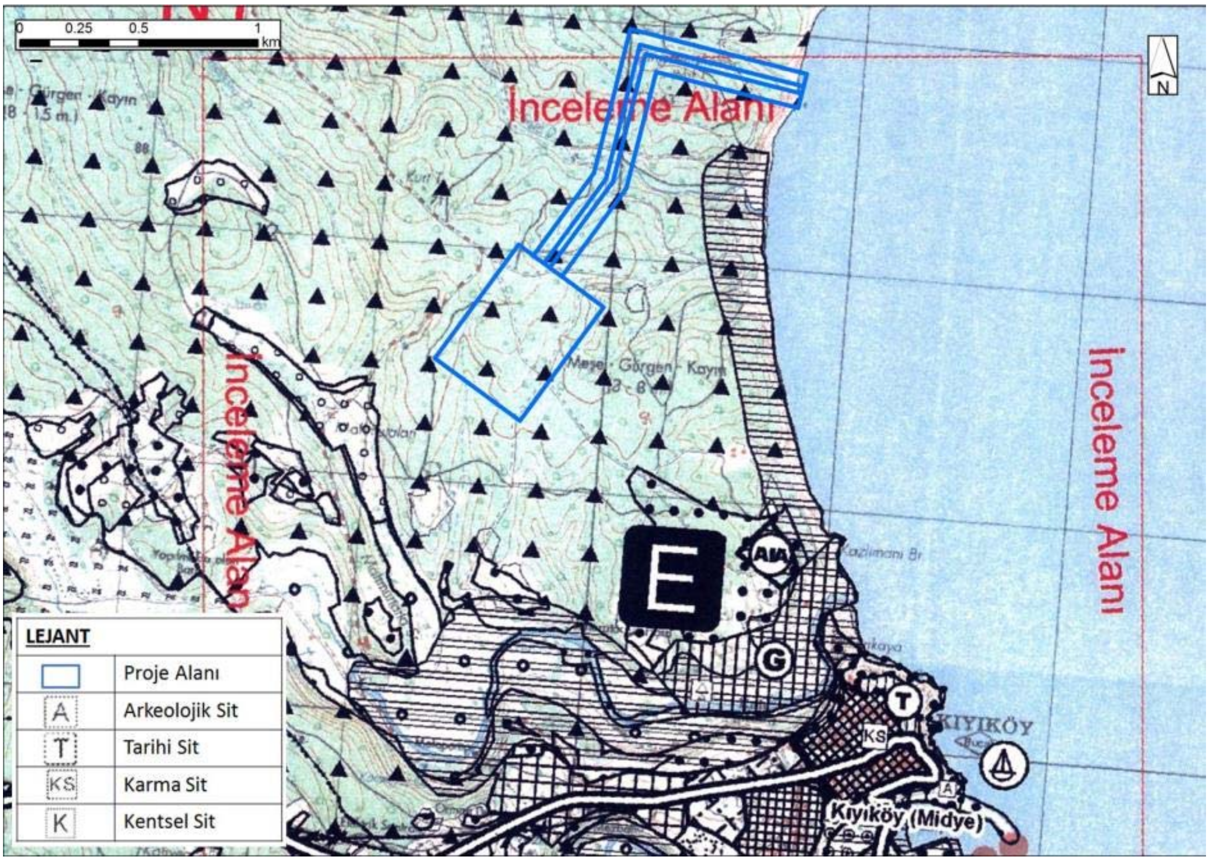


Figure 6.9: Historical, Archaeological and Mixed Sites in the Immediate Proximity of the Project within Kırklareli Provincial Special Administration

6.1.3.3.5 Impacts and Measures to be Taken During the Project (Land preparation, construction, operation and post-operation)

The map of Boundaries of Micro-Basins and Elevation in the Onshore Section of the Project and Its Vicinity, prepared for the Agricultural Report in May 2017 within the scope the project, is used as the base for the 1/25,000 scaled topographic map by General Command of Cartography and given in Figure 6.10. Accordingly, the Onshore Section of the Project is located within three different micro basin boundaries.

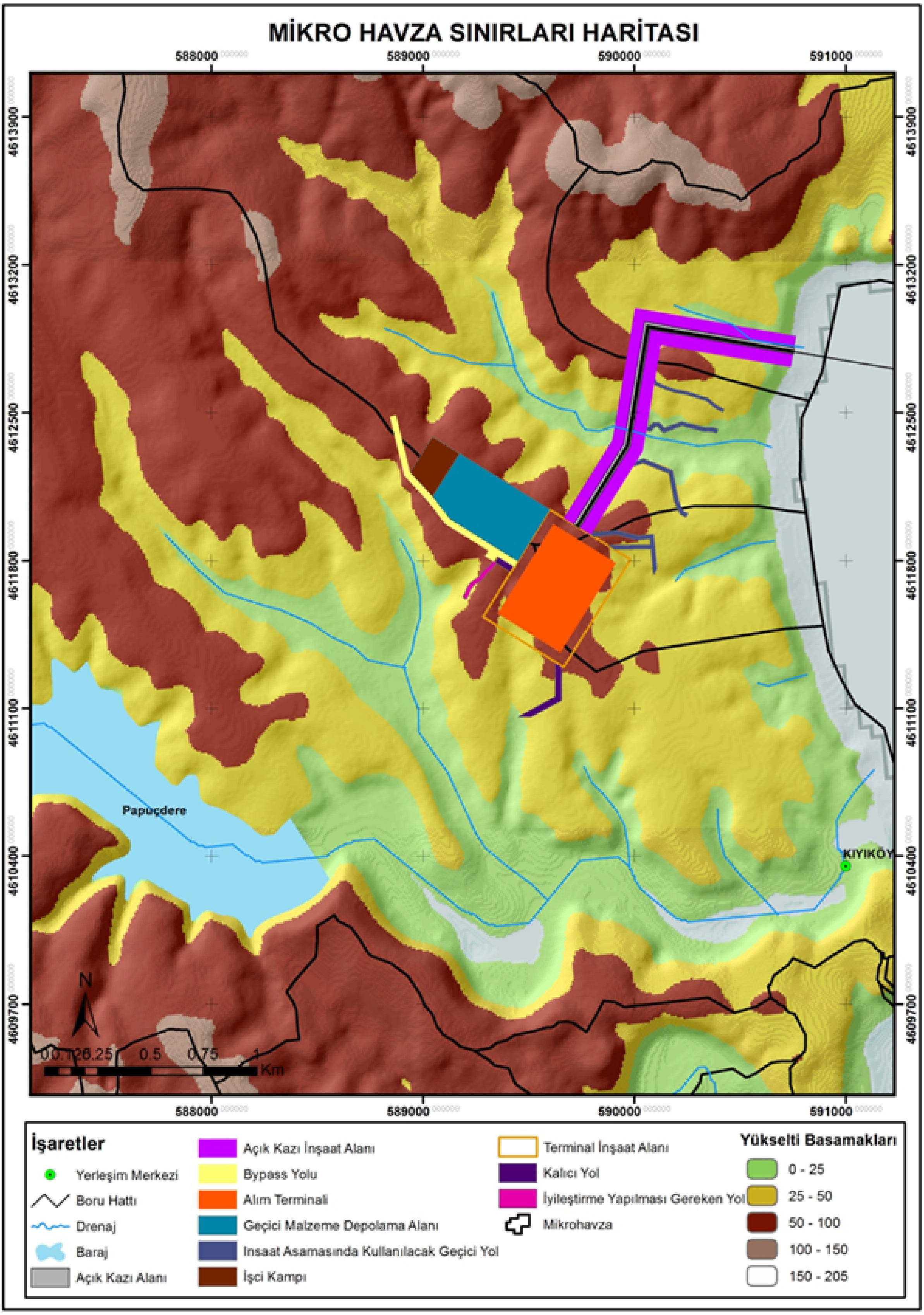


Figure 6.10: Micro-Basin Boundaries and Elevation Map

The agricultural and pastoral areas in the micro basin, which is located at the south of the area, are closer than 500 m to the Onshore Section. Sediments to be transported during the construction work; land stripping and liquidation operations have the potential to pollute the agriculture and pastoral areas. In addition, if necessary precautions are not taken pollution and sedimentation may bare a risk for ecological deterioration as the natural waterways are connected to the sea.

Pabuçdere, which passes through the south of the Onshore Section of the Project, is used as drinking water reservoir for Istanbul (Ref. 6.4.). As can be seen in Figure 6.10 above, the micro basin feeding this brook is located within the Onshore Section of the Project. Therefore, in case of an uncontrollable sedimentation and pollution in the Onshore Section of The Project the following measures will be taken within the scope of the Project.

In the construction stage, the surface soil (vegetation, fertile soil layer) and subsoil will be carefully scratched and necessary precautions will be taken to keep them separately intact. Long-term possible erosion and sedimentation will be prevented through the rehabilitation/planting to be carried out after the completion of the construction activities. Re-planting activities will also contribute to the rehabilitation of the natural balance around the Onshore Section and soil rehabilitation at a significant level.

Additionally, to prevent surface flows, to reduce the problems caused by the flow of dust or sludge from the surface of bare soil, to reduce the transportation of sediments to downstream areas, to bolster the drainage, to improve the scene of the construction site and to prepare the Onshore Section of the Project, to ensure the ground and slope stability hydro seeding (seed water spraying), steel grid wire mesh systems and/or erosion felts (polyester nets, for bevel control and prevention of erosion) will be used in bevels and slopes.

During all stages of the project, the Law on Soil Preservation and Land Utilization No. 5403 and the Law on Pastures No. 4342 and the legislation related to these laws will be followed.

In addition to the above-mentioned precautions carried out by the Project Owner, the supporting mechanical soil protection measures (terraces, trenches, ditches, etc.) shall be designed and realized in detail for each slope where deemed necessary. Thus, any possible sedimentation will be prevented.

In addition to the measures set out above, the application of measures in Section 8.5 is intended to minimize the potential impacts of Onshore the pre-construction preparations and construction activities to be undertaken in the Onshore Section of the Project.

No significant impact is expected during the operation and post-operation stages of the project.

6.2 Soil Properties (Onshore Section)

6.2.1 Classification of Soil Structure and Land Use Capability

Lands are categorized according to their ability to be used on agricultural purposes on a scale of one to eight, corresponding the agricultural lands which are cultivated in the best, easiest and most economical manner without erosion, and the lands can be utilized as resting place and a national park by people who cannot be used as grasslands or forests but cannot be used as agricultural landscapes, respectively.

Within the scope of the Agricultural Report prepared for the project in May 2017, all the lands in the Onshore Section of the Project falls into the 4th grade of soils according to the Land Use Capability

Classification. The characteristics of these properties are evaluated according to the "Technical Instruction on Soil and Land Classification Standards and Related Legislation"[1] as follows;

4th Grade Land: The fourth-grade lands are a land class that is particularly suitable for permanent meadows. Field crops can occasionally be grown as well. Excessive gradient, erosion, poor soil characteristics and climate are limiting factors for agriculture on this class of land. The less inclined soils with poor drainage are also included in the fourth class. They are not exposed to erosion, but they are not suitable for growing many products as they suddenly dry up in the spring and are not fecund too much. In semi-dry regions, application of alternation systems containing legumes is usually not possible on the fourth-grade lands due to the climate.

All of the soils in the Onshore Section of the Project are included in the large soil group of non-calcareous brown forest soils and their characteristics are evaluated as follows according to the "Technical Instruction on Soil and Land Classification Standards and Related Legislation".

Non-calcareous Brown Forest Soils: In these soils there is a dark colored layer above and a slightly different layer below. The soil is lime-free and the reaction is acid, neutral or alkaline. Their natural efficiency is not so much.

Detailed information on land use capability categories and soil structure according to the map of land groups and land use capability categories of the lands in the Onshore Section of the Project and Its Surrounding Area, which is based on the digital soil database (Ministry of Food, Agriculture and Livestock Turkey General Land Map, 1982), is presented in **Chapter 8** (The Assessment of Areas to be Dismissed for the Project).

6.2.2 Slope Stability

Within the scope of the Agriculture Report prepared in May 2017 for the Project, the topographical structure of the Onshore Section of the Project was analyzed with the help of Digital Elevation Model and Geographic Information Systems and the slope map of the region [2] was prepared (Figure6.**11**). Accordingly, the average slope, including roads in the Onshore Section of the Project Area, was observed to be 4.31 degrees. The areal distributions of the slope grades of the Onshore Section are given in Table 6.5.

Table 6.5: Slopes and Their Spatial Distributions according to Grades in the Onshore Section of the Project Area

Slope Degree	Area (m^2)
0 - 2	335,300
2 - 5	242,300
5 -10	121,100
10 - 15	53,200
15 - 20	21,100
20 – 21.7	12.500

[1] Technical Instruction on Soil and Land Classification Standards and Related Legislation. Ministry of Agriculture and Rural Affairs, General Directorate of Agricultural Production and Development, 2008.

[2] The 1/25,000 scale topographic map surveyed by the General Command of Cartography has been used as a base for the "Slope Map for the Onshore Section of the Project and Its Vicinity".

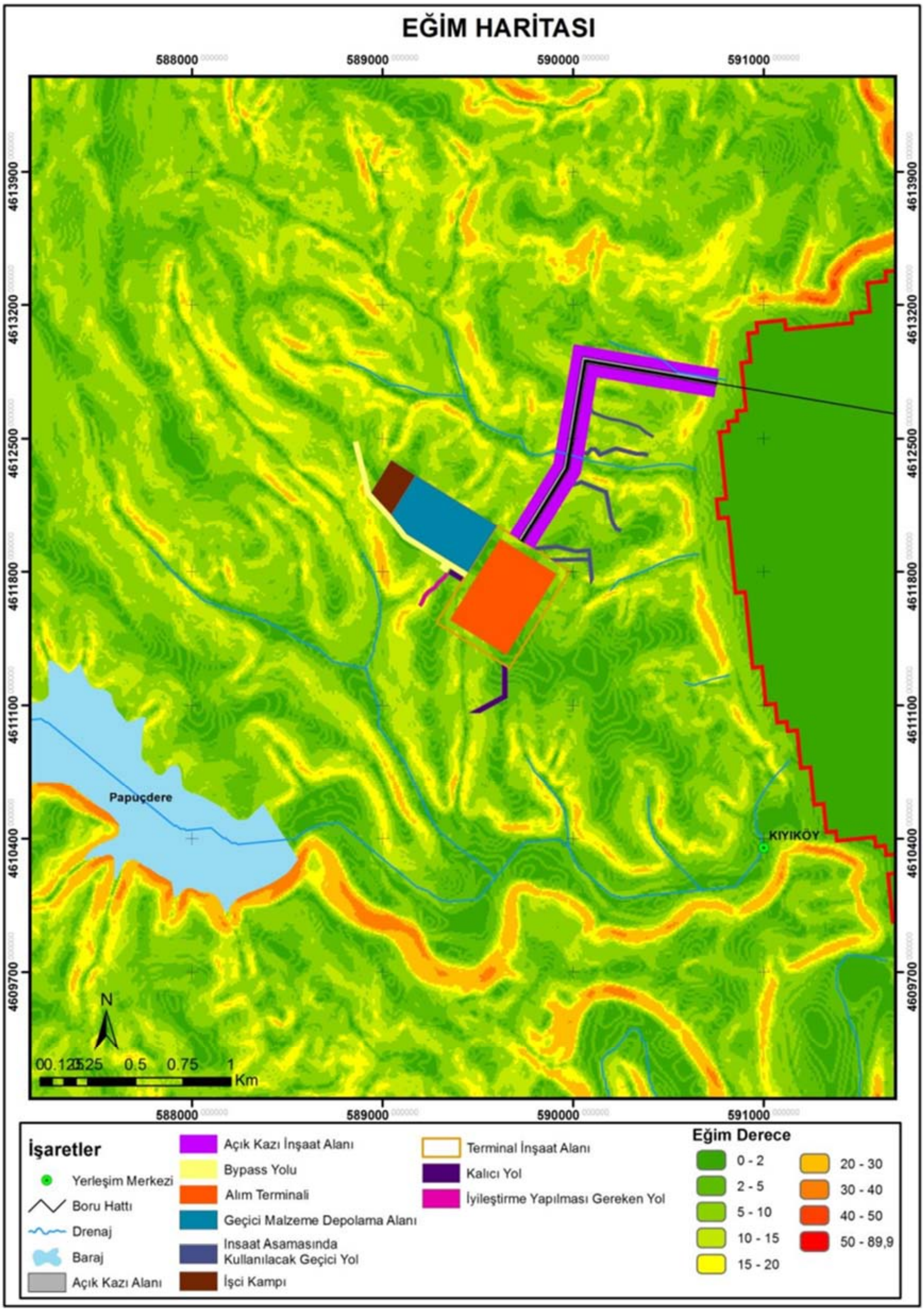


Figure6.11: Project Onshore Section and Surrounding Area Slope Map (Ref 6.1)

The plant soil and vegetation cover on the main rock will be stripped and land excavation and landfilling activities will be carried out after the fencing around the construction site where the units to be built for the project will be planted (Receiving Terminal and temporary storage area). The temporary storage area to be used for storage of vegetable and excavated soil, equipment and other materials will be restored after construction works. A problem is not expected in terms of slope stability during and after construction works, as the slope stiffening is less than 15 degrees in the whole of the Receiving

Terminal and temporary storage area and the land can be leveled with the excavation and filling activities.

6.2.3 Erosion

In the Agriculture Report prepared for the Project in May 2017, erosion-induced soil losses in the Onshore Section were estimated as real (prior to construction works) and potential (during construction works) soil losses by the USLE/RUSLE methodology.

USLE/RUSLE erosion estimation technology is a reliable universal method which is used for the Maps of Development of Sediment Model and of Erosion Risk in Turkey Project (Ref. 6.1). The equality and equality parameters used in the method are as follows.

$$A = RxKxLxSxCxP \qquad [1]$$

Here,

A: Annual soil loss (t $ha^{-1}y^{-1}$)

R: Precipitation Erosion Factor (MJ mm ha^{-1} $hour^{-1}y^{-1}$);

K: Soil Erosion Sensitivity Factor (t ha hour ha^{-1} MJ^{-1} mm^{-1});

L: Slope length multiplier;

S: Tilt multiplier

C: Product and product management numerical multiplier;

P: Soil conservation methods numerical multiplier

In Equation [1], only variables R and K have units and other variables are lack of units. As a result, the product of the annual R and K factors is obtained by the soil loss (A) "t ha^{-1} y^{-1}" units.

According to the findings of the Agricultural Report prepared in May of 2017, the depth of the field varies around 20-50 cm depth and is classified as shallow. Considering the soil formation process, when the average duration for development of an average soil profile (150 cm) in semi-arid conditions is taken as 2,000 years, the amount of recommended allowable soil loss for the application of soil, topography, water and plant protection methods is about 5 t ha^{-1} y^{-1}.

Real and potential soil loss maps are given at Figure 612 and Figure 6.13 respectively; while at Table 6.6 and Table 6.7, respectively, the spatial distributions of real and potential soil losses are provided.

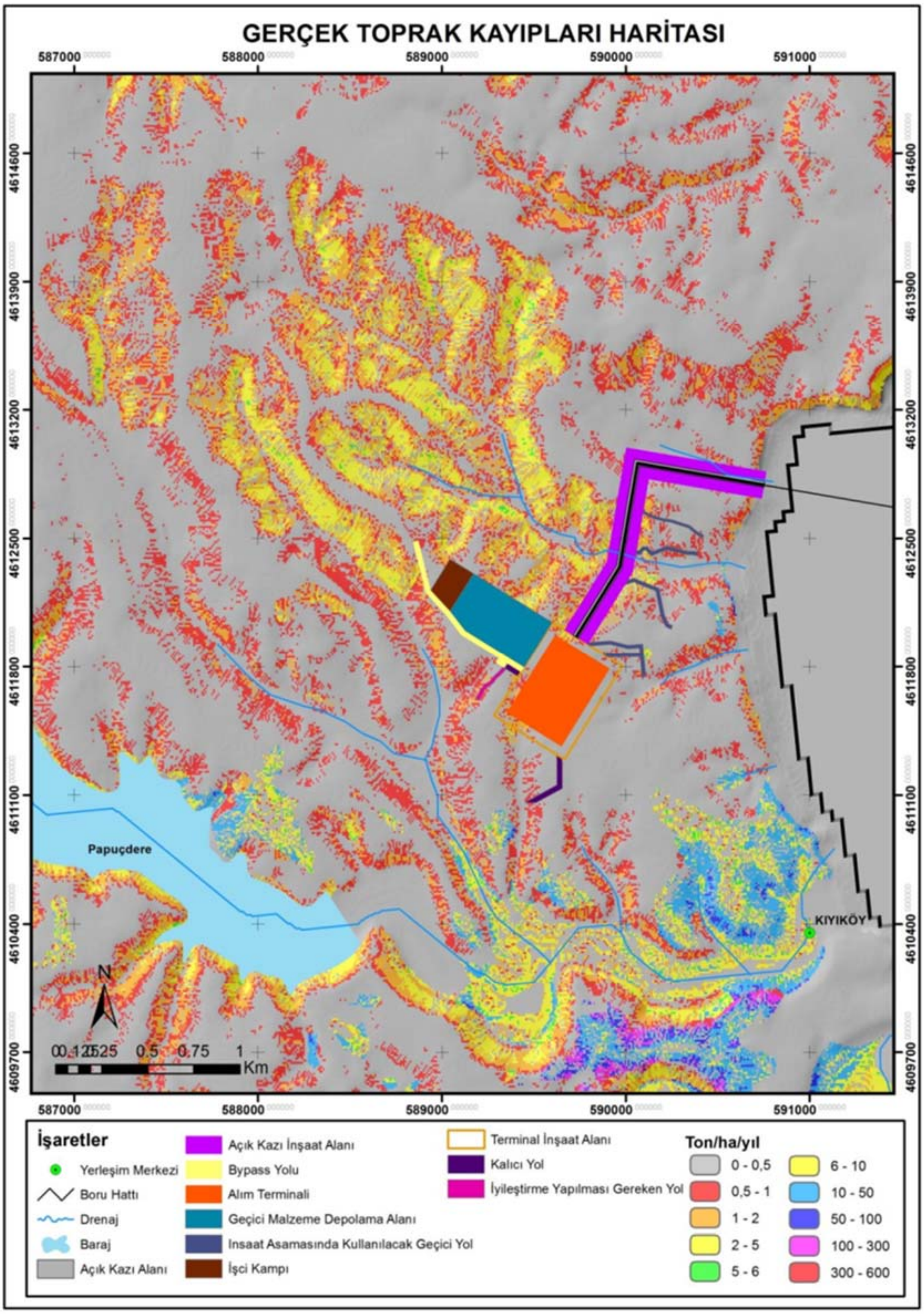


Figure 6.12: Real (Prior to Construction Works) Map of Soil Losses (Ref. 6.1)

Table 6.6: Spatial Distribution of Real Soil Losses (Prior to Construction Works)

Erosion Grade ($t\ ha^{-1}\ y^{-1}$)	Area (m^2)
0 - 0,5	465,700
0.5 - 1	252,600
1 -2	54,600
2 - 5	10,700
6 – 9.3	1,900

Real soil losses illustrate the soil losses under current conditions in quantity (prior to construction works). In the current conditions, in the areas where the construction activities are carried out in the Onshore Sections, the average actual soil loss is 0.56 $t\ ha^{-1}\ y^{-1}$ on average, considering the entire construction site, including the roads. In this case, prior to the construction activities, when profile development and soil depth are taken into consideration, it has been determined soil losses are above the permissible limit value of 5 $t\ ha^{-1}\ y^{-1}$ at the 0.24% of the Onshore Section.

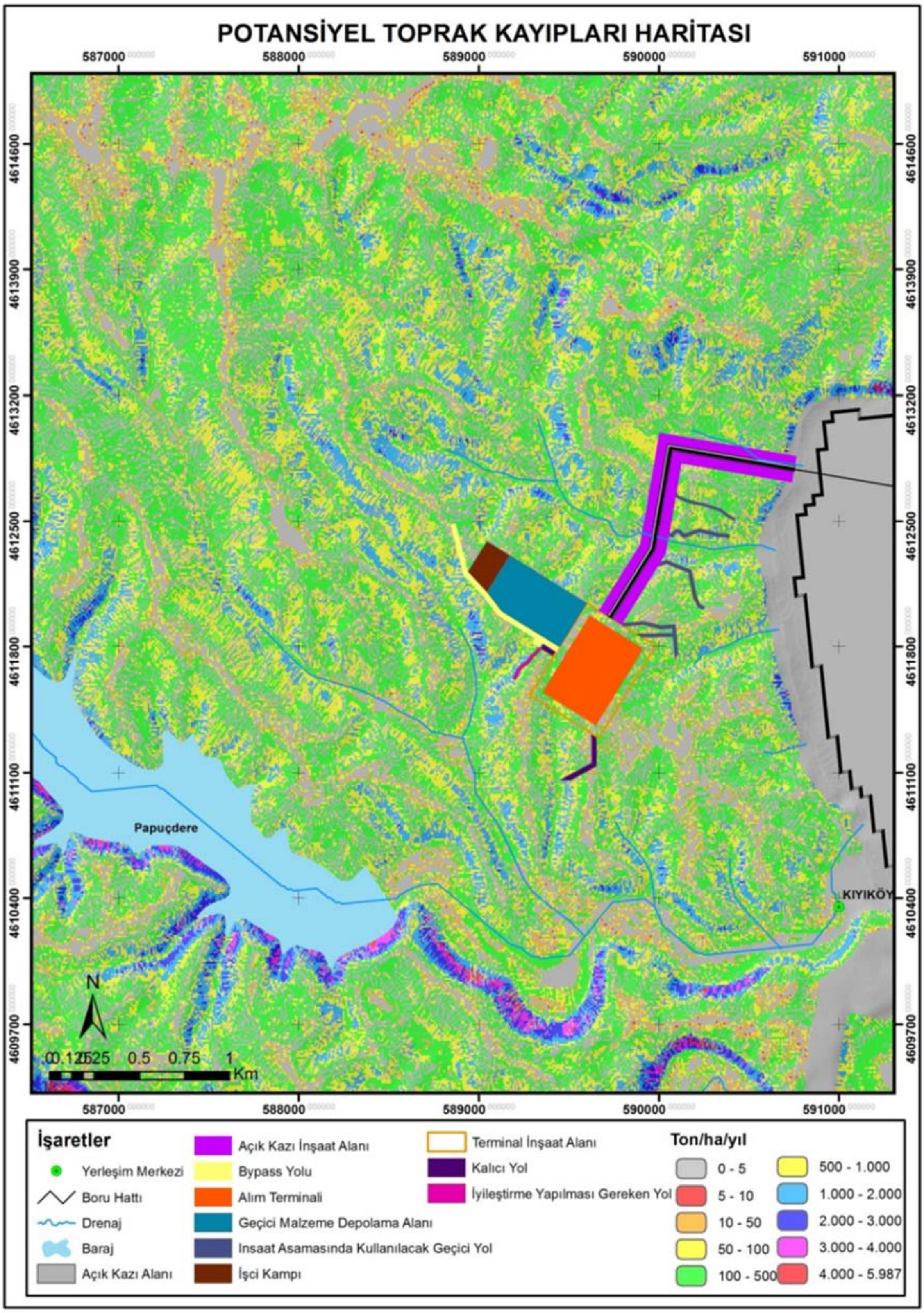


Figure 6.13: Potential (During Construction Works) Soil Loss Map

Table 6.7: Spatial Distribution of Potential Soil Losses (During Construction Works)

Erosion Grade (t ha^{-1} y^{-1})	Area (m^2)
0 - 5	335,100
5 - 10	187,500
10 - 50	160,500
50 - 100	41,300
100 - 500	37,200
500 - 1000	15,600
1000 – 2050.9	8,300

The soil loss that occurs in the whole Onshore Section, including roads and vegetation coverings, resulted from the construction activities forms potential soil losses. The average potential loss of soil in the Onshore Section will be 48.40 t ha^{-1} y^{-1}. In this case, 57.34% of the Onshore Section, 45.04 ha, is above the permissible value of 5 t ha^{-1} y^{-1}, during the construction works. These losses will be tried to be reduced by the mitigation measures detailed in Section 6.2.5 below and described in detail in Section 8.5 (Impacts and Measures to be taken during the Project).

6.2.4 Reservoir Sedimentation

The transportation of sediments is extremely important in terms of reservoir safety. Within the framework of Agricultural Report prepared in May 2017 for the project, under the current circumstances (prior to the construction works) the ratios of sediment scraped by erosion to rivers, regarding the Onshore Section including the roads, are given in Table 6.8, and assessed as demonstrated in Figure 6.14.

Table 6.8: Spatial Distribution of Soil Losses Reaching to the Rivers According to Classes

Erosion Grade (t ha^{-1} y^{-1})	Area (m^2)
0 – 0.5	527,900
0.5 - 1	156,400
1 - 2	84,800
2 – 3.6	16,400

According to this, 67.21% of the Onshore Section has an average of 0.54 t ha^{-1} y^{-1} sediment transported to rivers.

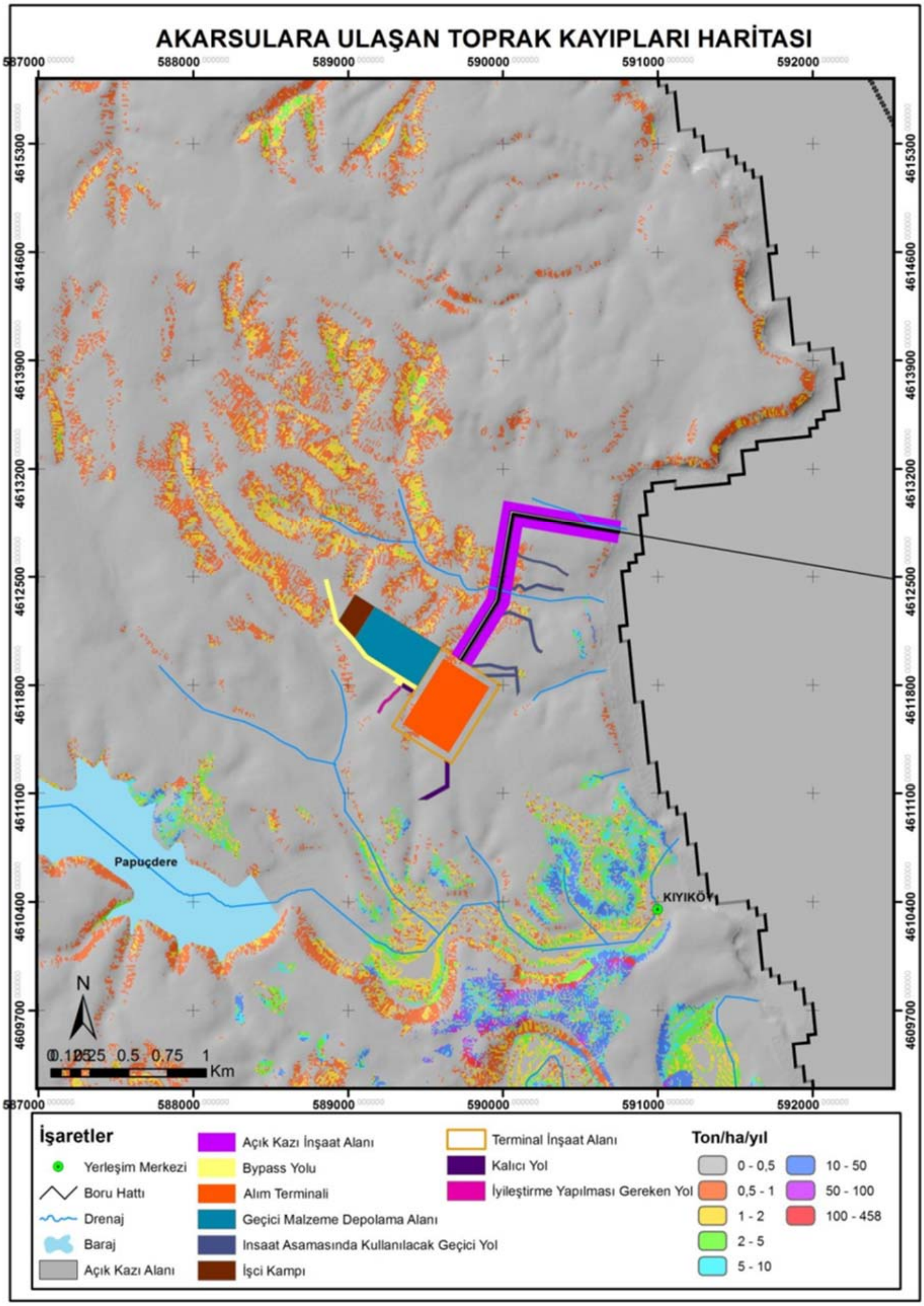


Figure 6.14: Map of Soil Losses Reaching Rivers (Ref.6.1)

6.2.5 Impacts of the Works and Operations within the Scope of the Project on the Soil and Measures for Controlling and Reducing Them (Construction, Operation and Post-Operation)

With the measures presented in **Chapter 8** (Evaluation of Areas to be Dismissed from the Project), it is anticipated to reduce the effects of the Project by taking the following measures.

The planned management of soil and soil batches is of utmost importance to reduce the transportation of sediments. During the construction works, in order to carefully peel off the surface (vegetative layer, fertile soil layer) and subsurface soil with suitable equipment and to preserve them separately without deterioration, all kinds of excavation slopes and filler sections must be trenched around, erosion and sedimentation must be reduced to a great extent by the plantation of the slopes of excavation and fillings. In addition, necessary precautions should be taken in the river systems and micro-basins to prevent the erosion and sediment, which may be resulted from the construction works from, reaching other basins and reservoirs. Long-term possible erosion and sedimentation will be prevented through the rehabilitation/planting to be carried out after the completion of the construction activities. Re-planting activities will also contribute to the rehabilitation of the natural balance around the Onshore Section and soil rehabilitation at a significant level.

In accordance with the Soil Protection and Land Utilization Law numbered 5403, the Soil Conservation Project will be prepared and implemented within the scope of the related legislation, including the prevention of the deterioration of the natural structure of the waterways, the directing of surface flows in a controlled way to the waterways, and the scavenging and terracing activities in the construction sites where excavation activities are to be carried out. In addition to the above-mentioned precautions carried out by the Project Owner, the supporting mechanical soil protection measures (terraces, trenches, ditches, etc.) shall be designed and realized in detail for each slope where deemed necessary. Thus, any possible sedimentation will be prevented.

Additionally, to prevent surface flows, to reduce the problems caused by the flow of dust or sludge from the surface of bare soil, to reduce the transportation of sediments to downstream areas, to bolster the drainage, to improve the scene of the construction site and to prepare the Onshore Section of the Project, to ensure the ground and slope stability hydro seeding (seed water spraying), steel grid wire mesh systems and/or erosion felts (polyester nets, for bevel control and prevention of erosion) will be used in bevels and slopes.

In the Onshore Section, uncontrolled burning of any material will not be allowed in order to avoid any forest fire at the construction and operation and post-operation stages of the Project. Mobile fire extinguishing equipment will be available on construction sites. This equipment shall be procured in accordance with the relevant articles of the "Occupational Health and Safety Law" and routine checks shall be carried out. Additionally, the personnel will be educated on this topic. In spite of these precautions, if a fire breaks out, the fire will be intervened immediately and the nearest fire brigade will be notified. During all stages of the project, the Law on Soil Preservation and Land Utilization No. 5403 and the Law on Pastures No. 4342 and the legislation related to these laws will be followed.

6.3 Geological Features

6.3.1 Geological Features (Onshore Section), Excluding the Seabed

6.3.1.1 Geology of the Region

The Thrace Region, where the Onshore Section of the Project is located, consists of two main geological units (Ref. 6.5): the metamorphic rocks of the Strandzha massif forming a mountain belt parallel to the Black Sea in the north-east and the Ergene (Thrace Tertiary) basin of the massif southwest. Studies have shown that the Strandzha massif is formed from a base extending before the Triassic, and from these foundation-covered Triassic-Jurassic meta-sedimentary rocks (Figure 6.115 and Figure 6.16) (Ref. 6.5). Strandzha Massif (Yıldız Mountains) is a massif located in the northwest part of Turkey with NW-SE extension covered with old sediments from Black Sea at the northeastern, Tertiary at the southern-southwestern. The massif consists of a granitic/ metamorphic core and metamorphic covering units pushed over each other and north-northeast by apricot slices (Ref 6.6).

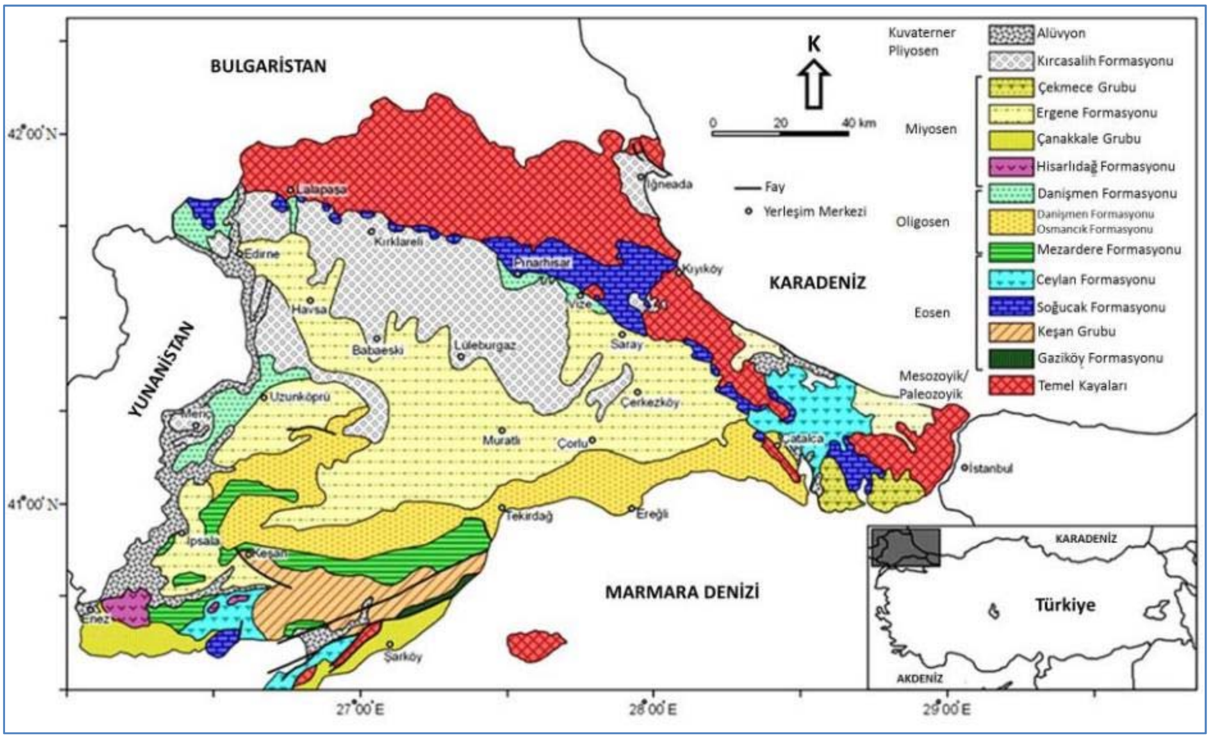


Figure 6.115: The Geological Map of Ergene Basin (Ref. 6.7)

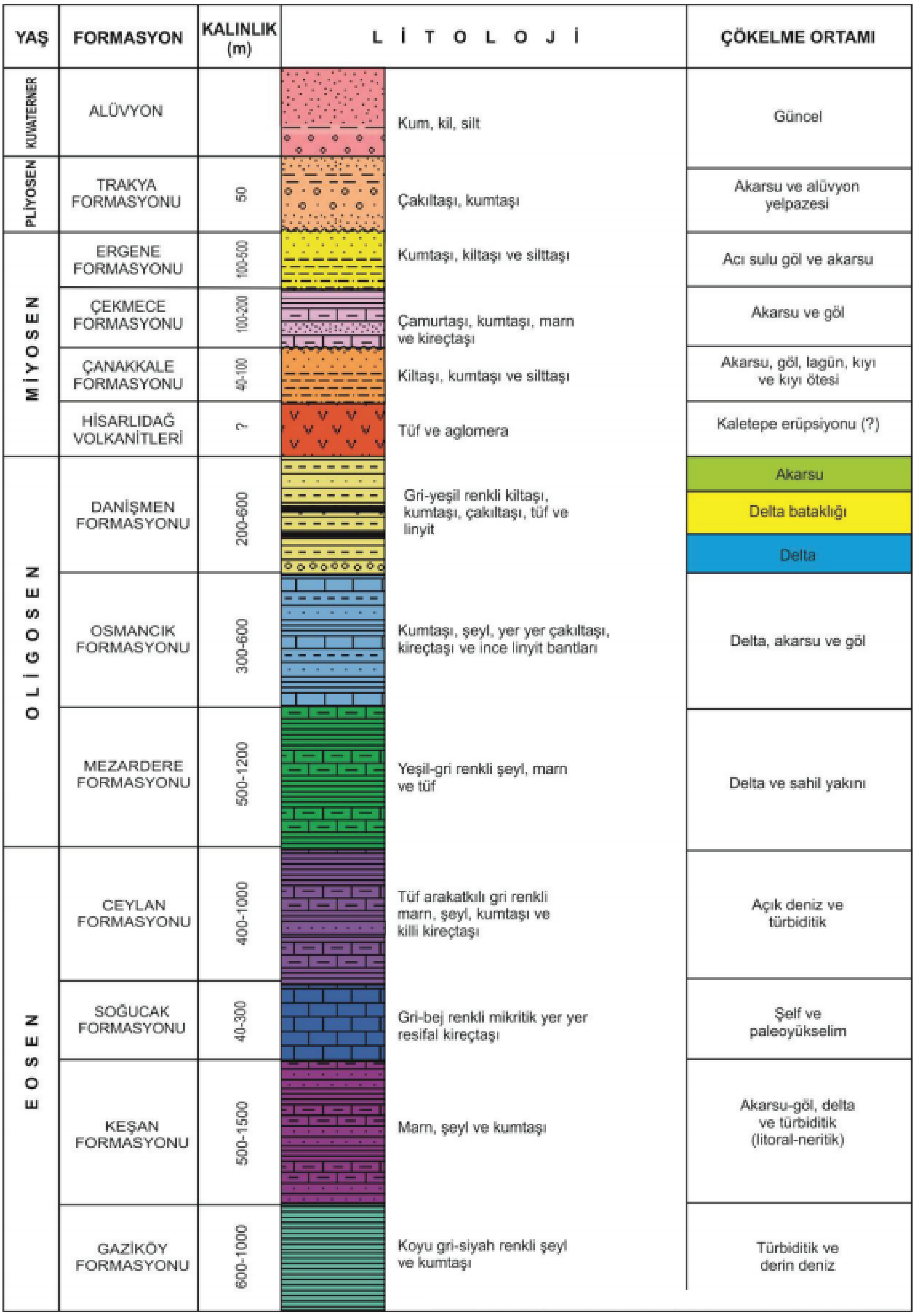


Figure 6.16: Stratigraphic Profile Ergene Basin Generalized (Ref. 6.8)

The base and cover metamorphites which create the Strandzha massif are covered under the title of Metamorphic Rocks; and the rock units which consist of Upper Cretaceous-tertiary age sediments which cover the magmatic rocks, which were put inside these metamorphites during the Jura-Early Cretaceous Era, the Mesozoic Migmatites and all these units with a transgressive overthrust are covered under the title of Sediment Rocks.

Metamorphic Rocks; the metamorphic rocks of Strandzha Massif consists of the Tekedere Group which contains granite and sedimentary metamorphic rocks, varying from almandine-amphibolite facies to the green schist facies, and the Kırklareli Group, discordant with the former at north and concordant at the south, and the Lower Mesozoic Strandzha Group, sitting on the basement with transgressive overturning to the northwest, in the green schist facies. Strandzha Massive metamorphic rocks, all units of the Tekedere group in the western and central part of the Yıldız Mountains; represented by the Çatmaköy complex, Evciler gneiss, Koruköy gneiss, Fatmakaya formation, all units of the Kırklareli group, Kocabayır metaclastics belonging to the Strandzha group, Mahya schists and all members of Dolapdere formation. Dolapdere formation surfaces only in the western and middle parts of the Yıldız Mountains. This sequence partly changes laterally in the Demirköy region. The Tekedere group was only represented by biotite schists of Yassıgeçit formation. While the Demirköy is represented by Fatmakaya formation, Kırklareli group is represented by Şeytandere metagranit formation around Vize and Aydıntepe is represented by alkalic gneiss, and in the other regions of the eastern part; Kızılağaç is represented by metagranit, Sivriler by metagranitoid, Şermat by quartzite and partially by Kocabayır clastics, Çiftlik is represented by quartz schist, Rapmana is represented by quartz schist; Mahya by schists Manastır by chert, Taştepe is represented by phyllite calcschist, Serves calcschist metagraywacke, Nişantaşı by metasandstone and Mustafa Pier is represented by metavolcano sediments (Ref. 6.6).

Mesozoic magmatites; the intrusive and dyke rocks in the northern block of the Sergen Cleavage which starts from the Malkoçlar, passes through close north of Kapaklı until Armağan-Çukurpinar (B4) - Beypınar-Yenice-Sergen-Kömürköy (B5) are listed as Cretaceous Magmatites. Triassic Mahya shists and Jurassic Dolapdere formation have been cut and contact metamorphosed by magmatic intrusions. On the other hand, İğneada group rocks are sitting under the gravel base which contains the magmatite gravels on these rocks. According to fieldwork data, the intrusions are younger than the Jurassic and older than the Cenomanian (Ref. 6.6).

Sedimentary Rocks with fossils were identified on the metamorphic and intrusive rocks of Yıldız Mountains, yet no Lower Cretaceous sedimentary sequences were found. Upper Cretaceous (Cenomanian) volcano-sedimentary sequences (Igneada group) developed only to the north-northeast part of the Yıldız Mountains near the Bulgarian border, in a basin southern border of which is controlled by a fault. Apart from this sequence, Upper Cretaceous units are not seen in the Strandzha massif. However, the Mustafa Pier volcano-sediments are very similar to the Upper Cretaceous units (Ref 6.6).

The Ergene Basin covers the area beginning from Istanbul provincial borders in the east to Bulgaria and Greece borders in the west. Due to the potential of coal and hydrocarbons, the Ergene Basin is one of the major energy basins of our country in terms of economy (Ref 6.6, Ref 6.8). Unlike Strandzha massif, Ergene Basin has been subject to extensive geological researches because of its petroleum and gas resources.

It is not known precisely whether sedimentary units before Tertiary existed and how sedimentation had begun in the basement of Tertiary units emerging with erosion on different bedrocks in Thrace and surrounding areas and it is estimated that thickness of Tertiary pile reaches up to 9,000 m. It is possible to build an approach on the development and stratigraphy of the basin in this region, with the information obtained from the southern outcrops as well as with geophysical and well data. Accordingly, Ergene which consists generally of clastic sediments (sediments) is a basin which collapses quickly and floods as it collapses. In some parts the sedimentation is continuous and interruptions and erosion phases are occasionally seen.

Located at the top of the bedrocks, the Gaziköy Formation consists of dark gray colored shales containing fine sandstones, siltstones and silicified tuffs forming the basement of the Eocene sediments on Çetmi Ophiolitic Melange. The formations above it are respectively; Keşan formation, usually composed of sandstone, Soğucak Formation consisting of gray-beige micritic limestone and reef limestone, Ceylan Formation consisting of gray shale, sandstone and clayey limestone with interbedded tuff. At the very basement of Oligocene sediments, there is Mezardere Formation, which consists of green gray shales, marls and tuffs. It is followed by Osmancık Formation containing sandstone, shale, locally gravel, limestone and thin lignite bands and Danişmen Formation containing gray or green claystone, sandstone, gravel, tuff and lignite. The Danişmen Formation was called lignite sandstones during the first studies in the region. However, this usage also encompassed the Osmancık Formation. Ünal (1967) distinguished the Osmancık Formation and defined the Danişmen shale during the formation. Kasar and others (1983) changed the name to Danişmen Formation because lithology was not homogeneous (Ref 6.7, Ref 6.8).

The basement of Miocene aged rocks is composed of ebonites of Hisarlıdağ which consist of tuffs and aglomalands. Above these ebonites there are respectively; Çanakkale Formation with lithology of claystone, sandstone and siltstone on it and Çekmece Formation with mudstone, sandstone, marl and limestone lithology and Ergene Formation with sandstone, claystone and siltstone lithology. Pliocene sediments in Ergene basin are represented by Thrace formation composed of loosely packed gravel, coarse grained gravel and locally claystone. The uppermost layer unit consists of the Quaternary sediments with loosely packed carbonated sandstones and gravels (Ref 6.8).

The coal formations in the Ergene basin are located within the Oligocene Danişmen Formation. However, following recent studies, the age of Danişmen Formation has been increased up to Lower Miocene. In the north of the Ergene Basin, lignites are usually found on the Strandzha Massif foothills; also known as Istanbul - Silivri - Sinekli; Tekirdağ - Saray - Küçük Yoncalı; Tekirdağ - Saray - Safaalan; Tekirdağ - Saray - Edirköy fields. The coal formations in the south of the Ergene Basin are referred to as Keşan, Malkara, and Uzunköprü and Meriç fields. The lignites exhuming in the north and south of the basin, deepen into the middle of the basin and they are located at a depth of more than 600 m in the sedimentary sequence which reaches 10.000 m in the middle parts of the basin (Ref 6.8).

The general structure of the massif is determined by the normal fault systems. The first and most effective of these fault systems lying perpendicular to each other are the normal faults extending in the NW-SE direction, starting from the Bulgarian border to the Sea of Marmara through the Catalca. The second system is the faults extending in the NE-SW direction, which is developed perpendicular to these faults, cutting and shifting them (Ref. 6.6).

Located in the northern part of Thrace, Yıldız (Strandzha) Mountains have received a great amount of interest since ancient times owing to the mineral deposits and energy raw materials. Porphyritic type mineralization is observed in the magmatic rocks intruded into the bedrocks and cover rocks of Strandzha and skarn type mineralizations take place at its contacts. Skarn type mineralizations are vanetum, molybdenum and copper mineralizations seen in Demirköy granodiorite and contacts of İkiztepeler granite and around Kaletepe-Korutepe. Stockwork-type mineralization occurs in the form of pyrite, chalcopyrite, molybdenum and sulphide mineralizations in Demirköy and Dereköy intrusions. Besides these metallic mineralizations; the region is also rich in terms of finished underground resources such as granitoids, marbles, sand and travertines as well as coal, which is used as industrial raw material.

Figure 6.17 shows the Receiving Terminal and the pipeline route to be built in the Onshore Section of the Project, reflected on the geological map of section E20 with 1: 100,000 scale obtained from MTA.

Accordingly, Belgrade Formation located in the Onshore Section of the Project Area is also referred to as the Thrace Formation in the Geological Maps of Turkey - No: 20, 21, 22, 23 (Ref. 6.9) published by MTA. In the same publication, it is stated Soğucak Formation is an equivalent to Kırklareli Limestone. Also, it is stated that Soğucak Formation encompasses Kırklareli Limestones.

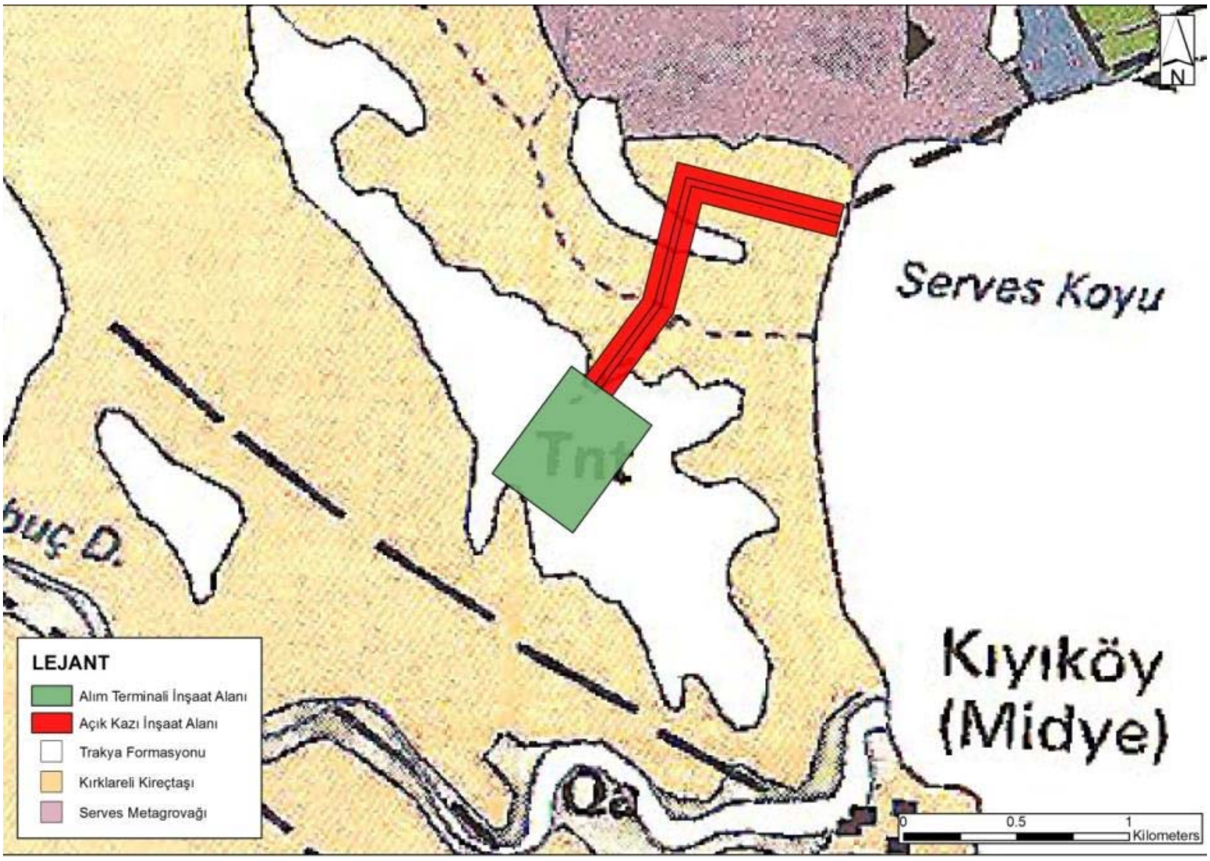


Figure 6.17: Regional geological map of section E20 with 1: 100,000 scale obtained from MTA depicting Onshore Section of the Project.

In summary, Sogucak and Belgrade Formations can be considered as the intersection of regional geology and project site geology.

6.3.1.1.1 Geomorphological Characteristics of the Region:

Kırklareli is in the Thrace Region of Turkey which is located in Europe. It is located on 41°44 - 42°00 N Latitude and 26°53 - 41°44 E Longitudes. It has an area of 6.555km^2. It borders Bulgaria with a borderline length of 159 km to the north, black sea with a coastal length of 58km to the east, Istanbul to the southeast and Tekirdağ to the south. 48% of the territory of the province is mountainous, 35% is peneplains and 17% is lowlands (Ref 6.10).

The region contains various geographical formations. The Yıldız Mountains (Strandzha) extending in the north and northeast direction, form a kind of natural wall to the north of Kırklareli. The name "Strandzha" means "Streamy Place" as a lot of creeks and streams emerge especially from the southern slopes of the mountains. Mahya (Magiada) Hill, which lies between Evciler Village of Pinarhisar and Sergen Town of Vize district, is the highest peak of Yıldız Mountains with 1.031 meters. The lowest level is 10 meters on the Black Sea shore. Accordingly, Thrace is in the form of a bowl with very high hills at its edges and a pit (the Ergene Lowland) in the middle. However, it looks like a lowland that has begun to flatten gradually as a result of erosion due to various causes. Soil structure and surface image of the region were formed in first, second and third geological time periods. For this reason, the soil is enriched with various layers. The region is considered as 4th Degree Earthquake Zone due to its settled, compressed and static layers. The region is affected by earthquakes that take place in the south of Bulgaria, Romania and Russia (Ref. 6.10).

Mountains and plateaus constitute most of the Kırklareli's land. Mountains constitute 48% of the province's geographical area. The most important elevation of the region is the Yıldız Mountains (Strandzha) extending in the northwest-southeast direction. These mountains, which run parallel to the Black Sea, start from the Bulgarian border and extend downwards until Durusu Lake. Despite its structural difference between the form North Anatolian Mountains, Yıldız Mountains are considered as extensions of the North Anatolian Mountains in Thrace because they extend in the same direction. This region, which separates the basins of the streams directly reaching the Black Sea from the Aegean Basin, is a mountain of medium altitude. The highest peak of these mountains is the Mahya Peak (1031m) located between Pınarhisar and Demirköy districts. Other significant elevations of Yıldız Mountains are Karamanbayırı Peak (986m), Boyunduruk Peak (958 m), Fatmakaya Peak (901m), Paraşüt Peak (877 m), Sivri Peak (851m) and Kale Peak (846m). The Yıldız Mountains are deeply split by the streams flowing down to the Black Sea in the north and the Ergene Lowland in the south. This feature is more evident in the north-western part of the province and on the Black Sea sloping shore line. Towards the Ergene Lowland, the mountains steeply descend and low elevation plateaus start to appear (Ref 6.10).

Plateaus are plains that are split by streams. The Yıldız Mountains Massif, which is the old Tekirdağ erosional surface, has been eroded and split by external forces (streams, wind, floods, etc.), creating eroded plateaus. According to the Kirklareli Morphology Map, flat areas ranging from 200 to 500 m have a large area in the region. Except from the Kırklareli-Demirköy line that forms the actual mountainous area, the areas of the province form the plateaus. These areas, which are fragmented and split in places, are very similar to each other in the form of wavy plains. Plateaus are divided into north and south plateaus (Ref 6.10).

The North Plateaus are lined up on various elevation levels between the Yıldız Mountains and the Black Sea shore line. The most prominent of these are Demirköy and Limanköy Plateaus (Ref 6.10).

The southern Plateaus cover the area between the Ergene Lowland and the Yıldız Mountains. The elevation of these plateaus, which are separated from each other by the branches of the Ergene River, decreases gradually towards south and merges with alluvial cuts on the lowland (Ref 6.10).

After the Yıldız Mountains, towards the Ergene Basin the bases of the valleys expand and almost all lowlands of the region are here. All of these lowlands are called "Ergene Lowland". Lowlands cover Vize, Pinarhisar the southern sections of the Kırklareli City Center and Pehlivanköy, Babaeski and Lüleburgaz fields. The Ergene Basin became a pit at the third geological time as the Thrace Peninsula curled south. The alluvials carried from the Yıldız Mountains filled the pit and the valley bases merged forming large and small lowlands. The elevation of these lowlands varies between 50-150 m (Ref 6.10).

The molten formations created by the rainwaters melting the limestones are called Karstic formations". The calcic fields in Kırklareli province surround the Pınarhisar and Vize districts starting from the southern foothills of Yıldız Mountains. The primary karstic formations located in and around Kırklareli province:

1. Limestone pavement: It is the formation of small channels, grooves and holes formed on the stone after the rainwaters melt the calcic stones in dip slopes. It is widely seen in the mountain areas of Vize and Pınarhisar districts.

2. Cave: Underground gaps created by water in karstic areas. The most interesting cave of the region is the Dupnisa Cave near the Sarpdere Village in Demirköy District. There are stalactites and stalagmites inside the cave and there is a creek and a puddle reaching out of the cave.

There are a lot of caves along the valley in Soğucak Village of Vize district.

3. Mesa: In the Vize plateau, depending on the progress of the corrosion, the limestone which covered the whole area at the beginning, cracked and took the resemblance of a table. These kinds of plains stoned with a hard layer over a horizontal structure are called "Mesas". There are a lot of mesas in the Dere Kayalıkları region of Vize district. The most interesting of these is the Göztepe Hill (450m). With the limestone on this hill melting, limestone pavements were formed.

Turoglu (1995) has carried out a geomorphological study on a wide area (Figure 6.218) including Kıyıköy (Ref.6.11). Five surface levels belonging to different elevations are identified. These levels are basically parts of the erosion surfaces at two different ages on different elevations. Limit of the Miocene erosion surface, passes through the 400m level in the north-east of the metamorphic Strandzha mass. The vertical tectonic movements that lead to the development of the Miocene erosional surface are originated from the Middle Alpine movements in the Lower Miocene (Savian Phase) (Ref. 6.12; Ref. 6.13). The shallow depth structural platform formed by descent also preserved its state in Middle Miocene (Ref. 6.13; Ref. 6.14). This situation continued until the Late (New) Alpine movements in the Upper Miocene (Attican Phase). Thus, the field has remained in the erosion environment for a long time and helped the development of the Miocene erosion surface.

The eastern slopes of the upper Pliocene erosion surface are around 50 m level. The global elevation in Upper Miocene and the transition from the shallow deep structural platform into land have initiated the erosional activities in the region. Although occasionally interrupted, the erosional deformation continued until the Lower Pleistocene (Latest Pliocene). The level change, which is broadly effective in the area, is the result of the elevation took place in the Lower Pleistocene era (Ref, 6.15, Ref, 6.16). The tectonic movements during the Quaternary have been decisive in the formation of today's shore.

Miocene and Upper Pliocene erosional surfaces were exposed to tectonic movements took place during their development and later periods so, their levels have been changed. 5 level surfaces of different elevations identified originated from this (Table 6.9).

Table 6.9: Details of Surface Levels of the Erosional Surfaces in the Study Area (Ref. 6.11)

	Geological Age	Geomorphological Unit	Topographic Elevation
Level I Surface	Lower Miocene	Miocene Erosional Surface	600-800 m
Level II Surface	Middle Miocene		400-600 m
Level III Surface	Upper Miocene	Upper Pliocene Erosional Surface	200-400 m
Level IV Surface	Plio-Pleistocene		100-200 m
Level V Surface	Upper-Pleistocene		50-100 m

The geomorphological features of the current shore in the lower alluvial areas are as follows:

- All of the large streams on site end up in lakes (lagoon environment) and/or marsh environment when they reach the shore (Efendidere, Elmalidere, Bulanikdere, etc.). Young and seasonal streams mostly disappear near the shore, where the topographic slope is extremely low (average slope 0.1%);

- The shore and its immediate vicinity are free of fluvial or marine terraces. Alluvial deposit formations along the beds of streams are not very common. Examples of these encountered at the shore are the coastal plains at the mouths of the large streams that flow into the Black Sea. These plains are of tectonic origin and have been subjected to sea pressure and/or alluvial drowning due to their slope values;
- In low foreshores, Bathymetry supports the continuation of the morphology of the coast with the slope and depth values. In high foreshores, the isobath lines become frequent, reflecting the sudden depths at short distances;
- Differences in shape and phase are observed in the geomorphological development of different lithologies in high coastal areas, where similar dynamic processes are effective. In the coasts formed by metamorphic and volcanic formations, the steepness of the cliffs reaches to 15-20 m (as can be observed on the northern coasts of Limanköy, Kıyıköy and Çilingöz bay), whereas in sedimentary units, this height decreases to 5-7 m (as on the southern coasts of İğneada, Kıyıköy). In front of the cliffs consisting of sedimentary units, beaches that narrow and expand depending on the season, that may even disappear completely at certain periods, can be found. Here, due to mass movements like breaks, collapses, slides caused by the waves the coast is regressing at a great pace. The younger streams on the high coast have narrow deep "V" shaped valleys. The mouths of the larger rivers are often overwhelmed by the sea, causing the development of the "Ria coast" type (as can be seen in Eriklidere, which flows through the Çilingözderesi and Kasatura bay). Lineaments belonging to the examination site are shown in Figure 6.218.

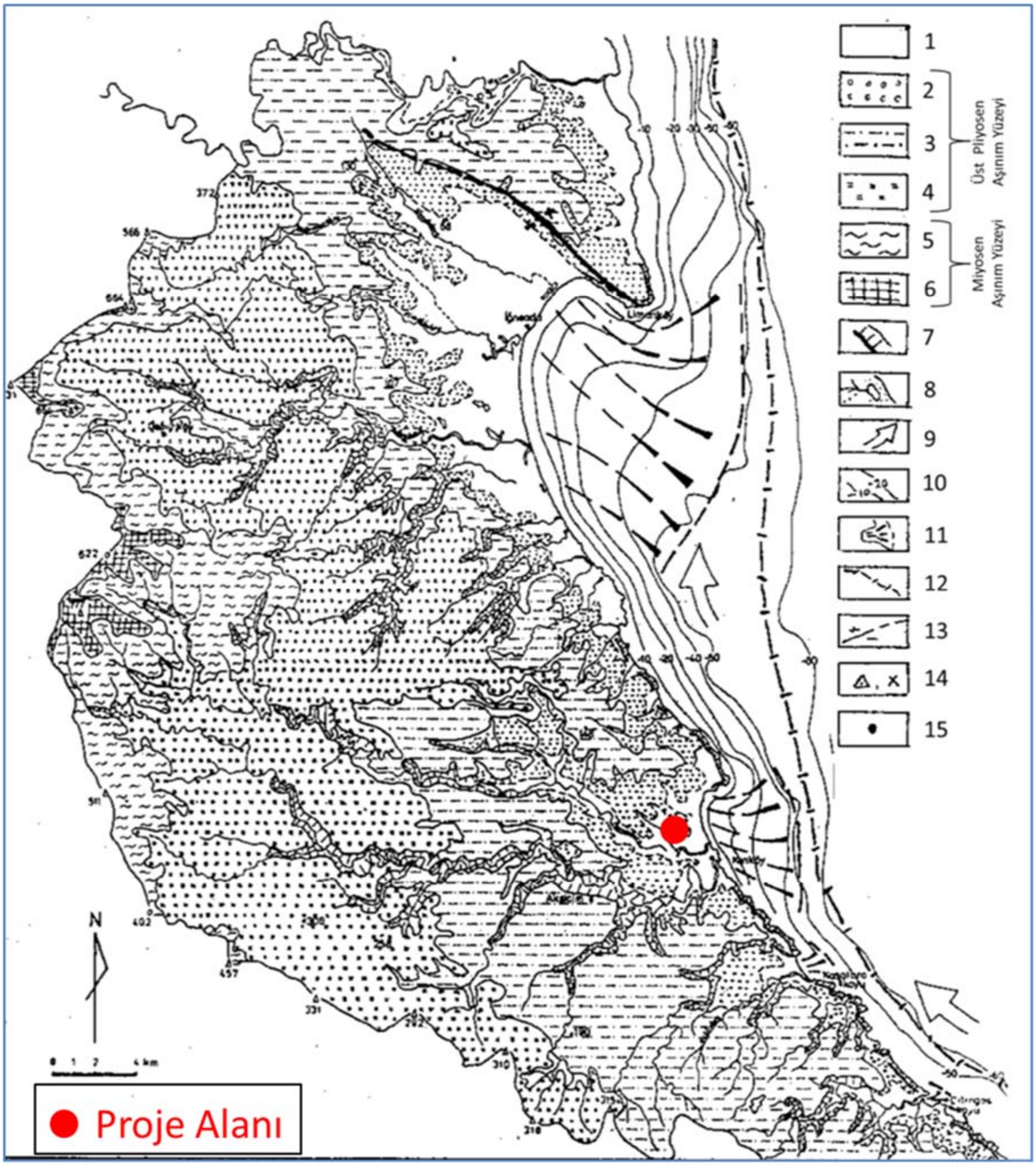
Level V Surface: It can be followed in a narrow zone in the NW-SE direction. The elevation is around 50-100 m. It has been split by young parallel and sub-parallel streams in many places. This is typically observed on the southern shores of Igneada. Young rivers splitting cliffs of tectonic origin which form the high coast with "V" shaped valleys have eroded the level V surface next to depression plains to form ridges and hills.

Level IV Surface: This surface, which extends in the NW-SE direction, is limited to roughly 100-200 m contours. According to the section in the northern part of the landscape, it occupies wider areas in the west and southwest of Kiyikoy. Starting from the north of Kiyikoy, it can be observed that the elevation values increase in the NW-SE direction at shorter distances. It is seen that the Level V and IV surfaces are considerably narrower in this part of the field, and therefore the slope grades are higher here than in the southeast (the average topographic slope on the west of Igneada is 5%, whereas this value drops to 1% in the southeast, west of Kıyıkoy and Cilingoz).

Level III Surface: This plain which is seen in NW-SE direction in the inner part is represented by 200-400 m levels. It is narrower than the area on the west of Igneada. Streams have split this surface with deep and steep sloped valleys in many places. The large streams that form meanders have been buried epigynically, and narrow, deep gorges have been formed especially in the metamorphic land (as in Kazandere, Papucdere valleys).

Level II Surface: This surface level, which can be observed around the 400-600 m contour range, also represents the lower parts of the Miocene erosional surface. Almost throughout the entire field, it can be followed as the surface level where the metamorphic and volcanic rocks are exposed. Level shifts which caused the formation of the Miocene erosional surface started at the lower Miocene and continued at the Middle Miocene (Erinç, 1988). The Miocene erosional surface is therefore observed at two different levels. This surface reflects that the environment, in which the tectonic calmness is dominant, where overflows are effective, has been continuing for a longer period of time, as compared to the I-level plain.

Level I Surface: It is the last surface level in the field, which can be traced in the 600-800 m elevation, with a very small spreading area, in the east of the study area. The surface formed by the granite, crystal stones and phylates is under forest cover in patches. In areas where the forest cover is removed, gleying is widely observed.



Descriptions: 1-Low Alluvial Areas. 2- Level V Surface. 3- Level IV Surface. 4- Level III Surface. 5-Level II Surface. 6-Level I Surface. 7- High-shore with cliff. 8- Low shore. 9- Direction of flow. 10-Isobaths. 11-Alluvial accumulation. 12- Probable old shore. 13-Fault, possible fault. 14- Elevations. 15-Premises.

Figure 6.28: Morphometric (Morphographic) Map showing the Structural Shape of the Study Area (Ref. 6.11)

6.3.1.2 Geology of the Project Area

In addition to the desk-based assessments to determine the geology of the Project Area, geological field studies, surveys and geophysical studies were carried out in the Project Area in July 2015 and

January-February 2017 and July 2017. Studies which were planned and carried out are presented in Table 6.10. The opinion letter of General Directorate of Mineral Research and Exploration within the scope of the Project is presented in Annex-5.A.

Table 6.10: Planned and Carried Out Geological Studies in the Study Area

Study	Current Situation (As of August 2017)
Geological Mapping of RT and Shore Components	Completed
Topographic Study of RT and Shore Components	Completed
Topographic Study of Access Roads	Completed
Pre-Geophysics Survey of RT and Shore Components	Completed
Geological-Geotechnical Study Base for the Land and Shore Zoning Plan	Completed
Geophysics Survey of RT and Shore Components	Completed
Geotechnical Study of RT and Shore Components	In Planning Stage
Geotechnical Study of Access Roads	In Planning Stage

In the geological field surveys performed, the surface sediments and mostras were visually examined in order to determine the status of the basic rocks in and around the Project Area; bedding, cracks, erosion / deformation and stratigraphic geometry (inclination, slope angle, etc.) and discontinuities were evaluated with measurements made with a geological compass. In order to evaluate rock discontinuities, bedding and planar slip, more than one hundred slope and slope direction measurements were conducted.

In addition, Geological-Geotechnical Study Base for the Land and Shore Zoning Plan was conducted in July 2017. In this study, ground experiments were conducted, through the samples gathered from the drilling activities, and the suitability for settlement of the study area was aimed to be evaluated.

Apart from the geological field studies and surveys, a geophysical study was carried out using electric resistivity tomography (ERT) and seismic refraction tomography (SRT) methods in order to gather information about the underground stratigraphy of the Project Area and potential anomalies in the field.

During desk-based assessments, the geological map of section E20 with 1: 100,000 scale obtained from MTA in 2017 and the Geological Maps of Turkey - No: 20, 21, 22, and 23 (Ref. 6.9) published by MTA were used. Other studies conducted around the Project Area were also included in the desk-based assessments.

The findings of these desk-based assessments are presented below.

The Project Area is located in the Thrace Basin where the Strandja Massif and the cover units are seen. The project site geology dates back to the Paleozoic ages and extends to the present day, as shown in Figure 6.39, in the geological map of section E20 with 1: 100,000 scale obtained from MTA in 2017. The prevailing geology of the Project Area forms the Sogucak Formation and the Belgrade Formation, which discordantly covers this formation (Figure 6.39).

The geology of the Project Area can basically be expressed in metamorphic and sedimentary rock units. The Strandja Massif metamorphic rocks are recrystallized in the mid-metamorphism that forms the basis of the Project Area. These are discordantly covered by Tertiary sediments and Quaternary deposits.

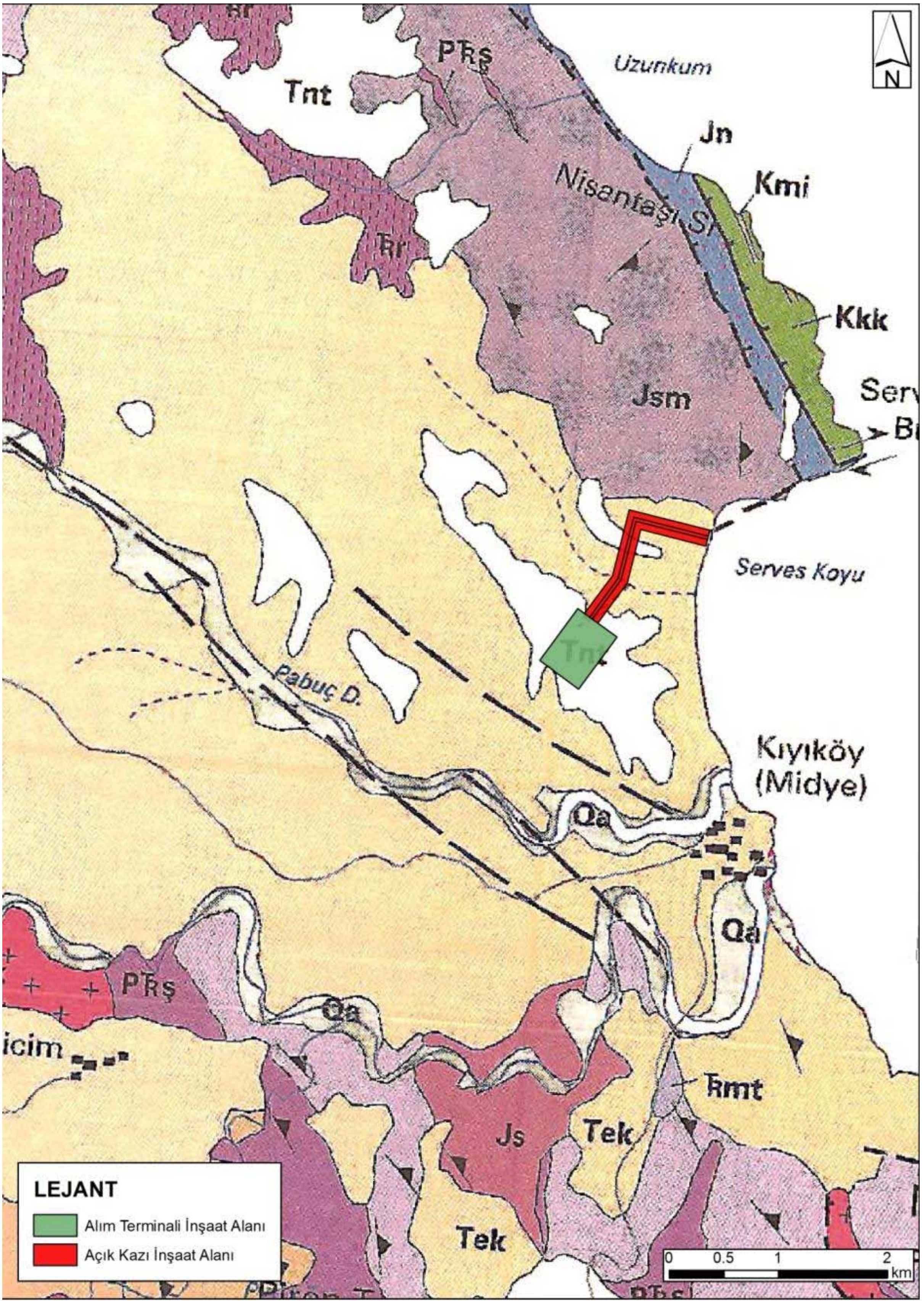


Figure 6.39: Regional geological map of section E20 with 1: 100,000 scale obtained from MTA PTRk Kocabayır Metadetritic Sandstone; PTRş Şermat Metaquartzites; Pkk Kizilagac Metagraniti; Js Sivriler Metagranidoid; TRR Rampana Quartzshist; TRm Mahya Schist; Jn Nişantaşı Meta-Sandstone; Jsm Serves Metagrovak; Kkk Kumluköy Meta-Sandstone; Tek Soğucak Formation; Tnt Belgrade Formation (also known as Thrace Formation in MTA publication); Qa Quaternary Alluviums.

Paleozoic units, which are related to each other in magmatic contact or tectonic slices, are observed throughout the zones, which are usually separated by rock units. These tectonic units are usually arranged side by side by the fault lines in the paleo tectonic period during the Paleo-Tethyan ocean closure in the Cretaceous period. These fault lines are not active today. Paleozoic metamorphic units; Sivrileri Metagranitoid (Js), Nişantaşı Metaclastic (Jn), Serves Meta-greywacke (Jsm) and Kumluköy Meta-sandstone (Kkk) (Figure 6.39).

Sedimentation units, carbonate and detritus, accumulate in sea and land. The Eocene aged Soğucak Formation was deposited in shallow waters located in an irregular topography. The terrestrial late-Miocene Belgrade Formation units in the plains came incompatibly with older units in the region.

Quaternary sediments actively accumulate along stream channels and coastal areas (Figure 6.39). The general lithological and stratigraphic characteristics of the units are given below.

Metamorphic Rocks

Kızılağaç Metagranit (Pkk) consists of quartz, biotite, large microklin and porphyroblast feldspars with white, light pinkish brown, gneiss texture, aplite veins, the granites are gradually separated and took a granular structure (Özgül, 2011). Stratigraphically it is accepted that it belongs to Early Permian Age incongruently placed on Şermat Meta-Quartz.

Şermat Metaquartzite is composed of polluted white, beige, light gray, white mica and rarely stratified metamorphic-phyllite and quartzites with quartz-schist feldspar alteration. The quartz content decreases and the amount of feldspar increases, as feldispatic quartzite and sericite, chlorite, quartz schist pass through. It is located on the Mahya Schist and is stratigraphically Lower Triassic aged.

Mahya Schist (TRM) consists of gray, bluish gray, dark gray, phyllite, chlorite, schist, graphiticist, clayey schist, carbonate intercalated calcschist and recrystallized limestone blocks (Ref 6.9). Triassic aged.

Sivriler Meta-granitoid (Js) exhumes at the axe of Kazandere Dam. In addition, the dam reservoir is located in the west of Kıyıköy Lake. The gneiss consists of quartz diorite, granitoid, quartz diorite porphyry and granitoid porphyry. The Kazandere Dam is gneiss-textured to the western part of the gneiss, has undergone schistosity and has been decomposed at a high level. The erosion surfaces are covered by the limestones of Soğucak Formation. Sivriler meta-granitoids have been intrusive in the strands belonging to the Strandzha Massif during the Triassic period and have metamorphosed along the Triassic and Jurassic.

Serves Meta-Greywacke (Jsm) is a turbiditic-type metamorphic rock composed of quartz schists, meta-tuffs and metaclastics from beige, brown and light green alkali-volcanic interlayer meta-groves. It is Triassic-Jurassic aged.

Nişantaşı metasandstone (Jn) is a turbiditic type metasandstone composed of dark green-green color, metashale and meta-greywacke interlayered, less metamorphosed and medium-thick bedded sandstones.

Kumluköy metamorphic rock (Kkk) is a turbiditic sequence consisting of cross-bedded, thin-medium bedded sandstone and conglomerate. It is lightly metamorphosed and forms the Jurassic-Cretaceous age upper part of the Strandzha Massif.

Sedimentary Rocks

Soğucak Formation (Tek) Eocene aged carbonate alternation. The formation, in the north of the Thrace Basin, extends to the south of the Strandzha Massif. It is the most observed unit in the Thrace Basin found in Vize-Kıyıköy and the Black Sea. It also includes the Kırklareli Limestones (Tek).

The formation is represented by limestone, sand, silt and marl alteration, fossiliferous limestone accumulated in the reef core, as well as the reef front and back facies (Ref. 6.17). The formation came discordant over the basement rocks. Upper Miocene-Pliocene Belgrade aged Formation came over it.

Soğucak Formation extends from the Project Area towards the southern part of Kıyıköy (Figure 6.39). An asymmetric syncline is observed. The syncline axis is about east-west direction in the coastal area whereas it is in the northwest-southeast direction in the west. The synclinal axis has shifted a few degrees west. The stratifications are almost horizontal along the synclinal axis in a wide field. It becomes completely horizontal to the south near Pabuçdere.

Belgrade Formation (Tnt) is reddish Thrace accretion. It contains gravels and mud lenses in places. The formation comes discordant over the older rock units located in Istanbul and Kocaeli. The unit has been given different names since it is spread over large areas (Ref 6.9).

Quaternary Accretion (Qa)

The Quaternary accretions in the Project Field are non-reserved alluvial fillings along the river valleys and coastal sands that actively accrete along the Black Sea coast.

The stratigraphic profile showing the general geological units of the immediate vicinity of the Project Area is given below Figure 6.20.

Dönem	Bölüm	Formasyon	Litoloji	Tanımlama
Kuvaterner	Holosen	Alüvyon		Konsolide olmayan kil, silt, kum çakıl ve iri kayaç parçaları
		Kıyı Birikintileri		Konsolide olmayan iri-ince taneli kum ve çakıl
Neojen	Miyosen	Belgrat Formasyonu		Sarımsı-kırmızımsı renkte, konsolide olmamış - yarı konsolide, çakıl, kum ve silt
Paleojen	Eosen	Soğucak Formasyonu		Taşlaşmamış iri taneli kum ve çakıl, orta yataklanmış zayıf taşlaşmış kumtaşı, marn ara katmanlı silttaşı alterasyonu. Orta yataklanmış nodüler kireçtaşı, kumlu kireçtaşı, marn ara katkılı siltli kireçtaşı alterasyonu. Orta - çok kalın tabakalanmalı resifal kireçtaşı.
Jura	Üst Orta	Nişantaşı Meta-kumtaşı		Alkalin volkanit ara katmanlı meta-grovak, meta-kumtaşı, mata-tüf ve kuvarsşist. Gnays dokulu kuvars diyorit, kalsiyum granotoyid, porfiri kuvars diyorit ve porfiri granitoyid.
	Alt	Serves Meta-grovak		
Triyas		Sivriler Meta-granit		Fillat, klorit, garnetşist, grafitşist, killi şist ve karbonat arakatmanlı kalkşist ve rekristalize kireçtaşı blokları.
				Gnays dokulu kuvars diyorit, kalsiyum granotoyid, porfiri kuvars diyorit ve porfiri granitoyid.
Permiyen		Mahya Şist		Fillat, klorit, garnetşist, grafitşist, killi şist ve karbonat arakatmanlı kalkşist ve rekristalize kireçtaşı blokları.
		Şermat Meta-kuvarsit		Beyaz, kirli beyaz, ince - orta meta-kuvarsit.
Permiyen Öncesi		Kızılağaç Meta-granitoyid		Farklılaşmamış meta-konglomera, meta-kumtaşı ve şeyl.

Figure 6.20: General Geological Units of the immediate vicinity of the Project Area (Çağlayan and Yurtsever (1988) and Özgül (2011)).

Surface sediments and crops were visually inspected during the geological field investigations carried out in and around the Project Area by July 2015. During field inspections, a Garmin ™ 60 Cx brand hand-held GPS device with a measurement accuracy of +/- 4 meters was used and the points at which the field survey was carried out were recorded (Figure 6.41).

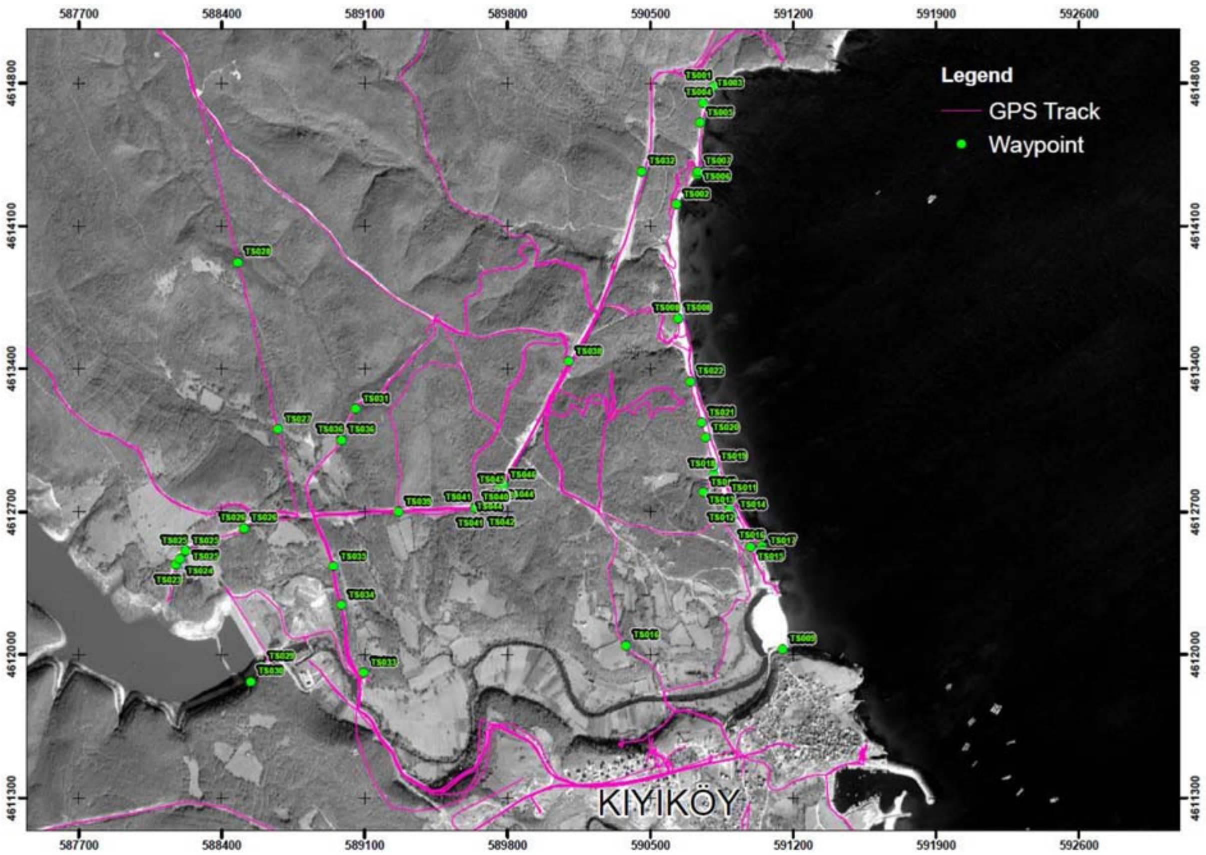


Figure 6.41: July 2015 The Fields Inspected Geological Field Inspection

The information about the geological structures during the inspections was obtained by measuring slope and direction of the cracks and beds with a geological compass and assessment of the discontinuities and segregations. The method used to determine the asperity classification of discontinuities is developed by Brown (1981) and named after him. The thickness of the beds was evaluated according to the criteria suggested by Bogs (2001) (Table 6.11) whereas ISRM (International Society for Rock Mechanics) method is used for the assessments related to the strength of the rocks (Table 6.12).

Table 6.11: The Criteria to Determine the Thickness of a Bed

Thickness of a Bed (mm)	Specification
0-1	In the form of a very fine plate
1-3	Very fine
3-10	Fine
10-30	Medium
30-100	Thick
>100	Very Thick

Table 6.12: The Rock Strength ISRM Standard for the Mapping of Surface Geology

Grade	Definition	The Identification Criterion based on the Field Inspection	Single Axial Compression Strength Interval (Mpa)
R0	Excess Incompetent rock	Can scratch the surface of the rock with a nail.	0.25-1

Grade	Definition	The Identification Criterion based on the Field Inspection	Single Axial Compression Strength Interval (Mpa)
R1	Very Incompetent rock	Rock can be chopped with a pocket knife and crumbled with a hard hit of the geology hammer	1-5
R2	Incompetent rock	Rock is hardly chopped by with a pocket knife. A hard hit with a geology hammer would leave a mark on the surface on the rock.	5-25
R3	Medium Competent rock	Rock cannot be chopped with a pocket knife. Rock sample can be tore apart by a hard blow hit with a geology hammer.	25-50
R4	Competent rock	A number of blows are needed to break the rock sample.	50-100
R5	Very Competent rock	A high number of blows are needed to break the rock sample.	100-250
R6	Excessive Competent rock	Rock sample can only be whittled by the geology hammer.	>250

The surface geology map for the Project Field in Figure 6.52 is created with the help of the findings obtained by the methods mentioned above and the workshops during the site investigation. Since the Project Area has a thick vegetation cover, the contacts between the units are drawn approximately according to limited information and geological maps of General Directorate of Mineral research and Exploration (MTA) (Ref. 6.9). As seen on Figure 6.52, the dominant formations in the Project Area are Soğucak and Belgrade formations according to the surface geology mapping. Apart from these formations, controlled filling areas were also observed in and around the Project Area (especially where the roads are).

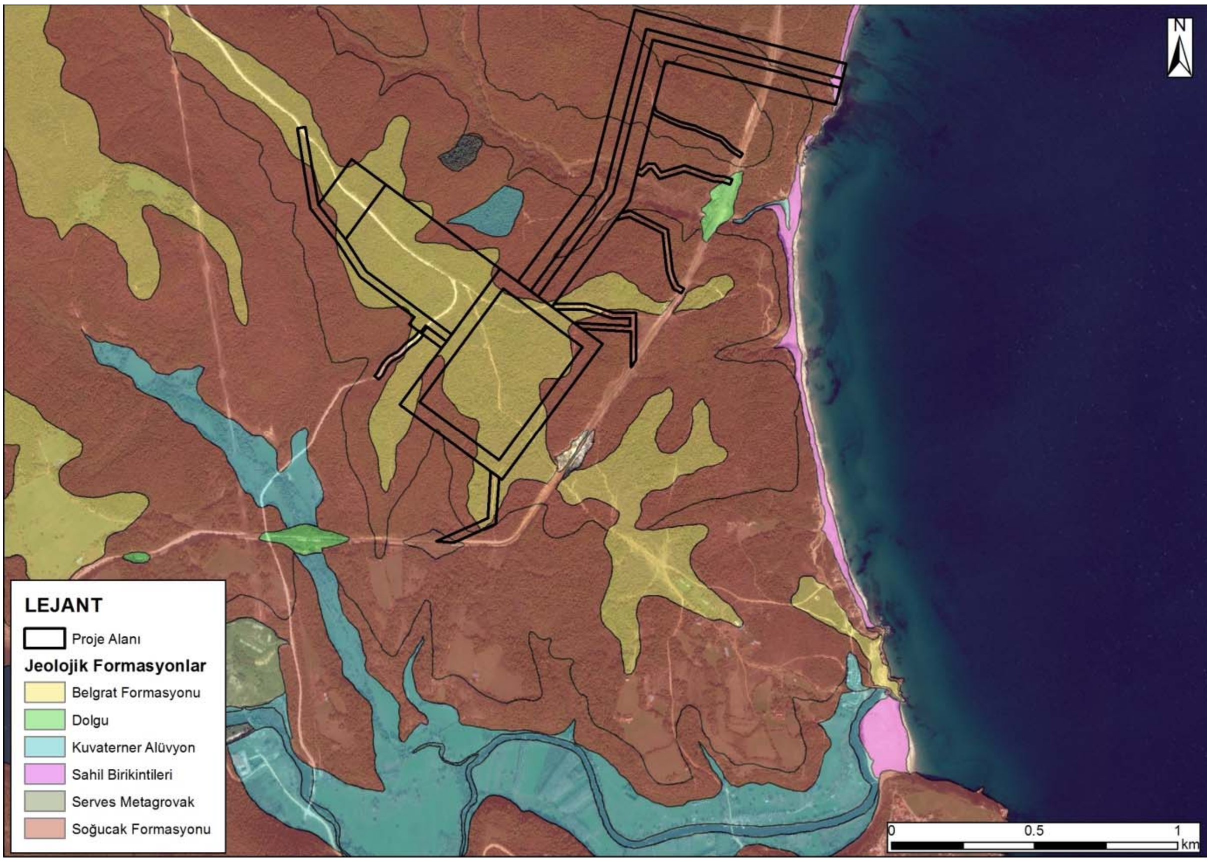


Figure 6.52: Project Area Onshore Section Geology Map

Observations, made on the Project Field geology in the field reviews carried out between July 2015 and January-February 2017 are summarized below:

The Project Area is represented as a fragmented erosional plain composed of different rock units. The debris probably eroded during the Late Quaternary and metamorphic basement or sedimentary rock units emerged. The open excavation route planned in the Project Area is located in the east-west directional linear ridge on the northern part of the site. The northern and southern slopes of the ridge are relatively long (about 350 m). The area includes the lower parts of the Soğucak and Belgrade Formations as well as the current coastal debris. The Soğucak Formation is represented by an alternation of creamy color, beige and yellow, carbonated mudstone and silty-sandy limestone, discordantly overlying the underlying metamorphic rocks (Figure 6.52). Consists of medium-thickly layered, medium-poorly disintegrated, slightly cracked (two sets) and weak-medium durable rocks (Figure 6.63, Figure 6.74). Layer planes are continuous (> 10m) and wavy, crack systems are rare, discontinuous and wide spaced. However, a sufficient number of discontinuities have not been observed for kinematic analysis.

Figure 6.63: Carbonated Mudstone, Typical Lithology for Soğucak Formation of Silty-Sandy Limestone

Figure 6.74: Medium Competent, Carbonated, Fine Stratified Mudstone with Joint Systems from Soğucak Formation

Soğucak Formation includes karstic cavities developing horizontal formed in the bedding planes. Dolines or caves have not been observed in the field.

Carstic structures observed in the Soğucak Formation are generally represented with solution dolines. This karst type formation is observed towards deeps. As Soğucak Formation is covered by Belgrade Formation in the Project Area and doline typed karstic formations have not been observed during surface surveys. Besides, in the lithologies that emerge along the shore strip, carstifications parallel to the stratigraphy have been observed.

The Belgrade Formation, which is observed in the fields, is composed of reddish light brown-gray colored loose gravel sand and blocks. It is a metamorphic basement rock that is weakly graded and semi-round, varying from the sand to the size of a large gravel.

Coastal debris is usually sand without consolidation and stored along the shore strip under the influence of waves (Figure 6.85). The thickness is estimated to be more than 3 meters.

Figure 6.85: Project Area - Onshore Section Pipeline Route Shore Strip

The Receiving Terminal and the pipeline route to be located in the Onshore Section of the Project Area are on similar geological structures. These lithologies are medium-thick bedded, low-cracked, weak-to-durable carbonated mudstone, silty-sandy limestone and reef limestone. Apart from these, the most important feature of the rocks here is the existence of karstic structures due to their resolution.

Considering the water level of the Black Sea, which is 120-140 meters below the current level in the Ice Age, karstic formations may also vary depending on the sea level, as well as karstic caves may be encountered under the sea belonging to the Soğucak Formation. Thus, the planned structures in the Project Area have the potential to be affected by carstification. There are potential risks such as carrying bearing capacity, sags that may occur in the receiving terminal, pipeline floor and stability. The sags may be caused by the cover rock over the carstized beds and the unconsolidated superficial sedimentary cover. Despite the cover rock being durable, the depression may occur depending on its thickness and width. In the Project Area, there are carbonated mudstone and silty-sandy limestone covered by Belgrade Formation. Thus, broad karstic structures are observed during the surface surveys in the Project Area.

Geomorphology of the Project Area

As a result of the observations made during the workshops and during the geological field investigations in July 2015, the following evaluations were made on the geomorphology of the Project Area:

The erosional surface in the Project Area is expressed as Eocene sedimentary sediments and erosional plateau separated by fragments formed in the hills formed by metamorphic rocks. The erosional surfaces on the sedimentary units developed on a syncline in the NW-SE direction. The continental Belgrade Formation, which is compatible with the abrasion debris, is incompatible with the syncline in the project area.

The Project Area and its surroundings are being drained with stream systems which are not parallel to each other and poured into the Black Sea. It is observed that the main current valleys are typically NW-SE directions and are shaped according to the bedding orientation. The erosional surface in and around the site is fragmented by river systems. The V-shaped valleys developed on the clasted units in the north of the project area transforms into canyon valley in the south along the Pabuçdere and Kazandere rivers in the form. The erosional surface between the valleys is about 40-50 meters above the sea level, rises to the northwest and merges with Strandzha outside the work site. The karstic formations in the Soğucak Formation at the southern part of the work site are micro-morphological structures frequently observed on the abrasion surface. Dense ponor formations of different sizes have also been observed in this area. In addition, the wide caves on the valley slopes and the rocks along the Black Sea coast are an evidence of dense karstic structures located in the Soğucak Formation.

The coastal section of the project area includes coastal rocks and coastal sand. Serves cape and Kıyıköy shore strip are almost linear and no deltas in the river mouths came into existence. This is a sign that the coast is under wave impact. The breadth of the beach ranges from a few meters to 100 meters and is composed of fine sand. The rocks are represented by perpendicular slopes. In the Serves cape, a narrow wave-cut terrace developed in the metamorphic rocks in front of the rocks. The large blocks that have fallen are the characteristic feature of some regions of the Onshore sections of Kıyıköy, where the thick and wide limestone of the Soğucak formation surface. In addition, small scaled landslides have been observed in the middle part of the rocks in Selves cape.

Towards the west of the Project Area, even though the valleys, forming over the metadetritic units, is shallow and has a "V" shape, they take step valley form by passing through sediment units towards the Black Sea. The shore strip of the study area consists of uneven perpendicular rocks. The rocks are 25m high on average. The capes, which are made up of more competent rocks, have higher elevation towards the sea. It forms a narrow wave-cut terrace on the metamorphic and sedimentary rocks located in front of the cliff. Carstic surface formations were developed in the Soğucak Formation which contains limestone and carbonated mudstone in and around the study area.

Monitored Landslide Zones

During the field observations two landslide zones have been observed. Field observations could not be made in the potential landslide area located at the north of the receiving terminal due to the dense vegetation cover.

During the surveys in the Project Area, two landslide zones have been observed. The first landslide region is a natural landslide located within Unit-2 and is observed in the coastal area, rocky region. The landslide here is active on the recent coastal sand (Figure 6.96). The landslide mechanisms could not be identified due to the dense vegetation cover. However, it is, by observation, estimated that the shallow and slip plane of the landslide is less than 10 meters. It can be concluded that the landslide is active for a long time, considering the hard fall and deformity of sliding material.

Figure 6.96: Landslide observed on the southwestern coast slope of the Receiving Terminal Site within the Soğucak Formation Unit-2 (dashed yellow lines indicate the estimated landslide region limit and yellow arrows indicate the landslide direction)

In Unit-3 an active debris flow develops on the slope near the İSKİ pipeline. This is not a landslide occurred by natural means and developed in the weak gravel region due to the extreme steep slope in Unit-3 (Figure 6.107). This shows that the pebbly and sandy parts in Unit-3 are not stable in steep slopes.

Figure 6.107: Debris Slide Observed on the Slope Near the ISKI Pipeline

Landslides that can not be observed during the site investigations are also included in Unit-3 materials. The angles of dip are developed in the eastern parts of the river valleys, which are 15-20 degrees. Observations made in these fields show that the material of Unit-3 is not stable even on flat surfaces.

Geophyscial Measurements

A geophysical study was carried out using electric resistivity tomography (ERT) and seismic break (SRT) methods in order to gather information about underground stratigraphy and potential anomalies in a wide area of investigation, including the Project Area. RTK GPS is used to identify line coordinates and elevation of the ERT and SRT. Firstly, the starting and ending points of the ERT and SRT lines were marked in the study area, and then the electrodes and geophones were placed along the lines. Additionally, fire coordination of the SRT investigation are also recorded.

The following evaluations are made with regard to the Project Area as a result of the findings obtained from geophysical measurements carried out between 14 January and 5 February 2017:

The Project Area looks spatially heterogeneous. Some show linear structure while others are complex. The investigated area geology generally consists of sandy-silty, marly limestone interlayered Soğucak Formation. The upper parts of the Soğucak Formation are generally composed of coarse grained sediments (from silt to gravel size). Due to the variability of materials in this context, the range of electrical resistivity values is considerably wide. Thus, electric resistance is evaluated from fine-grained material (clay, silt) to coarse-grained material (sand, gravel) and finally to limestone. Limestones can show low resistance as well as high resistance compared to marl content. The complexity of the ERT data stems from the fact that the layer sequences are not the same. For example, in line 1-1, first a conductive, then a resistive, and then a conductive layer is observed (

Figure 6.118).

Figure 6.118: Figure Showing the Electrical Resistance Profiles

In the light of all these observations, it can be said that the conditions of geological precipitation vary widely in relation to the heterogeneity and the alteration heterogeneity of the materials. A general ERT profile obtained from the study is shown in the map in Figure 6.129.

According to observations, the field can be divided into 3 divisions. The southern and northern regions (regions delimited by black lines) appear to be less resistant than the middle region. This regional delimitation is clearly seen in Line 4. The more resistant material in the middle of the study area will be confirmed by the drilling operations planned. However, it is thought that the increasing thickness of the Belgrade Formation along the syncline axis under the field is related to the sandy units of the Soğucak Formation.

It can be said that the Soğucak formation was formed from three different units:

Unit 1. The reef unit of the Soğucak Formation. It mainly consists of horizontally bedded reef limestone and sandy-clay limestone interlayers. Karstic formations in different sizes exist. The ponors and caverns around the project area show that the karstic formations found here are polygenic and the vertical karst systems are related to the horizontal karsts.

Unit 2. It is located between the 1st and 3rd units, stratigraphically and is formed by of reef limestones and precipitation of detritic rocks contacting with each other. This unit has thin to medium thickness and contains nodular limestone, sandy limestone, silt limestone alternation and marl interlayers. It consists of different sized karstic formations. The biggest karstic cave observed in the Project Area has a 1.5 m width.

Unit 3. Constitutes the uppermost segment of the Soğucak Formation. The unit consists mainly of coarse grained sediments reaching to the size of gravel from silt. The upper segment of the unit is abraded and covered by the Belgrade Formation. The unit is present in itself as contacts of sand and sandstone-siltstone-marl alternation.

Another formation seen in the Project Area is the early Quaternary aged Belgrade Formation. This unit is composed of reddish-brown-gray colored, very loose, non-porous gravel, sand and coarse fragments. It is very weak and slightly decomposed. It starts with boulders and pieces at the bottom and moves up to fine granules in the upper parts.

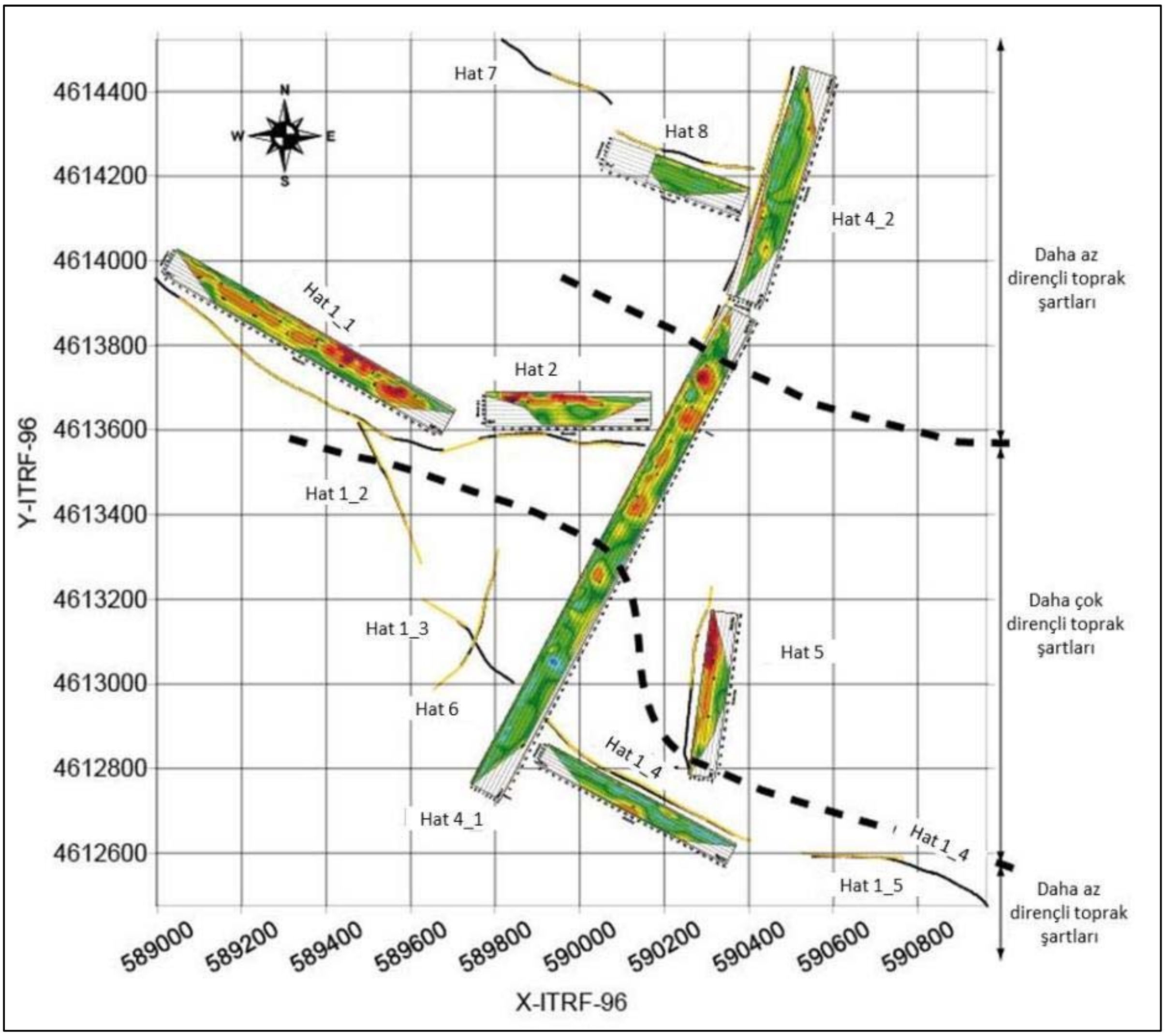


Figure 6.129: Study Area ERT Profiles

The work site is characterized as a fragmented erosional plateau, consisting of sedimentary tali and metamorphic basement rocks. The waters around the site and its surroundings are poured into the western Black Sea via semi-parallel river systems. The main bed valves, Papuç and Kazan, are E-W shaped according to lithology. Those erosional surfaces in and around the field are separated by the streams and the drainage systems of their tributory. Although the valley on the metadetritic units towards the west is shallow and "V" shaped, it passes through the sedimentary units toward the Black Sea and forms a step valley. Although the main drainage system is tortous, its tributories are, in general, dentritic.

The shore strip of the investigation field consists of non-linear steep rocks. The rocks are 25m high on average. Capes formed out of more rigid rocks have tens of meters more height towards the sea. In the local regions that streams reach at Black Sea, narrow beaches emerged along the coast. Beach areas have a width varying from a few meters to 35 meters, and composed of coarse blocs and fine sands in rocky areas and where the streams pour into the sea, respectively. There are no delta deposits in the coastal strips of the Black Sea, which are the coastal characteristics of Turkey, formed by the sediments. It forms a narrow wave-cut terrace on the metamorphic and sedimentary rocks located in front of the cliff. The most common type of slope slide along the coast is fall. Those slides occur as a result of the steep discontinuities in the large rock masses.

As a result of the geophysical studies carried out, it can be characterized as a limestone formation (high resistivity and seismic velocity) covered with coarse-grained grounds (low resistivity and seismic velocity compared to the main rock), which also covers the Onshore Section of the Project Area. The data obtained from the geophysical measurements complies with the literature related to the geology of the region. According to geophysical measurement results, the limestone has disintegrated in a karstic environment, possibly with empty or filled cavities. Two different comments can be made for those cavities in this karstic area, according to electrical resistivity results:

- Cavities are filled with cohesive soil like clay and silt (conductive material)
- Cavities are filled with coarse material (resistant material).

As mentioned above, the more resistant material in the middle of the examination site will be confirmed by the extra drilling operations planned to be conducted. However, it is thought that the increasing thickness of the Belgrade Formation along the syncline axis under the field is related to the sandy units of the Soğucak Formation. According to the results gathered in the scope of the Geological-Geotechnical Study Base for the Land and Shore Zoning Plan, details of which is presented in **ANNEX 6.H**and the summary of which is presented below, a white-beige coloured, karstic pored, clay interfingered, densely faulted, partly oxidized, midi-competent limestone layer was observed locally in the study area starting from 12m depth in the east of the land and 9.5m depth in the southwest of the land, and continuing until the end of the well.

The surveys conveyed in the Project area are stated above. As soon as the detailed soil surveys for obtaining more detailed information about the geology of the Project Area are completed the results of geotechnical survey will be shared with the Ministry of Environment and Urbanization. The results of the Geological-Geotechnical Study Base for the Land and Shore Zoning Plan are summarized below.

Geological-Geotechnical Study Base for the Land and Shore Zoning Plan

A Geological-Geotechnical Study Base for the Land and Shore Zoning Plan was prepared including the Shore Crossing Section of the Project and with the studies conducted in this scope the suitability for settlement of the Project Area was evaluated and the approved report was given in **Annex-6.H**. Within the scope of the study, as per the notice of the MoEU dated 28.09.2011 and numbered 102732, the suitability for settlement condition was determined in accordance with the Format-3, by conducting field, drilling and geophysical studies, gathering laboratory results and all of the data in the studies and as a result of geological-geotechnical evaluation.

Drilling and geophysical locations were determined following the field studies conducted in and near the Project Area within the scope of field studies. In order to determine the vertical and horizontal relationship of geological units and engineering parameters of the units, necessary ground drilling operations in 19 locations with a total of 382m, each with a depth of 20m and field studies were conducted during the drilling operations (Table 66133, Figure30). The drilling operations were conducted via rotary type hydraulic boring machine. In order to determine the dynamic and elastic parameters of the ground, Seismic Refraction-Masw measurements along 6 profiles, micro-tremor measurements in 12 locations and Multi Electrode (ERT) measurements along 6 profiles, were conducted between 17.07.2017 and 20.07.2017. Geometrics Es-240l Smartseis device was used for these measurements. According to the data gathered from all of the profiles in general, while the corrosion level of the ground is determined to be very corrosive in places close to surface in 6 profiles, midi-corrosive ground type continues in these profiles after 6-8 meters on average.

Table 6613: The coordinates and depths of the drilling operations conducted in the study area

Drill No.	Depth (m)	Starting Elevations		
		x	y	z
A-08	20	589615.934	4613569.566	64.61
A-24	20	589565.886	4613464.267	64.04
A-30	20	589801.088	4613304.572	50.6
A-44	20	589643.066	4613239.84	59.82
A-B-11	20	589652.038	4612986.633	52.01
B-21	20	589877.038	4613468.231	52.65
B-24	20	589715.94	4613557.887	62.76
B-67	20	589767.765	4613147.636	50.81
I-04	20	589998.083	4613934.703	18.2
I-10	20	589884.403	4614009.267	18.28
I-12	20	590050.038	4614084.751	15.9
I-13	20	589902.278	4614110.58	12.24
I-23	20	590182.636	4614103.815	60
K-12	20	589787.053	4613579.519	60.16
K-15	21	590039.081	4613567.202	50.35
K-46	21	589109.483	4613248.644	34.1
K-48	20	589331.813	4613448.817	56.35
K-58	20	589432.492	4613639.338	66.26
SK-1	20	590673.062	4614469.245	6.3

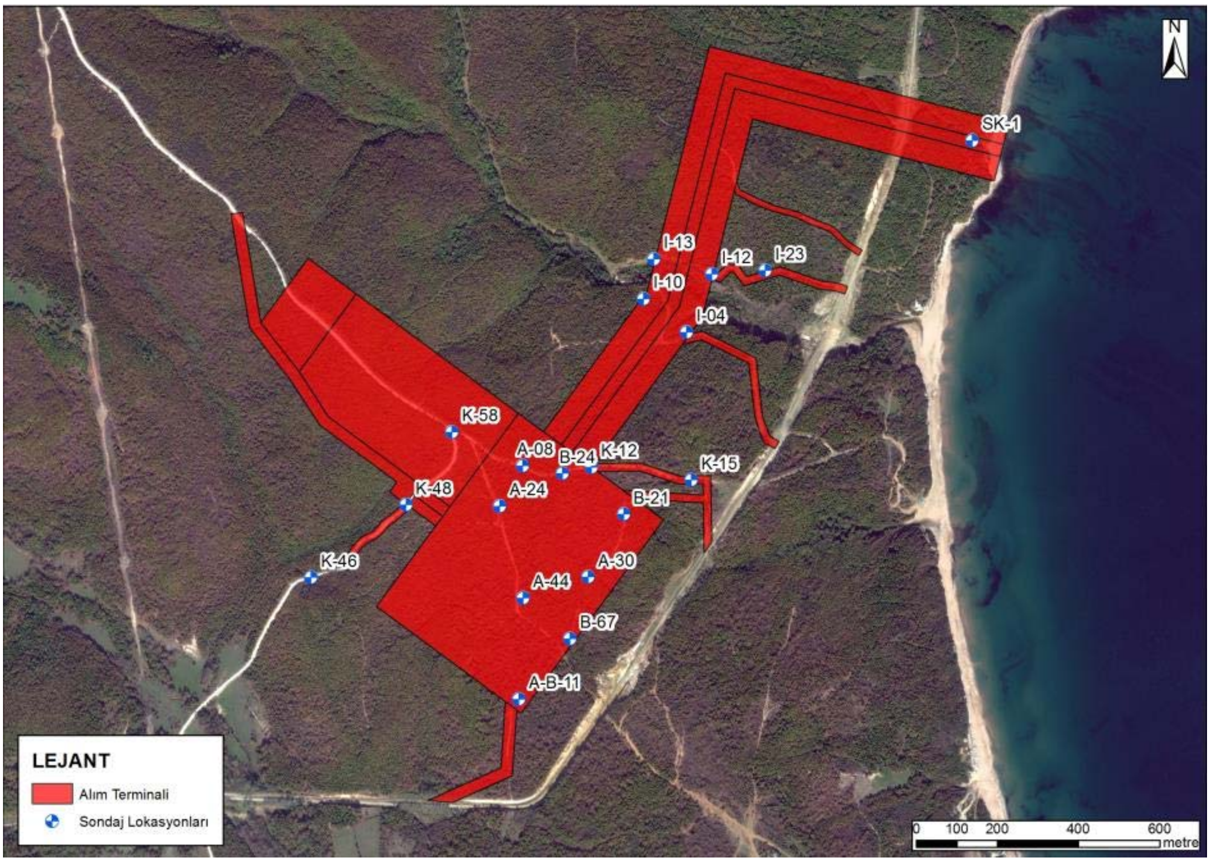


Figure 6.30: Drilling Operation Locations Conducted within the Scope of the Geological-Geotechnical Study Base for the Land and Shore Zoning Plan Report

The details concerning the studies are presented in the Geological-Geotechnical Study Base for the Land and Shore Zoning Plan Report given in **Annex 6.H**. In summary the geology of the Project Area consists of filler units, clays and sands which belong to the Pliocene aged Thrace Formation, claystones and sandstones and limestones which belong to Upper Eocene aged Kırklareli Formation. The topographical slope of the field varies between 0% and 40%. Liquefaction risk is expected in the field. The clays which belong to the Thrace Formation are determined to have medium-high compressibility and low-medium plastic features. While the swelling level is medium-high-very high, the settling amount is within the acceptable limits. It is determined that the claystones, which belong to the Thrace Formation, are in "Very Weak- Weak- Medium- Good" quality rock class in general according to the RQD values and are in the "Low Strength Rock" class according to the point load strength. It is determined that the limestones, which belong to the Kırklareli Formation, are in "Very Weak" quality rock class in general according to the RQD (rock quality) values and "Medium Strength Rock" according to the point load strength and "Low Strength Rock" class according to the uniaxial compression values. No mass movements such as falling rocks or landslides were currently observed in the field. However, stability problems may occur in deep cut slopes to be created. Since it is decided that the possible stability problems can be resolved via engineering measures, it is evaluated to be "Area with Stability Problems of Preventable Nature" in the aspect of suitability for settlement. Therefore, by taking the measures below, the risks concerning the stability can be reduced.

- Engineering measures shall be taken concerning the possible stability problems;
- The slopes occurring from deep excavations shall be protected via designed retaining walls;
- Proper drainage systems shall be created which will remove the underground, surface and waste waters from the area;

- The provisions of the Regulation for the Structures to be Built in Earthquake Areas shall be followed.

6.3.1.3 Seismicity

Kırklareli Province, where the Onshore Section of the Project area is located, is in the northwest of the Marmara region and has one of the causeways that connect Turkey and Bulgaria via Dereköy border gate. The location of the Project Area in the Thrace Region is given in the Turkey active fault-line map above (Figure 6.31, Ref. 6.18).

Figure 6.31: Turkey Active Fault-Line Map (Ref. 6.18)

According to the data from the Kandilli Observatory and Earthquake Research Institute, Kırklareli can be deemed as one of the cities with least seismic movements in Turkey (Figure 6.32 and Figure 6.1333). The Project Area is located in the 4th degree earthquake zone according to the Turkish Earthquake Zones Map (1996) prepared by the Ministry of Public Works and Settlement (Figure 6.1434) (Ref. 6.18).

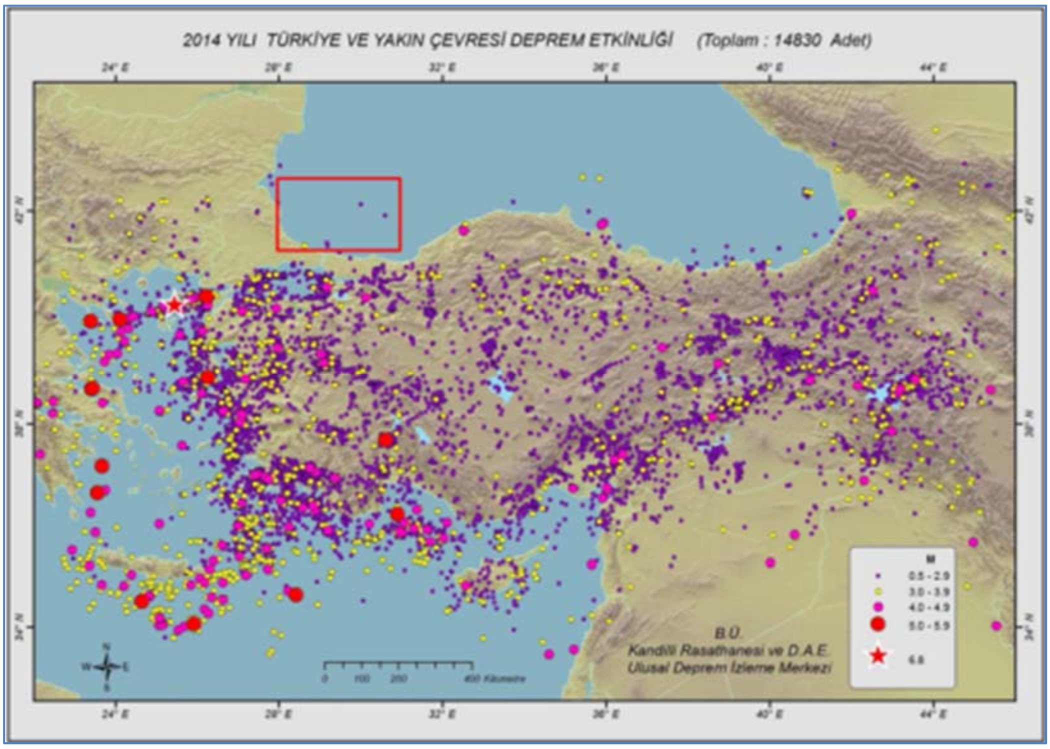


Figure 6.32: Earthquake Activity in Turkey and its Near Vicinity in 2014

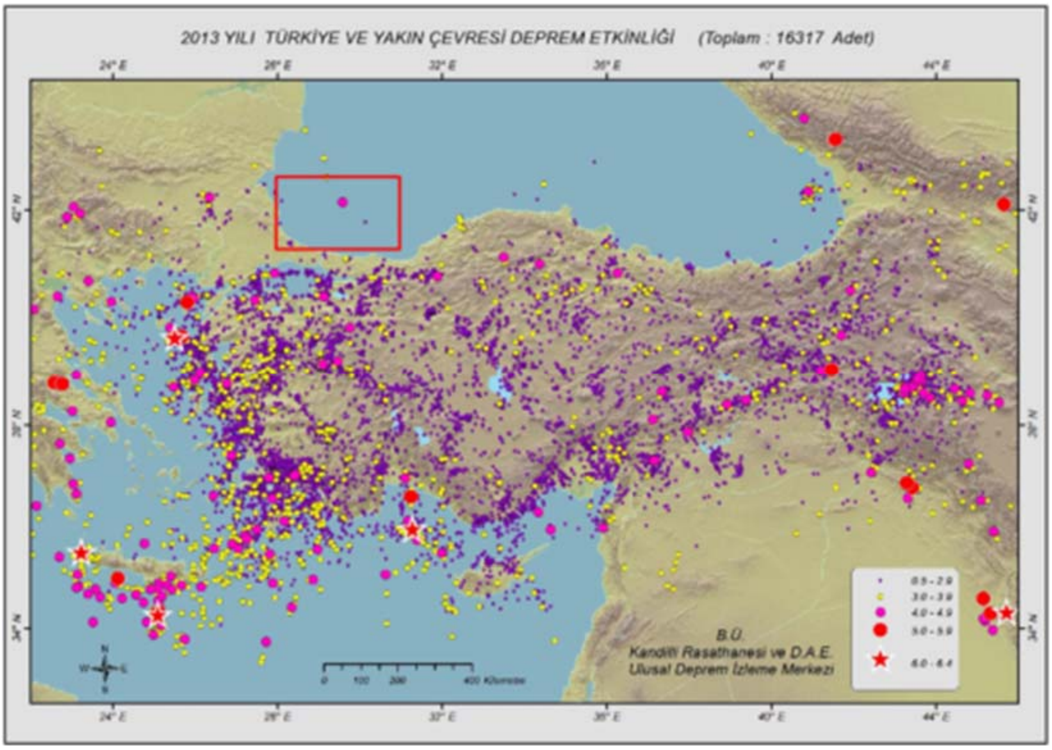


Figure 6.133: Earthquake Activity in Turkey and its Near Vicinity in 2013

Figure 6.144: Kirklareli Province Earthquake Map (Ref. 6.18)

The general structure of the Strandja massif is determined by normal fault systems. The first and most effective of these fault systems lying perpendicular to each other are the normal faults extending in the NW-SE direction, starting from the Bulgarian border to the Sea of Marmara through the Catalca. The second system is the faults extending in the NE-SW direction, which is developed perpendicular to these faults, cutting and shifting them. From the Bulgarian border to the Çatalca area, a step fault which crosses the massif from end to end in the NW-SE direction, in five parallel fault lines, caused the Paleozoic foundation to split and deepen from the sea to the north-northeast direction. The directional components of these faults could not be detected in the field. The most important of the NW-SE-trending normal faults is the Sergen fault. The second fault system, which affects the massif, is the NE-SW trending fault, which is perpendicular to the NW-SE trending step fault system. These are the faults that lead to the development of the Thrace basin, the present shape of the massif and the formation of the Black Sea. The most important of these faults are the Kirklareli Fault and the Catalca Fault, which cut the Strandja massif.

The closest known active fault in the Project Area is the Quaternary North Anatolian Fault in the Marmara Sea. The ~ 100 km long part of the fault located at Marmara Sea has created a seismic cavity that can produce an earthquake of magnitude M ≥ 7. Another potential seismic structure near the Project Site is the Kirklareli fault about 20 km away. Several geological faults have been mapped in the Thrace Basin and the Strandja Massif, but there is no clear evidence that these faults have been active during the Quaternary-Holocene period.

The Kirklareli Fault, which is the nearest and most obvious fault to the Project Area, has also been identified in the field studies. No earthquake records have been found on this fault. In addition to the Kirklareli Fault, many small-scale faults were observed in the roadcuts in the Project Area and its immediate vicinity. All faults are located in Sogucak Formation. Observations related to faults encountered during site observations are given below.

Fault-1 It surfaces in the roadcut to the south of Pabucdere Dam. This fault is represented by a deformation zone of several meters wide and a shear zone of about 25 centimeters wide in the reef limestone and sandy limestone sequence of Unit-1 (Figure6.155). The slickenside, on the other hand, indicates that this is a right-lateral fault. Similar lithologies can be found in an order in the fault (alternation of very thick-thick bedded limestone in the southern block, and medium thick-thick bedded limestone and sandy limestone in the northern block). The fault plane is wavy and extends in the NW60̊ direction. Along the roadcut, several secondary faults parallel or semi-parallel to the main fault have been found (Figure 6.166). These are faults potentially formed by forking from the main fault. Karstic structures have developed along the main and secondary faults. Not only does this fault not show any activity sign taking place in the present topography recently, but also no geomorphological structures showing activity from the Quaternary period have been observed. The fault crosses only the Sogucak Formation. This also is thought to be the main reason as to why two different geological formations do not go side by side along the fault. For this reason, the fault was not a main structure and probably developed during a period between Late Eocene and Early Miocene.

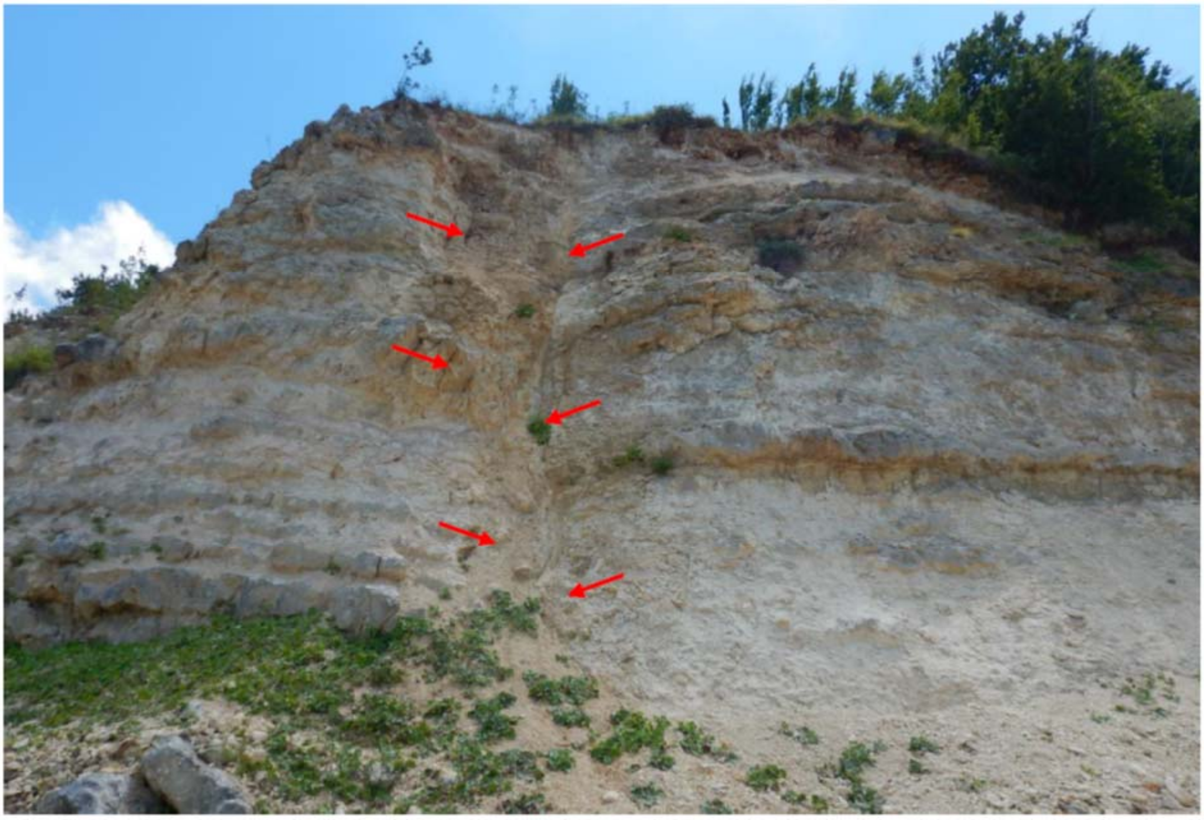


Figure6.155: Fault-1 Shear and Deformation Zone in the Roadcut of Pabucdere Dam Reservoir in the Soğucak Formation (Arrows show the shear zone. Direction: Southeast, Location: 588602 E - 4611940 N)

Figure 6.166: Secondary Faults in the South-West of the Main Shear Zone (Arrows indicate secondary faults. Direction: Southeast, Location: 588553 E - 4611865 N)

Fault-2 has been observed along the roadcut of ISKI pipeline, southwest of the Project Area. Fault-2 includes two parallel and one reverse faults. The fault zone is located in Unit-2 of the Sogucak Formation and is an internal formation fault. The fault zone is in the structure a negative flower with the main fault in the middle, the southern fault dipping to the north and the northern fault dipping south (Figure 6.177). The main fault is in the NW65̊ direction. The main fault plane having a horizontal surface shows that it is a right-lateral fault. Other secondary fault surfaces exhibit strike-slip motion with some normal dip-slip components. 1-centimeter thick clay formation occurred along the fault plane. The fault is exposed on the eastern slope, and the fault does not appear on the other side of the ISKI pipeline slope. This has created a short-range slip which is characteristic of weak strike-slip faults. About 400 meters north of the main fault, another secondary fault was observed along the ISKI pipeline road. It is located in the Sogucak Formation Unit-2 and is in the NE25̊ direction (Figure 6.188). It is small fault and causes very little slippage in the plates. This is probably a conjugate fault of Fault-2 located further south. The above-described faults do not provide geomorphological evidence of Quaternary activity in the current topography. There was also no geological evidence showing a current fault activity. The location of the fault, which is located in the same lithological unit and shows small slip, indicates that this is a small internal fault.

Figure 6.177: General View of Fault-2 in the ISKI Pipeline Roadcut in the South of the Project Area (Arrows show faults. Direction: East, Location 588236 E – 4612502 N)

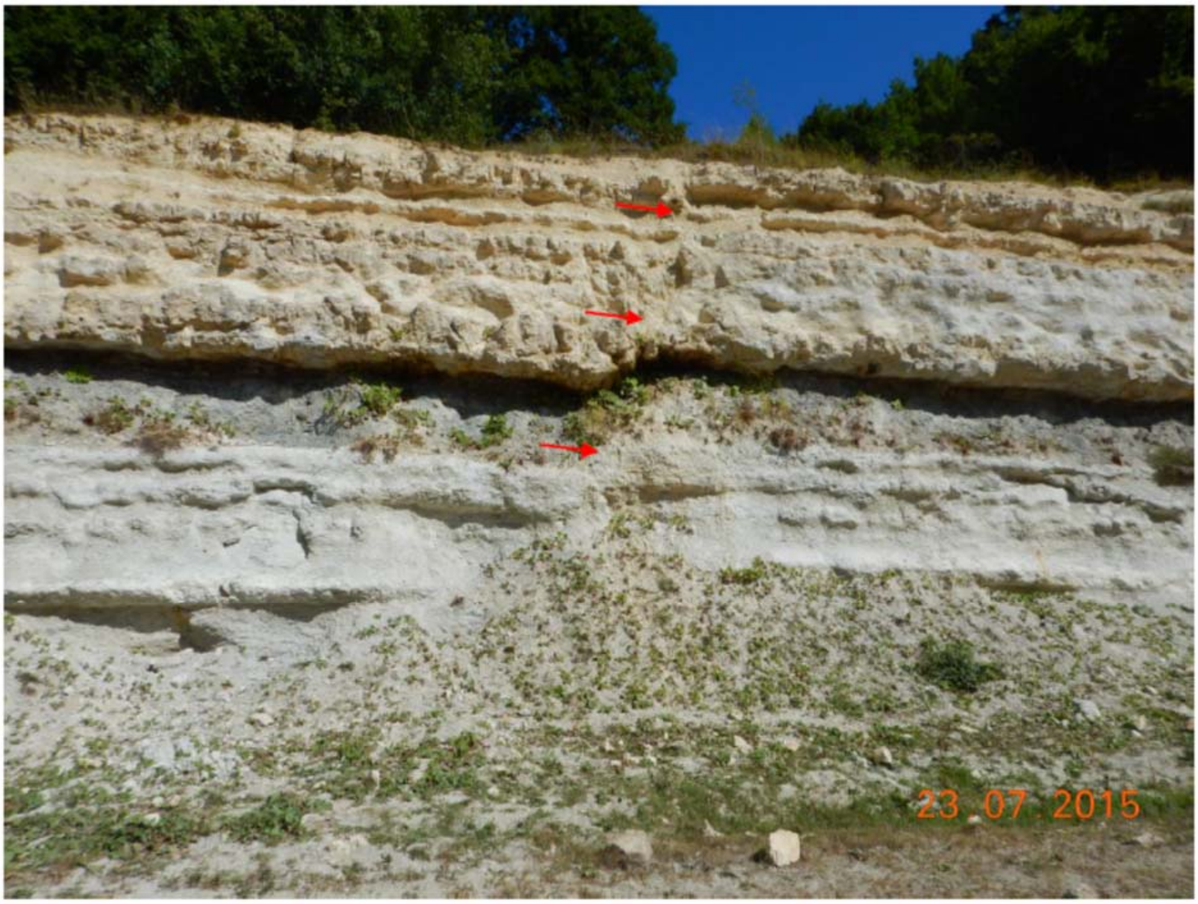


Figure 6.188: Small-scale Fault Fractures in Sogucak Formation Unit-2 (Arrows indicate faults. Direction: North, Location: 588513 E - 4612619 N)

Fault-3 contains a group of parallel faults in Sogucak Formation Unit-2. It is generally in the NW40̊ direction. Many have formed small slips on the surface of the layers (Figure 6.199). The main fault is located in the Sogucak Formation Unit-2 and is in the NW45 direction (Figure6.40). Only a few structures are small-scale faults that go in the opposite direction of the roadcut. Fault-3 does not show any geological or geomorphological evidence of Quaternary activity. The location of the fault, which is located in the same lithological unit and shows small slip, indicates that this is a small internal fault.

Figure 6.199: Small-scale Slip Faults on Layer Surfaces in Unit-2 (Arrows indicate faults. Direction: East, Location: 589667 E - 4612709 N)

Figure6.40: General View of Fault-3 in the Sogucak Formation Unit-2 of the Project Area (Arrows indicate the fault plane. Direction: Southeast, Location: 589758 E - 4612804 N)

As a result, the strike-slip, reverse and normal faults formed due to tectonic slices observed in field studies in the Project Area are not active in engineering/geotechnical terms. That being said, the structures to be built within the scope of the Project will be planned in line with the provisions of "Specification for Buildings to be Built in Seismic Zones".

6.3.1.4 Geological Impacts and Measures to be Taken During the Project (Land Preparation, Construction, Operation and Post-operation)

The geological effects that may occur during the construction of the project are very important for assessing the risks that may arise during construction. Taking into consideration that the water level of the Black Sea was 120-140 meters below the current level in the glacial period, the karstic formations may vary depending on the sea level and karstic caverns belonging to the Sogucak Formation may exist under the sea.

Due to these karstic formations in the Project Area; potential impacts such as a drop in transport capacity, collapses at the reception terminal, stability at the bottom of the pipeline, or water problems in the tunnels may occur. The collapses can be caused by the cover rock over the karstized beds and by the unconsolidated superficial sedimentary cover. Despite the cover rock being durable, the depression may occur depending on its thickness and width.

Potential geological risks in the Onshore Section of the Project have been identified during the studies carried out within the scope of the project. Potential geological impacts were assessed on the basis of projected activities related to the Construction, Operation and Post-Operation (Decommissioning) stages of the Project. The geological impact assessment was made in parallel with **Chapter 2** (Environmental Impact Assessment Approach). Controls and other mitigation measures included in the design to limit potential geological effects are provided below in Table 6.13**14**.

Table 6.134: Mitigation Measures and Design Controls- Onshore Section

Stage	Activity	Impact	Impact Reducing Measures / Design Controls
Land preparation, Construction	All construction activities (excavation and site preparation) and equipment movements in the area	• Deposits depending on the structure of ponors • Sudden water intake associated with karstic channels • Erosion-related doline formation • Subsidence associated with poor filling material in the karstic pit and dolines • The collapse of the cover rocks on the karstized beds or unconsolidated superficial sedimentary covers • The collapse of karstic channels or underground caves	• Detailed ground survey for geological and geotechnical purposes • Performing sediment and erosion controls in the entire work area to prevent soil loss • Drainage control during construction activities • Projecting according to seismic activity of the zone and observed faults • Creation of engineering designs based on slope stability, ground subsidence risks, karstic structures and seismic risks • Planning and construction of Onshore facilities in accordance with the provisions of the "Specification for Buildings to be Built in Seismic Zones"
	Improve existing roads and make new access roads	• The collapse of a nearby cave or karstic canal • Deposits depending on the structure of ponors • Subsidence associated with poor filling material in the karstic pit and dolines	• Performing sediment and erosion controls in the entire work area to prevent soil loss • Drainage control during construction activities • Projecting according to seismic activity of the zone and observed faults • Creation of engineering designs based on slope stability, ground subsidence risks, karstic structures and seismic risks

Stage	Activity	Impact	Impact Reducing Measures / Design Controls
Operation and Post-operation	Operation of the RT and pipeline	• Depression created by large fluctuations in hydrostatic pressure • Deposits depending on the structure of ponors • Sudden water intake associated with karstic channels • Erosion-related doline formation • Subsidence associated with poor filling material in the karstic pit and dolines • The collapse of the cover rocks on the karstized beds or unconsolidated superficial sedimentary covers • The collapse of karstic channels or underground caves • Earthquake that may occur due to the North Anatolian Fault	• Performing monitoring regarding sediment and erosion controls in the entire work area to prevent ground loss • Performing monitoring regarding drainage control during construction activities • Creation of a geotechnical monitoring program to monitor slope stability and ground subsidence risks

6.3.2 Geological Features of the Seabed (Offshore and Shore Crossing Sections)

6.3.2.1 General Geological Features of the Black Sea

6.3.2.1.1 Sedimentation

The drainage basin area of the Black Sea is about 1.864.000 km^2 and consists of the Russian Platform area (85%) and high mountainous areas (15%) (Ref. 6.19). The Danube River is the most important river flowing to the Black Sea and has a low discharge rate along with the Dniester, Bug, Dnieper and Don rivers, which drain the Russian Platform areas.

The southwest, south and east parts of the Black Sea are surrounded by mountainous areas (the Balkans, Eastern Black Sea and the Caucasus mountains) and there are many small but extremely abrasive rivers in this region. The amount of sediments coming from the rivers to the Black Sea can be seen in

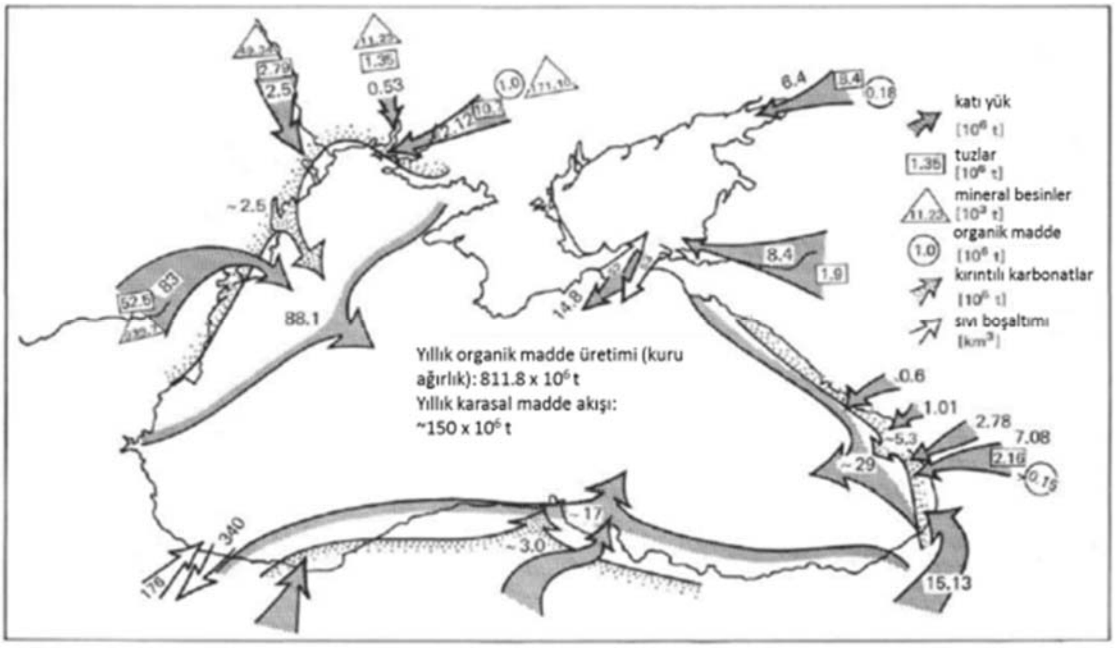


Figure 6.41.

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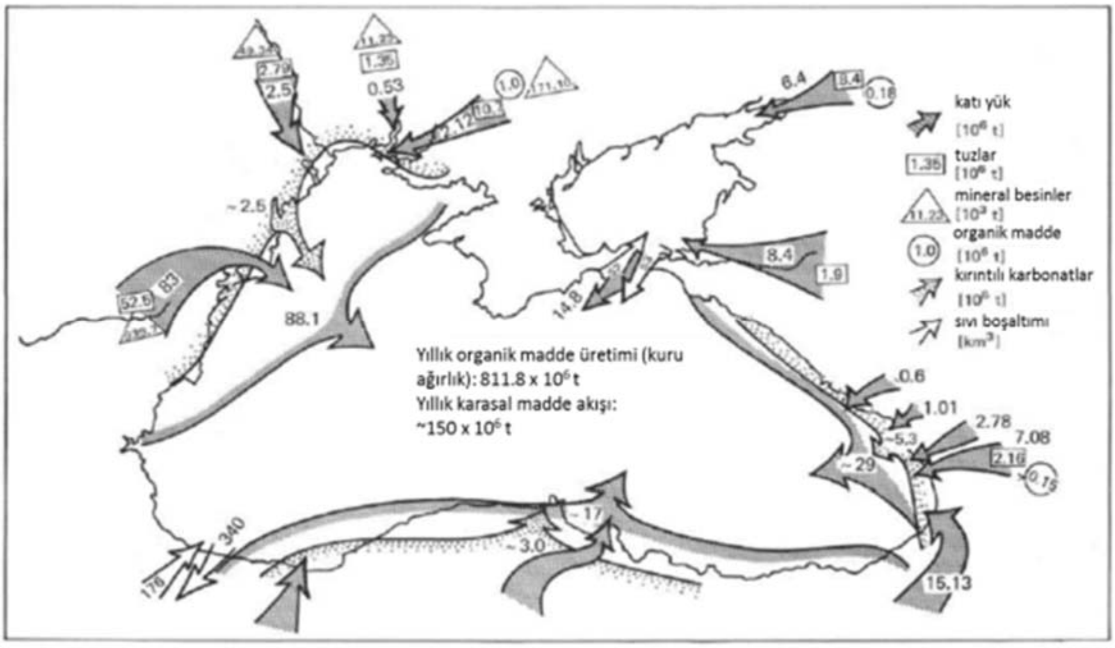


Figure 6.41: Annual Volume of Sediment Material Flow in the Black Sea Basin (Ref 6.20)

It is known that the sedimentary distribution of the Black Sea near the coast is shaped by surface and coastal bottom currents and wave motion (Ref. 6.19). The sediment distribution in the deep basin is controlled by an isolated cyclonic flow system and bottom morphology.

While large sediments from the rivers flowing into the Black Sea accumulate in the wide western part of the shelf, terrestrial sediments from the North Anatolian and Caucasian mountains and sediments from the Crimean Peninsula (shallow sedimentary rocks from the erosion of rocks on land) cross the shallow shelf sea and enter the deep basin generally in the form of turbid sediment (sedimentary rocks composed of coarse and fine graded particles from the bottom to the top).

Tissue analysis of core samples taken from the western and eastern basins shows these differences in the morphology of the land. Whereas in the western basin more fine-grained uniform material can be found to a large extent, turbidit and silt material, which are abundant off the east shore, show high variability in sedimentation distribution (Ref. 6.19).

Recent period sediments in the Black Sea are characterized by the sedimentation of low-carbon allochthones from land (a large rock usually carried by a low-angle reverse fault from its original site) and a large amount of biogenic carbonate materials (microscopic calcite plate planktonic form of limestone and limestone sediments known as coccolithophorids).

The highest content of clay and carbonate is in the central region of the western and eastern basins. Due to the formation of biogenic components in clay-sized calcites, the total carbonate content as well as the amount of moiety, which is greater than 2 micrometers (µm), increases simultaneously with the amount of coccolithophorids. The types of sediments found in the Black Sea can be seen in Figure 6.2.

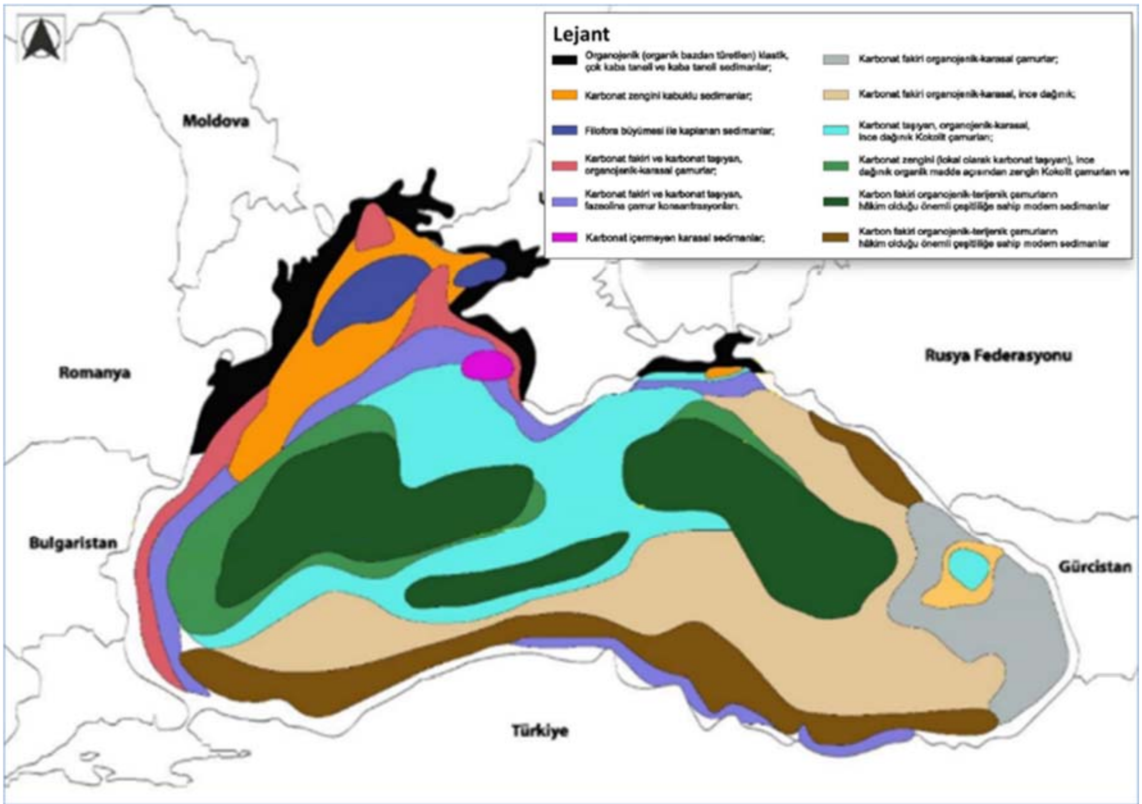


Figure 6.20: General Types of the Modern Black Sea Sediments (Ref. 6.21)

Sediments can be divided into compound-genetic type classes as shallow and deep-water sediments. Shallow water sediments consist of the following:

- Organogenic (derived from organic origin) -clastic, very coarse-grained and coarse-grained sediments;
- Carbonate-rich crustacean sediments;
- Sediments covered with Phialophora overgrowth;
- Carbonate-poor and carbonate-bearing, organogenic-terrestrial muds;

- Carbonate-poor and carbonate-bearing, phaseolin mud concentrations.

Deep-water sediments are as follows:

- Carbonate-free terrestrial sediments;
- Carbonate-poor organogenic-terrestrial muds;
- Carbonate-poor organogenic-terrestrial, finely dispersed;
- Carbonate-bearing, organogenic-terrestrial, finely dispersed Coccolith muds;
- Carbonate-rich (locally carbonate-bearing), Coccolith muds rich in finely dispersed organic matter;
- Modern sediments with considerable diversity in which carbon-poor organogenic-terrestrial muds predominate; and
- Modern sediments with considerable diversity in which carbon-poor organogenic-terrigenous muds predominate.

Stratigraphic studies based on piston core samples (

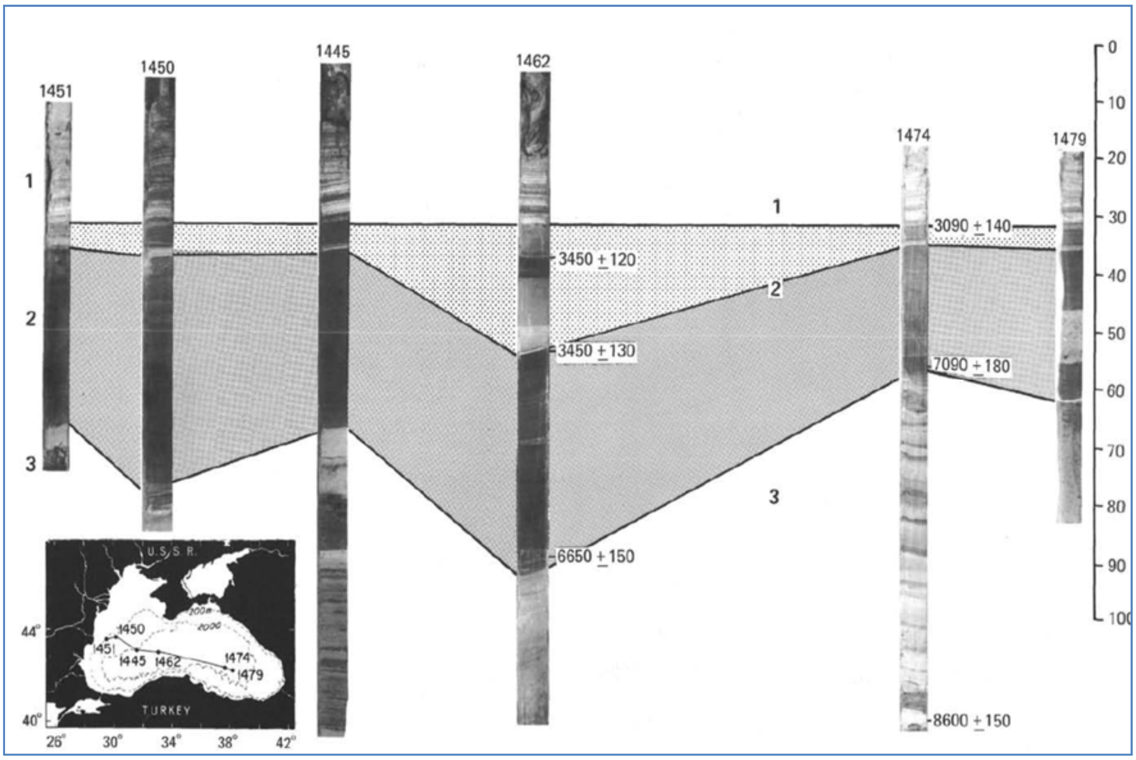


Figure 6.213) reveal three distinct sedimentary units that could be associated with a large part of the Black Sea. The upper unit (1st Unit), which is approximately 30 cm thick, consists of alternating layers of white carbonate and dark lutite (sediments of silt size, sediments of clay size or fine grained sedimentary rocks which are a mixture of both). The white layers generally entirely consist of coccoliths. The 2nd unit is a dark brown, jelly-like sapropel (unconsolidated sediment accumulation rich in bitumen) containing up to 50% organic matter. This unit usually consists of fine inorganic aragonite (carbonate mineral) layers. The 3rd Unit is the alternating sequence of dark and light colored lutites composed of clastic material with low carbonate and organic matter content.

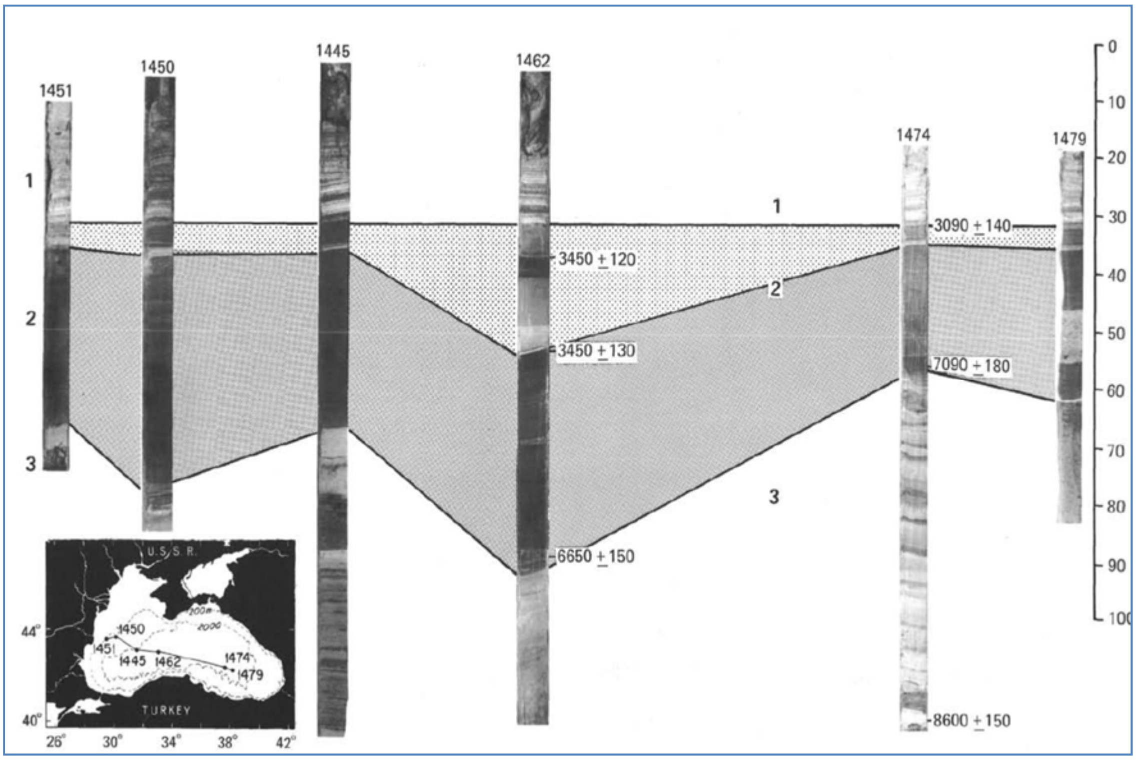


Figure 6.213: Sediment Profiles of Some Core Specimens (Ref. 6.22)

In 1974, drilling researches were carried out by the "Woods Hole Oceanographic Institution" in order to obtain the Pleistocene stratigraphic section in the Black Sea (Ref. 6.23). Late Cenozoic sediments were obtained by three field drilling and continuous coring, as seen in

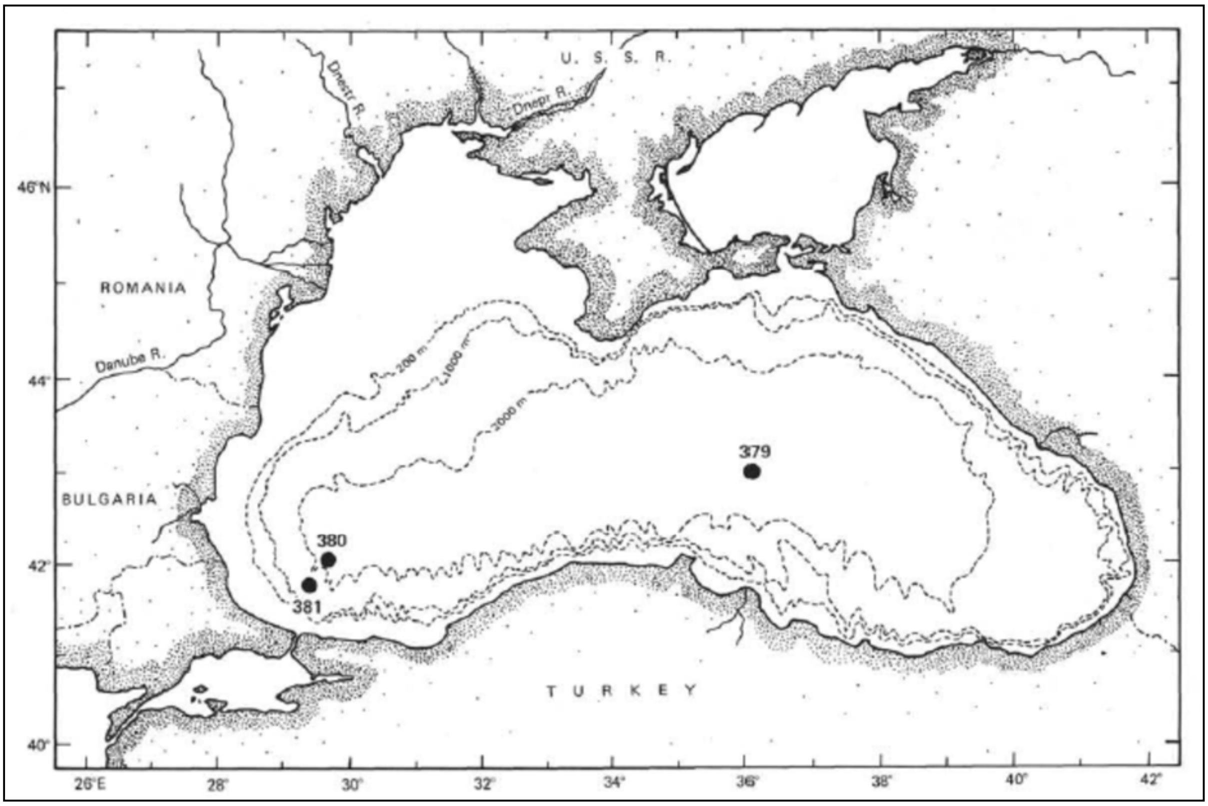


Figure 6.224. Prior to reaching the base, Pleistocene strata of significant thickness were obtained in field study number 379. Two drilling holes were opened at 2.115 and 1.750 meters depth on the continental slope near the Bosporus.

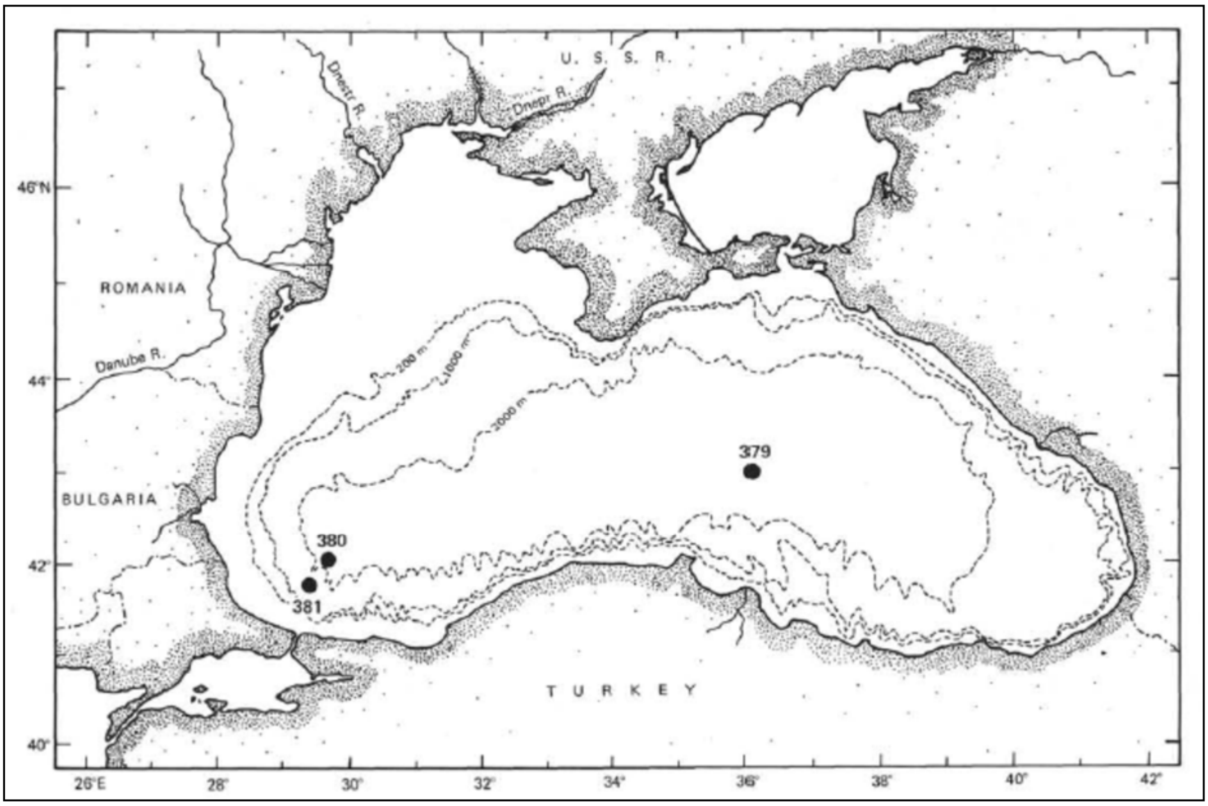


Figure 6.224: Drilling Locations

Pleistocene sediments were mainly in the form of terrestrial mud, silt and fine sandy interbeds in all three field works. In this period, sedimentation conditions in the basin are closely related to climate changes (Figure6.).

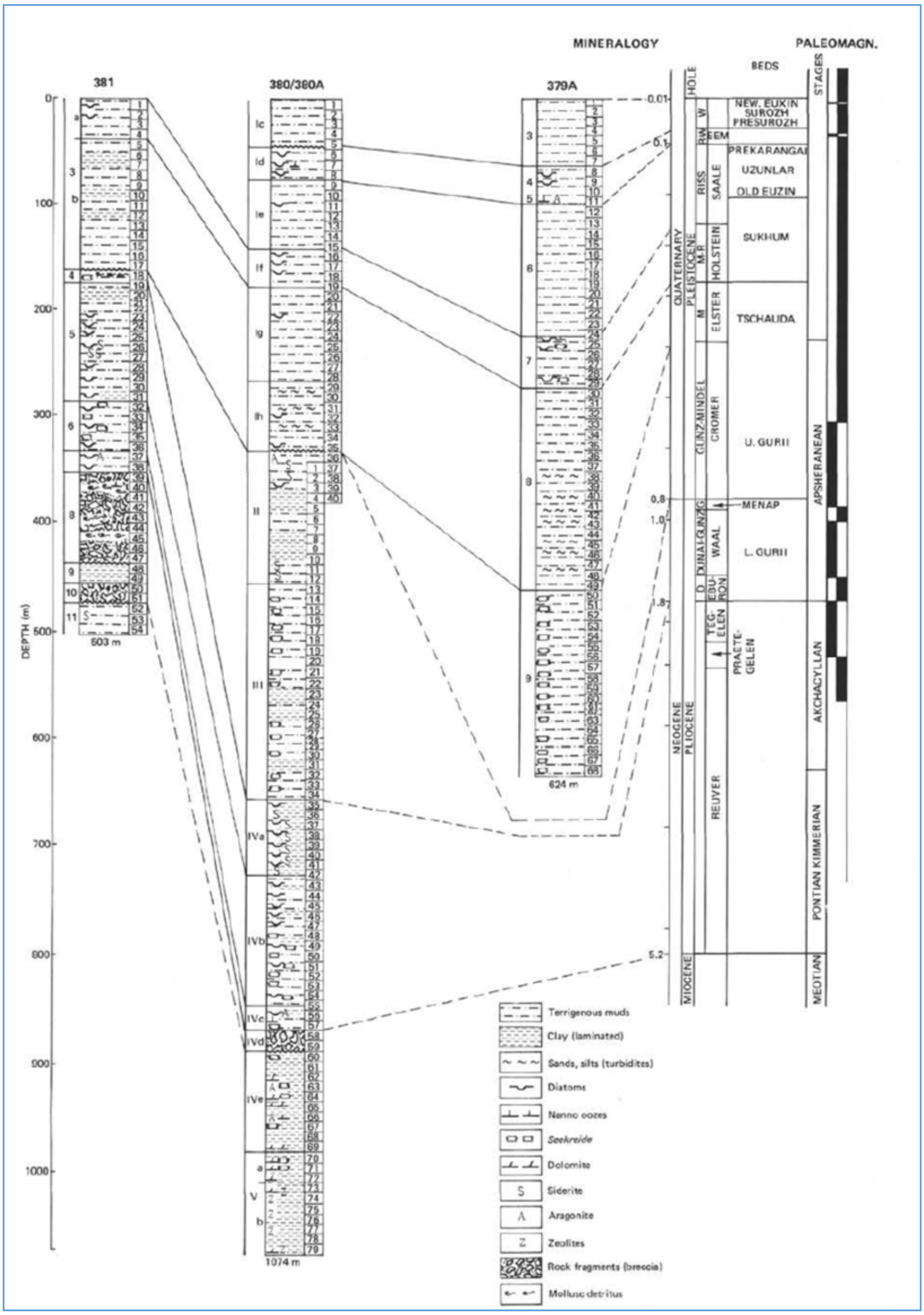


Figure6.23: Cross-section obtained from drilling points (Ref. 6.23)

Semi-closed Black Sea Basin has a different character than the other seas, due to the climatic conditions of the anthropogene era. Its location between Europe and Asia shows that the water level is determined by the fluctiations caused by the Eurasian climate. During the glacial age the Black Sea became isolated from the Mediterranean and the ocean (Ref. 6.106).

The Late Anthropogene lithostratigraphy of the Black Sea (Ref. 6.107) shows the three sedimentation sections, observable under 200m below sea level (Figure 6.46):

Unit 1: Cocolith (special calcium carbonate particles formed by algae and water column) bed, thin laminated, light green-gray coloured mud, rich with organic components. It is characterized with millimetric – semi millimetric, light greenish gray and lighter almost white coloured layers. The upper layer shows a homogeneous tissue for several centimeters. Unit 1 is described as a unit formed due to the direct sedimentation of biogenic and clastic material in low energy conditions. Thin layering observation is interpreted by Degens (Ref. 6.108) in order to explain the annual climate cycle.

Unit 2: Contains carbonate-weak sapropel mud involving sapropel interlayer with thin lamination. Sapropels are units which are sharp contacted, dark coloured and rich in organic materials (Ref. 6.109). The repetition of these kinds of sediments is the result of the climate changes in topographically isolated basins.

Unit 3: Corresponds to the last lacustrine period of the Black Sea. Generally represented as light and dark gray homogeneous mud and sometimes as lighter coloured lenses due to the widespread bioturbaitons. Black clays are also common. Reddish brown clays can be frequently observed in some parts of the Unit 3 (usually 4 meters below sea level). These interlayers are important stratigraphic signs.

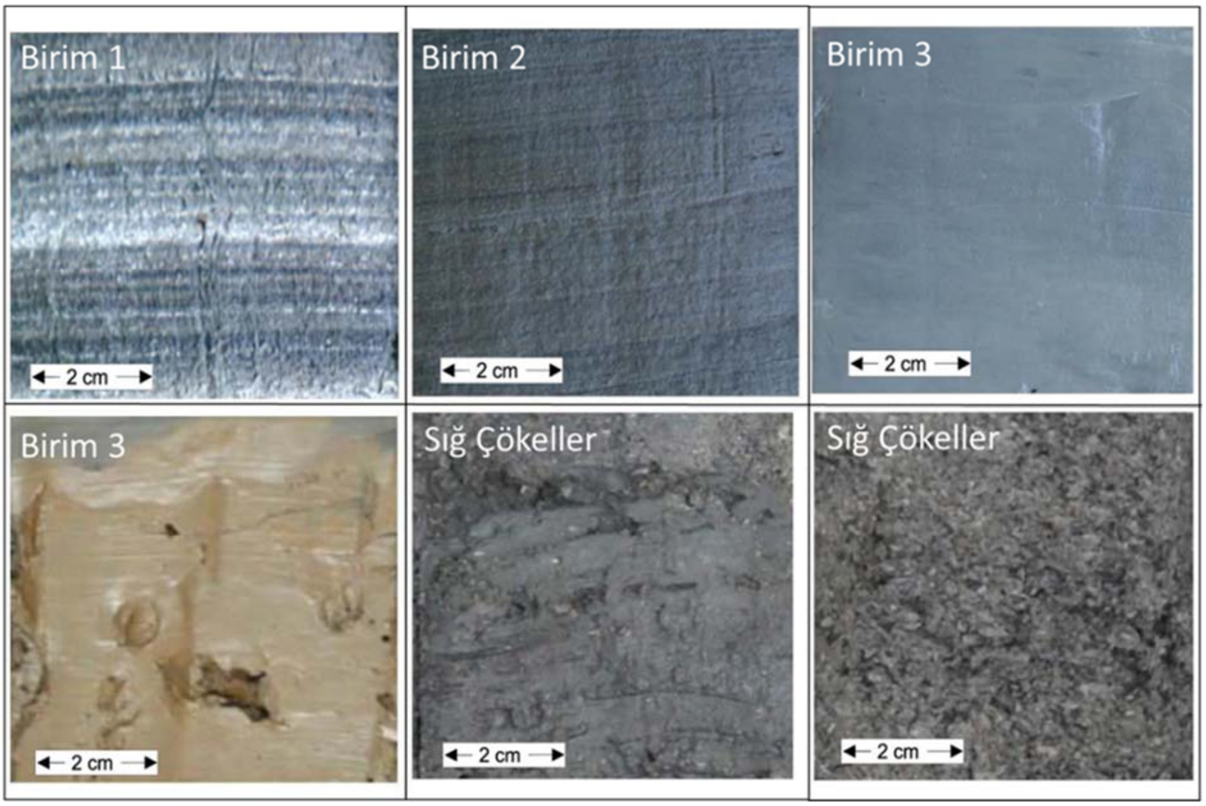


Figure 6.46: Sedimentation Sections Beginning From Below 200 Meters Under the Sea Bed (Ref. 6.118)

These sub-sections are located in the shallow areas. It is determined, from a single disturbed borehole sample (MAR02-45, Figure 6.47) of the constant sediments which belong to the last 9.100 years, that the southwest landing of the Black Sea consists of three basic lithostratigraphic units. The uppermost Unit A, consists of coloured banded bioturbation silted mud and many molluscs. Unit B consists of silted mud and mud intercalations which contain sea shells. Unit C consists of silted mud, gradual bedded silt and fine sand. The sediments which correspond to the unit A and B sediments are identified with shallow boreholes, presented in Figure 6.46 and Figure 6.47.

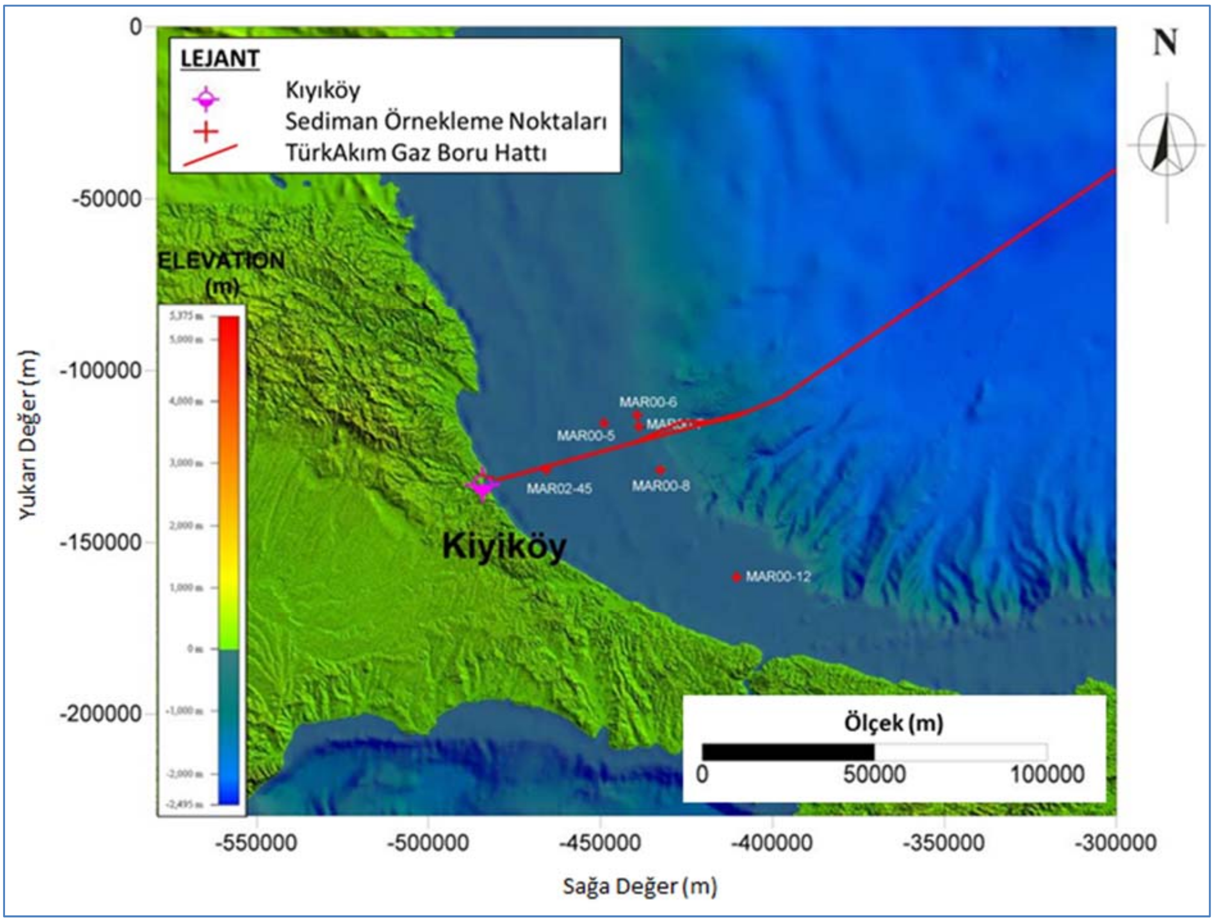


Figure 6.47: Disturbed Borehole Sample Which Belongs to the Last 9100 Years

6.3.2.1.2 Bathymetry

The bathymetry of the Black Sea is generally parallel to the topography of the land mass adjacent to it as seen in

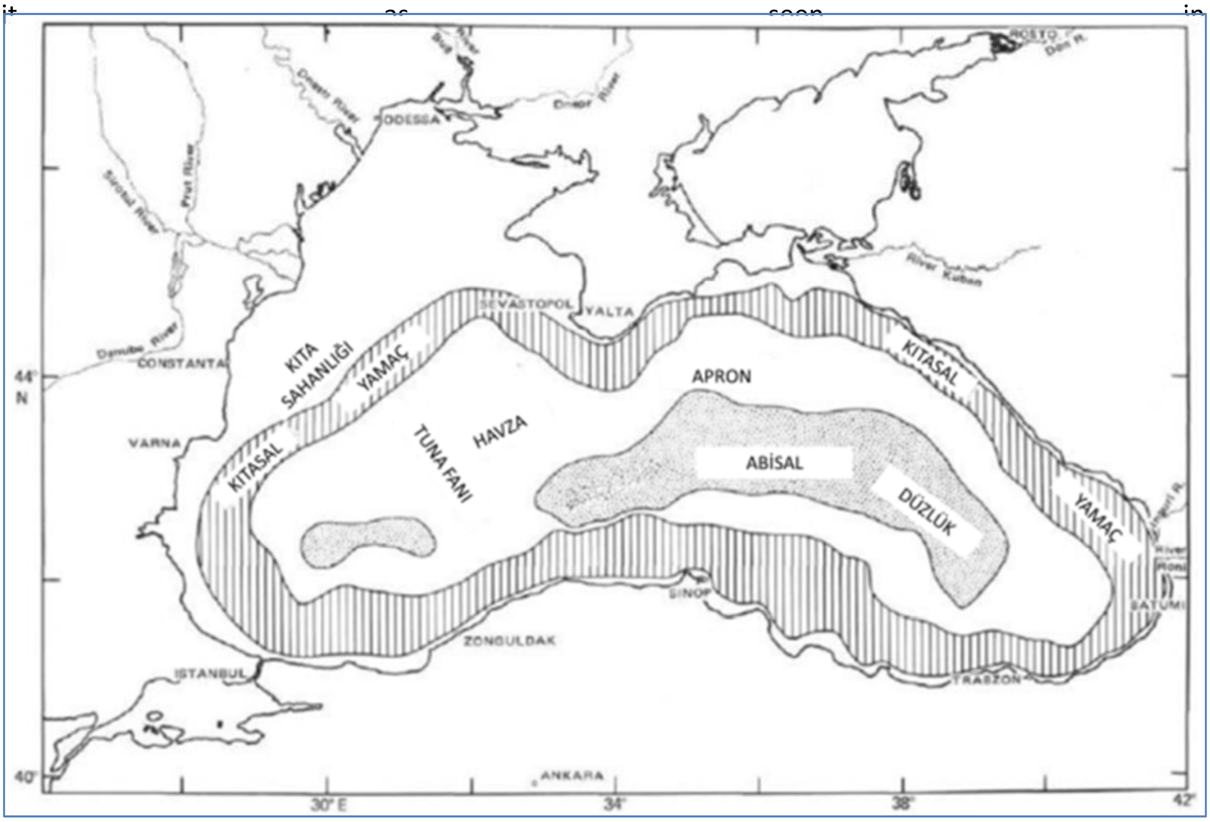


Figure 6.248 and

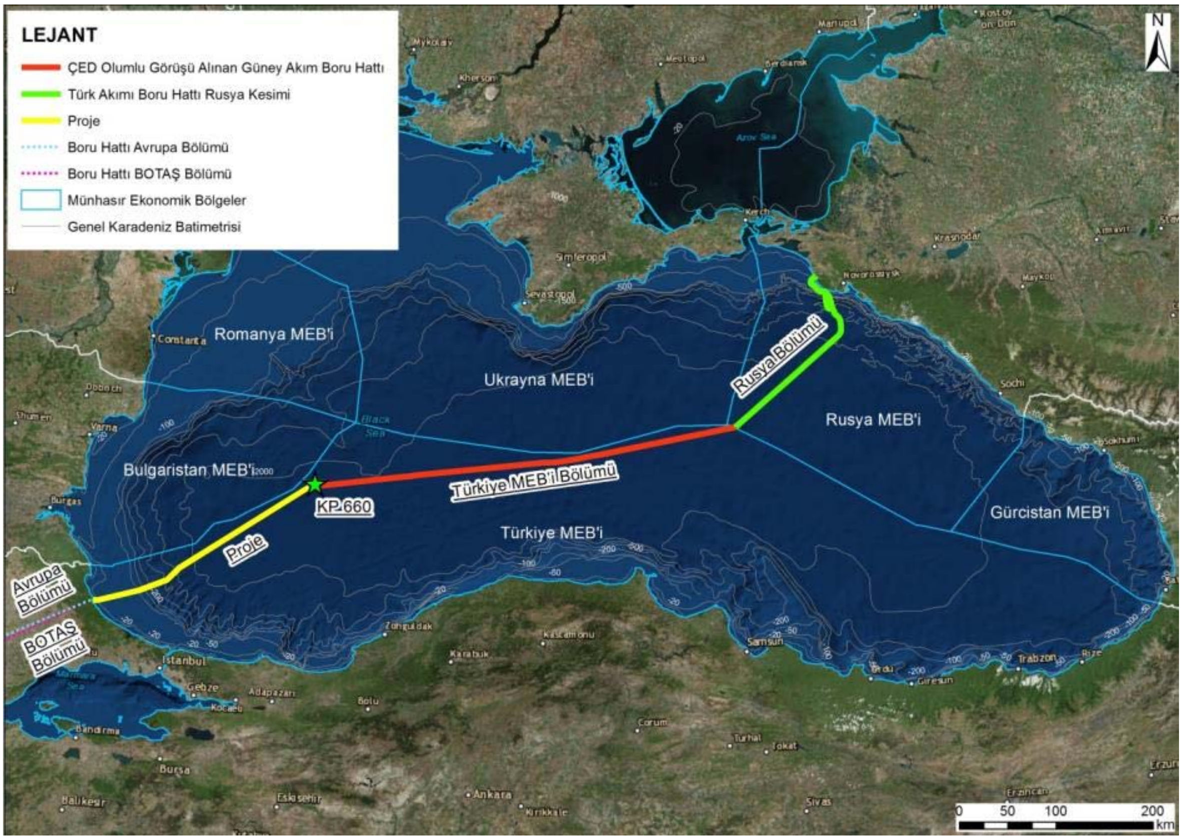


Figure 6.259. The Black Sea basin can be divided into four physiographic regions (Ref. 6.24):

- Shelf: The area extending to about 0-110 meters (maximum 160 m) deep and covering about 29.9% of total sea area;
- Basin slope: At water depths of 110 to 1,500 meters, covering approximately 27.3% of the total sea area;
- Basin apron: about 1.500 meters deep, covering 30.6% of total sea area); and
- Abyssal (deep-sea) plane: At depths of 1.500 meters and below sea level, covering about 12.2% of the total sea area.

The Black Sea bathymetry is characterized by a relatively narrow coastal landscape along the very deep and relatively flat inner basin. The northwestern region is the only region where the continental shelf is of significant length. Here, the alluvial discharge plateaus of the Danube River, Dinkyer, Dniester and Yuzni (South) Bug Rivers reach a significant distance from the shore.

On the Caucasus and Anatolian coasts, the shelf is only a narrow and discontinuous strip. Along the Crimea, Caucasus and Anatolian shores, the shelf is formed by intensely abraded Mesozo-Cenozoic folded formations as well as abrasion type reliefs.

Underwater valleys and canyons make the landscape of the shelf more complicated. Significant underwater canyons of rivers such as Yesilirmak, Kizilirmak and Karasu can be found near the Anatolian shore (Ref. 6.25).

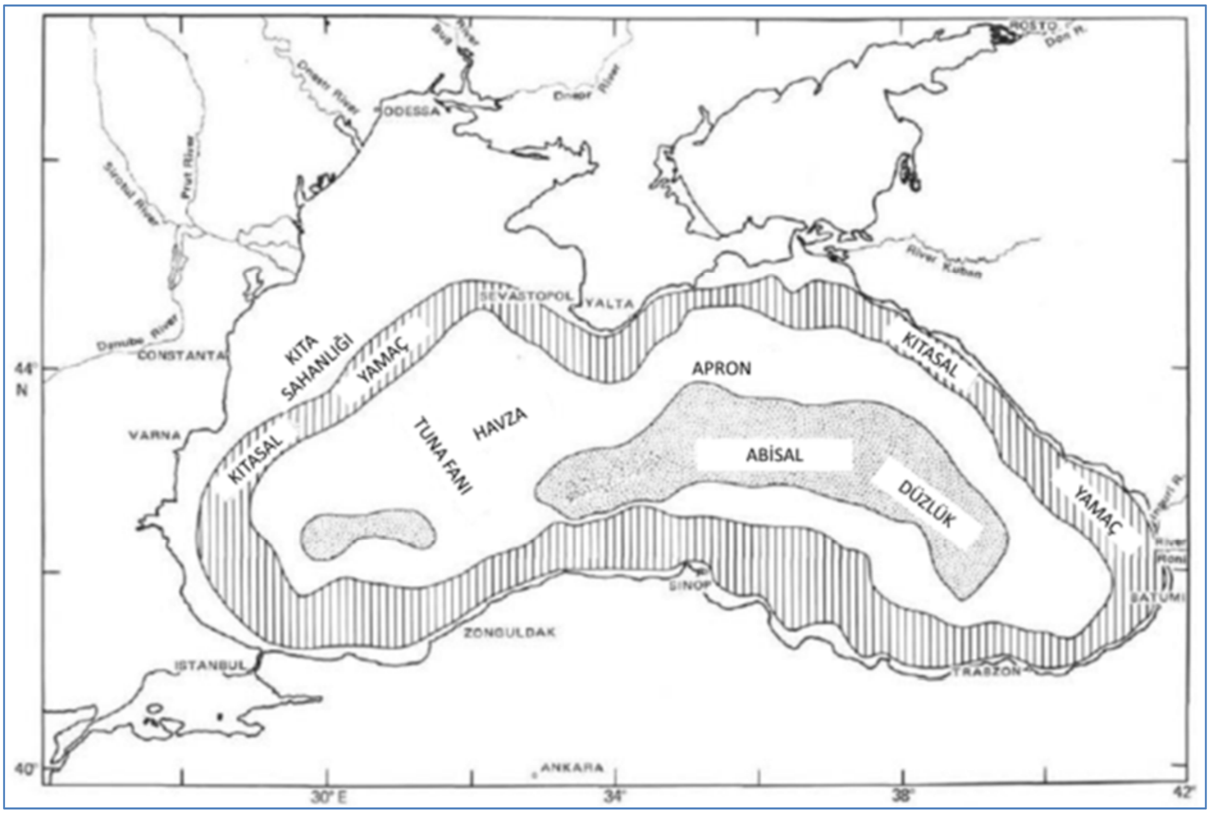


Figure 6.248: Main Physiographic Characteristics of the Black Sea (Ref. 6.22)

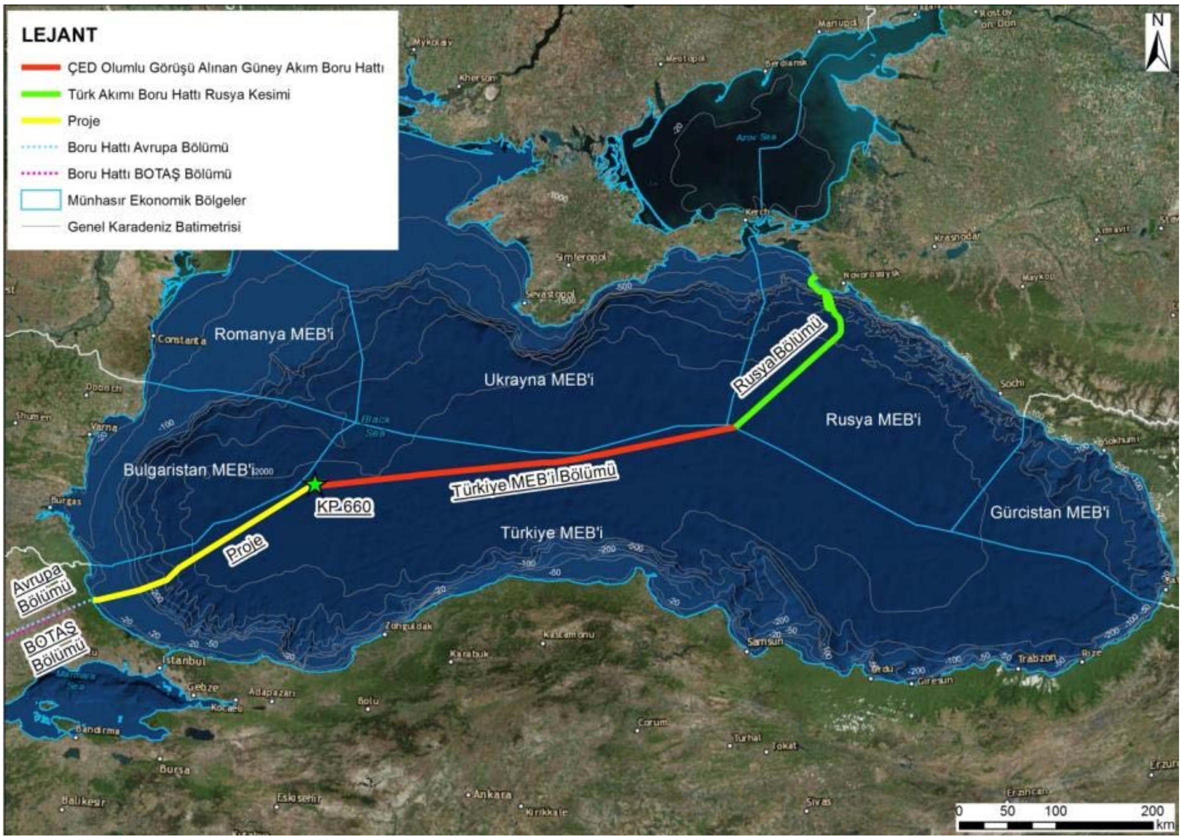


Figure 6.259: General Bathymetry of the Black Sea

The boundary between the continental shelf and the continental slope is generally of tectonic origin. The upper part of the continental slope between Anapa and Gelendzhik is abrasive; the lower part is structural abrasive in the east and the accumulative in the west (in the paleo deltas of the Don and Kuban rivers). The majority of the continental slope is characterized by gravitational slope movements such as avalanches, landslides, and mass movements (Ref. 6.25).

Both the continental slopes of Russia and Bulgaria are characterized by complex, interlaced V-shaped canyon systems that transform into U-shaped valleys at deeper segments. The hills of submarine canyons are limited to river mouths that pass through the shelf, join at the edge of the shelf, and then cut into the canyon through the continental slope.

The base of the canyons on the upper continental slope is covered with debris flow sediments and landslide masses, which involve large amounts of coarse rock blocks. At the end of the canyon there are detrital fans of various origins generally cut by river flow channels (Ref. 6.25).

The continental slope flattens at the base and transitions into continental rise. The boundary between the continental slope and the continental rise is marked by a significant decrease in the slope of the seabed (smaller angles than 1°). The lower limit of the continental elevation is about 2.000 meters and denotes the area of deep-sea (abyssal) plain. The greatest width of the continental rise (90 to 100 km) is in the northwest, northeast and southeastern parts of the Black Sea.

The middle region of the Black Sea basin is the abyssal plain, located at a depth of 2,000 to 2,200 meters. The bottom of the basin is a flat accumulation plain with an inclination to the south. The area within the 2.000-meter depth contour constitutes approximately 34% of the total area of the Black Sea. The Andrusov elevation, which is seen as weak in the base topography, and Arkhangel'skii elevation in the south, divide the Middle Black Sea depression basin into two parts, west and east.

Literature studies show that the abyssal plain is formed by mud volcano activity, with 1 to 30 meters high and 600 to 1,000 meters wide peaks. Fissures are usually associated with tectonic faults and are usually asymmetric in shape. While one side of the fissure is steep (usually 10 to 20 meters deep) and the other side is slightly gentler. However, some slightly inclined symmetrical shaped fissures have also been encountered. The fissures are usually 500 to 1,000 meters long (minimum 200 meters and maximum 4,500 meters) (Ref. 6.25).

Hakyemez and Erkal (1994) conducted a study to determine the coastal types of Thrace on the Black Sea coastal zone (Ref. 26). Six coastal types have been determined taking into account the morphological characteristics of the coast and the environment in which the coast is studied. These are:

- *Beğendik type coast profile*: This type of coastal profile includes summer and winter beaches and local low-level formations from the sea outwards. It is observed in the northeast of Beğendik village.
- *Iğneada type coast profile*: From the sea outwards, there are summer and winter beaches and wind dunes. Behind these, there are sometimes lagoons and occasionally base rocks. It is observed between Iğneada-Erikli Lake and Mustafa pier and in Yaliköy.
- *Kıyıköy type coast profile*: This type coast profile consists of summer and winter beaches and backshore areas. It is observed in Küçük Poliçe, Uzunkum, Selvez, Kıyıköy, Kasatura and Çilingos beaches.
- *Ormanli type coast profile*: In this profile, the coast rises as base rock cliffs following the summer and winter beaches. Pleistocene - Lower Holocene aged dune dominant deposits are located about 25 m above these cliffs. It is observed between Podima (Yalıköy)-Kumru stream and Rokethane hill to the east of Ormanlı village.
- *Terkos lake type coast profile*: After summer and winter beaches and wind dunes from the sea, Pleistocene - Lower Holocene dune dominated sediments and lagoon behind it can be found. It is observed between the lifeboat service buildings to the west of Rokethane hill and Karaburun hill.
- *Yeniköy type coast profile*: The present section of this coast type consists of summer and winter beaches and the backshore. Behind them are two terraces, one at low level and one at middle level. It is observed between Karaburun village and Yeniköy.

The coastal segment including the Shore Crossing Section of the Project Area enters the category of coasts, which is called "Pacific type" or "Longitudinal coast" according to various coastal classifications. The coast has the least indentation of Turkey, and its shoreline runs parallel to the structural lines (Ref 6.26). Hakyemez and Erkal (1994) also examined the Kıyıköy coast in their study and observed that this type of coast profile consists of summer and winter beaches and backshore areas (Figure 6.50).

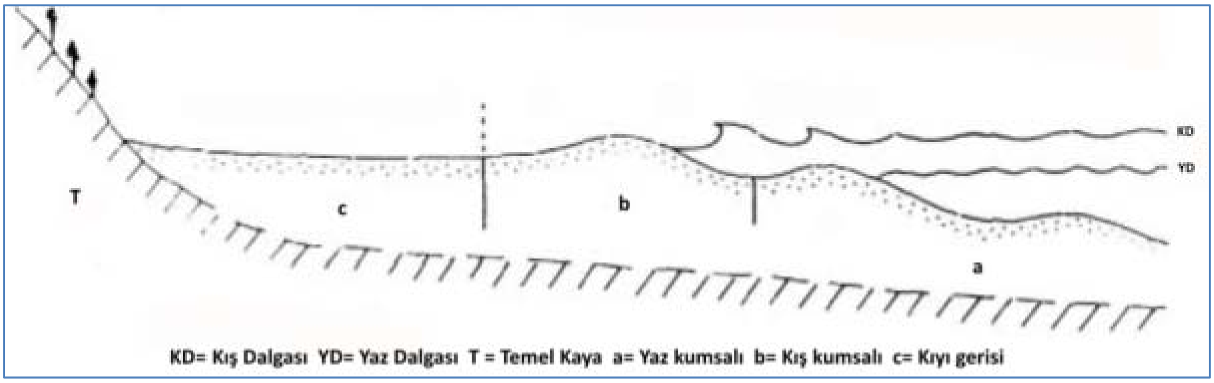


Figure 6.50: Kıyıköy Coast Type (Ref 6.26)

According to the Shore Crossing submarine topography, in general, the outer edge of the Black Sea shelf passes through 90 m to 100 m depths aside from some local exceptions. (Erinc, 1984/1985). This depth corresponds to the eustatic low level of the Black Sea during the last glacial period. This period is also the period during which the Late Alpine movements in Tyrrhenian demonstrate the effects of subsidence in the region (Ref 6.12, Ref 6.19).

The general slope of the North West Black Sea shelf is about 0.05-0.50% (Ref. 6.19, Ref. 6.27). If there was a leveling movement within a time period of 25,000 to 30,000 years (approximately from the upper Pleistocene to the present day), the shelf slope value must have been preserved. When the study area's coastal bathymetry is examined, it is observed that the steepness of high coastal areas continues under the sea while the low-lying coastal areas preserve the topographic slope under the sea to a certain degree. Similarities in underwater characteristics of low and high coastal morphology on land and at sea disappear at around -55 m at the seabed and the possible old shoreline is found at a depth of -55 to -60 m.

6.3.2.1.3 Faults, Seismicity and Seismic Risks

Today, the basin is surrounded by folded structures in the north, northeast, south and southwest. It is bordered by the epi hercynian platform which forms part of the Black Sea landscape between the coast of the Balkan Peninsula and the Crimea in the northwest. The tectonic map of the Black Sea Region can be found in Figure 6.51 (Ref. 6.28).

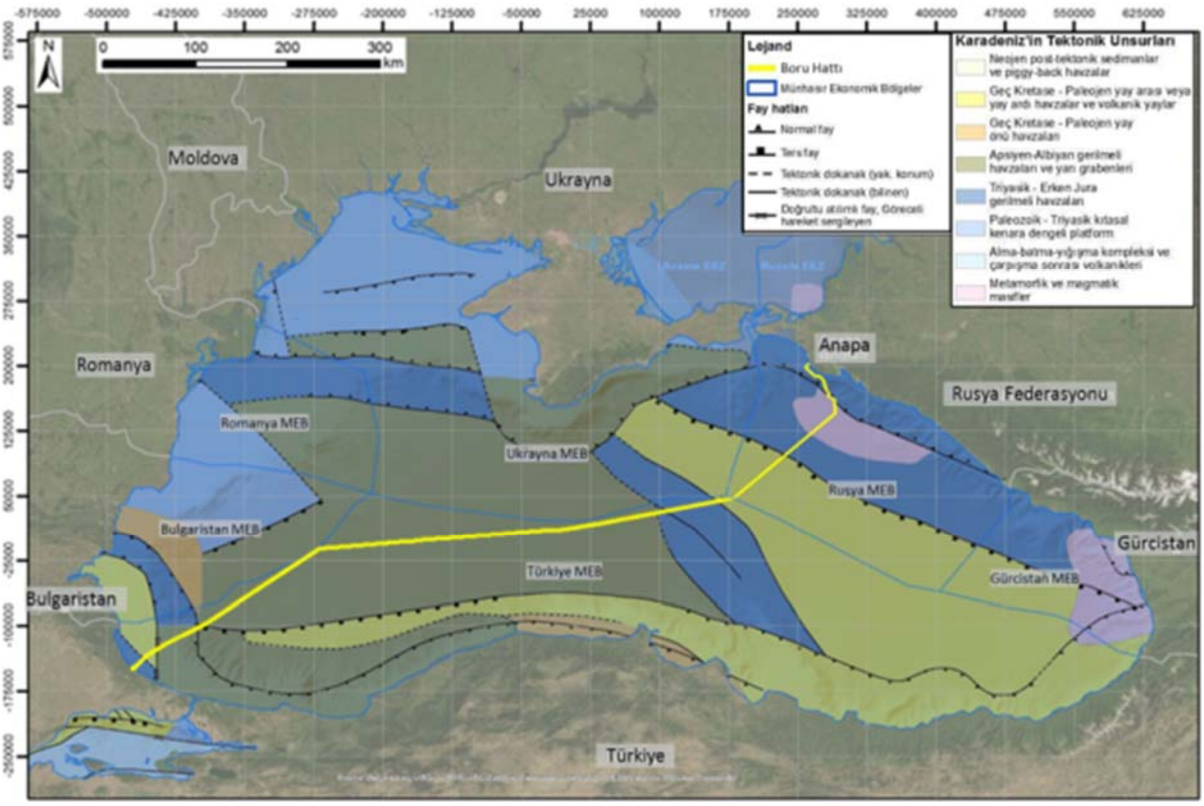


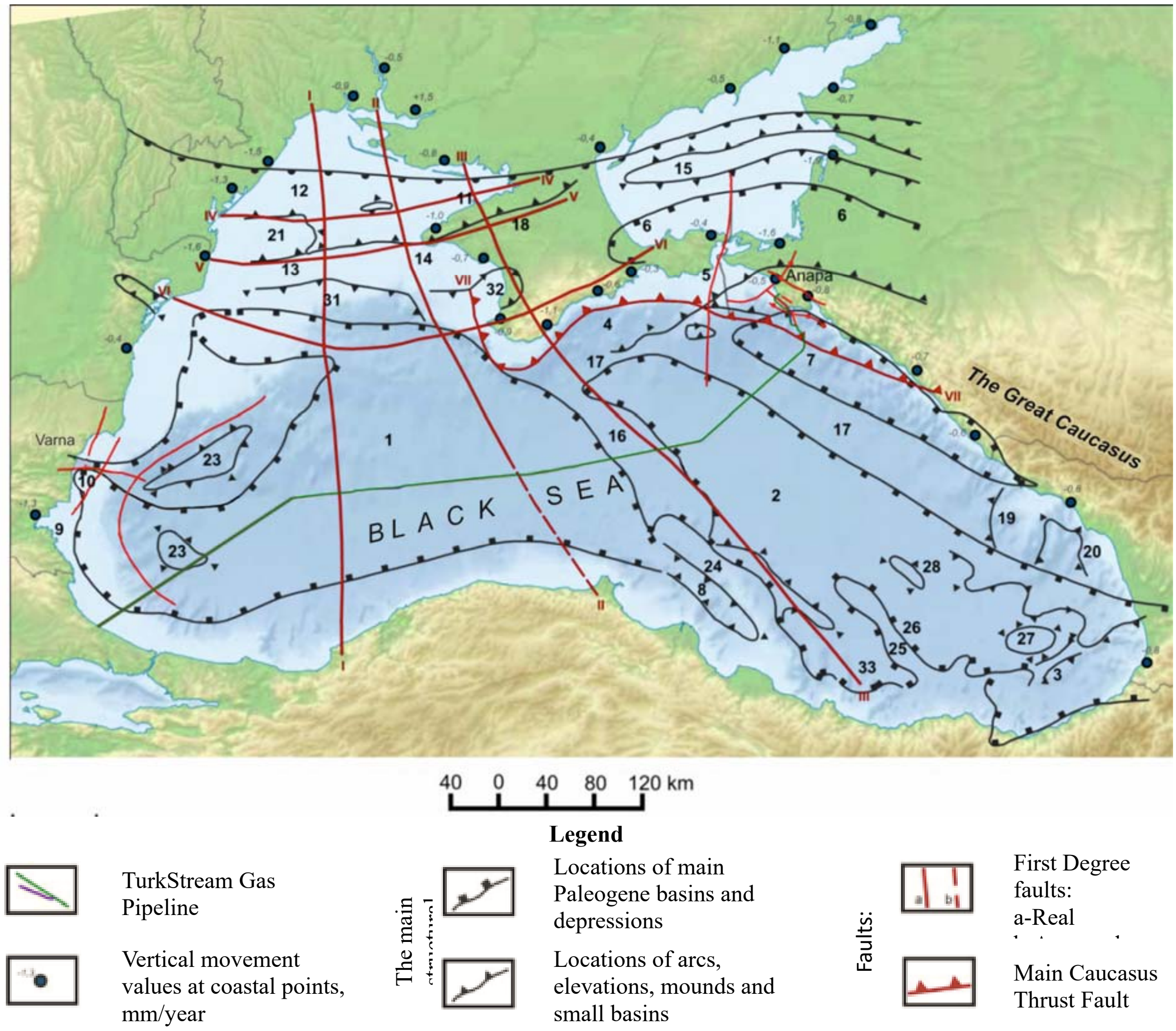
Figure 6.51: Tectonic Map of the Black Sea Region (Ref. 6.28)

In the Black Sea, the following tectonic structures exist from east to west:

- *West Utrish fault line*: It is 48 km long in the north-northwest direction. Some experts state that the development of dense gravity-tectonic depression blocks (Figure 6.51) in the rising wing of the Western Utrish fault is indicative of the current activity. In the offshore studies (Ref. 6.29) no activity has been identified along the Western Utrish fault.

- *Tuapse fault trough*: It is 60-70 km wide and asymmetric. The northeast slope of the basin is very steep, while the south slope (Shatsky rise) is slightly inclined.
- *Main Caucasus overthrust*: It has regional character and is western-north-west-lateral fault. The main Caucasus overthrust is a large-scale shift of Transcaucasia sinking under the Great Caucasus.
- *Shatsky rise*: It is a large earth crust rise on the northeastern border of the deep waters of the Eastern Black Sea. It is roughly asymmetrical in shape with a very steep south-west slope and a gentle north-east slope.
- *Eastern Black Sea basin*: The maximum depth of the pre-Cenozoic main rock in the basin is 13 to 15 km and the average depth below the abyssal plain is 12 km.

In the Eastern Black Sea basin and Andrusov rise, there are hundreds of meters of Mesozoic sediments between the consolidated bed rock and the Cenozoic environment (Ref. 6.28). These sediments are faulty and, together with the bed rock, form sloping blocks extending under almost the entire basin. Seismic data indicate that Cenozoic sediments in the Eastern Black Sea basin are hardly affected by fault movements (Figure6.52).



Flexures

The southern edge of the Ancient Eastern-European Platform

Second Degree faults:

The Numbers on the map

Main Basins

1- Western Black Sea
2- Eastern Black Sea

Fault Troughs

3- Gurian
4- Sorokin
5- Nerchensk-Taman
6- Indol-Kuban
7- Tuapse
8- Sinop
9- Burgas
10-Nizhnekamchinsk
11- Kakitin
12- Krylov

Elevation

13- Gubkin
14- Kalamitsk
15- Azov
16- Andrusov
17- Shatsky

Arches

18- Crimea
19- Gudauta
20- Ochamchire

Stresses

21- Chilia
22- Polshkov
23– Druzhba
24– Archangelsky
25- Muratov
26- Chikhachev
27- Dzhanelidze
28- Strakhov
29– Bariernoye
30- Golitsyn
31– Krayevayastupen
32- Alma Trench
33- Giresunkaya Trench

Roman Numerals on the Map

Regional Faults

I- Odessa-Zonguldak
II- Western Crimea
III- Crimea- Eastern Black Sea Mountains
IV- On the northern border of the Scythian Plateau
V- Northern Romania-Crimea
VI- Middle Romania-Crimea
VII- Southern Crimea and Main Caucasian Reverse Fault

Figure 6.52: Black Sea Structural and Tectonic Classification Scheme (Ref 6.30)

Seismic activity in the Black Sea is relatively weak. In the middle, seismicity is at a level that can be ignored, while moderate earthquakes are recorded on the shores. There are two important seismic zones around the Black Sea, one in the north of Turkey (North Anatolian fault line) and the other in the Caucasus region. The North Anatolian fault line, which lies in the east-west direction, is extremely active and is a right lateral strike fault. In the Caucasus region, active folding and thrusting are observed.

The Black Sea is a back-arc basin which has undergone many expansion and shrinking periods since the Permian (Ref. 6.111). The area continues to be deformed along Arabian Peninsula and Anatolian Fault System through north depending on Anatolian Block through west (Ref. 6.112), (**Error! Reference source not found.**). Back Sea arc has been formed along two continental arcs opening Great Caucasian Basin from Black Sea to Caspian Sea through east and west. Western and Eastern Black Sea Basins which are subbasins of Black Sea have been formed because of the extension of normal fault. Western and Eastern Black Sea Basins have different geological backgrounds.

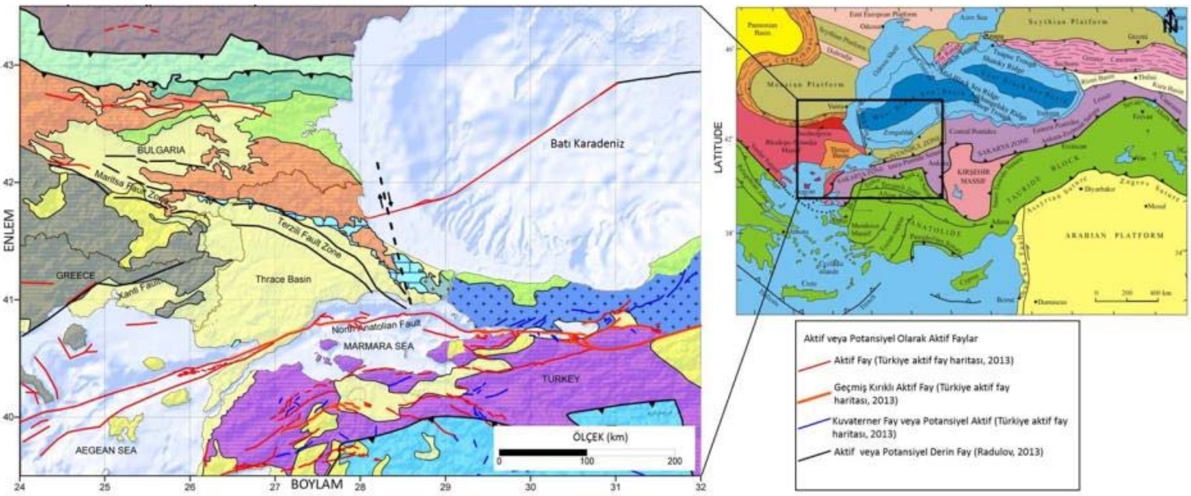


Figure 6.53: Deformation through East in Arabian Peninsula and Anatolian Fault System and Western Black Sea Fault Zone (Ref. 6.118)

Western and Eastern Black Sea Basins are different from each other regarding continental openness phases and sediment layers. While Western Black Sea Basin is filled with sediments in a plenary pattern nearly 13 km to the center of the ocean crust (Ref. 6.113), Eastern Black Sea Basin through northwest has a thin ocean crust covered with sediments in less thickness of 10-11 km (Ref. 6.114).

According to the information obtained from literature search, only and the most important tectonic formation cutting the offshore pipeline corridor is Western Black Sea Fault Zone (WBSF, **Error! Reference source not found.**). This fault has been taken into consideration as right-lateral fault along with left-lateral Western Crimean Fault (WCF) and it is considered that this fault is connected with the motion of İstanbul Zone during Late Cretaceous-Paleocene. According to Okay and Görür (Ref. 6.115) Western Black Sea Fault became passive during Early Eocene period and fault plane wasn't deformed and was covered with sea sediments during Middle Eocene. Covered faults can be observed as two seismic lines near the shelf break in the North of the slope where the research was conducted (Ref. 6.116), (lines no 56-57, **Error! Reference source not found.**). According to the information obtained from seismic reflection profiles and Huntec DTS profiles (Ref. 6.117), there is no active faults in shelf break of slope area where the research was conducted.

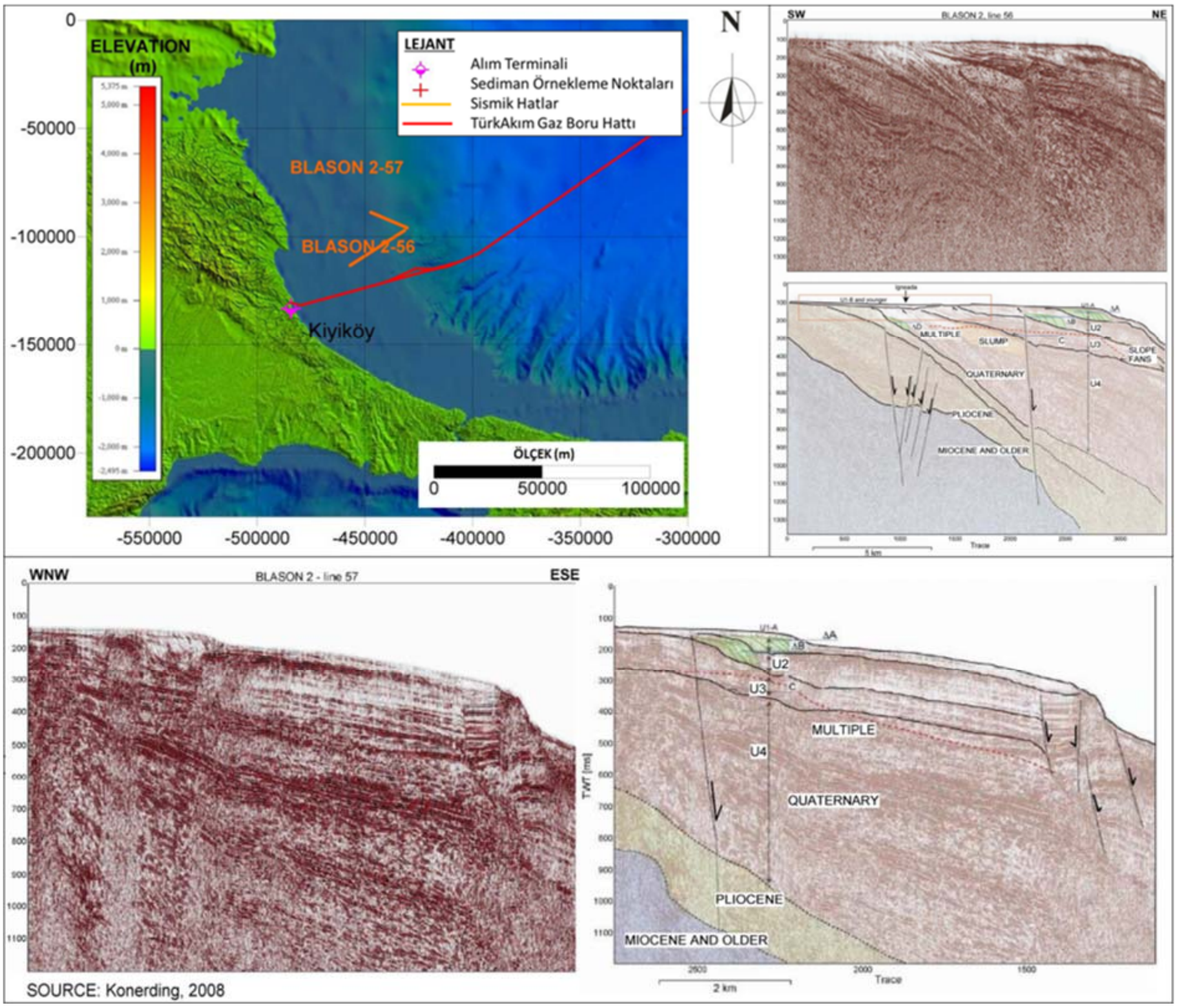


Figure 6.54: Deformation in Arabian Peninsula and Anatolian Fault System through West and Western Black Sea Fault Zone (Ref. 6.118)

Seismic hazard map developed under the GSHAP (Global Seismic Hazard Assessment Project) for the Black Sea region is seen in Figure 6.55 (Ref. 6.29). The peak ground acceleration (PGA) values are 0.10 gm/s^2 or less in the abyssal plain for a 500-year recurrence interval.

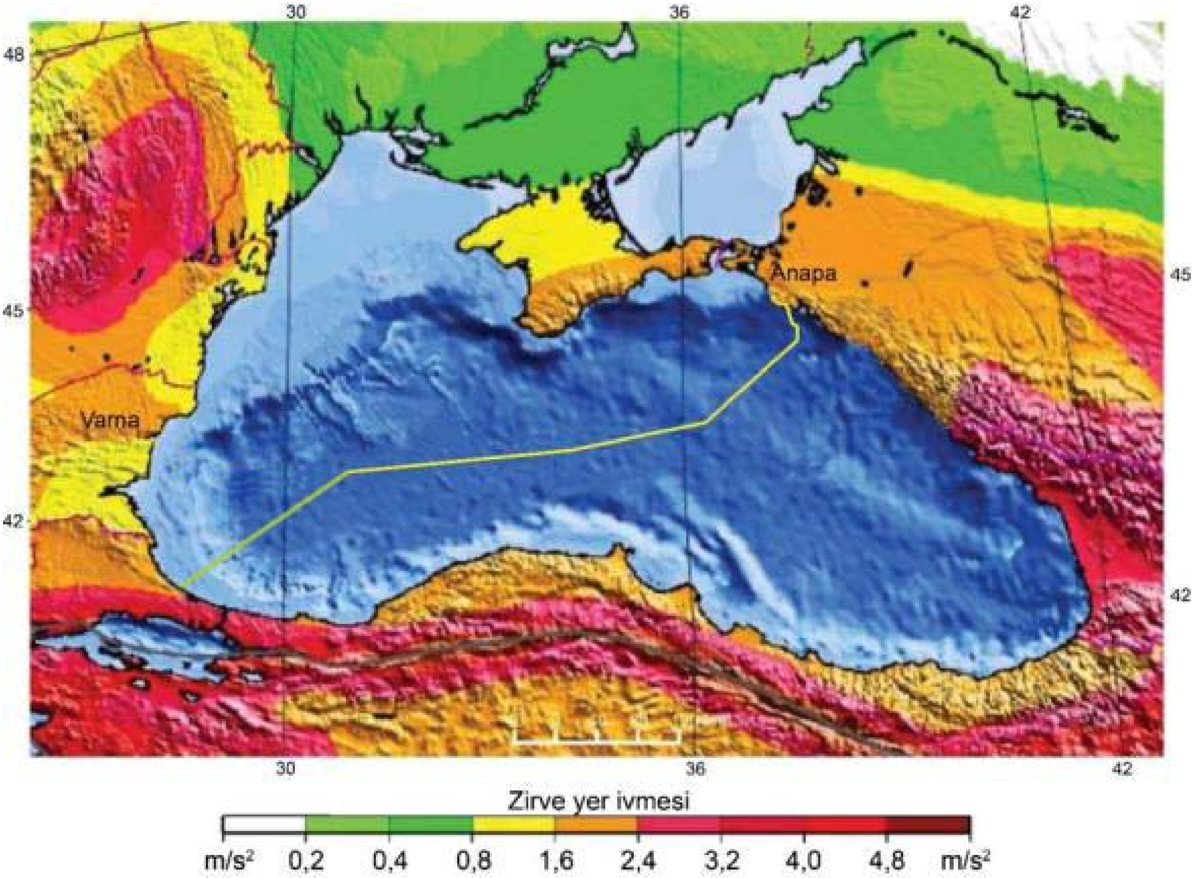


Figure6.55: Part of the Seismic Hazard Map Generated by the GSHAP International Project for Areas in the Black Sea Region (Ref. 6.29) (Note: Estimated seismic hazard for T = 500-year recurrence interval is shown in peak ground acceleration PGA (m/s^2) units in color. The calculated acceleration values are for typical solid sedimentary soils complying with category II soils according to SNiP II-7-81).

As part of the seismic hazard assessment, an initial point seismicity assessment based on probability analysis has been carried out. The results show that the largest ground acceleration changes from 0.33 to 0.28 g m/s with an interval of 1000 years from Anapa to Varna.

Clay volcanism is a sign of natural gas escaping from deep sedimentary layers on the sea surface. In the Black Sea there are two main types of mud volcanoes: those that are found along the perimeter of the basin (in the Kerch-Taman region of Bulgaria) and those associated with fracture-linked fluid sediment flows in the domes of the slightly inclined symmetric anticlines in the central region of the Black Sea. The natural gas leaks at the bottom of the Black Sea are widespread on continental margins and the abyssal plain. Abyssal flat gas spills are mainly associated with biogenic methane. Generally, the gas spills in the Black Sea are related to mud volcanoes and tectonic faults. A characteristic feature of some regions of the Black Sea slope (Bulgaria, Ukraine and Turkey) is the high gas saturation of new sediments and the emergence of gases in the form of gas clusters (Figure 6.266). At the top of the slopes of Bulgaria and Ukraine, a large number of gas clusters were recorded in water columns at depths of 650 to 700 m.

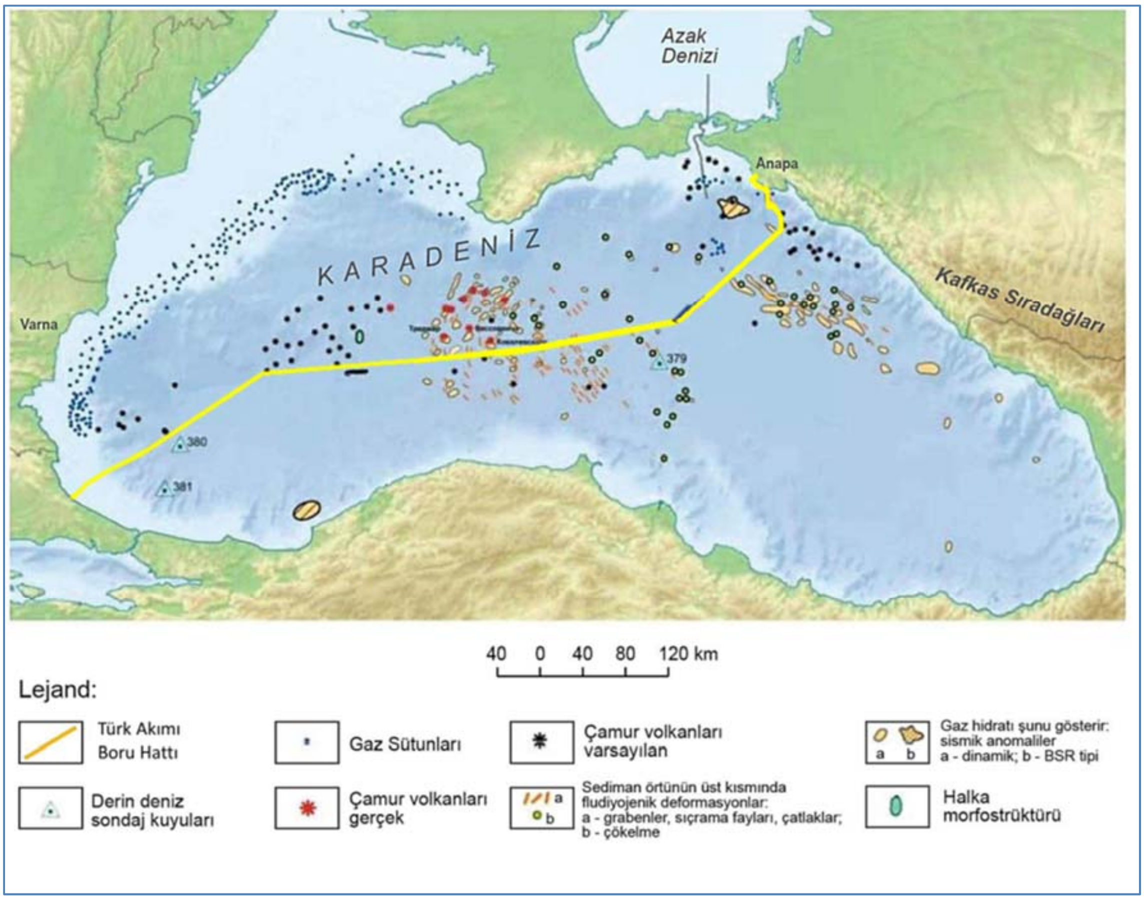


Figure 6.266: Mud Volcanism in the Black Sea (Ref. 6.29)

At the base of the slope of Turkey (1,850m depth), dense reflection layers at a depth of 4 to 40 m from the sea floor surface (probably "natural gas pockets") and probably due to the increased pore pressure in the thickness of the component sediments and to various stress cracks (fractures) in the form of "domes (hillocks)" (3 m high and 120 to 140 m wide cones) have been identified. On the abyssal plain there is also a significant number of "fluidogenic" deformation associated with the rise of hydrocarbon fluids. These are at the top of very slightly inclined anticlinal ridges, displacements, small faults, small depressions, and craters. "Fluidogenic deformation" field distribution is the same as in sludge volcanoes, gas saturated sediments, gas hydrate areas. No development of landslide processes in the Abyssal plain has been determined and such processes are not expected due to the small slopes on the surface of the sea floor.

6.3.2.2 Project Area Seabed Geology

6.3.2.2.1 Devices and Systems Used

The data set consisting of hydrographic, oceanographic, geological and geophysical raw data collected from the study area covering the Shore Crossing Section of the Project Area in 2015, and the "Hydrographic and Oceanographic Survey Report" prepared for the Shore Crossing Section of the Project within the scope of this EIA study, which serves as a summary of this data set, has been approved by Office of Navigation, Hydrography and Oceanography (ONHO) and the approved report is provided in **ANNEX-6.C**. In the approved ONHO report, the devices and systems used in the work carried out in 2015 are fully explained. A revision was requested from the ONHO, since the pipeline course of the Shore Crossing Section of the Project, which was updated in 2017, is located in the study area which was covered in the ONHO report approved in 2015.

Apart from the information included in the approved ONHO report of the Shore Crossing Section, the pipeline route in the Shore Crossing Section of the Project, which went through changes, has been supplemented by additional studies aimed at assessing the geological and environmental characteristics of the seabed. Various survey vessels (RV Heather Sea, MB Kemal Bey, MT Enad-1) with measuring equipment were used to perform additional studies. The basic measuring devices are listed below and all the devices and their technical specifications are given in **ANNEX-6.C**:

- Multi Beam Echo Sounder (MBES);
- Single Beam Echo Sounder (SBES);
- Sub bottom Profiler (SBP); and
- Side Scanning Sonar (SSS).

Shore CrossingThe Hydrographic and Oceanographic Study Report, which was prepared following the engineering studies conducted in the Offshore Section of the Project, was presented to ONHO in August 2017. Due to the scope and the details of the report, ONHO's inspection on the report continues. As stated in the opinion letter received from the Directorate of ONHO in 06.09.2017 **(Annex-5.A),** in case some inadequate and/or faulty subjects are identified by the ONHO during the inspection period of the Hydrographic and Oceanographic Study Report, these inadequate and/or faulty subjects shall be fulfilled/corrected by the Project Owner and construction works shall not start without receiving the approval of the ONHO. The approved report shall also be shared with the Ministry of Environment and Urbanization.

Studies which were planned and carried out in the Offshore Section of the Project are presented in Table 6.145.

Table 6.145: Planned and Carried Out Geological Studies in the Offshore Section

Study	Current Situation
Meteorological and Oceanographical Study	Completed
Offshore Section, Continental Slope Seismic (2DHR)* Study	Completed
Route Exploration Study (Abyssal Plain)	Completed
Route Exploration Study (Continental Slope)	Completed
Route Exploration Study (Continental Shelf)	Completed
Continental Slope Upper Section Detailed AUV** Study	Completed
Abyssal Plain Detailed AUV** Study	Completed
Continental Shelf Footing Survey: Sparker/Magnetometer Measurements	On Going
Offshore ROV*** Study	In Planning Stage
Pre-Geotechnical Study	Partially Completed
Detailed Geotechnical Survey	Partially Completed
Detailed Goehazard Survey	Partially Completed

* Two-dimensional, high resolution
** Autonomous Underwater Vehicles
*** Remotely Operated Vehicles

6.3.2.2.2 Sedimentation

Offshore Section

TurkStream Gas Pipeline - Turkey EEZ Section (Formerly South Stream Offshore Pipeline - Turkey Department Project) has revealed that the upper part of the sediments of abyssal plains at the base of Turkey's EEZ is composed of a thick terrestrial clay layer. The top layer of Sediment (about 0.3 m) is important as the pipelines will be placed directly on it. Water content, density, atterberg limits (tests to identify the consistency and behavior of the grounds), grain size distribution, organic matter and carbonate content tests have been carried out in order to classify the features and soils in various sampling locations within the Turkey EEZ. Thermal conductivity, conductivity, pH, carbonate and bicarbonate ions, chloride and sulphate ions, calcium and magnesium tests have been conducted and thermophysical and geochemical soil properties have been identified. Mechanical properties (including bearing capacity) have been assessed using triaxial tests (which measure the mechanical properties of many solids, especially soils, which may deform) and the odometer test (measuring the consolidation properties of the soils). These results are in parallel with the prior sediment sampling results conducted in Black Sea (Ref. 6.31). The sediment structure in the Offshore Section of the Project is expected to show similarities to the general sedimentation characteristics of the Black Sea. The report, which contains the results of the studies conducted in order to determine the sedimentation in the Offshore Section of the Project, was presented to ONHO. The report, which is in the approval stage, shall be presented to Ministry of Environment and Urbanization upon being approved by the ONHO.**Shore Crossing Section**

According to the results of the studies conducted in 2015 in the Shore Crossing Section of the Project, on the basis of the grain size of the examination area, the sediment distribution ratios of the sea floor varies between 0.32-58.61% for gravel, 21.24-52.84% for sand 8.02-28.93% for silt and 1,73 and 6,98% for clay content. It is identified that the average percentages for gravel, sand, silt and clay are 14.43, 70.95, 11.25, and 3.37, respectively. According to the results obtained from sediment samples, there are sandy and pebbly units in the whole area.

In the Shore Crossing Section of the Project, Project Area was determined to have sandy sediment structure according to the further investigations aiming to evaluate the environmental characteristics of the seabed due to the changes in open cut pipeline route. According to the findings obtained from the studies under details under **Chapter 7** (Biological Environment Assessment, Sections 7.1.2.2 and 7.1.2.3.2), the sand content of the examination site varies between 65.7% and 98.6%. The map of the sediment classes showing the changes in the route of the project is given in Figure 6.277.

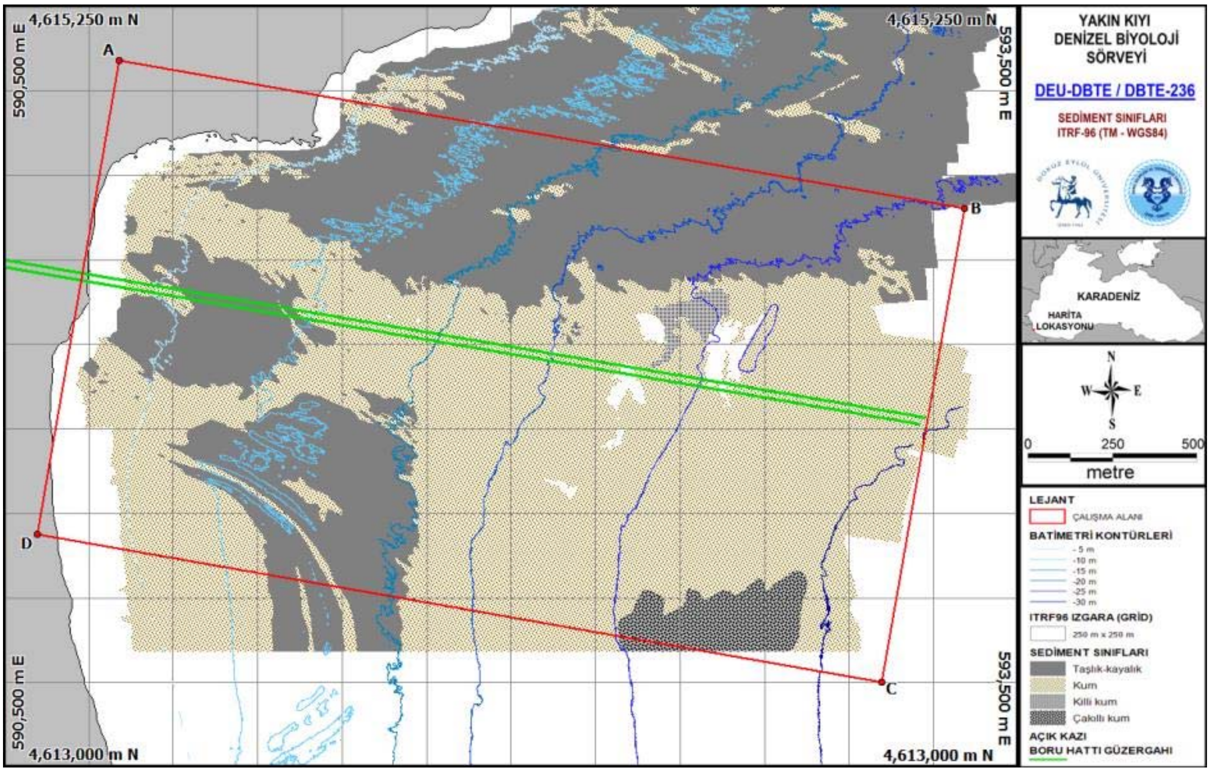


Figure 6.277: Sediment Classes Map

The interpretations of the sedimentation on the basis of geophysical studies in the Shore Crossing Section of the Project Area have been proposed as a result of the comparison of the seismic characteristics with the geological information and scientific articles based on the Marine Seismic Data (SBP) data. According to the research carried out in the Shore Crossing Section of the Project Area, the site is located in the Thrace Basin where the third-level sedimentary rocks (syncline), the Quaternary Alluvial Sediments is the cover unit and the Strandzha Massive metamorphic rocks forms the basis of. The shallow region geology is basically composed of three main units. Those units are explained below.

Unit QB: are the Anthropogene Tali. It is in transparent/ translucent seismic recording type which has discontinuities and weak internal reflectors. Usually accumulated via alluvions, conglomerate sediments, streams and coastal sands. The base of this unit is erosional surface and its thickness can vary from a few centimeters to 4.5 meters.

Unit 1: Its upper level dipping towards the west is cut by the erosional surface and it has Clinostratific reflectors. These internal reflectors are more distinctive towards the right section according to the signal absorption characteristic and they are constantly in a meandering state. Unit 1 has a structure-wise fragmented morphology where it exhumes on the seabed. It has medium-thick layering which consists of karstic reef limestone containing fossils and arenaceous limestone. It can be observed in the southwest and west of the Shore Crossing Section of the Project.

Unit Jsm: It is in transparent seismic recording type according to the acoustic signal absorption of the bedrock. It has a structure-wise fragmented morphology where it exhumes on the seabed. Turbiditic type alkaline ebonite consists of interbedded meta-greywacke, meta-psammite, meta-tuff and quartz schist units.

6.3.2.2.3 Bathymetry

Offshore Section

2-dimensional high resolution (2DHR) seismic, Multi Beam Echo Sounder (MBES) and Sub-botom Profiler (SBP) for sea seismic studies were conducted via R/V Heather Sea Research Vessel in order to determine the bathymetry of the Offshore Section of the Project and the geological risks that can occur within the scope of the Project. The investigations began on 28 January 2017 and ended on 6 February 2017. MBES Seson SeaBat 8160 is used for Offshore Section bathymetry mapping. The satellite complex of the used echo-sounder is shown in Figure 6.288.

Figure 6.288: Satellite Complex of the Echo-Sounder

Echo-sounder data is obtained via EIVA NaviScan software, and then MBES data is processed with a special software. An operator is appointed to check the parameters during the investigations.

Shore Crossing Section

In order to define the bathymetry in the Shore Crossing Section of the Project, MB Kemal Bey research ship from the shore strip to the depth of about 5m water depth and MT Enad-1 research ship for the depth of 5m water to the depth of approximately 30m in the research area. While the echo-sounder sensor was in MB Kemal Bey Research vessel, the Multi Beam Echo Sounder (MBES), Side Scanning Sonar (SSS), Sub bottom Profiler (SBP); Sparker (SPK) and Magnetometer (MAG) sensors were mounted on MT Enad-1 research vessel. The investigations began on 23 December 2016 and ended on 15 January 2017.

The results obtained from the studies on the bathymetric investigations of the Offshore and Shore Crossing Sections of the Project are presented under **Section 6.6.1** (Offshore Section Bathymetry) and **Section 6.6.2** (Shore Crossing Section Bathymetry), respectively.

6.3.2.2.4 Faults, Seismicity and Seismic Risks

The pipelines may be exposed to changing soil deformations due to the movements of active faults. Thus, an important issue while determining the pipeline routes is whether the fault-lines will cause the surface failures.

A part of the Offshore Section of the Project is located in the Western Black Sea basin. Oceanic crust and sub-oceanic crust lies along the Western Black Sea Basin (WBB). The basin began to widen in the Cenomanian period and the sediment cover is 14-16 km thick (Ref. 6.17) The Western Black Sea Region is located on the European continental margin and includes some parts of the northern periphery of the Alpine orogeny. The Western Black Sea Zone (WBZ), which is composed of the western part of the WBBs and of some ancient platforms (Moesya, Scythian and Eastern Europe) and Alpine orogenic units (Strandzha, East Srednogori, East Balkan, Pre Balkan and Northern Dobruca), has a very complex geological structure. The tectonic map of the WBZ is given in

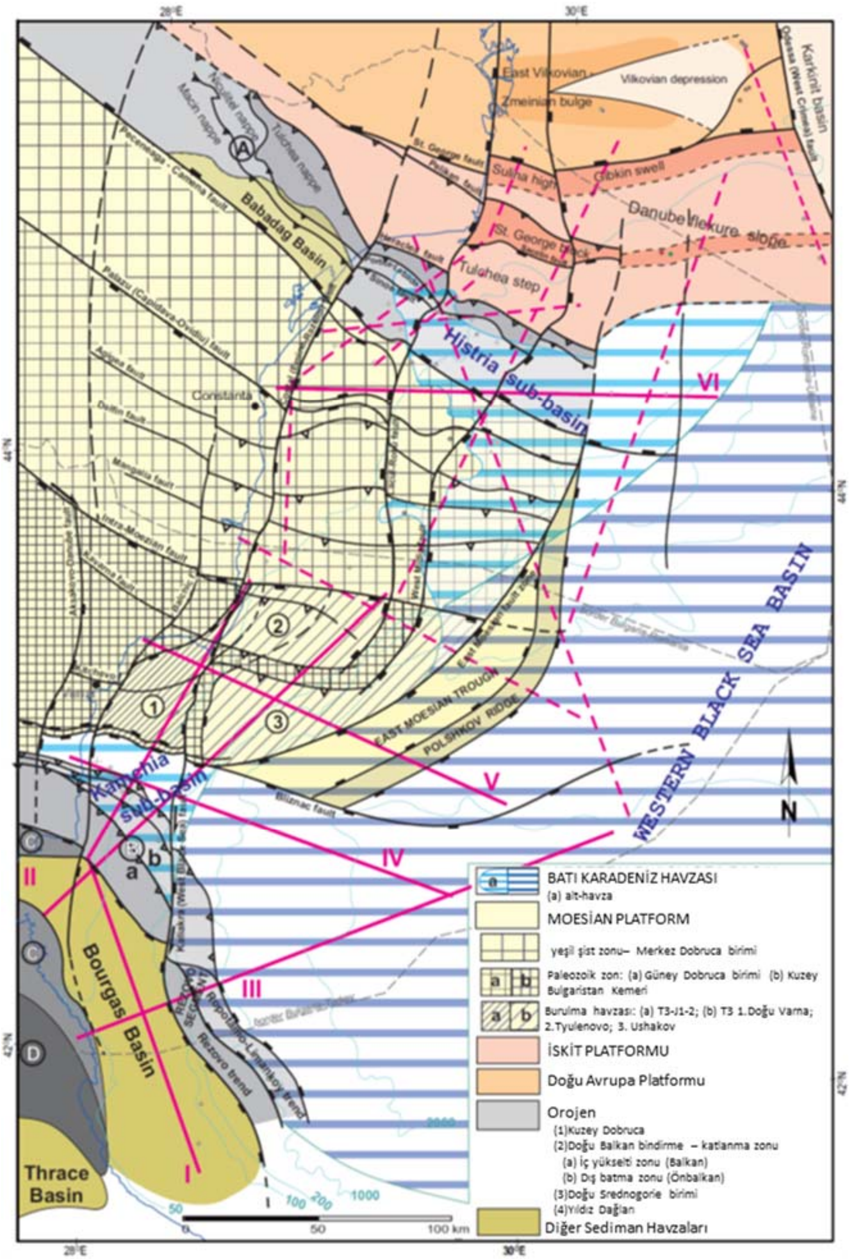


Figure 6.299.

The main tectonic units of the WBZ are the following: (1) the Western Black Sea Basin - western zone and its two deep tributaries wedging to the West: Kamçiya and Histriya sub-basins; (2) Platforms: (i) Moesya platform - the easternmost zone; consists of the following: (a) Green Schist Zone (Central Dobruca Unit), (b) Paleozoic Zone (Southern Dobruca unit and Northern Bulgarian arch), (c) Late Triassic and Early-Middle Juror torsion/pull-apart basins (d) Southern and Eastern platform shores and margins, (ii) Iskit platform - the Westernmost part, (iii) Eastern Europe Platform - a small part of the southernmost part; (3) Orogens: (i) North Dobruca thrust-fold belt (overturned North Dobruca rift zone), (ii) East Balkan thrust-fold belt and the easternmost Rezovo segment of it: (a) Elevated inner zone (Balkan), (b) Buried outer zone (front balkan), (iii) Easter Srednogori, (iv) Strandzha; (4) Smaller sedimentary basins: (i) Burgaz basin and (ii) Babadağ basin.

Burgaz Basin - This NW oriented Tertiary basin is predominantly located on the offshore in the SW part of the Western Black Sea Zone; only a small part of its NW periphery surfaces on the land (

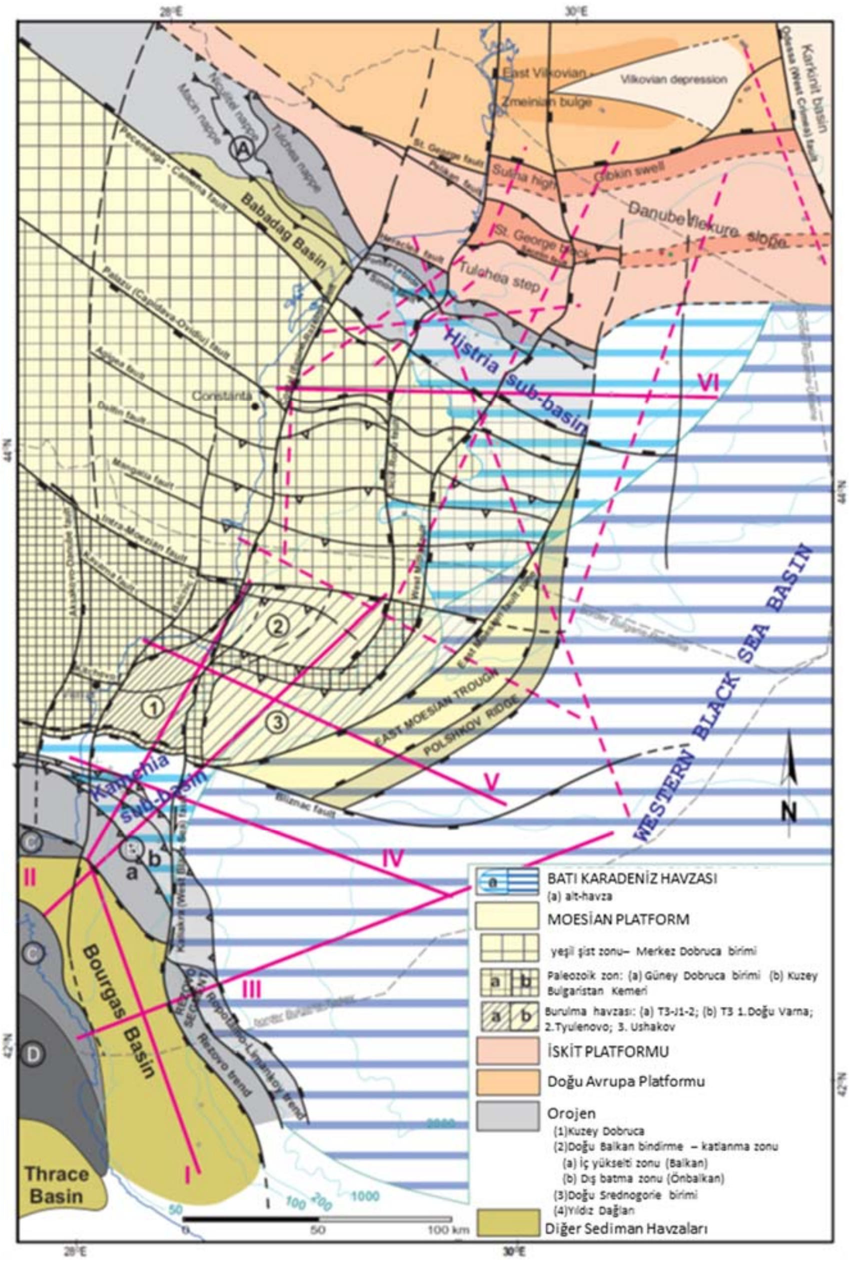


Figure 6.299). The basin is usually undergoing seismic data exploration on the coasts of Bulgarian. Drilling is carried out offshore (Pinusada and Black Sea wells) in Turkey and in the Onshore section of

Bulgaria (Burgas region). The Back Balkan basin is located on the eastern border of this basin, which is a semi-graben geometric structure. At the western and northern border of basin, the East Srednogori unit is located; whereas the last Balkan unit and Rezevo segment are at the northeast and east border

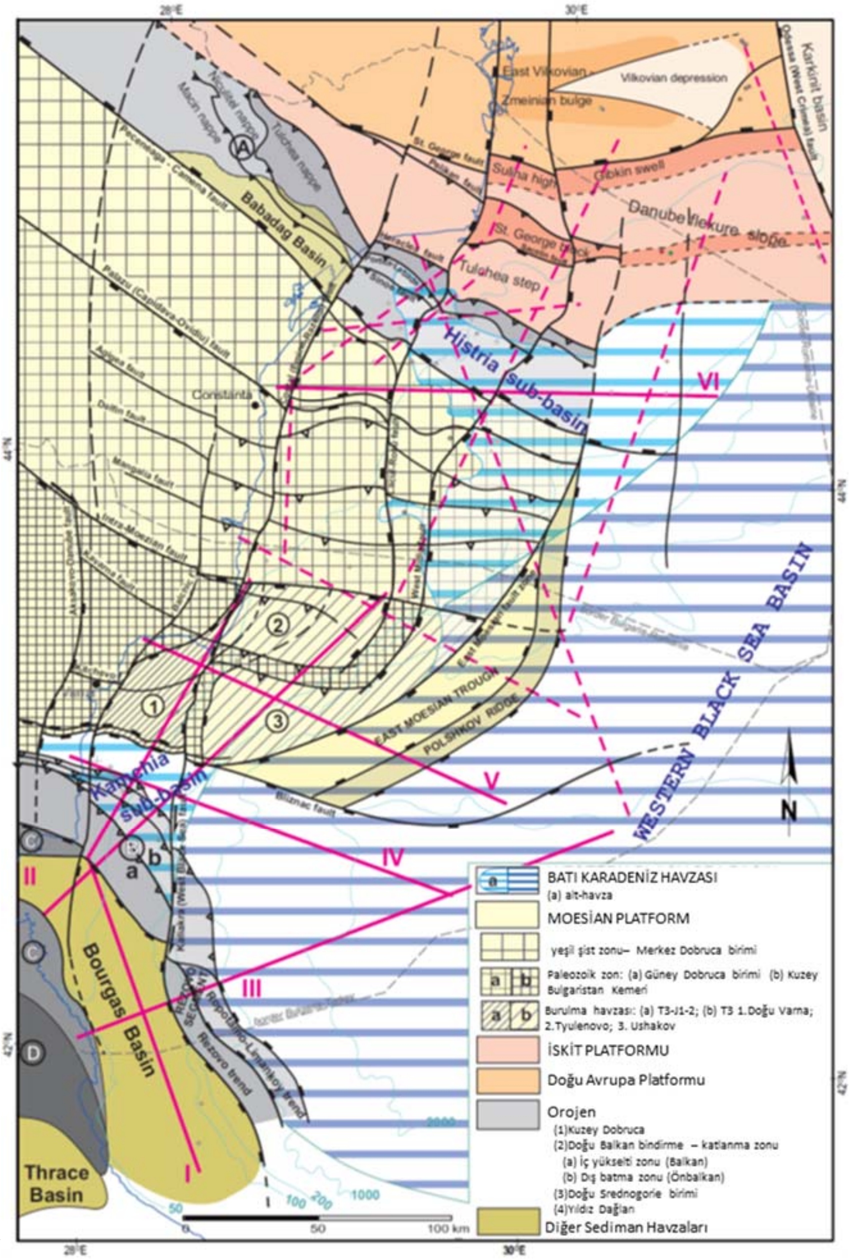


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Figure 6.299 and

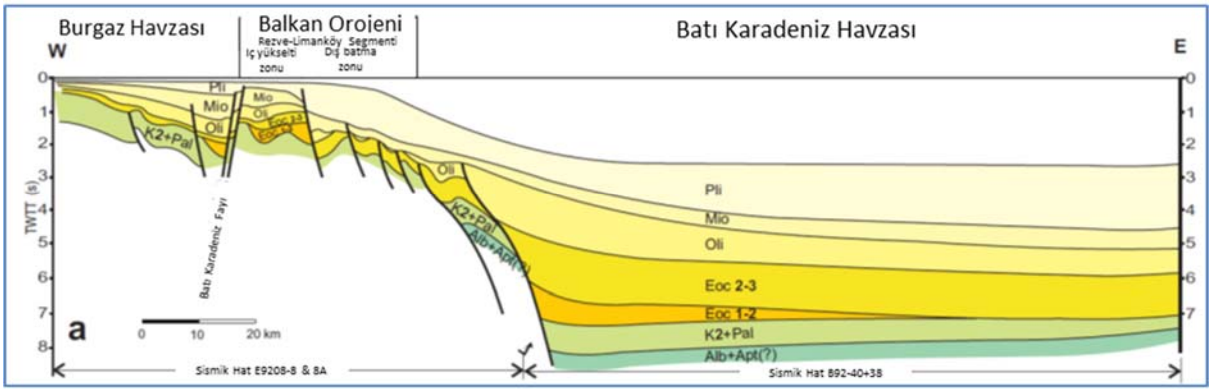


Figure 6.60) (Ref. 6.17).

Basin sediment filling composed of Middle-Late Eocene, Oligocene and Neogene clastics and clay. The seismic data show that the deep storage center of the basin is located near the border of Bulgaria, Turkey offshore and that the thickness of the precipitated sediment in this region is more than 4 km (

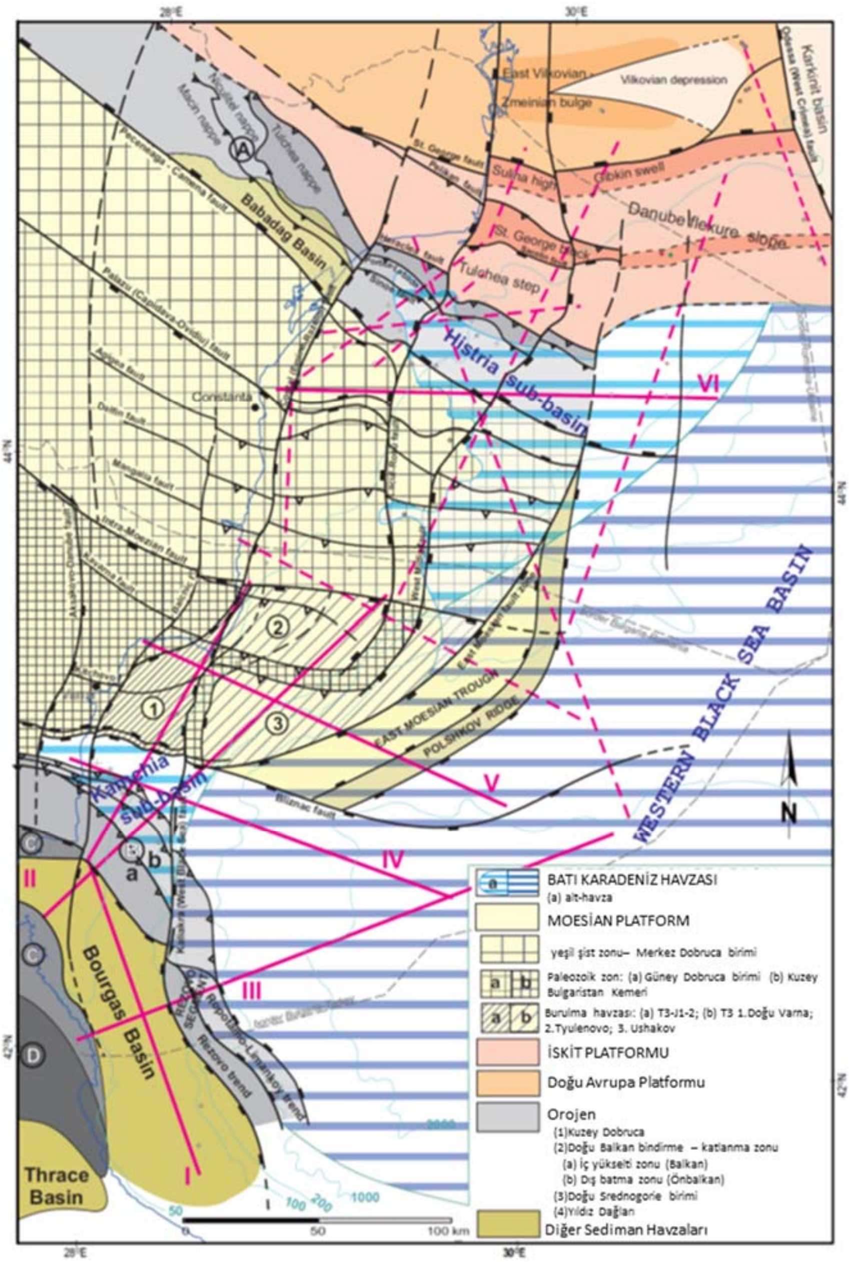


Figure 6.299). The basin is formed on the wing of overturned anticline of the hangingwall of the Back-Balkan fault line in the Middle Eocene (Ref.6.24). The north-western terminus of the basin, the Back-Balkan fault line - the anticline also terminates along the line - controlled by an east-leaning right-lateral transfer zone. The Late Eocene extension is also supported by coal, black shale and marl formations that filled the basin and occurred during this period. The development of the basin took place predominantly in the Neogene and Quaternary period.

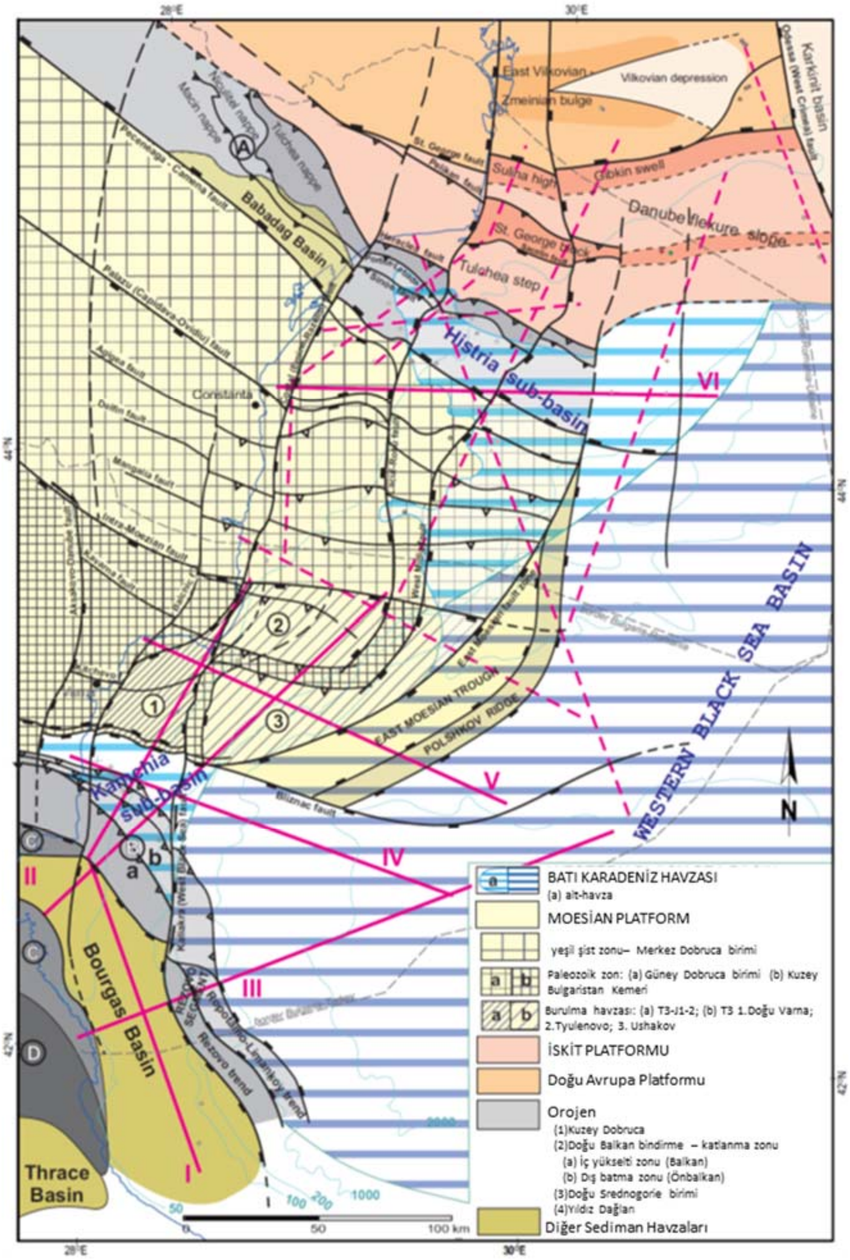


Figure 6.299: The Tectonism Map of Western Black Sea Basin

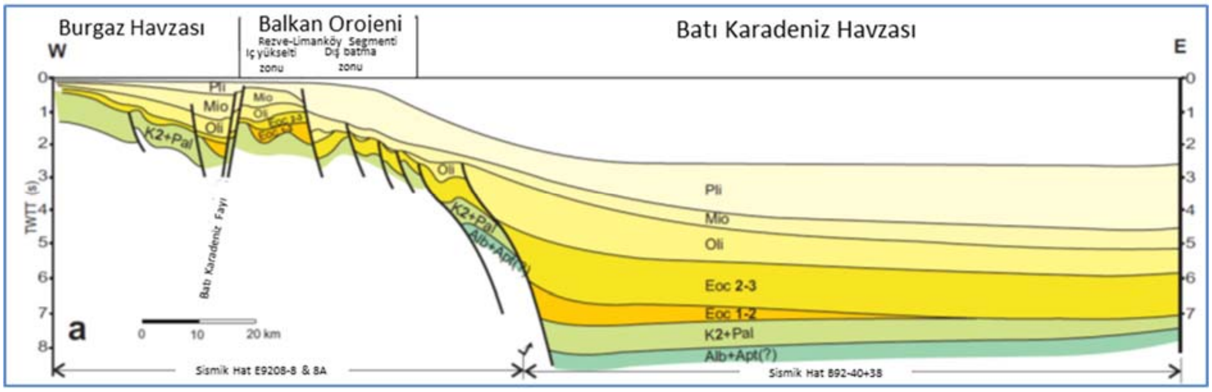


Figure 6.60: Geological cross section (Ref. 6.17)

Within the scope of the project, shallow faults intersecting the sea floor were not observed in the data obtained from the studies made with the Heather Sea exploratory ship in the Offshore Section. On the other hand, the faults observed in high-resolution profiles are overlapping gravitational structures with the main structures described in the literature. However, the probable presence of faults intersecting the seabed will be confirmed through the analysis of detailed geophysical data. A detailed seismic evaluation report to be prepared within the scope of the project will be submitted to the Ministry of Environment and Urbanization (MoEU) if it is requested.

6.3.2.2.5 Sedimentation Distribution

As explained in the Section 6.3.2.2, TurkStream Gas Pipeline - Turkey EEZ Section (Formerly South Stream Offshore Pipeline - Turkey Department Project) has revealed that the upper part of the sediments of abyssal plains at the base of Turkey's EEZ is composed of a thick terrestrial clay layer. The top layer of Sediment (about 0.3 m) is important as the pipelines will be placed directly on it. Water content, density, atterberg limits (tests to identify the consistency and behavior of the grounds), grain size distribution, organic matter and carbonate content tests have been carried out in order to classify the features and soils in various sampling locations within the Turkey EEZ. Thermal conductivity, conductivity, pH, carbonate and bicarbonate ions, chloride and sulphate ions, calcium and magnesium tests have been conducted and thermophysical and geochemical soil properties have been identified. Mechanical properties (including bearing capacity) have been assessed using triaxial tests (which measure the mechanical properties of many solids, especially soils, which may deform) and the odometer test (measuring the consolidation properties of the soils). These results are in parallel with the prior sediment sampling results conducted in Black Sea (Ref. 6.31). The sediment distribution in the Offshore Section of the Project is thought to be similar to the general sediment distribution of the Black Sea. However, the report, which includes the results of the studies, conducted in order to determine the sediment distribution of the Offshore Section of the Project, was presented to ONHO in August 2017. Due to the scope and the details of the report, ONHO's inspection on the report continues. As stated in the opinion letter received from the Directorate of ONHO in 06.09.2017 **(Annex-5.A),** in case some inadequate and/or faulty subjects are identified by the ONHO during the inspection period of the Hydrographic and Oceanographic Study Report, these inadequate and/or faulty subjects shall be fulfilled/corrected by the Project Owner and construction works shall not start without receiving the approval of the ONHO. The approved report shall also be shared with the Ministry of Environment and Urbanization.

According to the results of the studies conducted in 2015 in the Shore Crossing Section of the Project, on the basis of the grain size of the examination area, the sediment distribution ratios of the sea floor varies between 0.32-58.61% for gravel, 21.24-52.84% for sand 8.02-28.93% for silt and 1,73 and 6,98% for clay content. It is identified that the average percentages for gravel, sand, silt and clay are 14.43, 70.95, 11.25, and 3.37, respectively. According to the results obtained from sediment samples, there are sandy and pebbly units in the whole area. A similar distribution was found in the Shore Crossing Section of the Project, which aimed at assessing the environmental characteristics of the seabed due to the changing open cut pipeline route, and additional investigations conducted in 2017. According to the findings obtained from the studies under details under **Chapter 7** (Biological Environment Assessment, Sections 7.1.2.2 and 7.1.2.3.2), the sand content of the examination site varies between 65.7% and 98.6%. The map of the sediment classes showing the changes in the route of the project is given in Figure 6.3061.

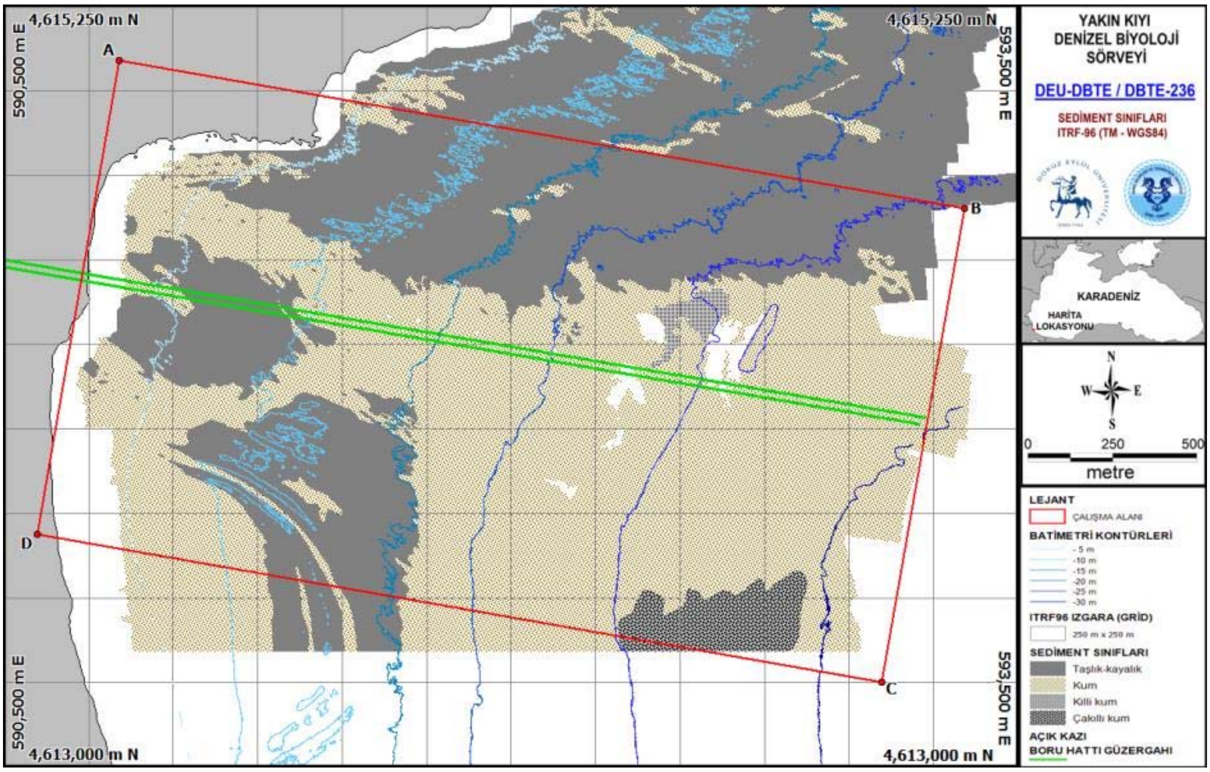


Figure 6.3061: Sediment Classes Map

6.3.2.2.6 Bathymetric Properties of the Project Area

Work carried out to determine the bathymetry of the Offshore and Shore Crossing Sections of the Project under the Project is given in Section 6.3.2.2.3 (Bathymetry). The results obtained from the studies on the bathymetric investigations of the Offshore and Shore Crossing Sections of the Project are presented under Section 6.6.1 (Offshore Section Bathymetry) and Section 6.6.2 (Shore Crossing Section Bathymetry), respectively.

6.3.2.2.7 Sonar Studies

During the sonar surveys which was conducted in the Shore Crossing Section of the Project in 2015 and which constitutes the basis for the summarized information given in Section 6.3.2, in order to assess the seabed morphology, to determine the changes in facies, to identify the natural and non-natural structures and to determine the objects in the Shore Crossing Section, the side-scan sonar acoustic system, placed on both sides of the route and can provide high grade data from the seabed, is used.

On the other hand, within the scope of the side-scan sonar study, 40 sonar lines have been drawn and the lines are positioned to cover 100% of the area (Figure6.62). During the measurements, the appropriate TVG settings have been made and the data quality has been tried to be increased. In the records, the coverage area of 100, 150, 200 m was selected in 50, 75, 100 m changing intervals for the side-scan sonar range. The resulting sonar images are interpreted with remarkable processing points. The most important information is the outcrop structure which appears on the sea floor. Besides, frequently observed sedimentary flow fields and facies changes are also striking.

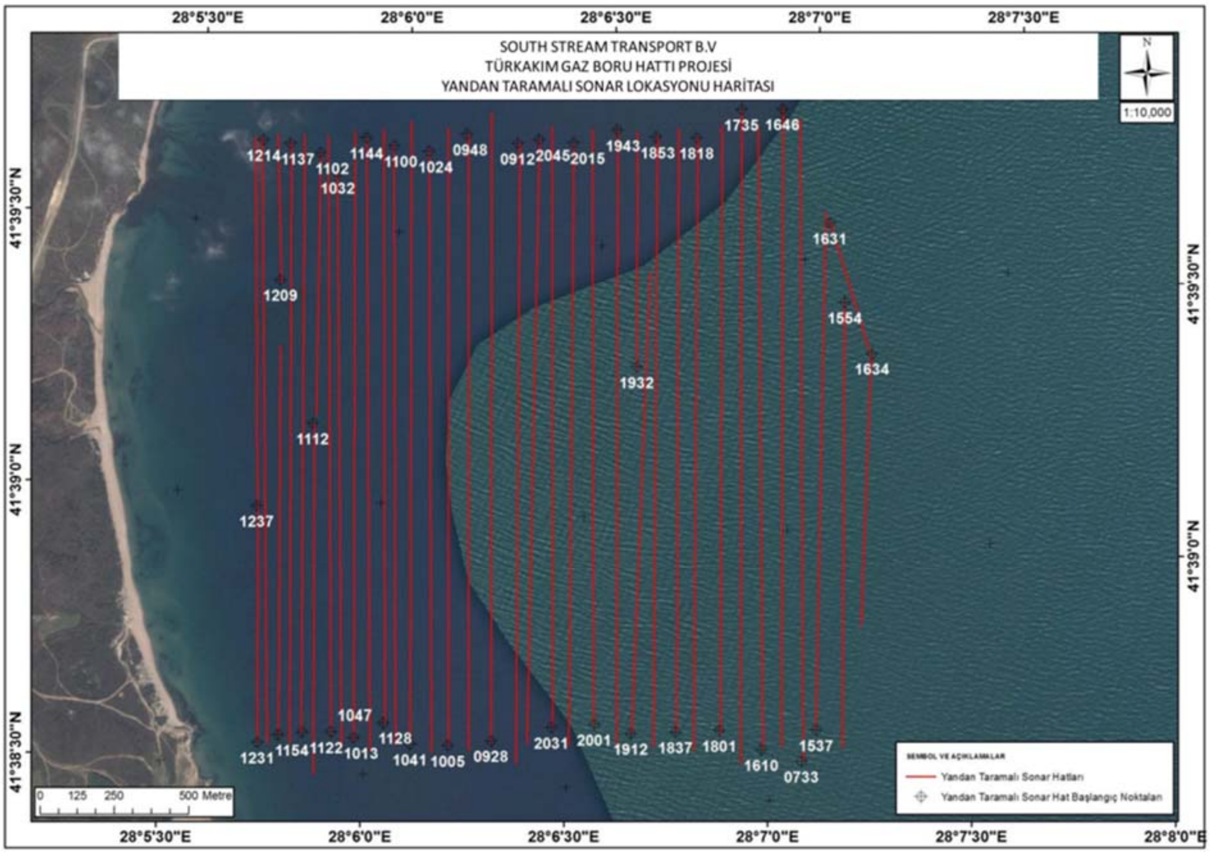


Figure6.62: Sonar Lines Map (2015 study)

Due to the pipeline course change made in the Offshore Section and especially in the Shore Crossing Section, extra sonar studies were conducted in the additional studies, conducted in 2017 in order to determine the geological and environmental characteristics of the sea bed.The studies conducted to determine the bathymetry of the Offshore and Shore Crossing Sections are given in Section 6.3.2.2.3 (Bathymetry). The results obtained from the studies conducted for the bathymetric analyzes of the Offshore and Shore Crossing Sections of the project and the studies conducted using the sonar sensors are presented under Section 6.6.1 (Offshore Section Bathymetry) and Section 6.6.2 (Shore Crossing Section Bathymetry), respectively.

Examples of multi-beam echo-sounder and side-scan sonar studies carried out in the Shore Crossing Section and data obtained from the bathymetry of Shore Crossingthis area and side-scan sonar studies are given in Figure 6.3163 and Figure 6.64 respectively.

Figure 6.3163: Bathymetry Obtained from Multibeam Echo Sounder Study in the Shore Crossing Section.

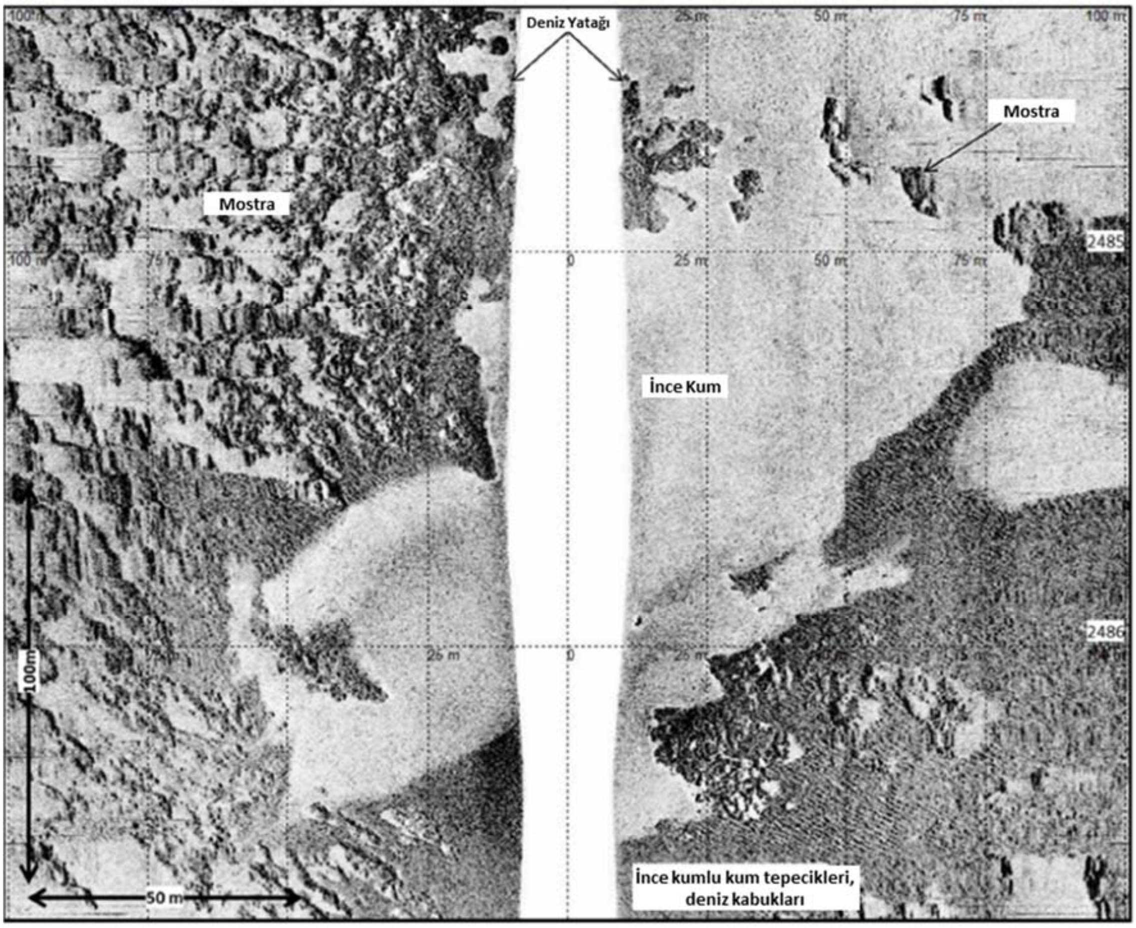


Figure 6.64: Example of Side-Scan Sonar Data Performed in Shore Crossing Section

6.3.2.2.8 Measures for the Control and Decrease of Geological Effects and Impacts within the Scope of Work to be Made within Project (After Construction, Operation and post-Operation)

Potential geological risks have been identified especially in the Offshore Section, during the studies carried out within the scope of the project. Potential geological impacts were assessed on the basis of projected activities related to the Construction, Operation and Post-Operation (Decommissioning) stages of the Project. The geological impact assessment was made in parallel with **Chapter 2** (Environmental Impact Assessment Approach). Controls and other mitigation measures included in the design to limit potential geological effects are provided below in Table 6.15.

Table 6.156: Impact Mitigation Measures and Design Controls

Stage	Activity	Impact	Impact Reducing Measures / Design Controls
Pre-construction and Construction	Offshore engineering studies Pipe-lay	• Damage to the pipeline or other structure in the following sections of the slope of the debris and/or turbidity flows as a result of diminishing soil support • Decrease in slope stability as soil structure weakens. • Pipeline damage due to fault movements	• Detailed geophysical, geotechnical, geochemical and geological studies and evaluations to minimize the risks posed by the geohazards for the pipeline • In order to maximize the stability of the pipeline in the seabed and especially on the continental slope, engineering designs and pipeline routing should be as far as possible to the defined geohazards. • Monitoring of anchor utilization

Stage	Activity	Impact	Impact Reducing Measures / Design Controls
		• Liquefaction • Seabed Erosion • Sediment mobilization • Decomposition of natural gas hydrates	
	Shore Crossing engineering studies, Pipe-lay Dredging	• Damage to the pipeline or other structure in the following sections of the slope of the debris and/or turbidity flows as a result of diminishing soil support • Decrease in slope stability as soil structure weakens. • Pipeline damage due to fault movements • Liquefaction • Seabed Erosion • Sediment mobilization	• Detailed geophysical, geotechnical, geochemical and geological studies and evaluations to minimize the risks posed by the geohazards for the pipeline • In order to maximize the stability of the pipeline in the seabed and especially on the continental slope, engineering designs and pipeline routing should be as far as possible to the defined geohazards. • Monitoring of anchor utilization

The physical existence of pipeline may change local hydrodynamics and sediment transportation. However, this change will have an impact over a very limited area and will decrease as the seabed reaches to its new balance by time. The physical existence of pipeline will not change the geochemical structure of the seabed. Based on the above considerations, the design controls of the Project have been deemed sufficient to minimize any geological impact resulting from the operation. Thus, any mitigating prevention is not needed.

During the preparation period of EIA Report, the decommissioning strategy is unknown. No geological impact is expected as long as the location of the pipelines remains unchanged. If pipelines are removed from the seabed, it is expected that decommissioning activities will lead to similar geological effects with the construction activities described above.

6.4 Hydrographic, Oceanographic and Hydrologic Properties

6.4.1 Region and Project Area Hydrologic Properties (Onshore Section)

6.4.1.1 Project Location According to Lake, Dam, Pond, Stream and Other Wetlands, Distance of Water Resources to Project Area

The Region of Thrace consists of two major hydrological basins; Meriç-Engene and Marmara Basins. General hydrological data about the Marmara and Ergene basins are given in Table 6.167. Kıyıköy town of Kırklareli province's Vize district in which the project is located, is hydrologically inside the Marmara Basin. Therefore, the hydrological factors of the Marmara Basin are taken into consideration in the assessments made in this chapter.

Table 6.167: General Information Concerning the River Basins (Ref.632)

River Basin Name	Precipitation Area (km^2)	Average Annual Flow (km^3)	Average Annual Yield ($l/h/km^2$)
Meriç-Ergene Basin	14.560	1.33	2.9

River Basin Name	Precipitation Area (km^2)	Average Annual Flow (km^3)	Average Annual Yield ($l/h/km^2$)
Marmara Basin	24.100	8.33	11.0

According to the information gathered from Marmara Basin Action Plan Final Report (2010) prepared by the Scientific and Technological Research Council of Turkey (TÜBİTAK) Marmara Research Center (MAM) Environment Institute, the average flow stated for Marmara Basin is 5.08 x 10^9 m^3 (6.69 L/h.km^2 and this amounts to the 2.77% of Turkey's potential surface waters. (Ref. 6.33). The usable part of this potential estimated to be ~2.54 x 10^9 m^3/year by using the average usable surface water ~50%. The groundwater management reserve of Marmara Basin is 297 x 10^6 m^3/year and it is estimated that its groundwater potential will be ~396 x 10^6 m^3/year (by accepting the management reserve is the ~75% of the groundwater potential). The total water potential is calculated to be 5.476 x 10^9 m^3/year when 5.08 x 10^9 m^3/year surface and ~396 x 10^6 m^3/year groundwater potential is taken into consideration.

The area, in which Kıyıköy is located, is a part of the Yıldız Mountains basin and its slopes facing the Black Sea in Turkey (Figure6.65). The Yıldız Mountains basin has been the subject of extensive researches in the past, including the assessment of surface water resources. Most of the present state information presented here is taken from the report prepared by Yusuf Serengil on behalf of AGRER-Agriconsulting-AGRIN about the Yıldız Mountains Ecohydrology (Ref., 6.34), to be submitted the Ministry of Environment and Forestry.

The Yıldız Mountains are located in the south-east of the Balkans, in the south of Bulgaria and in the European side of Turkey; the Thrace plains in the west and the lowlands around Burgas in the north and the Black Sea in the east. The highest point in Turkey is Mount Mahya (1.031 m).

Some of the streams in the Yıldız Mountains basin are steadily flowing brooks. But most of the smaller streams have a seasonal flow regime (they dry up in some seasons of the year). Many of the small rivers flowing into the Black Sea are either dry or do not flow in the summer. This is also a typical characteristic of floodplain forests (Longoz forests), which are submerged in the late winter to early summer, but are dry after June and hardy. The stream system and the existing reservoirs belonging to the region are shown in Figure6.326.

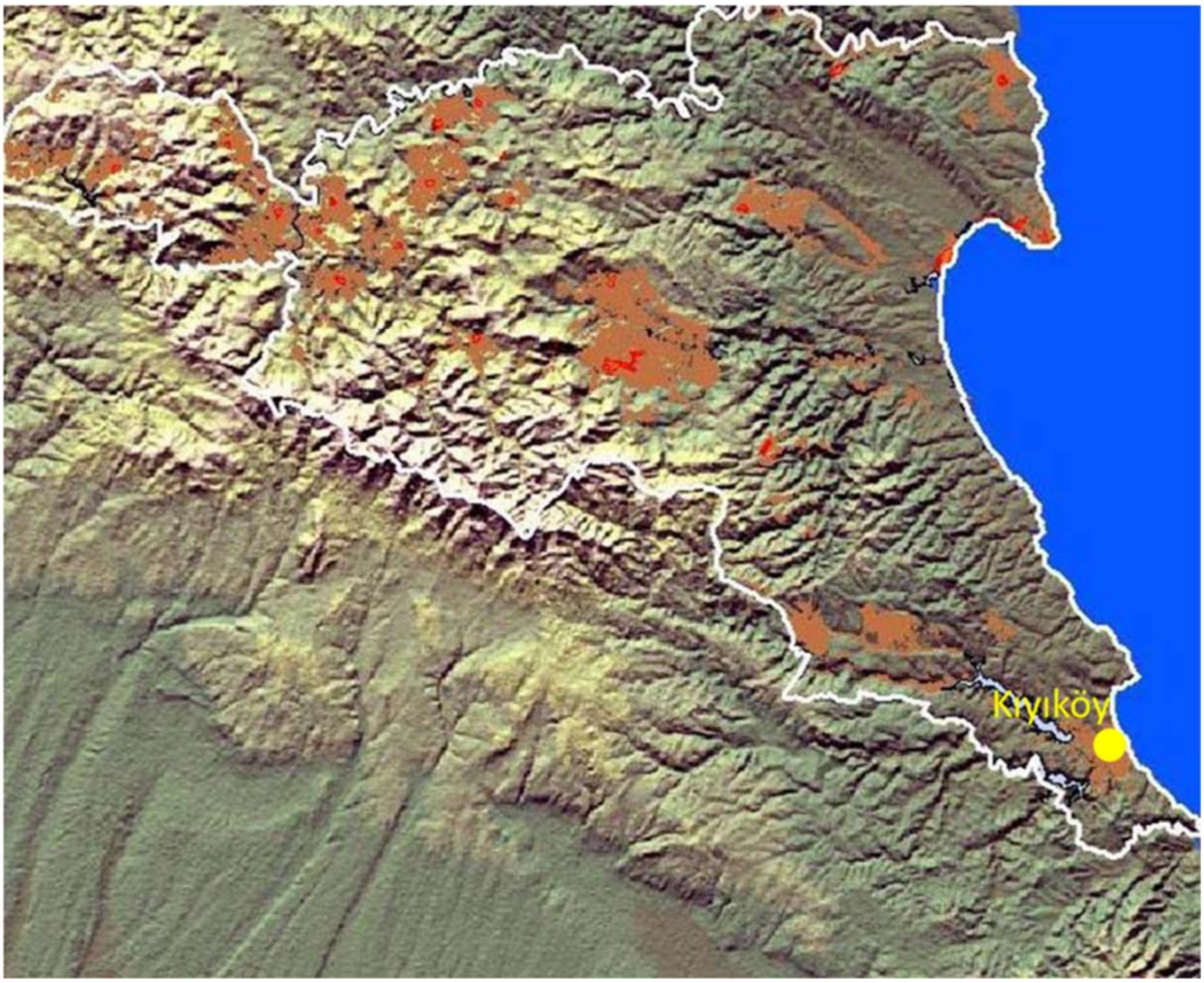


Figure6.65: Location of Yıldız Mountains Basin and Kıyıköy (Ref 6.34)

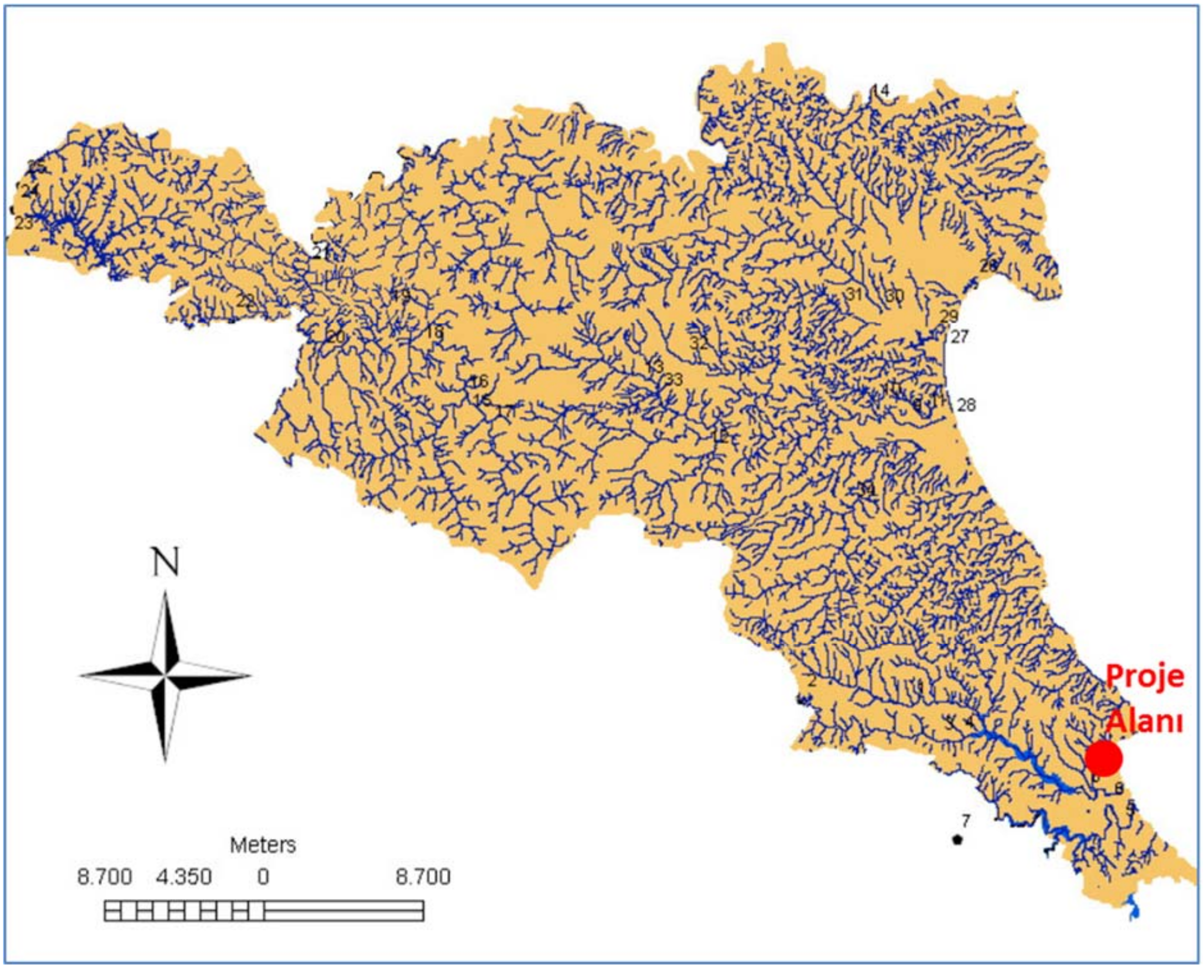


Figure6.326: Stream Systems and Existing Reservoirs (Ref 6.34)

6.4.1.1.1 Streams

The locations of streams and brooks are given in Figure 6.337. When the widths and lengths of the drainage areas are taken into consideration, it is possible to mention the river network belonging to three different groups. The first group streams with the highest values are Bulanıkdere, Papuçdere and Kazandere. The smaller second group streams are Efendidere and Çilingözderesi. The third group streams are the youngest ones which are shorter and have sub-parallel drainage systems. Although the rivers in the first and second group have a dendritic (tree-like) drainage network, when the main beds are brought into consideration a parallelism is observed, and the flow directions are towards west and southwest. Bulanıkdere, which is one of the first group streams, has a drainage basin 82.500 km^2. Efendidere in the second group has a drainage basin of 33,600 km^2, whereas this value is 47,200 km^2 for Değirmendere and Elmalıkdere combined; 38,400 km^2 for Arnavutdere, 23,200 km^2 for Sultanbahçedere, 15,000 km^2 for Ereklidere, and 18,000 km^2 for Çilingöz.

The following information summarizes the surface water resources in the region and Kıyıköy vicinity:

- The two major rivers in Kıyıköy region (Pabuçdere and Kazandere), the water of which are drawn by İSKİ (Istanbul Water and Sewerage Administration) with the development of dam/dam reservoir projects, are shown in Figure 6.337. This figure also demonstrates the surface water resources infrastructure planned by İSKİ and State Hydraulic Works (DSİ).
- The average streamflow for Pabuçdere and Kazandere are given in Figure 6.348. The highest streamflows occur in December and January, while in August and September the flow rate drops to its lowest value.

December and January are the months when the highest rainfall occurs and in March the streamflow is observed at the highest level (Figure 6.348).

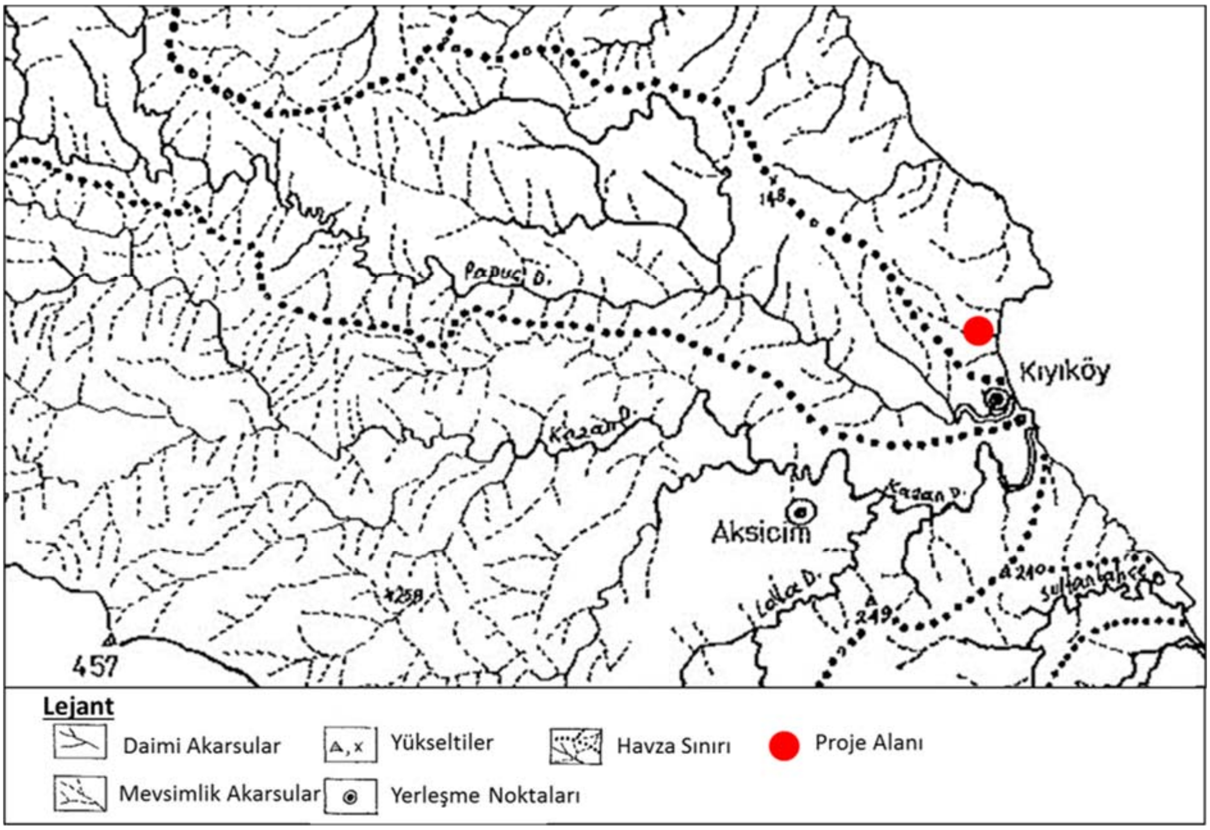


Figure 6.337: Streams and Brooks Near Kıyıköy

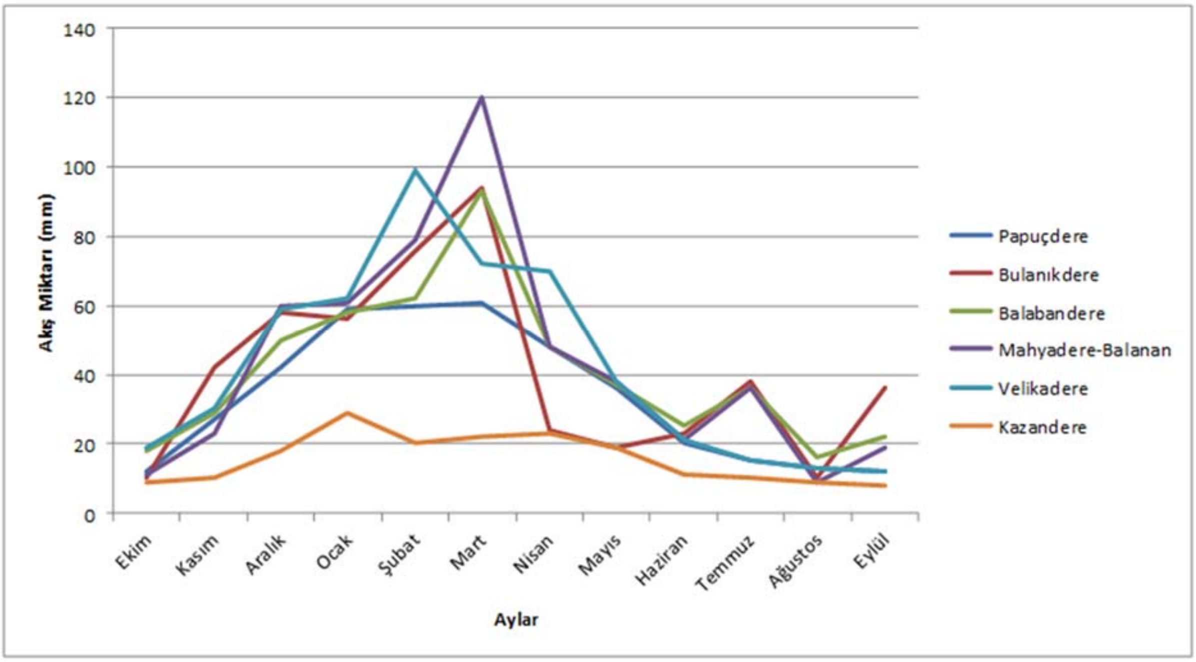


Figure 6.348: Monthly Average Streamflow in the Examination Site (Ref.6.34)

The photographs obtained from the field study carried out by the Project Owner in order to determine the hydrological statuses of Papuçdere, Çatallar and Sazlıdere in 2015 are given below between Figure6.359 and Figure 6.377.

Figure6.359: Pabuçdere River mouth of Pabuçdere Dam Lake (Clubs near the shore, irrigable land and boats are seen. Agricultural use of lands is seen along the streamside.

Figure 6.70: Pabuçdere Rivermouth of Pabuçdere Dam Lake where It Pours to the Sea (The beach shore before reaching the sea is noteworthy.)

Figure 6.71: The Rivermouth of Pabuçdere Dam Lake (41°38'19.58"N/ 28° 4'4.87"E)

Figure6.72: Crossing Road with Çatallar Stream (seasonal stream) (The stream finally merges with Pabuçdere at a point below Pubçudere Dam Lake. The lowest flow conditions are observed in the plain field.

Figure 6.73: The structure of the culvert built under the soil in the Sazlıdere stream bed near to the sea shore (It is built to provide access to İSKİ's water pipeline connecting to Pabuçdere Dam Lake and covers the stream bed transversely as well as lying in parallel to the sea shore. The image is taken to the seaside (41°39'18.77"N/ 28° 5'4.34"E).).

Figure 6.74: The structure of the culvert built under the soil in the Sazlıdere stream bed near to the sea shore (It is built to provide access to İSKİ's water pipeline connecting to Pabuçdere Dam Lake and covers the stream bed transversely as well as lying in parallel to the sea shore. The image is taken from the sea to the land (41°39'18.77"N/28°5'4.34"E).

Figure6.75: The View of the Basin where Sazlıdere is Functional during the Surface Water Discharge (41°39'18.77 "N/28°5'4.34"E)

Figure 6.366: The coastal section of Sazlıdere, below the culvert structure

Figure 6.377: Meandering Parts of Sazlıdere (41°39'25.35"N/ 28° 4'45.74"E)

All of Kazandere, Papuçdere and Sazlıdere have a dam on them. By connecting Kazandere and Pabuçdere dams via a 2.507m long 4.5m wide tunnel the excess water in Kazandere was transferred to Pabuçdere's reserve and 60 million m³ of water from Yıldız Mountains is being supplied to İstanbul annually. The dam has a basin area of 178.5 kilometer-square. Sazlıdere dam is among the most important water sources of İstanbul with 55 million m³ annual capacity. Sazlıdere dam lies 20km long east to west, has a width of 9km north to south and has a 165 kilometer-square basin area (Ref.6.4).

The Project route within Onshore Section runs on Sazlıdere north of the Receiving Terminal. The detailed crossing technique which will be prepared to determine the most appropriate creek crossing technique with the help of detailed field studies, will be submitted to DSI (General Directorate of State Hydraulic Works) and other related institutions, if necessary.

In order to determine the physicochemical properties of the surface water resources located around the Project Area, water samples from two different points, Sazlıdere Source (WS-7) and Sazlıdere Rivermouth (WS-8) are taken by Artek Engineering (Artek Laboratories) on April 19, 2017. The points where samples are taken are given in Figure 6.388.

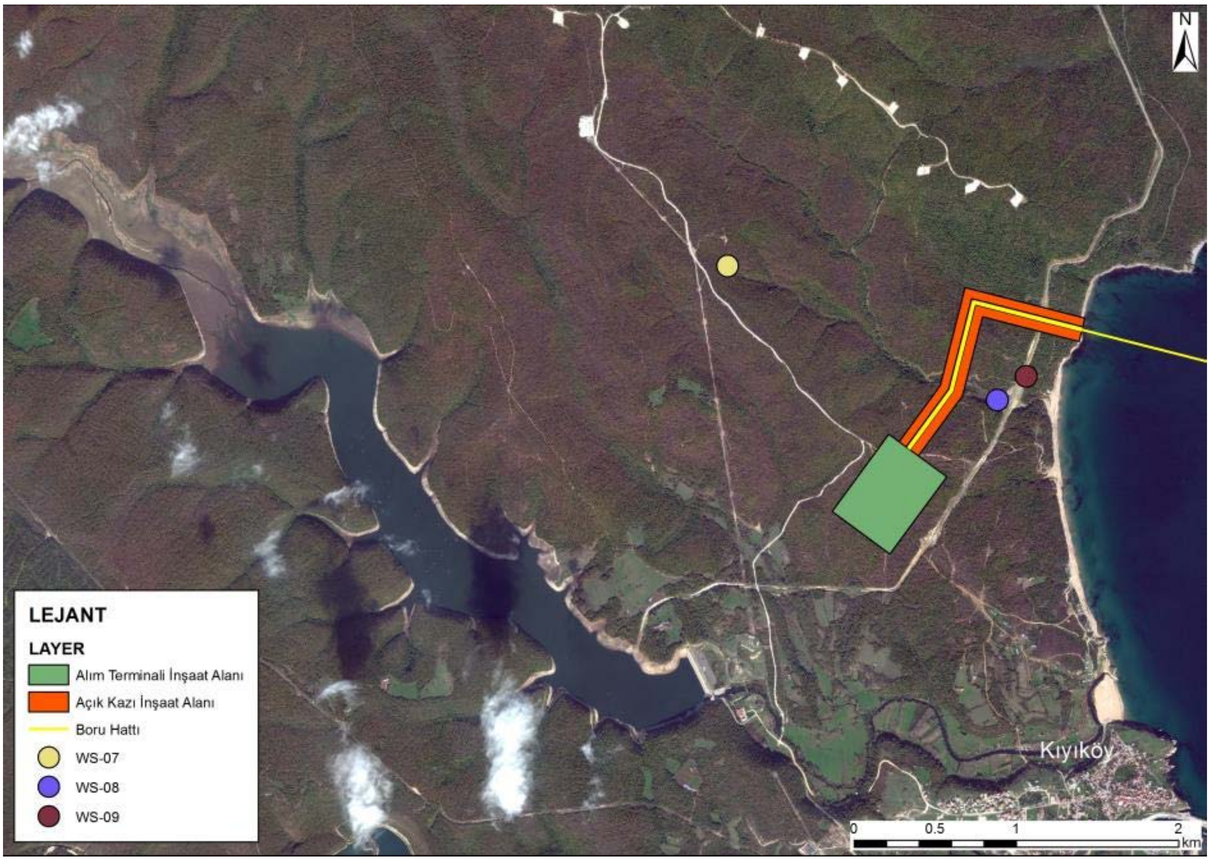


Figure 6.388: The Sampling Points near and around the Project Area

Water quality analyzes are carried out by Artek Laboratories on surface water samples taken from the 2 points mentioned. The results of the analysis are compared with the limit values given in Table 2 and Table 6 of Annex-5 Regulation on Surface Water Quality. Those assessments are given in Table 6.178 and Table6.189 below, whereas the results of the analysis are provided in **Annex-6.D**.

Table 6.178: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of the Coastal Waters according to the Receiver Ambient Quality Criteria (Surface Water Quality Regulation Annex-5 Table-2)

Parameter	Unit	Water Quality Classes				Sampling Station Name	
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	WS 7	WS 8
Color 436 nm	m^{-1}	≤ 1,5	3	4.3	> 4,3	**2.6**	**2.2**
Color 525 nm	m^{-1}	≤ 1,2	2.4	3.7	> 3,7	0.9	0.7
Color 620 nm	m^{-1}	≤ 0,8	1.7	2.5	> 2,5	0.3	0.2
pH	-	6-9	6-9	6-9	6-9	7.09	6.92

Parameter	Unit	Water Quality Classes				Sampling Station Name	
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	WS 7	WS 8
Conductivity	µS/cm	< 400	1000	3000	> 3000	**871**	**543**
Oil and Grease*	mg/L	<0.2	0.3	0.5	> 0,5	0.055	< 0,05
Dissolved oxygen (Oxygen Saturation Rate)	mg/L	> 8	6	3	< 3	8.81	9.26
Chemical Oxygen Demand (COD)	mg/L	< 25	50	70	> 70	**60.1**	**39.6**
Biological Oxygen Need (BON)	mg/L	< 4	8	20	> 20	**23**	**14.4**
Ammonium nitrogen (NH_4-N)	mg NH_4^+-N/L	< 0,2	1	2	> 2	< 0,02	0.04
Nitrate Nitrogen	mg NO_3^--N/L	< 3	10	20	> 20	< 0,02	0.12
Total Kjeldahl Nitrogen (TKN)	mg N/L	< 0,5	1.5	5	> 5	**2.6**	**2.9**
Total Nitrogen	mg N/L	< 3,5	11.5	25	> 25	2.6	3.1
Orthophosphate phosphorus (o-PO_4)	mg o-PO_4-P/L	< 0,05	0.16	0.65	> 0,65	< 0,015	< 0,015
Total Phosphorus	mg P/L	< 0,08	0.2	0.8	> 0,8	**5.14**	**2.55**
Fluoride (F)	µg/L	≤ 1000	1500	2000	> 2000	< 100	520
Manganese (Mn)	µg/L	≤ 100	500	3000	> 3000	8	22
Selenium (Se)	µg/L	≤ 10	15	20	> 20	5	< 5
Sulfur	µg/L	≤ 2	5	10	> 10	2	**4**

* Analysis of oil and grease parameters is made in Artek Laboratories but is analyzed a second time in ALS Laboratories because the regulation limit value could not be provided. The ALS Laboratory results are given in the Table

Table6.189: Standard Values Required for Coastal and Transitional Waters Used for Recreation (Surface Water Quality Regulation Annex-5 Table-6)

Parameter	Unit	Standard/Limit Value	The Sampling Point	
			WS 7	WS 8
Turbidity	NTU	-	23.9	31.7
Clarity Light Permeability*	m	Secchi disc depth 1 m - %90 (guide) 2 m - %95 (compulsory)	-	-
Dissolved oxygen	% saturation	≥ %80	% 98,6	% 105,5
Enterococi (Faecal streptococci)	colony/100 mL	100 (%95) (guide) 200 (%95) (compulsory) 185 (%90) (sufficient)	40	40
Escherichia Coli		250 (%95) (guide)	400	620

Parameter	Unit	Standard/Limit Value	The Sampling Point	
			WS 7	WS 8
	colony/100 mL	500 (%95) (compulsory)		
		500 (%95) (sufficient)		
Carbon residue and floating materials		Should not be detected.	ND	ND
pH	-	6-9	7.09	6.92
Color		There should be no unusual change in color.		
Floating material (including oil and grease)		Floating liquids such as oil, tar; garbage and similar solid materials and foam have not been detected.	ND	ND

ND: Not Detected

* Light permeability parameter could not be measured due to the depth.

6.4.1.1.2 Lakes and Dams

There are Mert, Hamam, Erikli, Saka and Pedina lakes in Demirköy district are the natural lakes in Kırklareli province (Ref. 6.35) The information related to the dams and lakes are given in Table6.20 and Table 6.191.

Table6.20: Information Table on Projects with Completed Pond Construction but not Started to Irrigation

Pond Name	Province	District	Village	Storage Capacity m^3
Kırklareli Demirköy-Sivriler Pond and Irrigation	Kırklareli	Demirköy	Sivriler	430,000
Kırklareli Kofçaz 1 Pond and Irrigation	Kırklareli	Kofçaz	Kofçaz	653,000
Kırklareli Kofçaz 2 Pond and Irrigation	Kırklareli	Kofçaz	Kofçaz	1,650,000
Kırklareli Pınarhisar Yenice Pond and Irrigation	Kırklareli	Pınarhisar	Yenice	3,354,000
Kırklareli Center Kadıköy Pond and Irrigation	Kırklareli	Central	Kadıköy	1.500.000
Kurudere Pond and Irrigation	Kırklareli	Pınarhisar	Kurudere	1,078,000

Table 6.191: General Information about the Dams and Pounds in Kırklareli Province

Installation Name	Spring	Objective	Height, m		Filling Volume hm3	Storage Volume hm3	Benefit		The Year Opened to Operation
							Irrigation, ha		
			From the Base	From the Thalweg			Gross	Net	
Center-Skopje Pond	Üsküpdere	Drinking Irrigation	23.2	22	0.18	1.24	166	143	1990
Central-Dolhan Pond	Cihanlar D.	Irrigation	27	22.5	0.38	1.089	172	152	2005
Babaeski-Sofuhalil Pond	Koru D.	Irrigation	15.14	12.14	0.045	0.5	56	45	1986
Lüleburgaz-Sarıcaali Pond	Taşköprü D.	Irrigation	20.5	12.7	0.112	0.867	128	108	1992

Installation Name	Spring	Objective	Height, m		Filling Volume hm3	Storage Volume hm3	Benefit		The Year Opened to Operation
							Irrigation, ha		
			From the Base	From the Thalweg			Gross	Net	
Lüleburgaz-Ahmetbey Pond	Çeşme D.	Irrigation	17.5	8.5	0.17	0.87	61	54	2001
Lüleburgaz-Turgutbey Pond	Sarpça D.	Irrigation	18	13.8	0.119	0.39	42	36	2005
Vize Sergen Pond	Değirmendere	Irrigation	35.5	30.5	0.42	1.04	341	298	2009
Kayalıköy Dam	Teke D.	Irrigation Flood	72	68.7	1.53	149.9	15957	13500	1986
Kırklareli Dam	Şeytandere	Irrigation Flood Drinking	70.5	67.5	1.46	113.3	13679	11943	1996
Armağan Dam	Kocadere	Irrigation	60.5	57.55	1.50	51.5		5400	1999

Kıyıköy is surrounded from north to Papuçdere and from south to Kazandere. Kazandere and Papuçdere Dams are built by ISKI to compensate the need for drinking water in İstanbul on the Kazandere and Papuçdere streams respectively. The information related to these dams is given in Table 6.202.

Table 6.202: The Information Related to the Dams Near to Kıyıköy (Ref. 6.4; Ref. 6.36)

Dam	Type	Commission Year	Lake Volume (Million m^3)	Annual Drinking Water (hm^3)
Kazandere	Zoned Earth fill	1997	17.60	19.4
Papuçdere	Zoned Rocky Filling	2000	62	11.5

Pabuçdere and Kazandere dams in the region are in operation. Pabuçdere and Kazandere dams are also drinking water facilities.

Within the scope of the "Kazandere and Pabuçdere Dam Basin Special Provisions" draft issued by the Ministry of Forestry and Water Affairs, the protection zones are classified as follows (Ref 6.37):

- **Absolute protected area:** The area of 300 m wide horizontally from 28 meters of maximum water elevation of Kazandere and Pabuçdere Dam Lakes;
- **Short-Ranged Protected Area:** Area with 700 m horizontal width from the border of the Absolute Protected Area
- **Medium-Ranged Protected Area:** Area with 1000 m horizontal width from the border of the Short-Ranged Protected Area
- **Long-Ranged Protected Area:** Area from the border of the Medium-Ranged Protected Area to the boundary of the catchment of the basin.

According to the information obtained from the Istanbul Provincial Directorate website (Ref 6.4), these two dams are built to provide drinking water to Istanbul. The Project Area is not located in these protected areas.

Areas where Kazandere and Pabuçdere are poured into the sea are within the boundaries of the First Degree Natural Protected Area.

6.4.1.1.3 Wetlands

In the province of Kırklareli, there are two wetlands in the district of Demirköy: İğneada Longozu and Dupnisa Wetlands. The Dupnisa cave, which is a wetland area, is one of the important cave ecosystems of the province and is classified as a Second Degree Protected Area. The Dupnisa cave system is located at the south-west of Sarpdere Village of Demirköy District, where the Yıldız (Strandzha) Mountains split with deep valleys and is located about 50 km from the Project Area. The reason why Dupnisa cave is an important underground habitat is the life of 184 different species of cave invertebrates excluding 11 species of bats in the cave system. Inside the Dupnisa cave there is an underground stream with continuous flow, and those streams form ponds with the depth of 2m (Ref 6.10).

Another wetland in Kırklareli Province is İğneada Longozu. The edge of the Western Black Sea shore is located near the Turkey-Bulgaria border. İğneada Longozu is located about 15 km from the project area. The special protected area is an ecologically rich area where seasonal floodplain forests, marshes, fresh water lakes and coastal dunes coexist. Five lake systems are located in the area: Erikli, Mert, Saka, Hamam and Pedina Lakes (Ref. 6.10; Ref. 6.35).

6.4.1.2 Current and Planned Utilization of Surface Water Resources (Drinking, Use, Irrigation Water, Aquaculture Production, Transportation, Tourism, Electricity Generation, Other Uses)

The province of Kırklareli is located in the Yıldız Mountains and Ergene Lowland sections of Marmara Region and is surrounded by Bulgaria to its north, Black Sea to its northeast, Tekirdağ to its south and southeast and Edirne to its west. Especially Demirköy (including İğneada town) and Kıyıköy town of Vize district are located inside the Marmara basin. The amount of ground water allocated to be used for drinking, tap, industrial water by the residents of Marmara basin and to be used by irrigation cooperatives (for irrigation activities conducted via groundwaters) is (273,73 + 23,98) x 106 = 297,71 x 106 m^3/year and this number amounts to the total of present groundwater management reserve (296,96 x 106 m^3/year) (Table 6.213) (Ref. 6.33).

Table 6.213: Utilization of Marmara Basin Groundwater Potential

Groundwater Management Reserve (hm^3/year)	Utilization Document Allocations given to the people for drinking-tap, irrigation, industry etc. purposes (hm^3/year)	Reserve Allocated to Groundwater Projects (hm^3/year)	Groundwater Irrigation Projects and Estimated Irrigation Area (Decare)	Groundwater Irrigation Projects and Number of Estimated Wells (number)	Groundwater Irrigation Projects and Constructed and Assigned Wells (number)	Groundwater Irrigation Projects and Constructed and Assigned Irrigation Areas (Decare)
296.96	273.79	23.98	31.000	86	56	19.610

The locations of the water resources in Kıyıköy and its surroundings are given in Figure6.399 and water potentials of these sources are provided in Table6.224.

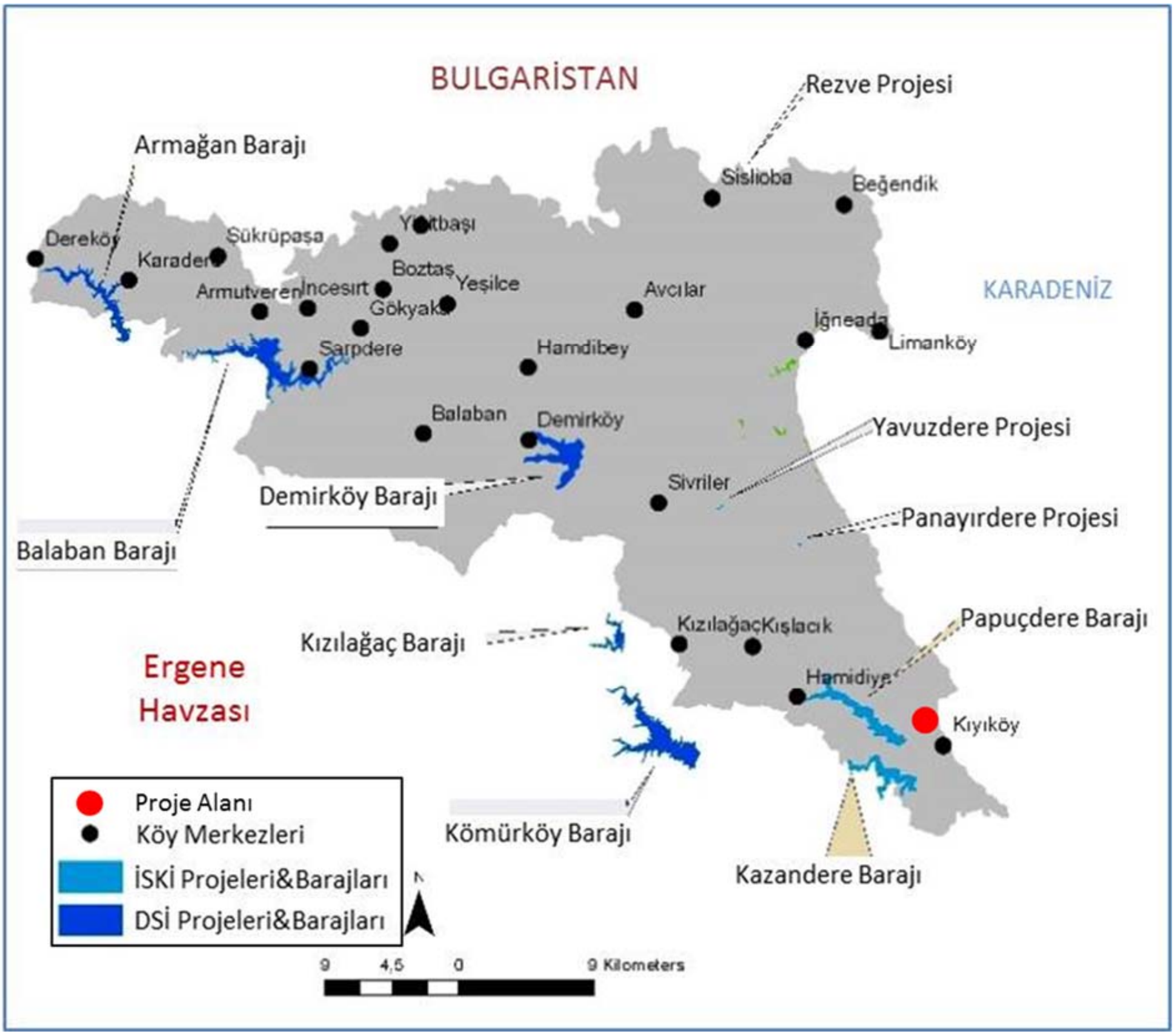


Figure6.399: Location of Water Resources in and around Kıyıköy

Table6.224: Potential of Water Resources in and around Kıyıköy

Water Sources Potential	Amount
Surface Water (provincial outlet total current average)	1.137 hm^3/year
Kayalıköy Dam	1.022 ha
Kırklareli Dam	580 ha
Armağan Dam	305 ha
Pond Reservoir Surface	54 ha
Stream Surfaces	114 ha

The usage of water for the settlements in the area is given in Table 6.235 below.

Table 6.235: The Usage of Water for the Settlements in the Area

	Seasonal (m^3/day)		Weighted Average (m^3/day)	Annual Total (m^3)	Population			Annual Water Consumption per Capita (m^3/capita)
	Summer	Winter			Summer	Winter	Weighted Average	
Demirköy	2.700	2.700	2.700	985,500	4.052	4.052	4.052	243
Igneada	2.000	600	950*	346.750	4.430	2.215	2.769	125
Pınarhisar	1.024	1.024	1.024	373.760	11.263	11.263	11.263	33
Kırklareli	15.000	15.000	15.000	5.475.000	59.970	59.970	59.970	91
Dereköy	160	160	160	58.500	650	535	564	104
Karadere	28	28	28	10.400	99	97	98	106
Şükrüpaşa	24	24	24	8.700	107	107	107	81
Armutveren	33	33	33	12.000	150	110	120	100
Sarpdere	25	25	25	9.200	90	79	82	112
İncesırt	8	8	8	2.900	150	43	70	41
Gökyaka	14	14	14	5.000	60	60	60	83
Boztaş	92	92	92	33.600	400	376	382	88
Yiğitbaşı	9	9	9	3.300	50	30	35	94
Karacadağ	6	6	6	2.200	40	30	33	67
Yeşilce	18	18	18	6.500	100	87	90	72
Balaban	111	111	111	40.500	490	440	453	89
Hamdibey	105	105	105	383,300	371	371	371	103
Avcılar	36	36	36	13.000	162	157	158	82
Sislioba	42	42	42	15.400	250	217	225	68
Beğendik	82	82	82	30.000	350	300	313	96
Limanköy	122	122	122	44.500	600	474	506	88
Sivriler	124	124	45.400	466	466	466	466	97
Kızılağaç	182	182	182	66.400	1.000	700	775	86
Kışlacık	267	267	267	97.600	1.050	1.050	1.050	93
Hamidiye	30	30	30	10.900	110	110	110	99
Kiyikoy	2.500	518	1.014	370,110	4.992	2.496	3.122	119

In the region where the project is located, Sazlıdere determines ways of separating surface waters. In order to support the infrastructure of ISKI's existing water pipeline, a 20-m high and 50 m wide filling has been constructed in the Onshore section. Sazlıdere is poured into the sea through the concrete culvert placed under this filling structure.

6.4.1.3 Impacts of the Works and Operations within the Scope of the Project and Measures to Control and Reduce Them (Construction, Operation and Post-Operation)

The following measures shall be taken before the construction stage to prevent hydrological resources from being affected by the planned Project Area;

- Since the pipeline route will pass through the Sazlıdere valley, necessary passage permits and approvals from the application projects prepared for the passage will be taken;
- All flood codes from DSİ will be respected in all projects as they show potential flood trails in Sazlıdere;
- If the necessary measures are not taken for pollution and sedimentation, which may be caused by the project activities, risk of ecological deterioration may arise due to the connection of natural waterways in the Onshore Section to the sea. In accordance with the Law on Soil Preservation and Land Utilization No. 5403, in the he areas where construction activities will be carried out, a "Soil Conservation Project" will be prepared and implemented, to prevent the impact of the Project to the waterways and surface flows, as well as to ensure the deterioration of the natural structure of the waterways will be prevented, the surface flows will be directed to these waterways, and shattering and terracing will be projected; and
- The Sazlıdere passage will be monitored periodically and the interaction of stream and pipeline will be checked and, if necessary, measures will be provided.

During the decomissioning stage;

- After 50 years, the assessment of technology and environmental conditions may lead the pipeline to be left on the site or dismantled. In the option of leaving pipes on the site, no environmental impact is expected to occur due to the decomssioning stage. In the option of removing the pipes, it is possible that similar effects of the construction stage will be observed and with the technological possibilities in that period, the most suitable method will be selected as possible and the requirements of the current period will be met.

6.4.2 General Hydrographic, Oceanographic Properties of the Black Sea

The Black Sea has a long and almost closed basin (Connected to the Mediterranean via Bosphorus and Dardanelles). The Black Sea is one of the biggest inland seas in the world with approx. 420.000 km^2 surface area, water depth above 2.200m and 534.000 km^3 total water volume (Ref. 6.38). Its waters are almost completely isolated from the other seas around it, due to its limited interchange via the Mediterranean via the Bosphorus and Dardanelles. The Black Sea has a layered system with cooler and sweeter surface waters covering the warmer and saltier deep waters. The lower salinity on the surface is originated from the freshwater effect, while the higher salinity in the deep waters is indicative of the Mediterranean effect (Figure 6.80).

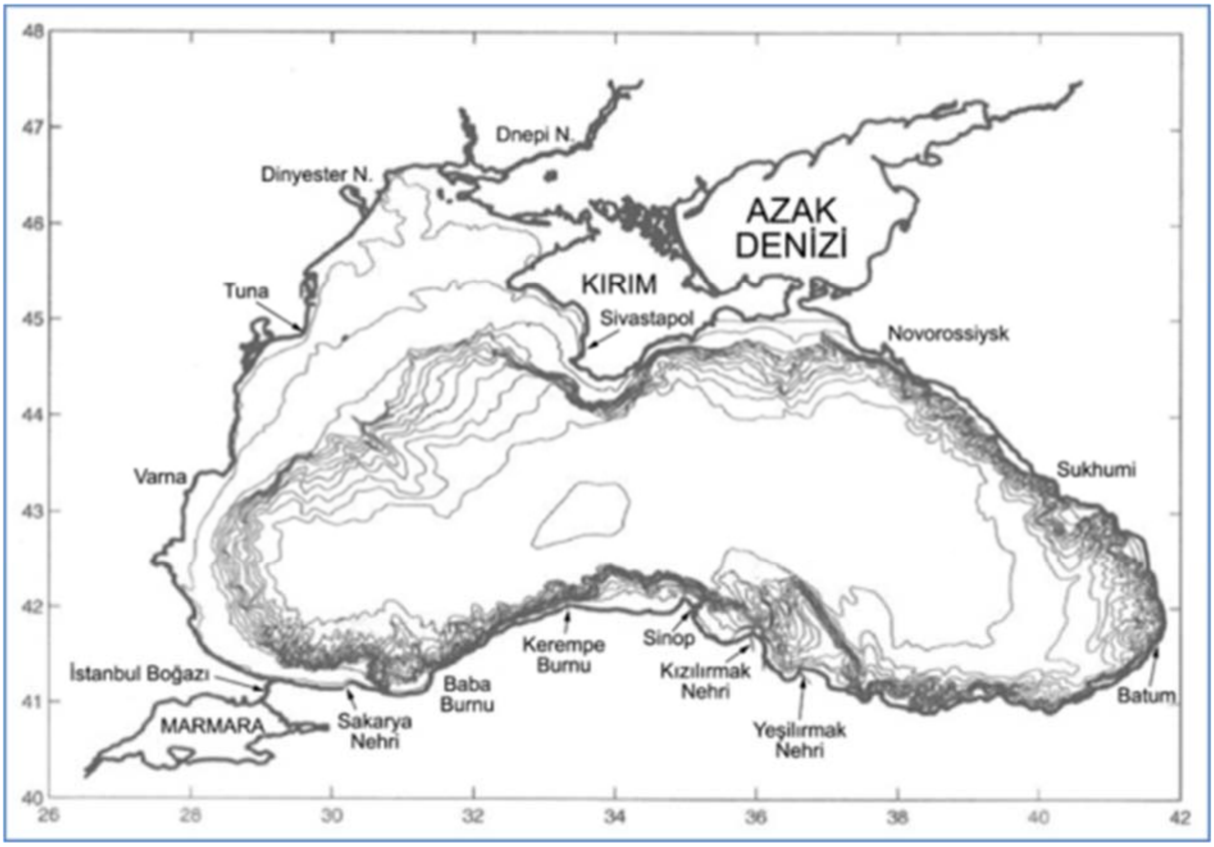


Figure 6.80: Black Sea: Geographical Order, Main Streams and Bathymetric Properties (Ref 6.39)

The Black Sea has a positive water balance that the inputs from the fresh water sources are more than the losses from the evaporation. While the amount of rainfall and surface currents constitute the positive inputs of 300 km^3/year and 350 km^3/year, evaporation occurs at 350 km^3/year. The net flow amount of the stratified flow formed by the Bosphorus corresponds to the remaining water (Ref 6.40).

The upper layer waters of the Black Sea are predominantly cyclonic, largely time-dependent and characterized by the spatial structured circulation throughout the basin. These analyses demonstrate a somewhat complex and vortex-dominated circulation pattern composed of various structural patterns within the internal cylonic cell, a coastal current which displays sudden alterations and is concurrent along the continental slope, and a series of anticyclonic currents as part of the continental slope topography surrounding the basin as well as on the shore-side of the coastal current. The interior circulation consists of several sub-basin scale gyres, each of which is formed by several cyclonic eddies. They evolve continuously by interactions among each other, as well as with meanders and coastal current line (Figure6.81). The structure of the coastal current is accompanied by waves trapped in the shore, consisting of buried strands formed by eddies and strands growing cyclonically around the basin (Ref. 6.28; 6.23) According to the annual time table, Rossby waves proliferating to the west increase the complexity of the circulatory system in the basin (Ref. 6.22)

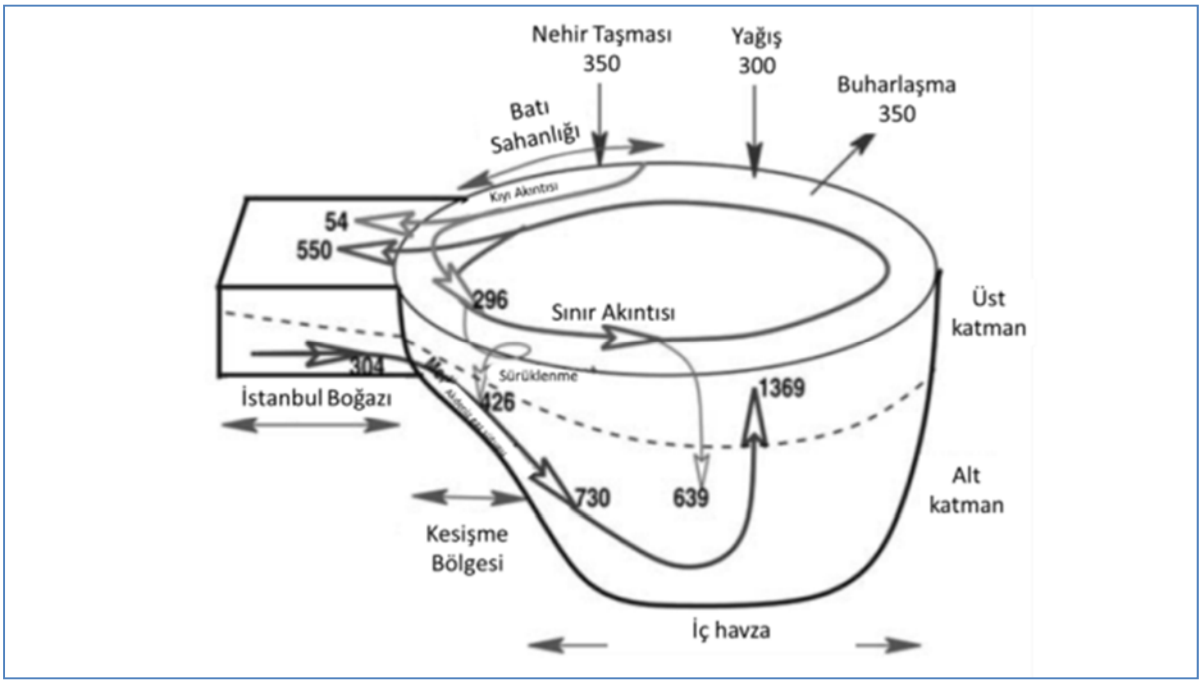


Figure6.81: Schematic view of the Five Parted Box Model Symbol of the Black Sea and Flows between Basic Parts Calculated According to Water and Salt Assets (Ref 6.41)

The mass flow of the Black Sea is summarized as the following (Ref. 6.41):

- Outflow from the surface via the Bosphorus is 604 km^3/year from the surface. This outflow consists of 54 km^3/year at a salinity of 16.5 along the western continental shelf; and 550 km^3/year of freshwater originated coastal flow at an average salinity rate from the rest of the basin;
- The denser Mediterranean waters with an average of 35.5 salinity enter the Bosporus as a bottom current of 304 km^3/year. By the intersection of the Mediterranean bottom current with the Black Sea continental shelf, the physical characteristics such as volume, speed, temperature and salinity are mixed with the upper layer water and change to a great extent. It spreads through the bottom of the basin as a thin layer and becomes much more diluted by the mixing of cooler and less salty ambient waters of the Cold Intermediate Layer (CIL). Here, the Mediterranean column of water with the rate of 426 km^3/year and has a salinity rate of 26.5 is mixed with the upper layer of Cold Intermediate Layer, forming a total of 730 km^3/year, with an average salinity of 22;
- This input is compensated by the upward and downward current difference of 639 and 1.369 km^3/year along the interface between the upper and lower layers, respectively; and
- The deepest column of water covering the whole abyssal plain consists of vertically homogeneous and horizontally uniform waters that are formed over several thousand years through convective mixing due to geothermal heat from the sea bottom.

The stratigraphy of the Black Sea in the 100 m upper layer varies from Sigma-t (σt) to about 5 kg/m^3 (Figure 6.82). The pycnocline corresponding to the density surface 16.2 kg/m^3 σt, approximately conforms to 150 m depth within the interior cyclonic cell or may extend to 200 m within coastal anticyclones. At depths of 100-150 m, the middle layer and deep-water masses below the stationary halocline have almost uniform properties defined by a temperature of about 9ºC, 22 salinity (S) and 17.0 kg/m^{3}σt (Ref. 6.42) The deep homogenous layer that has a thickness of 2000 m within the abyssal plain of the sea possesses almost vertically uniform characteristics below 200 m within the range of values of temperature (T) of 8.9-9.1°C, salinity (S) of 22-22.5, and σt of 17.0-17.3 kg m^3. The deepest part of the water column approximately below 1.700 m involves homogeneous water mass formed by convective mixing due to the bottom geothermal heat flux during the last several thousands of years. (Ref.6.43)

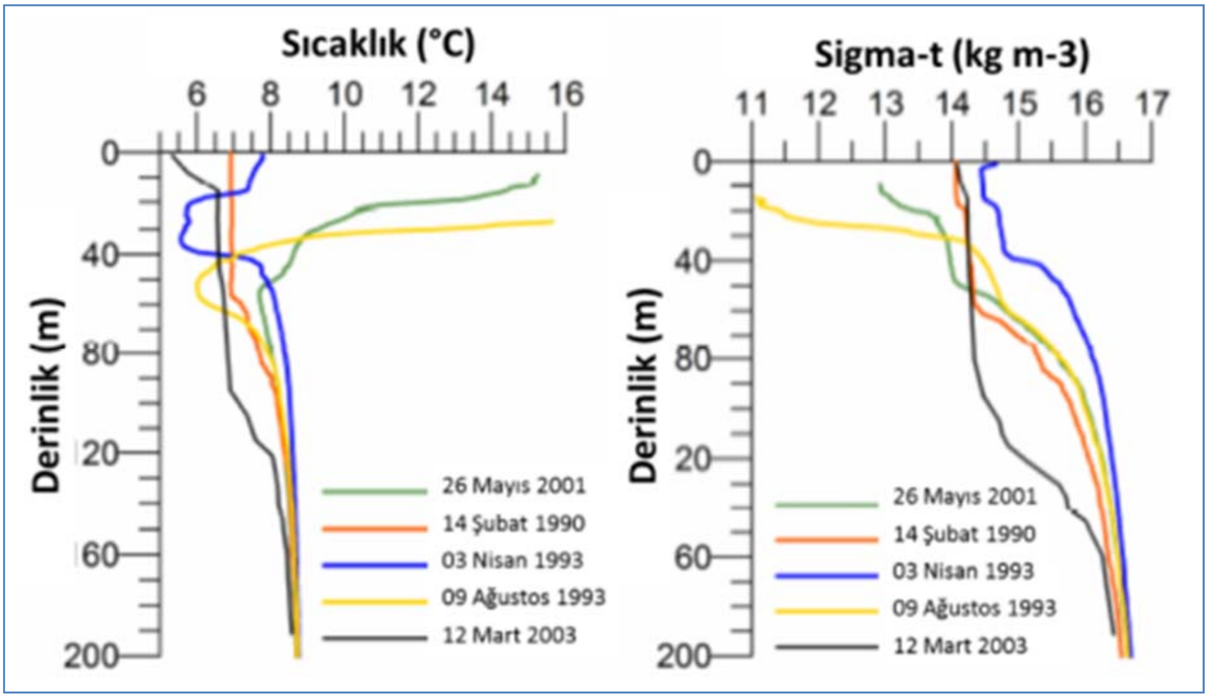


Figure 6.82: Vertical variations of temperature (OC) and density (Sigma-T, kg/m3) at various locations of the interior basin during different months representing different types of vertical structures (Ref. 6.44)

The upper layer of 50-60 m is homogenized in winter with T 6-7 °C, S 18.5-18.8, σt14.0-14.5 kg/m^3 (Ref. 6.44) when the northwestern shelf and near-surface levels of the deep basin exposed to strong cooling by successive cold-air outbreaks, intensified wind mixing, and evaporative loss. As the spring warming stratifies the surface water, the remnant of the convectively-generated cold layer is confined below the seasonal thermocline and forms the Cold Intermediate Layer of the upper layer thermohaline structure Following severe winters, the cold intermediate layer may preserve its structure for the rest of the year, but it may gradually warm up and loose its character in the case of warm winter months. Stratification in summer months comprises a surface mixed layer with a thickness of 10-20 m with T~22-26°C, S~18-18.5 and st ~10.5-11.5 kg m^{-3}.

6.4.2.1 Chemical Properties of the Black Sea Seawater

Over the last thirty years, eutrophication in the coastal regions of the Black Sea, especially severe anthropogenic nutrient and pollution loads that have caused significant changes in chemical and biological regimes in the northwestern parts, have been identified as major ecological problems. In order to understand the conditions of eutrophication, the Black Sea has been subject to many scientific studies. In this section, the literature has been taken as a starting point and the chemical pollution in the Black Sea has been discussed in general terms.

6.4.2.1.1 Biochemical Structure

The Black Sea has a two layered system consisting of an upper biochemical structure covering a deep anoxic layer. There are four different layers in this system. These are; oxic layer with an average depth of 40-50 m, the layer with distinct oxiklin and nitracline presence with an average thickness of 20-30 m, a sub-oxic layer with an average thickness of 20-30 m following these (Ref. 6.45). The last layer is the anoxic layer extending to the bottom of the Black Sea. The stratification in terms of sigma-t (σt) is shown in Figure 6.83.

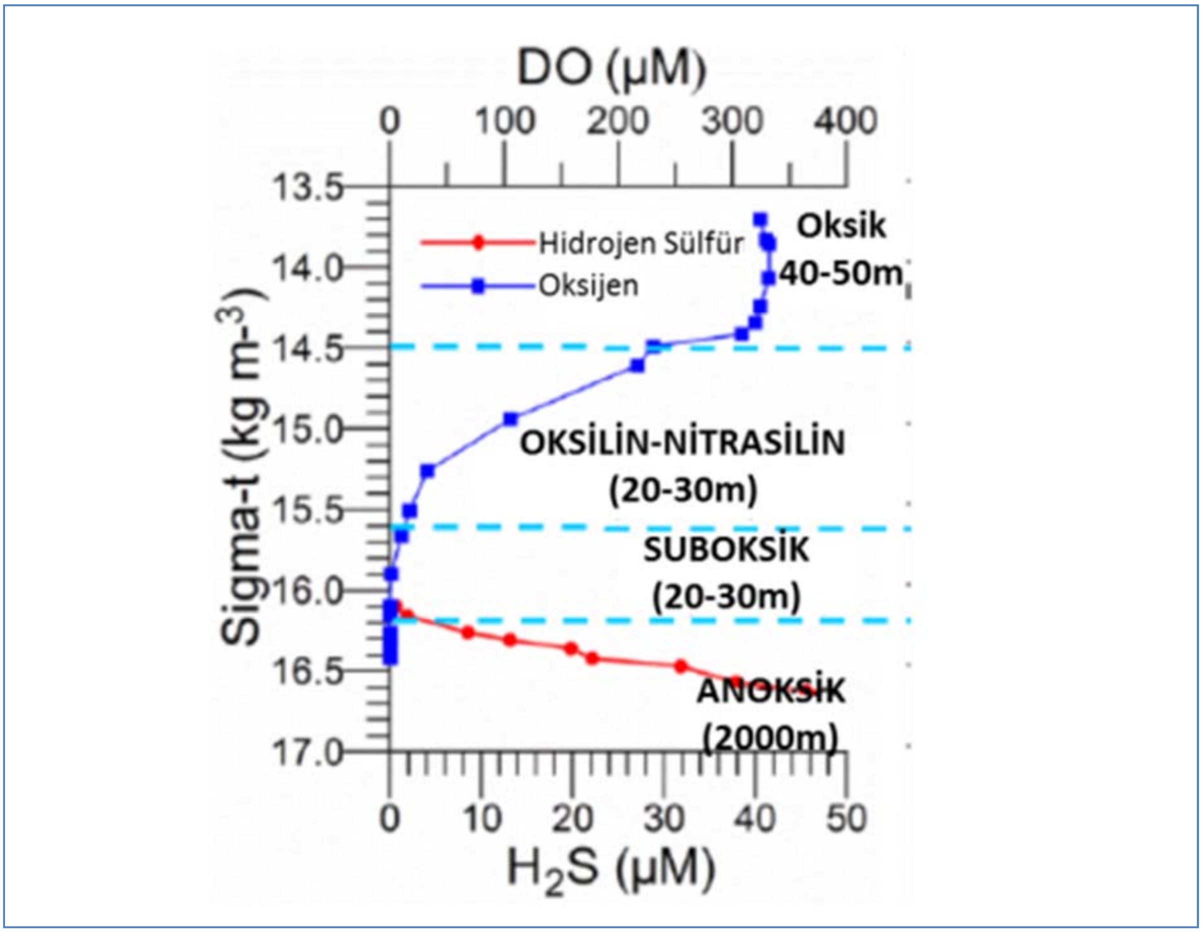


Figure 6.83: Stratified System Layers (Ref. 6.31)

The uppermost part of the water column to 1% light level depth is covered with a euphotic area with a maximum thickness of 50 m. This layer is characterized by high oxygen concentrations of about 300 µM, as well as nutrient and organic matter densities that vary from season to season, obtained laterally from rivers and vertically from the sub-surface levels. In the inner basin, mixed surface layer waters are poor in nutrients for most of the year except for the occasional floods from coastal areas and rainy periods (Ref. 6.31). The oxygen concentration of the euphotic layer is subject to seasonal variations, which has a wide range of values, ranging from 250 to 450 RM. From the start of January to the middle of March, the ~ 50 m upper layer of the water column is aired as a result of convective upset and vertically uniform composite layer densities between 300 and 350 RM are seen. After March, the start of a warmer season will bring about a loss of oxygen in the atmosphere and a drop in solubility, so in the spring and summer, near-surface oxygen densities drop to 250 RM at the top 10 m. The next linear upward trend in seasonal thermocline layers combines near-surface oxygen densities with higher sub-thermocline densities. Depending on the phytoplankton productivity level of summer, sub-thermocline densities may exceed 350 RM in summer (Ref 6.31).

Under seasonal thermocline and in deeper parts of the euphotic field, nitrate concentrations increase. The nutrient fluxes of anthropogenic origin are transported across the northwestern shelf and around the basin through the Rim Current system, and spread ultimately over the interior basin, while some is lost through Bosporus surface flow in winter months (Ref. 6.23). The river supply gives rise to a high Nitrogen/Phosphorus ratio within the northwestern-western shelf that makes phosphate as the primary nutrient of the cold intermediate layer along the coastal zone during the winter season. The river effect is considerably weaker in the open sea and southward along the coast for most of the year due to the consumption of dissolved inorganic nutrients by photosynthesis. However, below the seasonal thermocline, the cold intermediate layer, which is thicker in the coastal regions, contains nitrate concentrations at measurable levels, while the phosphate values are very low (<0.02 mM), leading to high Nitrogen/Phosphorus ratios at abnormal levels (Ref. 6.46, Ref. 6.47).

Figure 6.84 The organic properties of the two-layered system are given in xx (Ref 6.48):

- When the nitrate profiles are plotted on a density basis, the highest density points correspond approximately to σt 15,5 kg/m^3;
- In the oxygen-deficient part of the water column below σt 15,6 kg/m^3, the decomposition of the organic matter takes place by denitrification. This leads to the formation of a "low-nitracline" area with a major decrease in nitrate concentrations in about 100 m depth or in nitric acid concentrations of 30-40 m in thickness from the top to the trace values in the σt 16.0 kg/m^3 isopycnal surface;
- Nitrite is often used to oxidize ammonium. Deep waters carrying sulfur do not contain measurable levels of nitrate, but form large pools of ammonium and dissolved organic nitrogen. Ammonium concentration shows a large increase below σt 16.0 kg / m^3, reaching 10 RM at 150 m (σt ~ 16.5 kg / m^3) and 20 RM at 200 m level;
- The nitrite peak with a maximum concentration of 0.5 µM is usually found at σt 15.85 ± 0.05 kg m^{-3}, which is about 10 m above the nitrate consumption site (Figure 6.84). This corresponds to the minimum point of phosphate. Therefore, the thickness of the nitrite peak point determines the boundary of the denitrification area. Deep waters carrying sulfur in the Black Sea do not contain measurable levels of nitrate, but form large pools of ammonium and dissolved organic nitrogen;
- The vertical structure of the phosphate densities resembles the nitrate structure in the upper layer but is much more complex in suboxic/anoxic layers; and
- Because of the high oxygen consumption during the dissociation process of organic matter, the oxygen concentration decreases almost in a linear manner in the upper nitracline area by about 100 µM at a level of 15.3 kg / m^3 and by about 10 µM at a level of 15.6 kg / m^3. σt 16,2 kg / m^3 near the anoxic surface oxygen densities completely disappear (Figure 6.84). The oxygen-deficient layer which has a thickness of 20-40 m and (O_2 <10 RM), intersects with the lower nitracline area, is called "Suboxic Layer (SOL)". This condition is consistent with almost the same features throughout the basin (Ref 6.45).

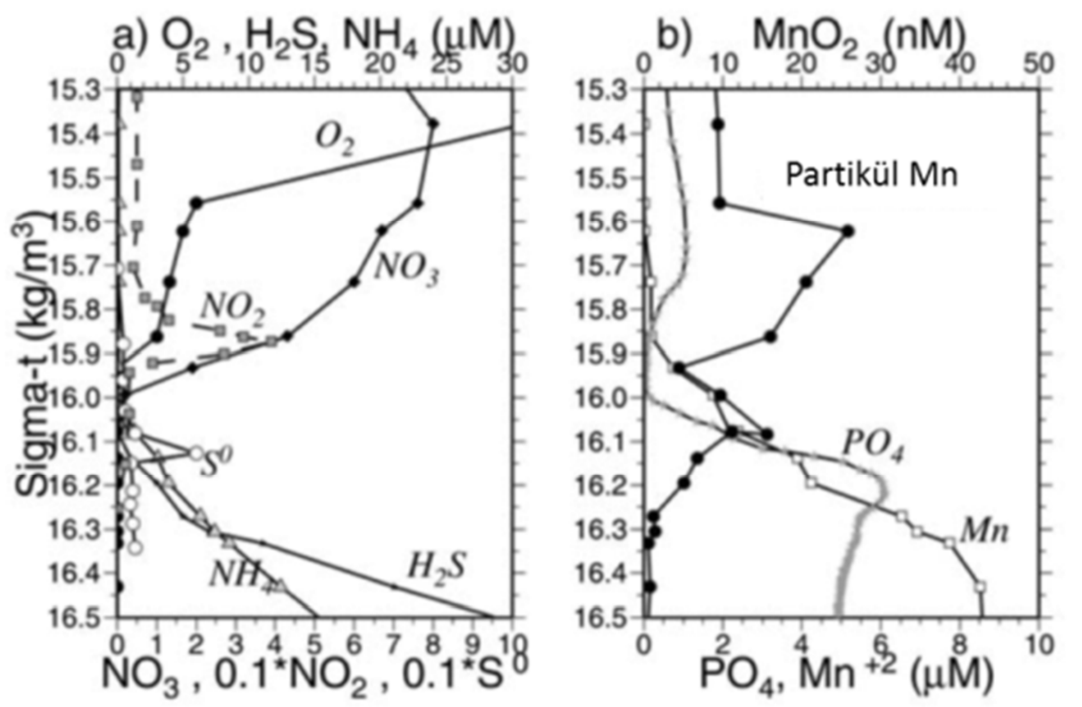
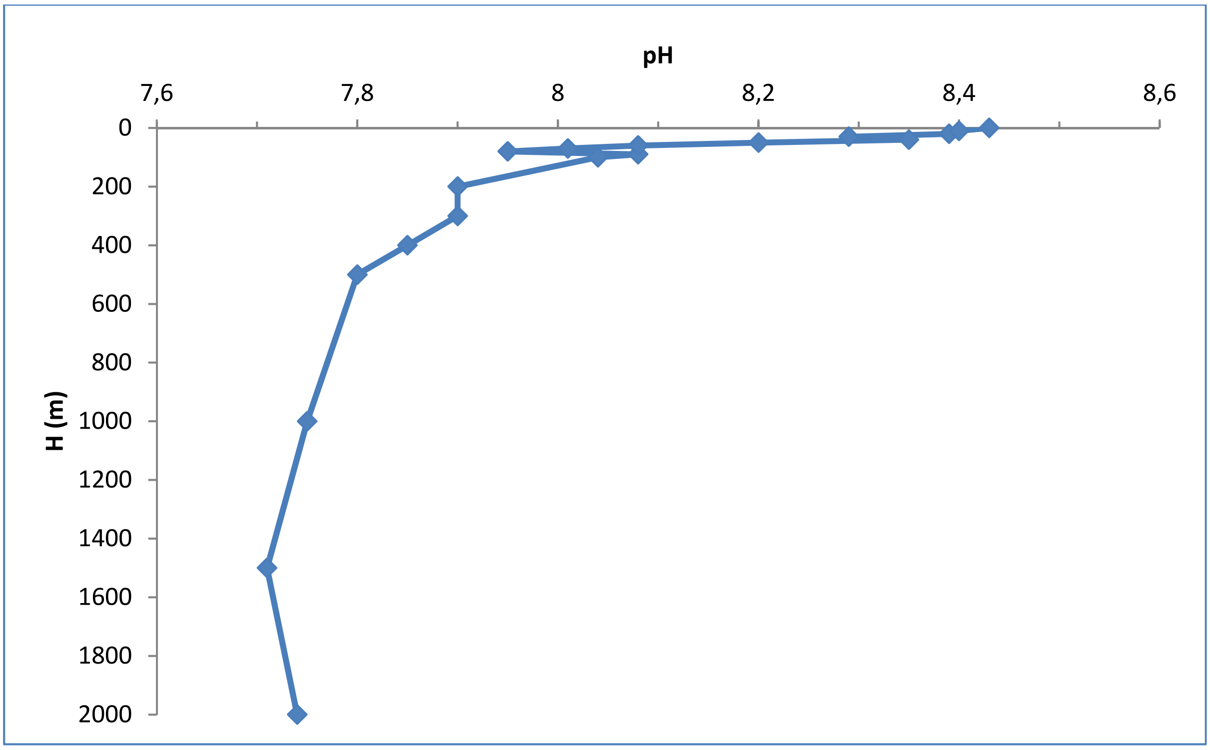


Figure 6.84: (a) The Upper 150 m Water Column (b) O2, HS-, NH4 +, NO3-, NO2-, S0 Profiles and (c) MnO2, Mn, PO4 Profiles (Ref. 6.41)

The boundary between the suboxic and anoxic layers consists of a series of complex reduction-oxidation (redox) processes. As the dissolved oxygen and nitrate concentrations disappear, dissolved manganese, ammonium and hydrogen sulfide densities begin to increase. Remarkable manganese gradients in the form of particles in this transition region close to 16,0 kg m^{-3} reflect the role of the manganese cycle. Deep ammonium, sulfur and manganese pools have accumulated over the last 5.000 years as a result of organic matter decomposition.

The pH value is largely determined by the oxidative degradation processes of organic substances. Thus, the pH value depends on the light intensity, temperature and overall photosynthesis process. The pH value of seawater varies seasonally and spatially. Average vertical pH profile indicates that the pH value falls sharply between the surface and the center of the cold intermediate layer (Figure 6.85) (Ref. 6.31).



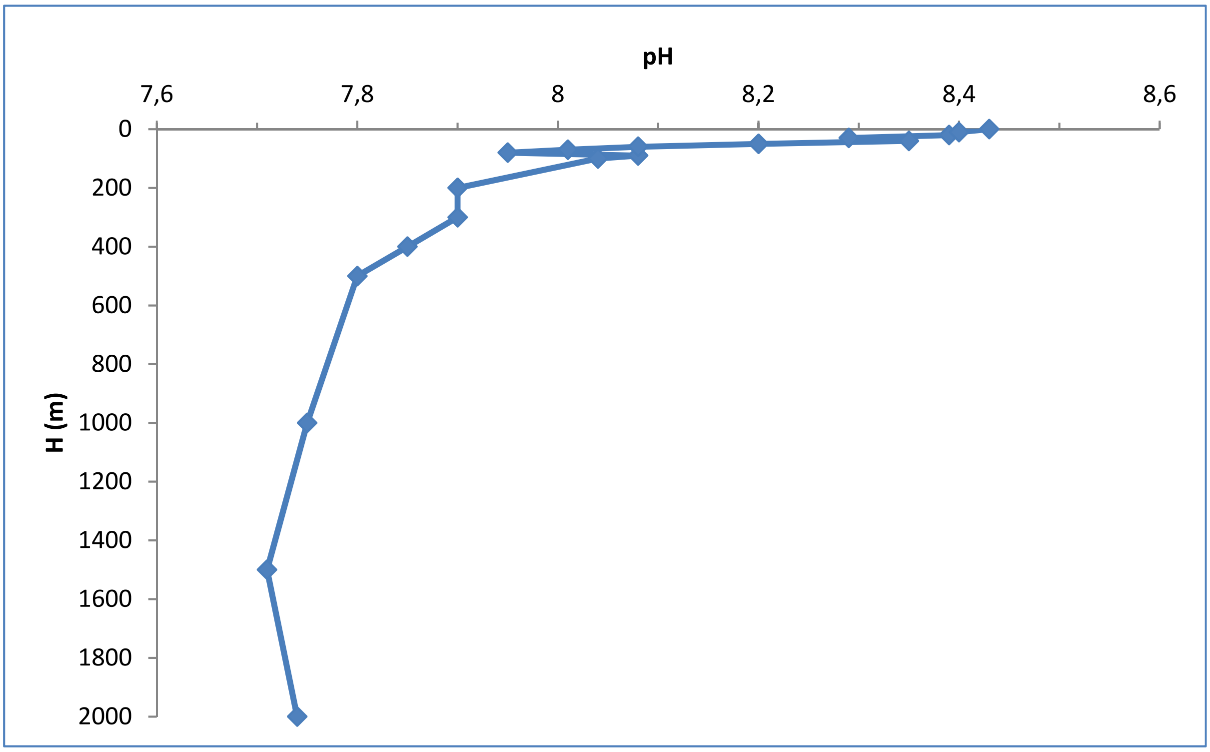


Figure 6.85: Profile of Average of the Standard Levels of pH Using All the Data of the Black Sea Between the Years 1924-2000. (Indicates the Spatial Distribution of pH Observations of the Whole Period in General (1924-2000))(Ref. 6.31)

6.4.2.1.2 Chemical Pollution

Oil spills into the sea occurs through terrestrial sources as well as during the operation of vessels and accidents. The level of current oil pollution is not high in the open sea but is at unacceptable levels in many coastal areas. Figure 6.86 shows a cumulative map of oil spills. The annual figures from the satellite radar data for 2009-2010 in the Black Sea show that the number of detected oil spills is 286, 253 and 247 respectively according to years. All these pollution incidents are due to waters containing oil spilled from moving vessels. As can be seen below in Figure 6.86 these spills concentrate in the main transport routes of Istanbul - Novorossiisk, Istanbul - Odessa and Istanbul - Tuapse. In addition to these routes, in major ports of Bulgaria, Turkey, Romania and Ukraine and petroleum loading terminals, spills are observed in large amounts.

As the ships continue on their way, they continue to evacuate their waste water several times over kilometers. The film layer formed by water containing oil spreads over the sea surface under the effect of wind and waves, covering large areas. According to the data, the size of the total contaminated area in the Black Sea is 790.806 and 768 km^2 respectively for the years 2009-2011 (Ref 6.49).

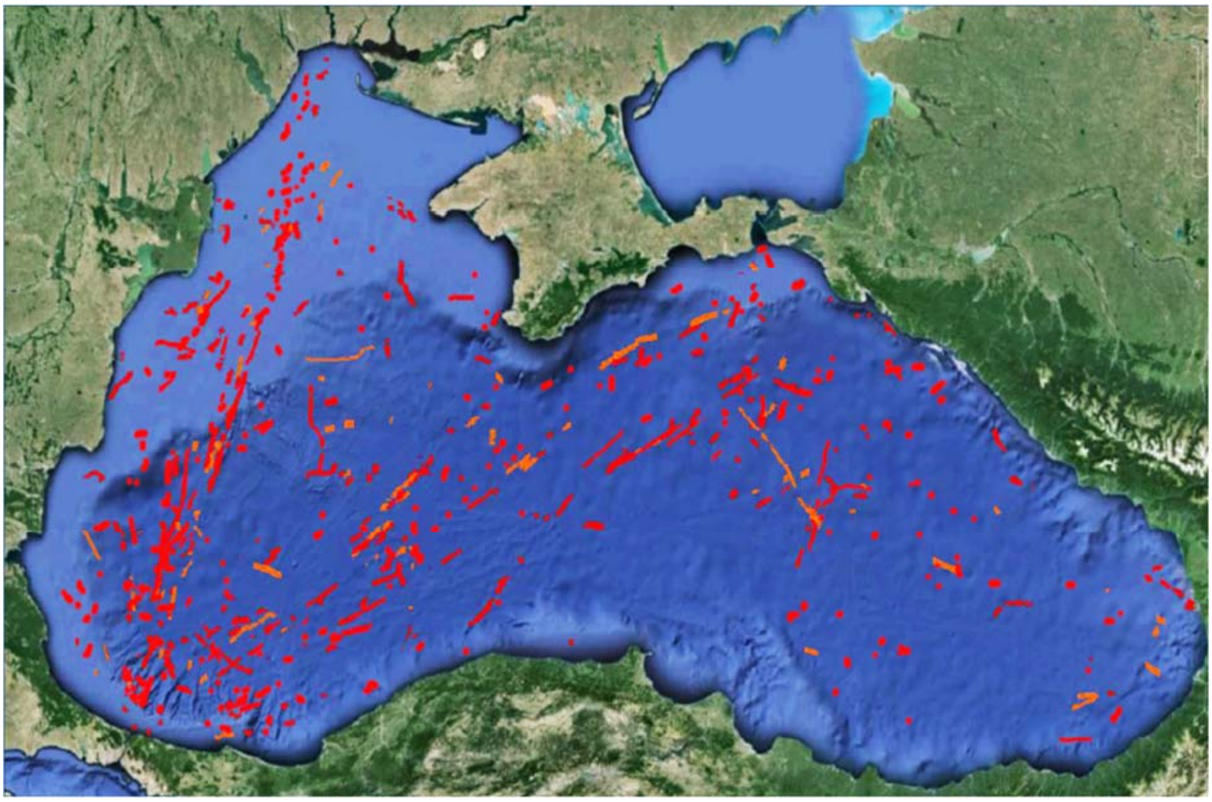


Figure 6.86: Map of the Oil Spill Events in the Black Sea between the years 2009-2011 by Pictures from Synthetic Aperture Radar (SAR)

Table 6.246: Maximum and Average Concentrations of Total Petroleum Hydrocarbons in the Black Sea (mg/L) (Ref 6.31)

Area	Year	Waters	Max	Average
IAEA	1998	West shelf	0,3 (Constantia)	0.084
IAEA	2000	East offshore	3,27 (Feodosya)	0.097
Ukraine	1992-1999	Shore	1.20	0.050
Ukraine	2000-2005	Onshore	0,18 (Kerch)	0.050
Ukraine	2004	Onshore	0,51 (Odessa)	0,12 (Odessa)
Ukraine	2004	Onshore	0,85 (Dinyeper - Southern Bug)	
Romania	2001-2005	Onshore	2,27 (Mandalia)	0.14-0.28
Turkey	2003	Onshore	0,255 (Bosporus)	0.092
Turkey	2004	Onshore	0,077 (Shile)	0.011

Area	Year	Waters	Max	Average
Turkey	2005	Onshore	25,466 (Danube river waters), 1,935 (Danube river waters),	0.199 (excluding 3 extreme cases)
Georgia	2000	Onshore	6,81 (Georgia)	0,13 (140 samples)
Russia	2002-2006	Onshore	3,200 (Novaja Matsesta, Sochi)	0.073
The Black Sea [10]	1978-1989 Winter	Shore + offshore, surface	0,89 (Midwestern basin)	0,10 (519 samples)
The Black Sea [10]	1978-1989 Spring	Shore + offshore, surface	0,59 (Crimean offshore)	0,08 (379 samples)
The Black Sea [10]	1978-1989 Summer	Shore + offshore, surface	0,55 (Odessa region)	0,08 (526 samples)
The Black Sea [10]	1978-1989 Fall	Shore + offshore, surface	1,29 (Sinop region)	0,09 (425 samples)
The Black Sea [10]	1978-1989	Shore + offshore, surface	1,29 (Sinop region)	0,09 (3828 samples)

Pesticides and heavy metals continue to cause pollution close to the known major sources. PCBs produced or manufactured for industrial purposes are now limited to closed systems, and the use of DDT is prohibited or restricted in many countries of the Black Sea. Despite these limitations, recent studies have shown that DDT is present at high concentrations in rivers, streams, discharges of domestic and industrial wastes in Turkey, which can be interpreted as illegal use (Ref. 6.31). The use of these chemicals in other Black Sea countries is uncertain at this time.

Except for some critical points where the anthropogenic effect from terrestrial sources is evident, heavy metal densities are below the maximum allowable concentration (MAC) levels in coastal waters, while offshore they are closer to the natural values of the past. Copper and chromium contaminations are widespread especially in the northwestern basin. The Crimean coast also has a high chrome density. The tendency to reduce the highest mercury and cadmium density limits in the last 10 years in the Danube Delta region has stood out (Ref. 6.31).

6.4.2.2 Current Circulation and Seasonal Cycles of the Black Sea

6.4.2.2.1 Circulation Structures and Currents

Circulation structures and currents are shown schematically in Figure 6.407. The basic features of the circulation system are given below (Ref 6.41):

- The meandering coastal current system that surrounds the basin cyclonically;
- Two cyclonic cycles in the sub-basin scale consisting of four or more cycles in the interior section;
- Anticyclonic eddies of the Bosphorus, Sakarya, Sinop, Kızılırmak, Batum, Sukumi, Caucasus, Kerch, Crimea, Sevastopol, Danube, Constanța and Kaliakra on the shore side of the coastal current region;
- Coastal current near the southern tip of Crimea separating into two branches; one flowing in the southeast direction along the topographical slope area and the other branching in the

northwestern direction in the basin, and then joining the interior basin flow system coming from the south;

- The separation of these two branches from the coastal current system at the beginning near the southwestern coast; and
- The presence of a large anticyclonic eddy in the northern part of the northwest basin.

The basic mechanism controlling the current structure in the surface layer of the northwest area is spread from the Danube outflow. Wind stress and coastal currents along the open sea area of the basin are the other regulators of this system. Freshwater flow affects not only circulation and mixing properties, but also the ecosystem of the whole basin area along the western shore. The Danube water outlet generally forms an anticyclonic ridge that is limited to a 25m layer on top. The foremost edge of this water outlet (ridge) goes south along the western shoreline as a fine baroclinic coastal stream (e.g. downstream). The coastal jet is separated from the inland waters with a certain line of boundaries with salinity differences above the level of 3.0 in an area of about 50 km along the shore. It is mostly unstable, showing meanders extending along the broad topographic slope area and forming filaments. The basin waters and inland waters are subject to hydrographic studies, satellite imagery, and diagonal changes on the basin, which are continuously recorded on the altimeter data.

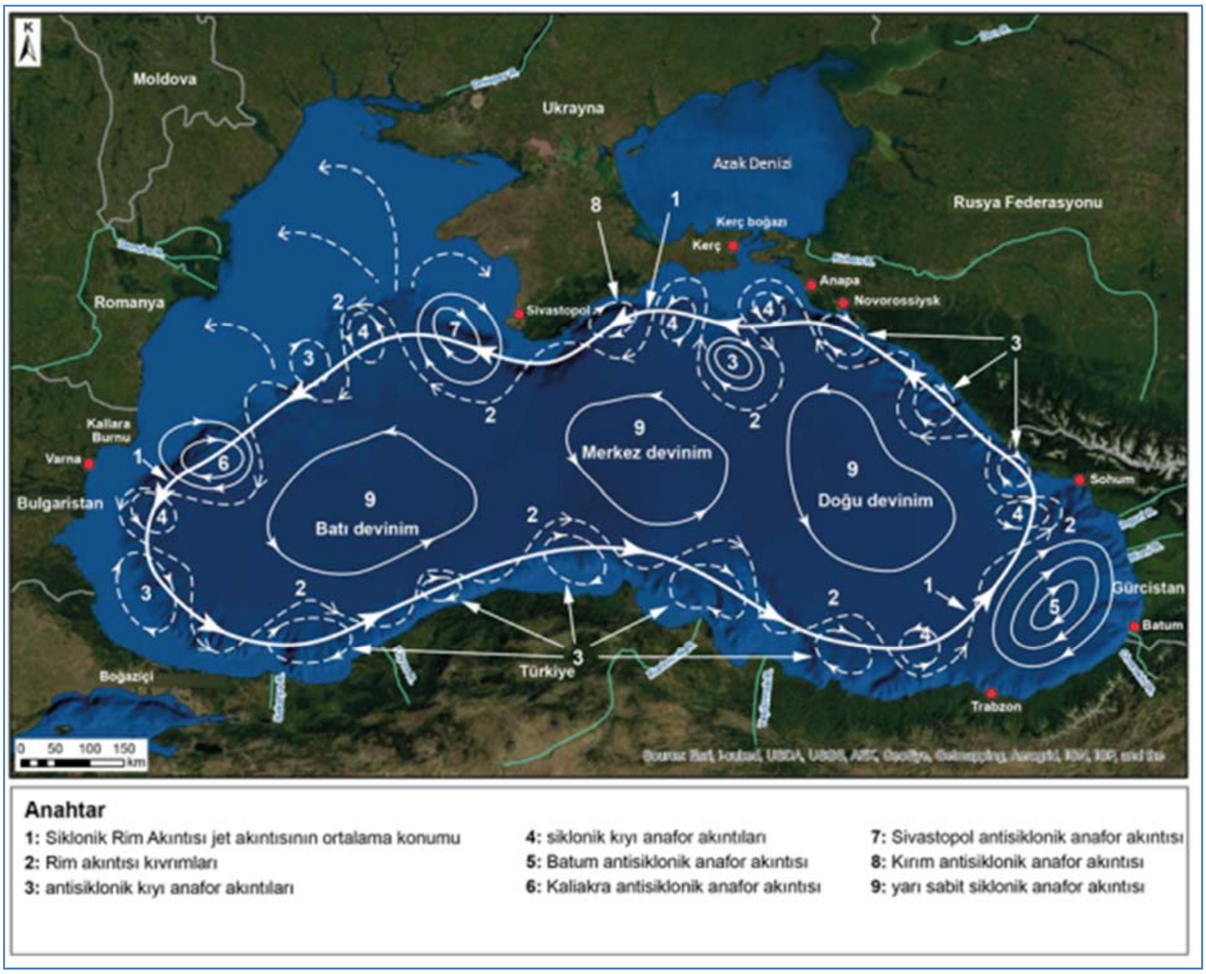


Figure 6.407: Schematic Diagram of the Currents in the Black Sea

Black Sea general flow regime obtained from the digital flow model

A three-dimensional (3-D) hydrodynamic circulation model of the Black Sea was developed by the Dokuz Eylül University Institute of Marine Sciences and Technologies for the Project within the scope of the Dredging Environmental Management Plan (2017). This model is a digital flow model known as NEMO (Nucleus for European Modeling of the Ocean). The NEMO model has been successfully used in many studies from the local to the global scale. The Black Sea model used in this study has grid horizontal resolution of 4 km and 75 vertical model levels.

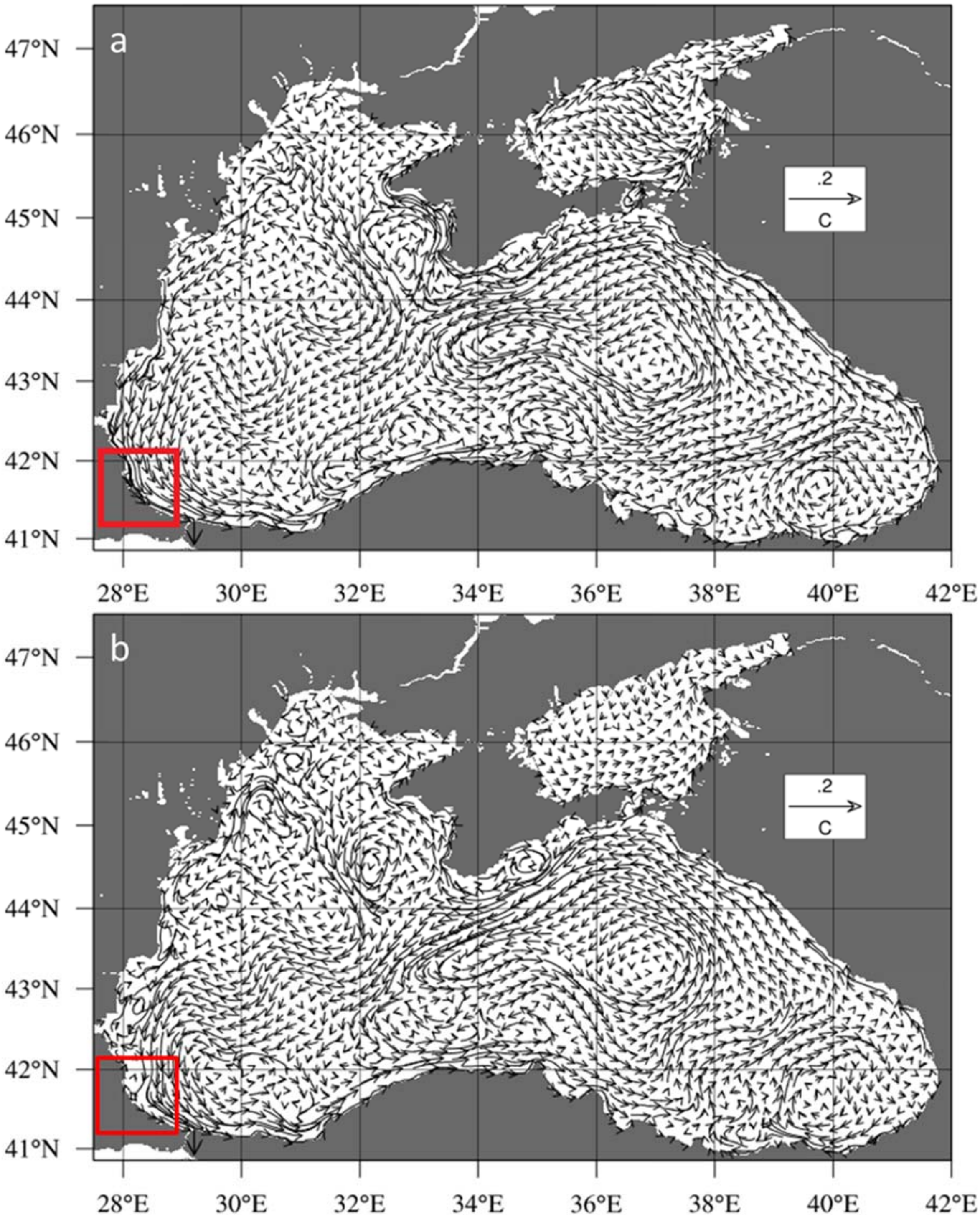


Figure 6.418: Average surface currents obtained from the numerical flow model for (a) August and (b) September 2015. The reference vector is 0,2 m/s. (The study area is marked with red.)

The numerical flow model shows the general current characteristics of the Black Sea. Figure 6.418(a) shows the average surface current for August 2015, obtained from the NEMO numerical model. The most spectacular feature of the Black Sea general current is the coastal current known as "Rim Current". This current is a current system circulating throughout the Black Sea. The current system is faster in the western part of the basin, due to the rivers present here. At this part of the basin, the southward current flows through the study area to the Bosphorus and continues eastward.

Similar current regime can also be seen in other months. For example, the surface flow regime of September, derived from the numerical flow model, is shown in Figure 6.418 (b). In September, the presence of strong coastal currents can be observed. Although the presence of small-scale eddies was observed in the study area in September, the flow regime in the Shore Crossing Section of the Project is still southward and strong. A similar situation has been observed for other months. These results are consistent with the current literature. According to the numerical flow model results, the Shore Crossing Section of the Project is under the influence of southward currents throughout the year. This stream shows Jet features and flows to Bosporus passing from the Shore Crossing Section of the Project.

6.4.2.2.2 Wave Heights

The wind regime is cyclical, with slight breezes from May to September, and strong winds in winter. The dominant directions of spring and summer winds are West, South-West and South. However, the number of days of severe wind in summer is limited to 3-5 days. In autumn and winter, the wind blows predominantly from the North, Northeast and East. While the maximum wind speed is 40 m / s, the maximum number of days with severe winds (October-March) is 12-15 (Ref. 6.29)

In the Turkish part of the Black Sea there are favorable conditions for the development of storm waves, in other words, large surface area, depth and low shore irregularities. During the summer season, the wave height frequency below 1 m is 60-70%. In winter, the frequency of these waves falls to 20-30%. While the 2-3 m wave height is generally seen in the winter season and the frequency of occurrence in this period is 20%, it does not exceed 15% in the rest of the year. 6 m and over, wave heights are rarely seen and the frequency of observations does not exceed 1%. The wave regime in the shores is highly variable and depends on the characteristics of the respective region. Storms (over IV) are more prevalent in cold seasons, while the frequency is at 10%. The frequency of periods when the sea is calm in the summer can be up to 10 days (Table 6.257).

Table 6.257: Wave Frequency in Different Seasons (Ref. 6.29)

Wave height, m	Winter	Spring	Summer	Autumn
<1	27	45	70	42
1—2	43	40	24	42
2—3	20	12	5	12
3—6	9	3	1	4
6-11	1	0	0	0
>11	0	0	0	0

6.4.3 Hydrographic and Oceanographic Features of the Project Area (Offshore and Shore Crossing Sections)

6.4.3.1 Chemical Characteristics of Seawater

Within the scope of the project, as a result of the meetings with the General Directorate of Environmental Management of the MoEU, in order to determine the quality of sea water as per the request of the General Directorate, between 23 January 2017 and 4 February 2017, along the pipeline route 250 m, 500 m, 1000 m and 1800 m from the shore and 500 m on both sides of the route (parallel to the route) with the same as the distances from the route (parallel to the route) water samples were taken by the Duzen Norwest Laboratories. The following sections present the evaluations made with the view that the samples taken at 250 m, 500 m and 1000 m offshore represent the Shore Crossing Section and the samples taken at 1800 m represent the Offshore Section. Sampling points are given in Figure 6.429 and Figure 6.90 below.

6.4.3.1.1 Offshore Section

A total of 3 seawater samples, which will represent the Offshore Section of the Project were taken (1800 m offshore and on either side of this point in a 500m distance), as specified by the MoEU General Directorate of Environmental Management (Figure 6.429). Coordinates of the sampling points are given below in Table 6.268.

Table 6.268: Coordinates of the Sea Water Sampling Points Representing the Offshore Section

Station Name	Coordinates	
	Latitude	Longitude
ENV 13N	41°39'39.43"	28°06'42.90"
ENV-NEW- 15N/ENV-10	41°39'23.22"	28°06'38.87"
ENV 16N/ENV11	41°39'02.71"	28°06'40.33"

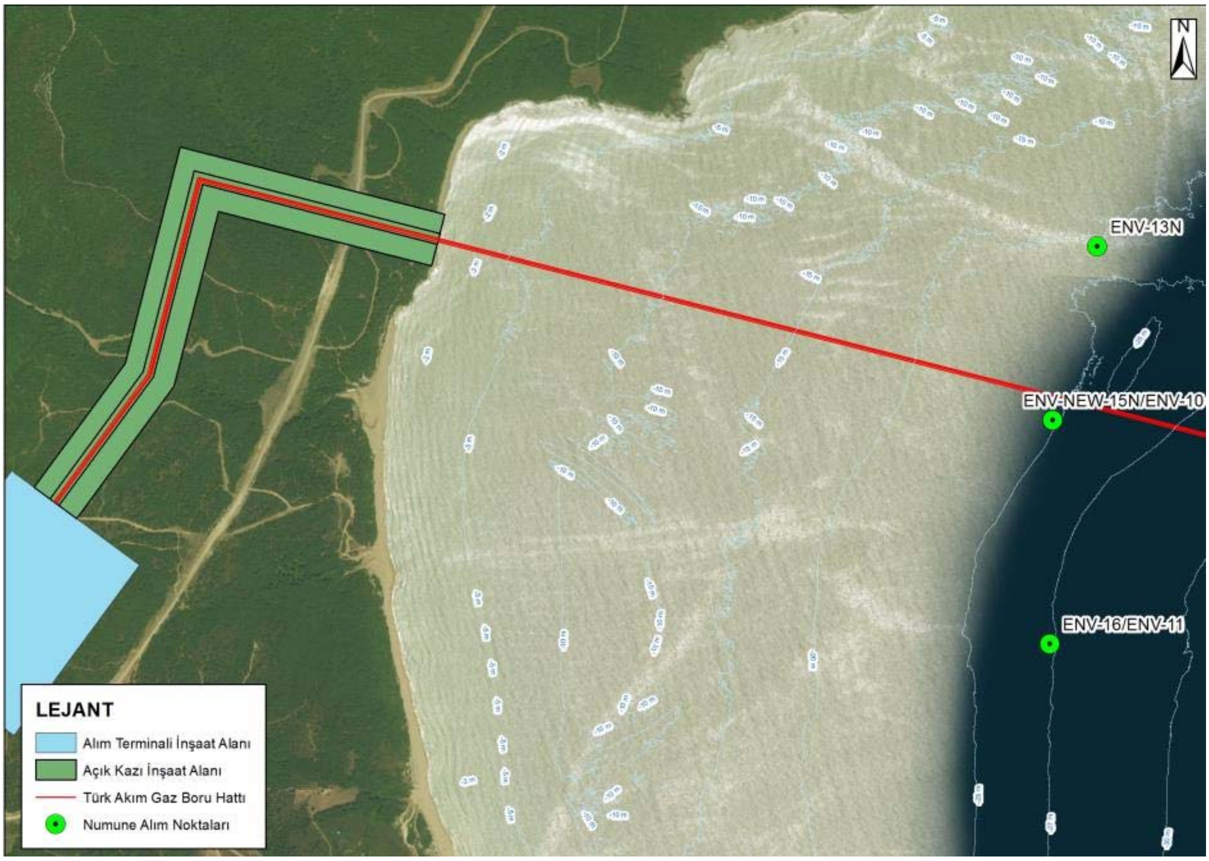


Figure 6.429: Sampling Points (1800 m offshore) Representing the Offshore Section

Water quality analyzes are carried out by Duzen Norwest Laboratories on surface water samples taken from the 3 points mentioned. The results of the analysis are compared with the limit values given in Table 4 of the Water Pollution Control Regulation; in Table 2, Table 3 and Table 6 of Annex-5 Regulation on Surface Water Quality. These assessments are provided in Table 6.279, Table 6.30, Table 6.281 and Table 6.292 below, whereas the results of the analyses are provided in **Annex-6.E.**

Table 6.279: Evaluation of Analysis Results According to Sea Water General Quality Criteria (Water Pollution Control Regulation Table-4)

Parameter		Unit	Limit Value	Sampling Station Name		
				ENV 13N	ENV-NEW-15N/ENV-10	ENV 16N/ENV11
pH			6.0 – 9.0	8.34	8.35	8.36
Color		Pt/Co	Natural	< 2	< 2	< 2
Turbidity		NTU		1.20	1.98	1.98
Floating Material			-	ND	ND	ND
Suspended Solids		mg/L	30	1.4	2.0	1.8
Dissolved oxygen		%	Saturation more than 90%	93.39	93.72	92.92
Degradable Organic Pollutants		mg/L	-	2.03	3.03	2.45
Crude Oil and Derivatives		mg/L	0.003	**0.06**	**0.08**	**0.08**
Radioactivity	Alpha	Bq/L	-	0.042	< 0,021	< 0,024
	Beta	Bq/L	-	8.56	5.89	4.69
Productivity		µg/L	-	1.82	2.30	2.25
Toxicity			Should not be detected	< 4	< 4	< 4
Phenols		mg/L	0.001	< 0,001	< 0,001	< 0,001
Copper		mg/L	0.01	< 0,0061	< 0,0061	< 0,0061
Cadmium		mg/L	0.01	< 0,0029	< 0,0029	< 0,0029
Cromium		mg/L	0.1	< 0,0044	< 0,0044	< 0,0044
Lead		mg/L	0.1	< 0,0048	< 0,0048	< 0,0048
Nickel		mg/L	0.1	< 0,0048	< 0,0048	< 0,0048
Zinc		mg/L	0.1	< 0,0058	< 0,0058	< 0,0058
Mercury		mg/L	0.004	< 0,0001	< 0,0001	< 0,0001
Arsenic		mg/L	0.1	< 0,0047	< 0,0047	< 0,0047
Ammonia		mg/L	0.02	0.00045	0.00087	0.00155

ND: Not Detected

Table 6.30.: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of Intra-continental Surface Waters according to the Quality Criteria by Classes (Surface Water Quality Regulation Annex-5 Table-2)

Parameter	Unit	Water Quality Classes				Sampling Station Name		
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 13N	ENV-NEW-15N/ENV-10	ENV 16N/ENV11
Color 436 nm	m^{-1}	≤ 1,5	3	4.3	> 4,3	< 0,1	< 0,1	< 0,1
Color 525 nm	m^{-1}	≤ 1,2	2.4	3.7	> 3,7	< 0,1	< 0,1	< 0,1
Color 620 nm	m^{-1}	≤ 0,8	1.7	2.5	> 2,5	< 0,1	< 0,1	< 0,1
pH	-	6-9	6-9	6-9	6-9	8.34	8.35	8.36
Conductivity	µS/cm	< 400	1000	3000	> 3000	**17240**	**17150**	**17120**
Oil and Grease*	mg/L	<0.2	0.3	0.5	> 0,5	< 0,05	< 0,05	< 0,05
Dissolved oxygen (Oxygen Saturation Rate)	mg/L	> 8	6	3	< 3	11.67	11.72	11.62
Chemical Oxygen Demand (COD)	mg/L	< 25	50	70	> 70	< 5,4	< 5,4	< 5,4
Biological Oxygen Need (BON)	mg/L	< 4	8	20	> 20	2.03	3.03	2.45
Ammonium Nitrogen (NH_4-N)	mg NH_4^+-N/L	< 0,2	1	2	> 2	0.00045	0.00087	0.00155
Nitrate Nitrogen	mg NO_3^--N/L	< 3	10	20	> 20	0.0937	0.09177	0.08777
Total Kjeldahl Nitrogen (TKN)	mg N/L	< 0,5	1.5	5	> 5	0.18	0.16	0.12
Total Nitrogen	mg N/L	< 3,5	11.5	25	> 25	0.28	0.26	0.22
Orthophosphate as phosphorus (o-PO_4)	mg o-PO_4-P/L	< 0,05	0.16	0.65	> 0,65	0.00859	0.00958	0.01132
Total Phosphorus	mg P/L	< 0,08	0.2	0.8	> 0,8	0.01482	0.01714	0.01916
Fluoride (F)	µg/L	≤ 1000	1500	2000	> 2000	510	500	540
Manganese (Mn)	µg/L	≤ 100	500	3000	> 3000	< 5	< 5	< 5
Selenium (Se)	µg/L	≤ 10	15	20	> 20	< 5	< 5	< 5
Sulfur	µg/L	≤ 2	5	10	> 10	< 2	< 2	< 2

* Oil and grease analyzes were conducted in the Duzen Norwest Laboratories, but no regulatory limit values were provided, thus analyzes were repeated in ALS Laboratories. The analysis results made in the ALS Laboratory are given in the table.

According to the analysis results in the tables given above, the parameters of conductivity and crude oil and its derivatives in seawater are above the limits specified in the regulations. The high conductivity value in the sea water is due to the high salt concentration in seawater. The high concentration of crude oil and its derivatives is thought to be due to the fishing activities carried out in the region.

Table 6.281: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of the Coastal Waters according to the Receiver Ambient Quality Criteria (Surface Water Quality Regulation Annex-5 Table-3)

Zone	Parameter	Unit	Water Quality Classes				Sampling Station Name		
			I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 13N	ENV-NEW-15N/ENV-10	ENV 16N/ENV11
Black Sea.	Dissolved oxygen	mg P/L	≥ 6	5	4	< 4	11.67	11.72	11.62
	TP	µg/L	< 8	8-12	12-16	> 16	**14.82**	**17.14**	**19.16**
	NOx	µg/L	< 14	14-20	21-34	> 34	**101.2**	**97.2**	**92.2**
	Oil-Grease*	mg/L	< 0,2	0.3	0.5	> 0,5	< 0,05	< 0,05	< 0,05
	Floating Material		Floating liquids, waste and similar solid materials and foam cannot be found.				ND	ND	ND

ND: Not Detected

* Oil and grease analyzes were conducted in the Duzen Norwest Laboratories, but no regulatory limit values were provided, thus analyzes were repeated in ALS Laboratories. The analysis results made in the ALS Laboratory are given in the table.

According to the water quality classes mentioned above, the total phosphorus and NOx according to the parameters of sea water have been regarded as Level IV. However, as described in detail in **Chapter 7** (Assessment of the Biological Environment), the eutrophication risk of the study area was found to be low, according to the average reference values that determine the trophic level on the Black Sea shores.

Table 6.292: Evaluation of the Analysis Results According to Standard Values Required for Coastal and Transitional Waters Used for Recreation (Surface Water Quality Regulation Annex-5 Table-6)

Parameter	Unit	Standard/Limit Value	Sampling Station Name		
			ENV 13N	ENV-NEW-15N/ENV-10	ENV 16N/ENV11
Turbidity Clarity Light Permeability	m	Secchi disc depth 1 m - %90 (guide) 2 m - %95 (compulsory)	7	3.5	4
Dissolved oxygen	% saturation	≥ %80	% 93,39	% 93,72	%92.92
Enterococi (Faecal streptococci)	colony/100 mL	100 (%95) (guide) 200 (%95) (compulsory) 185 (%90) (sufficient)	1	0	0
Escherichia Coli	colony/100 mL	250 (%95) (guide) 500 (%95) (compulsory) 500 (%95) (sufficient)	0	2	0
Carbon residue and floating materials		Should not be detected.	ND	ND	ND
pH	-	6-9	8.34	8.35	8.36
Color	Pt/Co	There should be no unusual change in color.	< 2	< 2	< 2
Floating material (including oil and grease)		Floating liquids such as oil, tar; garbage and similar	ND	ND	ND

Parameter	Unit	Standard/Limit Value	Sampling Station Name		
			ENV 13N	ENV-NEW-15N/ENV-10	ENV 16N/ENV11
		solid materials and foam have not been detected.			

ND: Not Detected

6.4.3.1.2 Shore Crossing Section

A marine survey was conducted between January 23, 2017 and February 4, 2017 to determine the current conditions in the Shore Crossing Section. The study includes analysis of seawater and sediment samples and an evaluation of the analysis results is presented in this section. Based on the opinion letter dated 2015 July of the MoEU General Directorate of Environment Management (**ANNEX-5.A**), sampling points were determined at the study area. Detailed information on the selection of sample points is explained in Section 6.4.3.1 above.

Seawater and sediment samples at the specified 12 points were taken by Düzen Norwest Environment (Düzen Norwest) laboratory authorized by the MoEU. The coordinates of the sampling points and the types of samples taken are shown in Table 6.303 and their locations are shown in Figure 6.90 below.

Table 6.303: Coordinates of all Sampling Stations

STATION CODE	Coordinates		CTD	Secchi Disk	Sediment	Water Quality
	Latitude	Longitude				
ENV 01N	41°39'40.63"	28°05'34.08"	√	√	√	√
ENV NEW 03N	41°39'32.51"	28°05'32.01"	√	√		√
ENV 04 NEW	41°39'15.56"	28°05'31.89"	√	√	√	√
ENV 05N	41°39'39.17"	28°05'44.81"	√	√	√	√
ENV NEW 07N	41°39'31.01"	28°05'42.78"	√	√		√
ENV 08N/ENV 04	41°39'15.29"	28°05'40.36"	√	√	√	√
ENV-09N	41°39'44.25"	28°06'08.38"	√	√		√
ENV-NEW 11N	41°39'28.00"	28°06'04.35"	√	√	√	√
ENV-12N/ENV-07	41°39'14.45"	28°06'02.11"	√	√		√
ENV 13N	41°39'39.43"	28°06'42.90"	√	√		√
ENV-NEW- 15N/ENV-10	41°39'23.22"	28°06'38.87"	√	√	√	√
ENV 16N/ENV11	41°39'02.71"	28°06'40.33"	√	√	√	√

Water quality analyzes are carried out by Duzen Norwest Laboratories on surface water samples taken from the 12 points mentioned. The results of the analysis are compared with the limit values given in the Table 4 (Table 6.4) of the Water Pollution Control Regulation; the Swimming Water Quality Regulation Annex-1 (Table 6.325) and the Table 2 (Table 6.336-Table 6.437), Table 3 (Table 6.448-Table 6.5459) and Table 6 (Table 6.60) of the Annex-5 Regulation on Surface Water Quality.

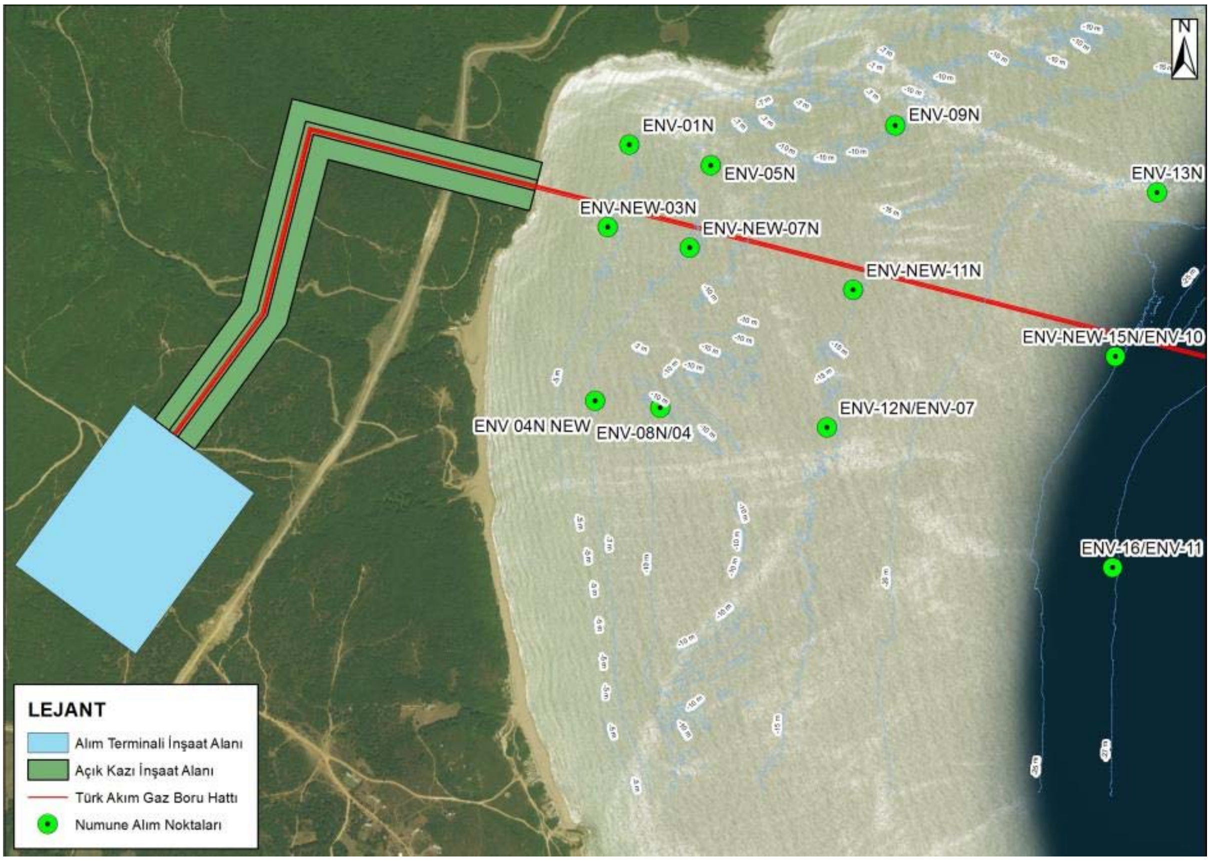


Figure 6.90: Locations of All Sampling Stations

Table 6.31: Evaluation of Analysis Results According to Sea Water General Quality Criteria (Water Pollution Control Regulation Table-4)

Parameter		Unit	Limit Value	Station code											
				ENV-01N	ENV-NEW-03N	ENV-NEW-11N	ENV-12N/ENV-07	ENV NEW 15N/ENV-10	ENV-16N ENV-11	ENV-09N	ENV-08 N ENV-04	ENV 13N	ENV-NEW-04N	ENV-05N	ENV-NEW-07N
pH			*6.0 – 9.0*	8.36	8.36	8.35	8.33	8.35	8.36	8.35	8.37	8.34	8.36	8.36	8.36
Color		Pt/Co	*Natural*	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Turbidity		NTU		5.70	2.48	2.46	2.95	1.98	1.98	1.16	1.53	1.20	0.90	1.56	1.21
Floating Material			-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Suspended Solids		mg/L	*30*	5.0	2.6	2.6	2.6	2.0	1.8	1.2	1.6	1.4	1.9	2.4	1.2
Dissolved oxygen		%	*Saturation more than 90%*	94.94	95.71	93.59	93.46	93.72	92.92	93.89	94.93	93.39	95.85	94.49	94.81
Degradable Organic Pollutants		mg/L	-	2.65	2.74	2.50	2.31	3.03	2.45	2.81	2.48	2.03	1.87	2.08	2.92
Crude Oil and Derivatives		mg/L	*0.003*	**0.03**	**0.06**	**0.113**	**0.09**	**0.08**	**0.08**	**0.05**	**0.03**	**0.06**	**0.06**	**0.03**	**0.03**
Radioactivity	Alpha	Bq/L	-	0.052	< 0,021	0.042	< 0,026	< 0,021	< 0,024	0.053	< 0,024	0.042	0.033	0.042	< 0,021
	Beta	Bq/L	-	7.07	6.83	6.13	6.28	5.89	4.69	7.58	4.93	8.56	5.69	4.48	7.00
Productivity		μg/L	-	1.76	1.76	2.07	2.38	2.30	2.25	2.10	1.90	1.82	1.93	2.22	2.41
Toxicity			*Should not be detected*	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4	< 4
Phenols		mg/L	*0.001*	< 0,001	< 0,001	< 0,001	< 0,001	< 0,001	< 0,001	< 0,001	< 0,001	< 0,001	< 0,001	< 0,001	< 0,001
Copper		mg/L	*0.01*	< 0,0061	< 0,0061	< 0,0061	< 0,0061	< 0,0061	< 0,0061	< 0,0061	< 0,0061	< 0,0061	< 0,0061	< 0,0061	< 0,0061
Cadmium		mg/L	*0.01*	< 0,0029	< 0,0029	< 0,0029	< 0,0029	< 0,0029	< 0,0029	< 0,0029	< 0,0029	< 0,0029	< 0,0029	< 0,0029	< 0,0029
Cromium		mg/L	*0.1*	< 0,0044	< 0,0044	< 0,0044	< 0,0044	< 0,0044	< 0,0044	< 0,0044	< 0,0044	< 0,0044	< 0,0044	< 0,0044	< 0,0044
Lead		mg/L	*0.1*	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048
Nickel		mg/L	*0.1*	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048
Zinc		mg/L	*0.1*	< 0,0058	< 0,0058	< 0,0058	< 0,0058	< 0,0058	< 0,0058	< 0,0058	< 0,0058	< 0,0058	< 0,0058	< 0,0058	< 0,0058
Mercury		mg/L	*0.004*	< 0,0001	< 0,0001	< 0,0001	< 0,0001	< 0,0001	< 0,0001	< 0,0001	< 0,0001	< 0,0001	< 0,0001	< 0,0001	< 0,0001
Arsenic		mg/L	*0.1*	< 0,0047	< 0,0047	< 0,0047	< 0,0047	< 0,0047	< 0,0047	< 0,0047	< 0,0047	< 0,0047	< 0,0047	< 0,0047	< 0,0047
Ammonia		mg/L	*0.02*	0.00011	0.00080	0.00115	0.00153	0.00087	0.00155	0.00081	0.00179	0.00045	0.00043	0.00076	0.00133

ND: Not Detected

Table 6.325: Evaluation of Analysis Results According to the Quality Criteria Required for Swimming and Recreation Waters (Annex 1 of Swimming Water Quality Regulation)

Parameter		Unit	Limit Value				Station code											
			G		C		ENV-01N	ENV-NEW-03N	ENV-NEW-11N	ENV-12N/ENV-07	ENV NEW 15N/ENV-10	ENV-16N ENV-11	ENV-09N	ENV-08 N ENV-04	ENV 13N	ENV-NEW-04N	ENV-05N	ENV-NEW-07N
Microbiological																		
Total Coliform		cfu/100ml	100	500 (2015)	10000	(1)	0	0	1	21	4	2	0	0	0	0	0	0
Fecal Coliform		cfu/100ml	200	100 (2015)	2000	(1)	0	0	0	4	2	0	0	0	0	0	0	0
Fecal Streptococci		cfu/100ml	100		1000	(1)	0	2	0	6	2	2	1	0	1	1	0	0
Salmonella		cfu/1 L	-		0	(2)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Enteroviruses		PFU/10L	-		0	(2)												
Physio-Chemical																		
pH			-		6-9 (0)	(2)	8.36	8.36	8.35									
Color		Pt/Co	-		There should be no unusual change in color (0)	(2)	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Mineral oils		mg/L	-		There should be no visible film layer and odor on the water surface	(2)	0.03	0.06	0.113	0.09	0.08	0.08	0.05	0.03	0.06	0.06	0.03	0.03
Surfactants reacting with methylene blue		mg/L	≤ 0,3		-	(2)	< 0,09	< 0,09	< 0,09	< 0,09	< 0,09	< 0,09	< 0,09	< 0,09	< 0,09	< 0,09	< 0,09	< 0,09
Total phenols		mg/L	≤ 0,005		≤ 0,005	(2)	< 0,001	< 0,001	< 0,001	< 0,001	< 0,001	< 0,001	< 0,001	< 0,001	< 0,001	< 0,001	< 0,001	< 0,001
Light permeability		m	2		1(0)	(1)	3.5	4.5	3.5	3	3.5	4	4.5	4.5	7	7.5	6	6.5
Dissolved oxygen Oxygen saturation percentage		%	80-120		-	(2)	94.94	95.71	93.59	93.46	93.72	92.92	93.89	94.93	93.39	95.85	94.49	94.81
Tar residues and wood, plastic materials, bottles, glass containers, plastic, rubber and other floating materials			Should not be detected			(1)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ammonium		mg/L NH_4				(3)	0.00011	0.0008	0.00115	0.00153	0.00087	0.00155	0.00081	0.00179	0.00045	0.00043	0.00076	0.00133
Kjeldahl Nitrogen		mg/L N				(3)	0.23	0.44	0.85	0.11	0.16	0.12	0.87	0.10	0.18	0.13	0.39	0.70
Other pollutants																		
Pesticides	Paratilon	mg/L				(2)	< 0,0000012	< 0,0000012	< 0,0000012	< 0,0000012	< 0,0000012	< 0,0000012	< 0,0000012	< 0,0000012	< 0,0000012	< 0,0000012	< 0,0000012	< 0,0000012
	HCH						0.000002	< 0,0000012	0.000005	< 0,0000012	0.00005	0.00007	0.00004	0.000005	0.000002	< 0,0000012	0.000005	0.000004
	Dieldrin						0.000014	< 0,0000018	0.000004	0.000003	0.00007	0.00002	0.000015	< 0,0000018	< 0,0000018	0.000012	0.000008	0.00001
Heavy metals	Arsenic	mg/L				(2)	< 0,0047	< 0,0047	< 0,0047	< 0,0047	< 0,0047	< 0,0047	< 0,0047	< 0,0047	< 0,0047	< 0,0047	< 0,0047	< 0,0047
	Cadmium						< 0,0029	< 0,0029	< 0,0029	< 0,0029	< 0,0029	< 0,0029	< 0,0029	< 0,0029	< 0,0029	< 0,0029	< 0,0029	< 0,0029
	Lead						< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048	< 0,0048

Parameter		Unit	Limit Value			Station code											
			G	C		ENV-01N	ENV-NEW-03N	ENV-NEW-11N	ENV-12N/ENV-07	ENV NEW 15N/ENV-10	ENV-16N ENV-11	ENV-09N	ENV-08 N ENV-04	ENV 13N	ENV-NEW-04N	ENV-05N	ENV-NEW-07N
	Chrome VI					< 0,002	< 0,002	< 0,002	< 0,002	< 0,002	< 0,002	< 0,002	< 0,002	< 0,002	< 0,002	< 0,002	< 0,002
	Mercury					< 0,0001	< 0,0001	< 0,0001	< 0,0001	< 0,0001	< 0,0001	< 0,0001	< 0,0001	< 0,0001	< 0,0001	< 0,0001	< 0,0001
Total Cyanide		mg / L CN			(2)	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01
Nitrate		mg/L NO_3			(2)	0.0939	0.09338	0.09076	0.08841	0.09177	0.08777	0.08709	0.08875	0.09370	0.05835	0.08956	0.09026
Phosphate		mg/L PO_4			(2)	0.00778	0.00698	0.01060	0.01020	0.00958	0.01132	0.00998	0.01163	0.00859	0.0053	0.01051	0.01088

ND: Not Detected

G: Guide

C: Compulsory

(0): Limit values can be exceeded when there are extraordinary geographical and/or meteorological conditions.

(1): Competent authorities can reduce the frequency of sampling by 2 times (for example once every four weeks instead of once every two weeks) when the samples taken in previous years give much better results than this table, and no new factor is likely to decrease water quality.

(2): In the event that the survey made on the swimming area shows that this material is present, or the quality of the water is degenerating, the concentration is checked by the competent authorities and as a result of the control, if the standard values stated in the Water Pollution Control Regulation, Table 4: "General Quality Criteria of Sea Water Quality" are exceeded, The Ministry will take necessary measures or ensure that these measures are taken.

(3): When a tendency towards water eutrophication is seen, these parameters should be controlled by the competent authorities.

According to the analysis results in the tables given above, the parameters of crude oil and its derivatives in seawater are above the limits specified in the regulations. The high concentration of crude oil and its derivatives is thought to be due to the fishing activities carried out in the region. Measures which will be taken in order to prevent extra pollution are given in **Chapter 10** (Assessment of Activities within the Scope of the Project) in detail.

Table 6.336: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of Intra-continental Surface Waters according to the Quality Criteria by Classes (Surface Water Quality Regulation Annex-5 Table-2)

Parameter	Unit	Water Quality Classes				STATION CODE
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 01N
Color 436 nm	m^{-1}	≤ 1,5	3	4.3	> 4,3	< 0,1
Color 525 nm	m^{-1}	≤ 1,2	2.4	3.7	> 3,7	< 0,1
Color 620 nm	m^{-1}	≤ 0,8	1.7	2.5	> 2,5	< 0,1
pH	-	6-9	6-9	6-9	6-9	8.36
Conductivity	µS/cm	< 400	1000	3000	> 3000	**17240**
Oil and Grease*	mg/L	<0.2	0.3	0.5	> 0,5	< 0,05
Dissolved oxygen (Oxygen Saturation Rate)	mg/L	> 8	6	3	< 3	11.87
Chemical Oxygen Demand (COD)	mg/L	< 25	50	70	> 70	< 5,4
Biological Oxygen Need (BON)	mg/L	< 4	8	20	> 20	2.65
Ammonium Nitrogen (NH_4-N)	mg NH_4^+-N/L	< 0,2	1	2	> 2	0.00011
Nitrate Nitrogen	mg NO_3^--N/L	< 3	10	20	> 20	0.0939
Total Kjeldahl Nitrogen (TKN)	mg N/L	< 0,5	1.5	5	> 5	0.23
Total Nitrogen	mg N/L	< 3,5	11.5	25	> 25	0.33
Orthophosphate as phosphorus (o-PO_4)	mg o-PO_4-P/L	< 0,05	0.16	0.65	> 0,65	0.00778
Total Phosphorus	mg P/L	< 0,08	0.2	0.8	> 0,8	0.01652
Fluoride (F)	µg/L	≤ 1000	1500	2000	> 2000	480
Manganese (Mn)	µg/L	≤ 100	500	3000	> 3000	< 5
Selenium (Se)	µg/L	≤ 10	15	20	> 20	< 5
Sulfur	µg/L	≤ 2	5	10	> 10	< 2

* Oil and grease analyzes were conducted in the Duzen Norwest Laboratories, but no regulatory limit values were provided, thus analyzes were repeated in ALS Laboratories. The analysis results made in the ALS Laboratory are given in the table.

Table 6.347: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of Intra-continental Surface Waters according to the Quality Criteria by Classes (Surface Water Quality Regulation Annex-5 Table-2)

Parameter	Unit	Water Quality Classes				STATION CODE
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV NEW 03N
Color 436 nm	m^{-1}	≤ 1,5	3	4.3	> 4,3	< 0,1
Color 525 nm	m^{-1}	≤ 1,2	2.4	3.7	> 3,7	< 0,1
Color 620 nm	m^{-1}	≤ 0,8	1.7	2.5	> 2,5	< 0,1
pH	-	6-9	6-9	6-9	6-9	8.36
Conductivity	µS/cm	< 400	1000	3000	> 3000	**17240**
Oil and Grease	mg/L	<0.2	0.3	0.5	> 0,5	< 0,05
Dissolved oxygen (Oxygen Saturation Rate)	mg/L	> 8	6	3	< 3	11.96
Chemical Oxygen Demand (COD)	mg/L	< 25	50	70	> 70	< 5,4
Biological Oxygen Need (BON)	mg/L	< 4	8	20	> 20	2.74
Ammonium Nitrogen (NH_4-N)	mg NH_4^+-N/L	< 0,2	1	2	> 2	0.00080
Nitrate Nitrogen	mg NO_3^--N/L	< 3	10	20	> 20	0.09338
Total Kjeldahl Nitrogen (TKN)	mg N/L	< 0,5	1.5	5	> 5	0.44
Total Nitrogen	mg N/L	< 3,5	11.5	25	> 25	0.54
Orthophosphate as phosphorus (o-PO_4)	mg o-PO_4-P/L	< 0,05	0.16	0.65	> 0,65	0.00698
Total Phosphorus	mg P/L	< 0,08	0.2	0.8	> 0,8	0.02027
Fluoride (F)	µg/L	≤ 1000	1500	2000	> 2000	54
Manganese (Mn)	µg/L	≤ 100	500	3000	> 3000	< 5
Selenium (Se)	µg/L	≤ 10	15	20	> 20	< 5
Sulfur	µg/L	≤ 2	5	10	> 10	< 2

Table 6.358: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of Intra-continental Surface Waters according to the Quality Criteria by Classes (Surface Water Quality Regulation Annex-5 Table-2)

Parameter	Unit	Water Quality Classes				STATION CODE
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 04 NEW
Color 436 nm	m^{-1}	≤ 1,5	3	4.3	> 4,3	< 0,1
Color 525 nm	m^{-1}	≤ 1,2	2.4	3.7	> 3,7	< 0,1
Color 620 nm	m^{-1}	≤ 0,8	1.7	2.5	> 2,5	< 0,1
pH	-	6-9	6-9	6-9	6-9	8.36
Conductivity	µS/cm	< 400	1000	3000	> 3000	**17270**

Parameter	Unit	Water Quality Classes				STATION CODE
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 04 NEW
Oil and Grease*	mg/L	<0.2	0.3	0.5	> 0,5	< 0,05
Dissolved oxygen (Oxygen Saturation Rate)	mg/L	> 8	6	3	< 3	11.98
Chemical Oxygen Demand (COD)	mg/L	< 25	50	70	> 70	< 5,4
Biological Oxygen Need (BON)	mg/L	< 4	8	20	> 20	1.87
Ammonium Nitrogen (NH_4-N)	mg NH_4^+-N/L	< 0,2	1	2	> 2	0.00043
Nitrate Nitrogen	mg NO_3^--N/L	< 3	10	20	> 20	0.05835
Total Kjeldahl Nitrogen (TKN)	mg N/L	< 0,5	1.5	5	> 5	0.13
Total Nitrogen	mg N/L	< 3,5	11.5	25	> 25	0.19
Orthophosphate as phosphorus (o-PO_4)	mg o-PO_4-P/L	< 0,05	0.16	0.65	> 0,65	0.0053
Total Phosphorus	mg P/L	< 0,08	0.2	0.8	> 0,8	0.00818
Fluoride (F)	µg/L	≤ 1000	1500	2000	> 2000	530
Manganese (Mn)	µg/L	≤ 100	500	3000	> 3000	< 5
Selenium (Se)	µg/L	≤ 10	15	20	> 20	< 5
Sulfur	µg/L	≤ 2	5	10	> 10	< 2

Table 6.369: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of Intra-continental Surface Waters according to the Quality Criteria by Classes (Surface Water Quality Regulation Annex-5 Table-2)

Parameter	Unit	Water Quality Classes				STATION CODE
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 05N
Color 436 nm	m^{-1}	≤ 1,5	3	4.3	> 4,3	< 0,1
Color 525 nm	m^{-1}	≤ 1,2	2.4	3.7	> 3,7	< 0,1
Color 620 nm	m^{-1}	≤ 0,8	1.7	2.5	> 2,5	< 0,1
pH	-	6-9	6-9	6-9	6-9	8.36
Conductivity	µS/cm	< 400	1000	3000	> 3000	**17310**
Oil and Grease*	mg/L	<0.2	0.3	0.5	> 0,5	< 0,05
Dissolved oxygen (Oxygen Saturation Rate)	mg/L	> 8	6	3	< 3	11.81
Chemical Oxygen Demand (COD)	mg/L	< 25	50	70	> 70	< 5,4
Biological Oxygen Need (BON)	mg/L	< 4	8	20	> 20	2.08

Parameter	Unit	Water Quality Classes				STATION CODE
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 05N
Ammonium Nitrogen (NH_4-N)	mg NH_4^+-N/L	< 0,2	1	2	> 2	0.00076
Nitrate Nitrogen	mg NO_3^--N/L	< 3	10	20	> 20	0.08956
Total Kjeldahl Nitrogen (TKN)	mg N/L	< 0,5	1.5	5	> 5	0.39
Total Nitrogen	mg N/L	< 3,5	11.5	25	> 25	0.48
Orthophosphate as phosphorus (o-PO_4)	mg o-PO_4-P/L	< 0,05	0.16	0.65	> 0,65	0.01051
Total Phosphorus	mg P/L	< 0,08	0.2	0.8	> 0,8	0.01758
Fluoride (F)	µg/L	≤ 1000	1500	2000	> 2000	520
Manganese (Mn)	µg/L	≤ 100	500	3000	> 3000	< 5
Selenium (Se)	µg/L	≤ 10	15	20	> 20	< 5
Sulfur	µg/L	≤ 2	5	10	> 10	< 2

Table 6.40: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of Intra-continental Surface Waters according to the Quality Criteria by Classes (Surface Water Quality Regulation Annex-5 Table-2)

Parameter	Unit	Water Quality Classes				STATION CODE
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV NEW 07N
Color 436 nm	m^{-1}	≤ 1,5	3	4.3	> 4,3	< 0,1
Color 525 nm	m^{-1}	≤ 1,2	2.4	3.7	> 3,7	< 0,1
Color 620 nm	m^{-1}	≤ 0,8	1.7	2.5	> 2,5	< 0,1
pH	-	6-9	6-9	6-9	6-9	8.36
Conductivity	µS/cm	< 400	1000	3000	> 3000	**17150**
Oil and Grease*	mg/L	<0.2	0.3	0.5	> 0,5	< 0,05
Dissolved oxygen (Oxygen Saturation Rate)	mg/L	> 8	6	3	< 3	11.85
Chemical Oxygen Demand (COD)	mg/L	< 25	50	70	> 70	< 5,4
Biological Oxygen Need (BON)	mg/L	< 4	8	20	> 20	2.92
Ammonium Nitrogen (NH_4-N)	mg NH_4^+-N/L	< 0,2	1	2	> 2	0.00133
Nitrate Nitrogen	mg NO_3^--N/L	< 3	10	20	> 20	0.09026
Total Kjeldahl Nitrogen (TKN)	mg N/L	< 0,5	1.5	5	> 5	**0.7**
Total Nitrogen	mg N/L	< 3,5	11.5	25	> 25	0.8

Parameter	Unit	Water Quality Classes				STATION CODE
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV NEW 07N
Orthophosphate as phosphorus (o-PO_4)	mg o-PO_4-P/L	< 0,05	0.16	0.65	> 0,65	0.01088
Total Phosphorus	mg P/L	< 0,08	0.2	0.8	> 0,8	0.01838
Fluoride (F)	µg/L	≤ 1000	1500	2000	> 2000	590
Manganese (Mn)	µg/L	≤ 100	500	3000	> 3000	< 5
Selenium (Se)	µg/L	≤ 10	15	20	> 20	< 5
Sulfur	µg/L	≤ 2	5	10	> 10	< 2

Table 6.371: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of Intra-continental Surface Waters according to the Quality Criteria by Classes (Surface Water Quality Regulation Annex-5 Table-2)

Parameter	Unit	Water Quality Classes				STATION CODE
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 08N/ENV 04
Color 436 nm	m^{-1}	≤ 1,5	3	4.3	> 4,3	< 0,1
Color 525 nm	m^{-1}	≤ 1,2	2.4	3.7	> 3,7	< 0,1
Color 620 nm	m^{-1}	≤ 0,8	1.7	2.5	> 2,5	< 0,1
pH	-	6-9	6-9	6-9	6-9	8.37
Conductivity	µS/cm	< 400	1000	3000	> 3000	**16970**
Oil and Grease*	mg/L	<0.2	0.3	0.5	> 0,5	< 0,05
Dissolved oxygen (Oxygen Saturation Rate)	mg/L	> 8	6	3	< 3	11.87
Chemical Oxygen Demand (COD)	mg/L	< 25	50	70	> 70	< 5,4
Biological Oxygen Need (BON)	mg/L	< 4	8	20	> 20	2.48
Ammonium Nitrogen (NH_4-N)	mg NH_4^+-N/L	< 0,2	1	2	> 2	0.00179
Nitrate Nitrogen	mg NO_3^--N/L	< 3	10	20	> 20	0.08875
Total Kjeldahl Nitrogen (TKN)	mg N/L	< 0,5	1.5	5	> 5	0.1
Total Nitrogen	mg N/L	< 3,5	11.5	25	> 25	0.19
Orthophosphate as phosphorus (o-PO_4)	mg o-PO_4-P/L	< 0,05	0.16	0.65	> 0,65	0.01163
Total Phosphorus	mg P/L	< 0,08	0.2	0.8	> 0,8	0.01975
Fluoride (F)	µg/L	≤ 1000	1500	2000	> 2000	520
Manganese (Mn)	µg/L	≤ 100	500	3000	> 3000	< 5
Selenium (Se)	µg/L	≤ 10	15	20	> 20	< 5
Sulfur	µg/L	≤ 2	5	10	> 10	< 2

Table 6.382.: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of Intra-continental Surface Waters according to the Quality Criteria by Classes (Surface Water Quality Regulation Annex-5 Table-2)

Parameter	Unit	Water Quality Classes				STATION CODE
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 9N
Color 436 nm	m^{-1}	≤ 1,5	3	4.3	> 4,3	< 0,1
Color 525 nm	m^{-1}	≤ 1,2	2.4	3.7	> 3,7	< 0,1
Color 620 nm	m^{-1}	≤ 0,8	1.7	2.5	> 2,5	< 0,1
pH	-	6-9	6-9	6-9	6-9	8.35
Conductivity	µS/cm	< 400	1000	3000	> 3000	**17070**
Oil and Grease*	mg/L	<0.2	0.3	0.5	> 0,5	< 0,05
Dissolved oxygen (Oxygen Saturation Rate)	mg/L	> 8	6	3	< 3	11.74
Chemical Oxygen Demand (COD)	mg/L	< 25	50	70	> 70	< 5,4
Biological Oxygen Need (BON)	mg/L	< 4	8	20	> 20	2.81
Ammonium Nitrogen (NH_4-N)	mg NH_4^+-N/L	< 0,2	1	2	> 2	0.00081
Nitrate Nitrogen	mg NO_3^--N/L	< 3	10	20	> 20	0.08709
Total Kjeldahl Nitrogen (TKN)	mg N/L	< 0,5	1.5	5	> 5	**0.87**
Total Nitrogen	mg N/L	< 3,5	11.5	25	> 25	0.97
Orthophosphate as phosphorus (o-PO_4)	mg o-PO_4-P/L	< 0,05	0.16	0.65	> 0,65	0.00998
Total Phosphorus	mg P/L	< 0,08	0.2	0.8	> 0,8	0.01646
Fluoride (F)	µg/L	≤ 1000	1500	2000	> 2000	530
Manganese (Mn)	µg/L	≤ 100	500	3000	> 3000	< 5
Selenium (Se)	µg/L	≤ 10	15	20	> 20	< 5
Sulfur	µg/L	≤ 2	5	10	> 10	< 2

Table 6.393.: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of Intra-continental Surface Waters according to the Quality Criteria by Classes (Surface Water Quality Regulation Annex-5 Table-2)

Parameter	Unit	Water Quality Classes				STATION CODE
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV-NEW 11N
Color 436 nm	m^{-1}	≤ 1,5	3	4.3	> 4,3	< 0,1
Color 525 nm	m^{-1}	≤ 1,2	2.4	3.7	> 3,7	< 0,1
Color 620 nm	m^{-1}	≤ 0,8	1.7	2.5	> 2,5	< 0,1
pH	-	6-9	6-9	6-9	6-9	8.36
Conductivity	µS/cm	< 400	1000	3000	> 3000	**17220**

Parameter	Unit	Water Quality Classes				STATION CODE
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV-NEW 11N
Oil and Grease*	mg/L	<0.2	0.3	0.5	> 0,5	< 0,05
Dissolved oxygen (Oxygen Saturation Rate)	mg/L	> 8	6	3	< 3	11.70
Chemical Oxygen Demand (COD)	mg/L	< 25	50	70	> 70	< 5,4
Biological Oxygen Need (BON)	mg/L	< 4	8	20	> 20	2.50
Ammonium Nitrogen (NH_4-N)	mg NH_4^+-N/L	< 0,2	1	2	> 2	0.00115
Nitrate Nitrogen	mg NO_3^--N/L	< 3	10	20	> 20	0.09076
Total Kjeldahl Nitrogen (TKN)	mg N/L	< 0,5	1.5	5	> 5	**0.85**
Total Nitrogen	mg N/L	< 3,5	11.5	25	> 25	0.95
Orthophosphate as phosphorus (o-PO_4)	mg o-PO_4-P/L	< 0,05	0.16	0.65	> 0,65	0.0106
Total Phosphorus	mg P/L	< 0,08	0.2	0.8	> 0,8	0.01786
Fluoride (F)	µg/L	≤ 1000	1500	2000	> 2000	460
Manganese (Mn)	µg/L	≤ 100	500	3000	> 3000	< 5
Selenium (Se)	µg/L	≤ 10	15	20	> 20	< 5
Sulfur	µg/L	≤ 2	5	10	> 10	< 2

Table 6.404.: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of Intra-continental Surface Waters according to the Quality Criteria by Classes (Surface Water Quality Regulation Annex-5 Table-2)

Parameter	Unit	Water Quality Classes				STATION CODE
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV-12N/ENV-07
Color 436 nm	m^{-1}	≤ 1,5	3	4.3	> 4,3	< 0,1
Color 525 nm	m^{-1}	≤ 1,2	2.4	3.7	> 3,7	< 0,1
Color 620 nm	m^{-1}	≤ 0,8	1.7	2.5	> 2,5	< 0,1
pH	-	6-9	6-9	6-9	6-9	8.33
Conductivity	µS/cm	< 400	1000	3000	> 3000	**17140**
Oil and Grease*	mg/L	<0.2	0.3	0.5	> 0,5	< 0,05
Dissolved oxygen (Oxygen Saturation Rate)	mg/L	> 8	6	3	< 3	11.68
Chemical Oxygen Demand (COD)	mg/L	< 25	50	70	> 70	< 5,4
Biological Oxygen Need (BON)	mg/L	< 4	8	20	> 20	2.31

Parameter	Unit	Water Quality Classes				STATION CODE
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV-12N/ENV-07
Ammonium Nitrogen (NH_4-N)	mg NH_4^+-N/L	< 0,2	1	2	> 2	0.00153
Nitrate Nitrogen	mg NO_3^--N/L	< 3	10	20	> 20	0.08841
Total Kjeldahl Nitrogen (TKN)	mg N/L	< 0,5	1.5	5	> 5	0.11
Total Nitrogen	mg N/L	< 3,5	11.5	25	> 25	0.20
Orthophosphate as phosphorus (o-PO_4)	mg o-PO_4-P/L	< 0,05	0.16	0.65	> 0,65	0.0102
Total Phosphorus	mg P/L	< 0,08	0.2	0.8	> 0,8	0.01863
Fluoride (F)	µg/L	≤ 1000	1500	2000	> 2000	540
Manganese (Mn)	µg/L	≤ 100	500	3000	> 3000	< 5
Selenium (Se)	µg/L	≤ 10	15	20	> 20	< 5
Sulfur	µg/L	≤ 2	5	10	> 10	< 2

Table 6.415.: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of Intra-continental Surface Waters according to the Quality Criteria by Classes (Surface Water Quality Regulation Annex-5 Table-2)

Parameter	Unit	Water Quality Classes				STATION CODE
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 13N
Color 436 nm	m^{-1}	≤ 1,5	3	4.3	> 4,3	< 0,1
Color 525 nm	m^{-1}	≤ 1,2	2.4	3.7	> 3,7	< 0,1
Color 620 nm	m^{-1}	≤ 0,8	1.7	2.5	> 2,5	< 0,1
pH	-	6-9	6-9	6-9	6-9	8.34
Conductivity	µS/cm	< 400	1000	3000	> 3000	**17240**
Oil and Grease*	mg/L	<0.2	0.3	0.5	> 0,5	< 0,05
Dissolved oxygen (Oxygen Saturation Rate)	mg/L	> 8	6	3	< 3	11.67
Chemical Oxygen Demand (COD)	mg/L	< 25	50	70	> 70	< 5,4
Biological Oxygen Need (BON)	mg/L	< 4	8	20	> 20	2.03
Ammonium Nitrogen (NH_4-N)	mg NH_4^+-N/L	< 0,2	1	2	> 2	0.00045
Nitrate Nitrogen	mg NO_3^--N/L	< 3	10	20	> 20	0.0937
Total Kjeldahl Nitrogen (TKN)	mg N/L	< 0,5	1.5	5	> 5	0.18
Total Nitrogen	mg N/L	< 3,5	11.5	25	> 25	0.28

Parameter	Unit	Water Quality Classes				STATION CODE
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 13N
Orthophosphate as phosphorus (o-PO_4)	mg o-PO_4-P/L	< 0,05	0.16	0.65	> 0,65	0.00859
Total Phosphorus	mg P/L	< 0,08	0.2	0.8	> 0,8	0.01482
Fluoride (F)	µg/L	≤ 1000	1500	2000	> 2000	510
Manganese (Mn)	µg/L	≤ 100	500	3000	> 3000	< 5
Selenium (Se)	µg/L	≤ 10	15	20	> 20	< 5
Sulfur	µg/L	≤ 2	5	10	> 10	< 2

Table 6.426.: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of Intra-continental Surface Waters according to the Quality Criteria by Classes (Surface Water Quality Regulation Annex-5 Table-2)

Parameter	Unit	Water Quality Classes				STATION CODE
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV-NEW-15N/ENV-10
Color 436 nm	m^{-1}	≤ 1,5	3	4.3	> 4,3	< 0,1
Color 525 nm	m^{-1}	≤ 1,2	2.4	3.7	> 3,7	< 0,1
Color 620 nm	m^{-1}	≤ 0,8	1.7	2.5	> 2,5	< 0,1
pH	-	6-9	6-9	6-9	6-9	8.35
Conductivity	µS/cm	< 400	1000	3000	> 3000	**17150**
Oil and Grease*	mg/L	<0.2	0.3	0.5	> 0,5	< 0,05
Dissolved oxygen (Oxygen Saturation Rate)	mg/L	> 8	6	3	< 3	11.72
Chemical Oxygen Demand (COD)	mg/L	< 25	50	70	> 70	< 5,4
Biological Oxygen Need (BON)	mg/L	< 4	8	20	> 20	3.03
Ammonium Nitrogen (NH_4-N)	mg NH_4^+-N/L	< 0,2	1	2	> 2	0.00087
Nitrate Nitrogen	mg NO_3^--N/L	< 3	10	20	> 20	0.09177
Total Kjeldahl Nitrogen (TKN)	mg N/L	< 0,5	1.5	5	> 5	0.16
Total Nitrogen	mg N/L	< 3,5	11.5	25	> 25	0.26
Orthophosphate as phosphorus (o-PO_4)	mg o-PO_4-P/L	< 0,05	0.16	0.65	> 0,65	0.00958
Total Phosphorus	mg P/L	< 0,08	0.2	0.8	> 0,8	0.01714
Fluoride (F)	µg/L	≤ 1000	1500	2000	> 2000	500
Manganese (Mn)	µg/L	≤ 100	500	3000	> 3000	< 5
Selenium (Se)	µg/L	≤ 10	15	20	> 20	< 5
Sulfur	µg/L	≤ 2	5	10	> 10	< 2

Table 6.437: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of Intra-continental Surface Waters according to the Quality Criteria by Classes (Surface Water Quality Regulation Annex-5 Table-2)

Parameter	Unit	Water Quality Classes				STATION CODE
		I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 16N/ENV11
Color 436 nm	m^{-1}	≤ 1,5	3	4.3	> 4,3	< 0,1
Color 525 nm	m^{-1}	≤ 1,2	2.4	3.7	> 3,7	< 0,1
Color 620 nm	m^{-1}	≤ 0,8	1.7	2.5	> 2,5	< 0,1
pH	-	6-9	6-9	6-9	6-9	8.36
Conductivity	µS/cm	< 400	1000	3000	> 3000	**17120**
Oil and Grease*	mg/L	<0.2	0.3	0.5	> 0,5	< 0,05
Dissolved oxygen (Oxygen Saturation Rate)	mg/L	> 8	6	3	< 3	11.62
Chemical Oxygen Demand (COD)	mg/L	< 25	50	70	> 70	< 5,4
Biological Oxygen Need (BON)	mg/L	< 4	8	20	> 20	2.45
Ammonium Nitrogen (NH_4-N)	mg NH_4^+-N/L	< 0,2	1	2	> 2	0.00155
Nitrate Nitrogen	mg NO_3^--N/L	< 3	10	20	> 20	0.08777
Total Kjeldahl Nitrogen (TKN)	mg N/L	< 0,5	1.5	5	> 5	0.12
Total Nitrogen	mg N/L	< 3,5	11.5	25	> 25	0.22
Orthophosphate as phosphorus (o-PO_4)	mg o-PO_4-P/L	< 0,05	0.16	0.65	> 0,65	0.01132
Total Phosphorus	mg P/L	< 0,08	0.2	0.8	> 0,8	0.01916
Fluoride (F)	µg/L	≤ 1000	1500	2000	> 2000	540
Manganese (Mn)	µg/L	≤ 100	500	3000	> 3000	< 5
Selenium (Se)	µg/L	≤ 10	15	20	> 20	< 5
Sulfur	µg/L	≤ 2	5	10	> 10	< 2

Table 6.448: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of the Coastal Waters according to the Receiver Ambient Quality Criteria (Surface Water Quality Regulation Annex-5 Table-3)

	Parameter	Unit	Water Quality Classes				STATION CODE
			I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 01N
Black Sea.	Dissolved oxygen	mg P/L	≥ 6	5	4	< 4	11.87
	TP	µg/L	< 8	8-12	12-16	> 16	**16.52**
	NOx	µg/L	< 14	14-20	21-34	> 34	**101.5**
	Oil-Grease	mg/L	< 0,2	0.3	0.5	> 0,5	< 0,05

	Parameter	Unit	Water Quality Classes				STATION CODE
			I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 01N
	Floating Material		Floating liquids, waste and similar solid materials and foam cannot be found.				ND

ND: Not Detected

Table 6.459: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of the Coastal Waters according to the Receiver Ambient Quality Criteria (Surface Water Quality Regulation Annex-5 Table-3)

	Parameter	Unit	Water Quality Classes				STATION CODE
			I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV NEW 03N
Black Sea.	Dissolved oxygen	mg P/L	≥ 6	5	4	< 4	11.96
	TP	µg/L	< 8	8-12	12-16	> 16	**20.27**
	NOx	µg/L	< 14	14-20	21-34	> 34	**99.9**
	Oil-Grease	mg/L	< 0,2	0.3	0.5	> 0,5	< 0,05
	Floating Material		Floating liquids, waste and similar solid materials and foam cannot be found.				ND

ND: Not Detected

Table 6.50: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of the Coastal Waters according to the Receiver Ambient Quality Criteria (Surface Water Quality Regulation Annex-5 Table-3)

	Parameter	Unit	Water Quality Classes				STATION CODE
			I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 04 NEW
Black Sea.	Dissolved oxygen	mg P/L	≥ 6	5	4	< 4	11.98
	TP	µg/L	< 8	8-12	12-16	> 16	**8.18**
	NOx	µg/L	< 14	14-20	21-34	> 34	**61.9**
	Oil-Grease	mg/L	< 0,2	0.3	0.5	> 0,5	< 0,05
	Floating Material		Floating liquids, waste and similar solid materials and foam cannot be found.				ND

ND: Not Detected

Table 6.461: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of the Coastal Waters according to the Receiver Ambient Quality Criteria (Surface Water Quality Regulation Annex-5 Table-3)

	Parameter	Unit	Water Quality Classes				STATION CODE
			I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 05N
Black Sea.	Dissolved oxygen	mg P/L	≥ 6	5	4	< 4	11.81
	TP	µg/L	< 8	8-12	12-16	> 16	**17.58**
	NOx	µg/L	< 14	14-20	21-34	> 34	**96.9**

	Parameter	Unit	Water Quality Classes				STATION CODE
			I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 05N
	Oil-Grease	mg/L	< 0,2	0.3	0.5	> 0,5	< 0,05
	Floating Material		Floating liquids, waste and similar solid materials and foam cannot be found.				ND

ND: Not Detected

Table 6.472: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of the Coastal Waters according to the Receiver Ambient Quality Criteria (Surface Water Quality Regulation Annex-5 Table-3)

	Parameter	Unit	Water Quality Classes				STATION CODE
			I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV NEW 07N
Black Sea.	Dissolved oxygen	mg P/L	≥ 6	5	4	< 4	11.85
	TP	µg/L	< 8	8-12	12-16	> 16	**18.38**
	NOx	µg/L	< 14	14-20	21-34	> 34	**97.7**
	Oil-Grease	mg/L	< 0,2	0.3	0.5	> 0,5	< 0,05
	Floating Material		Floating liquids, waste and similar solid materials and foam cannot be found.				ND

ND: Not Detected

Table 6.483: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of the Coastal Waters according to the Receiver Ambient Quality Criteria (Surface Water Quality Regulation Annex-5 Table-3)

	Parameter	Unit	Water Quality Classes				STATION CODE
			I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 08N/ENV 04
Black Sea.	Dissolved oxygen	mg P/L	≥ 6	5	4	< 4	11.87
	TP	µg/L	< 8	8-12	12-16	> 16	**19.75**
	NOx	µg/L	< 14	14-20	21-34	> 34	**92.8**
	Oil-Grease	mg/L	< 0,2	0.3	0.5	> 0,5	< 0,05
	Floating Material		Floating liquids, waste and similar solid materials and foam cannot be found.				ND

ND: Not Detected

Table 6.494: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of the Coastal Waters according to the Receiver Ambient Quality Criteria (Surface Water Quality Regulation Annex-5 Table-3)

	Parameter	Unit	Water Quality Classes				STATION CODE
			I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV-09N
Black Sea.	Dissolved oxygen	mg P/L	≥ 6	5	4	< 4	11.74
	TP	µg/L	< 8	8-12	12-16	> 16	**16.46**

	Parameter	Unit	Water Quality Classes				STATION CODE
			I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV-09N
	NOx	µg/L	< 14	14-20	21-34	> 34	**94.1**
	Oil-Grease	mg/L	< 0,2	0.3	0.5	> 0,5	< 0,05
	Floating Material		Floating liquids, waste and similar solid materials and foam cannot be found.				ND

ND: Not Detected

Table 6.505: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of the Coastal Waters according to the Receiver Ambient Quality Criteria (Surface Water Quality Regulation Annex-5 Table-3)

	Parameter	Unit	Water Quality Classes				STATION CODE
			I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV-NEW 11N
Black Sea.	Dissolved oxygen	mg P/L	≥ 6	5	4	< 4	11.70
	TP	µg/L	< 8	8-12	12-16	> 16	**17.86**
	NOx	µg/L	< 14	14-20	21-34	> 34	**94.7**
	Oil-Grease	mg/L	< 0,2	0.3	0.5	> 0,5	< 0,05
	Floating Material		Floating liquids, waste and similar solid materials and foam cannot be found.				ND

ND: Not Detected

Table 6.516: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of the Coastal Waters according to the Receiver Ambient Quality Criteria (Surface Water Quality Regulation Annex-5 Table-3)

	Parameter	Unit	Water Quality Classes				STATION CODE
			I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV-12N/ENV-07
Black Sea.	Dissolved oxygen	mg P/L	≥ 6	5	4	< 4	11.68
	TP	µg/L	< 8	8-12	12-16	> 16	**18.63**
	NOx	µg/L	< 14	14-20	21-34	> 34	**92.7**
	Oil-Grease	mg/L	< 0,2	0.3	0.5	> 0,5	< 0,05
	Floating Material		Floating liquids, waste and similar solid materials and foam cannot be found.				ND

ND: Not Detected

Table 6.527: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of the Coastal Waters according to the Receiver Ambient Quality Criteria (Surface Water Quality Regulation Annex-5 Table-3)

	Parameter	Unit	Water Quality Classes				STATION CODE
			I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 013N
Black Sea.	Dissolved oxygen	mg P/L	≥ 6	5	4	< 4	11.67
	TP	µg/L	< 8	8-12	12-16	> 16	**14.82**
	NOx	µg/L	< 14	14-20	21-34	> 34	**101.2**
	Oil-Grease	mg/L	< 0,2	0.3	0.5	> 0,5	< 0,05
	Floating Material		Floating liquids, waste and similar solid materials and foam cannot be found.				ND

ND: Not Detected

Table 6.538: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of the Coastal Waters according to the Receiver Ambient Quality Criteria (Surface Water Quality Regulation Annex-5 Table-3)

	Parameter	Unit	Water Quality Classes				STATION CODE
			I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV-NEW-15N/ENV-10
Black Sea.	Dissolved oxygen	mg P/L	≥ 6	5	4	< 4	11.72
	TP	µg/L	< 8	8-12	12-16	> 16	**17.14**
	NOx	µg/L	< 14	14-20	21-34	> 34	**97.2**
	Oil-Grease	mg/L	< 0,2	0.3	0.5	> 0,5	< 0,05
	Floating Material		Floating liquids, waste and similar solid materials and foam cannot be found.				ND

ND: Not Detected

Table 6.549: Evaluation of Analysis Results of the General Chemical and Physio-Chemical Parameters of the Coastal Waters according to the Receiver Ambient Quality Criteria (Surface Water Quality Regulation Annex-5 Table-3)

	Parameter	Unit	Water Quality Classes				STATION CODE
			I (Very Good)	II (Good)	III (Medium)	IV (Weak)	ENV 16N/ENV11
Black Sea.	Dissolved oxygen	mg P/L	≥ 6	5	4	< 4	11.62
	TP	µg/L	< 8	8-12	12-16	> 16	**19.16**
	NOx	µg/L	< 14	14-20	21-34	> 34	**92.2**
	Oil-Grease	mg/L	< 0,2	0.3	0.5	> 0,5	< 0,05
	Floating Material		Floating liquids, waste and similar solid materials and foam cannot be found.				ND

As described above in the Offshore Section (Section 6.4.3.1.1), sea water for the Shore Crossing Section was assessed as Class IV according to the total phosphorus and NOx parameters with respect to the water quality classes indicated in the above table. However, as described in detail in **Chapter 7** (Assessment of the Biological Environment), the eutrophication risk of the study area was found to be low, according to the average reference values that determine the trophic level on the Black Sea shores.

Table 6.60: Evaluation of the Analysis Results According to Standard Values Required for Coastal and Transitional Waters Used for Recreation (Surface Water Quality Regulation Annex-5 Table-6)

Parameter	Unit	Standard/Limit Value	STATION CODE											
			ENV-01N	ENV-NEW-03N	ENV-NEW-11N	ENV-12N/ENV-07	ENV NEW 15N/ENV-10	ENV-16N ENV-11	ENV-09N	ENV-08 N ENV-04	ENV 13N	ENV-NEW-04N	ENV-05N	ENV-NEW-07N
Turbidity Clarity Light Permeability	m	Secchi disc depth 1 m - %90 (guide) 2 m - %95 (compulsory)	3.5	4.5	3.5	3	3.5	4	4.5	4.5	7	7.5	6	6.5
Dissolved oxygen	% saturation	≥ %80	%94,94	% 95,71	%93.59	%93.46	% 93,72	%92.92	%93.89	% 94,93	%93.39	% 95,85	%94.49	% 94,81
Enterococi (Faecal streptococci)	colony/100 mL	100 (%95) (guide) 200 (%95) (compulsory) 185 (%90) (sufficient)	0	0	0	0	0	0	1	0	1	0	0	0
Escherichia Coli	colony/100 mL	250 (%95) (guide) 500 (%95) (compulsory) 500 (%95) (sufficient)	0	0	0	4	2	0	0	0	0	0	0	0
Carbon residue and floating materials		Should not be detected.	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
pH	-	6-9	8.36	8.36	8.35	8.33	8.35	8.36	8.35	8.37	8.34	8.36	8.36	8.36
Color	Pt/Co	There should be no unusual change in color.	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
Floating material (including oil and grease)		Floating liquids such as oil, tar; garbage and similar solid materials and foam have not been detected.	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND: Not Detected

Sediment Analysis

Between January 23, 2017 and February 4, 2017, sediment samples were taken in addition to the water samples detailed above in the marine survey to determine the current conditions in the Shore Crossing Section.

Since sediment samples cannot be taken because of the rocky bottom of the seafloor in the 5 points (ENV NEW 03N, ENV NEW 07N, ENV 09N, ENV 12N / ENV 07 and ENV 13N) given in Table 6.30 during the marine biology survey carried out from May 13 to May 5 within the scope of the field study of the water and sediment quality of the Coastal Transition Department, diving was carried out at five points where no sediment samples could be obtained. Sampling was carried out under the supervision of representatives of Norwest Laboratories and sent to the Düzen Norwest Laboratory to be stored under appropriate conditions and for chemical analyses. The sample was also sent to the Marmara Research Center of the Scientific and Technological Research Council of Turkey (TUBITAK) for hazard analysis in accordance with Annex-3B of the Waste Management Regulation. The sediment samples taken from the other 7 points were also tested in the Düzen Norwest laboratory and subjected to hazard analysis in accordance with the Waste Management Regulation Annex-3B at the TUBITAK Marmara Research Center. The results of the chemical analysis carried out, on the samples gathered in the first and second tour, in the Düzen Norwest Laboratory are presented in the following Table 6.551 and Table 6.62: Analysis Results of the Sediment Samples Gathered in the Second Tour

Parameter		Unit	STATION CODE				
			ENV-02N/ENV-03N	ENV-06N/ENV-07N	ENV-09N	ENV-13N	ENV-12N/ENV-07
pH		-	8,4	7,96	8,25	8,7	8,06
Total Organic Carbon (TOC)		%	0,10	0,30	0,30	0,30	0,10
Total PCB		mg/kg	0,0029	0,0060	0,0041	0,0016	0,0024
Pesticides	4,4 DDE	mg/kg	<0,0003	<0,0003	<0,0003	<0,0003	<0,0003
	4,4 DDD	mg/kg	<0,0004	<0,0004	<0,0004	<0,0004	<0,0004
	4,4 DDT	mg/kg	<0,0004	<0,0004	<0,0004	<0,0004	<0,0004
	2,4 DDT	mg/kg	<0,0003	<0,0003	<0,0003	<0,0003	<0,0003
	Hexachlorobenzene	mg/kg	<0,0004	<0,0004	<0,0004	<0,0004	<0,0004
Total Pesticide		mg/kg	<0,0003	<0,0003	<0,0003	<0,0003	<0,0003
Cadmium		mg/kg	<0,3	<0,3	<0,3	<0,3	<0,3
Arsenic		mg/kg	<0,3	<0,3	<0,3	<0,3	<0,3
Lead		mg/kg	4	1,7	1,6	2,9	2,4
Cromium		mg/kg	16,8	8,7	8,2	12,4	9,7
Copper		mg/kg	13,9	8,7	6,3	14,5	8,8
Nickel		mg/kg	7,5	7,3	6	10,7	7,2
Zinc		mg/kg	25,8	24,5	21,7	37,1	21,3
Mercury		mg/kg	<0,02	<0,02	<0,02	<0,02	<0,02
Oil and Grease		mg/kg	<10	38,0	36,1	25,0	22,0

Parameter		Unit	STATION CODE				
			ENV-02N/ENV-03N	ENV-06N/ENV-07N	ENV-09N	ENV-13N	ENV-12N/ENV-07
Moisture Content		%	27,9	31,2	28,7	29,7	28,2
Total Kjeldahl Nitrogen (TKN)		%	<0,16	<0,16	<0,16	<0,16	<0,16
Aluminum		mg/kg	7658	7972	5447	14283	5276
Barium		mg/kg	26,2	22,1	15	36,7	18,4
Molybdenum		mg/kg	<0,3	<0,3	<0,3	<0,3	<0,3
Antimony		mg/kg	<0,5	<0,5	<0,5	<0,5	<0,5
Selenium		mg/kg	<0,4	<0,4	<0,4	<0,4	<0,4
Tin		mg/kg	<0,4	<0,4	<0,4	<0,4	<0,4
TPH (C10-C40)		mg/kg	0,18	0,16	0,19	0,19	0,19
Dibutyltin		mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
Tributyltin		mg/kg	<0,007	<0,007	<0,007	<0,007	<0,007
PAH	Naphtalene	mg/kg	<0,007	<0,007	<0,007	<0,007	<0,007
	Acenaphtylene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Acenaphtene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Fluorene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Phenanthrene	mg/kg	<0,007	<0,007	<0,007	<0,007	<0,007
	Anthracene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Fluoranthene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Pyrene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Benzo(a)anthracene	mg/kg	<0,007	<0,007	<0,007	<0,007	<0,007
	Chrysene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Benzo(b)fluoranthene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Benzo(k) fluoranthene	mg/kg	<0,009	<0,009	<0,009	<0,009	<0,009
	Benzo(a)pyrene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Indeno(1,2,3-cd)pyrene	mg/kg	<0,009	<0,009	<0,009	<0,009	<0,009
	Dibenzo(ah)anthracene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Benzo(ghi)perylene	mg/kg	<0,009	<0,009	<0,009	<0,009	<0,009
Total PAH		mg/kg	<0,007	<0,007	<0,007	<0,007	<0,007
Eluate analyses							
TPH		mg/L	0,60	0,62	0,48	0,25	0,64
Tributyltin		µg/L	<0,076	<0,076	<0,076	<0,076	<0,076
Total organic carbon (TOC)		mg/L	5,23	8,19	6,00	9,01	7,20

Parameter	Unit	STATION CODE				
		ENV-02N/ENV-03N	ENV-06N/ENV-07N	ENV-09N	ENV-13N	ENV-12N/ENV-07
Dissolved organic carbon	mg/L	5,12	6,76	4,83	8,88	6,72
Total dissolved solids	mg/L	584	696	592	752	620
Arsenic	mg/L	<0,003	<0,003	<0,003	<0,003	<0,003
Barium	mg/L	0,005	0,005	0,003	0,007	0,005
Cadmium	mg/L	<0,002	<0,002	<0,002	<0,002	<0,002
Cromium	mg/L	<0,002	0,002	<0,002	<0,002	<0,002
Copper	mg/L	0,007	0,006	0,005	<0,002	0,002
Molybdenum	mg/L	<0,002	<0,002	<0,002	<0,002	<0,002
Nickel	mg/L	<0,002	<0,002	<0,002	<0,002	<0,002
Lead	mg/L	<0,003	<0,003	<0,003	<0,003	<0,003
Antimony	mg/L	<0,004	<0,004	<0,004	<0,004	<0,004
Selenium	mg/L	<0,004	<0,004	<0,004	<0,004	<0,004
Tin	mg/L	<0,004	<0,004	<0,004	<0,004	<0,004
Zinc	mg/L	0,007	0,007	<0,003	<0,003	0,003
Mercury	mg/L	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001
Chloride	mg/L	205,3	257,2	231,8	391,4	251,8
Fluoride	mg/L	0,20	0,26	0,22	0,47	0,23
Sulphate	mg/L	32,8	40,0	31,0	91,4	39,0
pH	-	7,90	8,10	8,07	7,71	8,04

Table 6.632 respectively, the sieve analyses results are given in Table 6.63 and 6.64, and the results of the hazard analysis carried out by TÜBITAK MAM are presented in the following section in detail. The analysis results from the laboratories are given in **ANNEX-6.F**.

Table 6.551: Analysis Results of the Sediment Samples Gathered in the First Tour

Parameter		Unit	STATION CODE						
			ENV-05N	ENV-NEW-11N	ENV-NEW-04N	ENV-16N-/ENV-11N	ENV-08N/ENV-04	ENV-NEW-15N/ENV-10	ENV-01N
pH		-	8.86	8.69	8.99	8.79	8.65	8.84	8.74
Total Organic Carbon (TOC)		%	0.14	0.12	0.22	0.20	0.15	0.13	0.31
Total PCB		mg/kg	0.0057	0.0012	0.0213	0.0501	0.0720	0.0020	0.0027
Pesticides	4,4 DDE	mg/kg	< 0,0003	< 0,0003	< 0,0003	< 0,0003	< 0,0003	< 0,0003	< 0,0003
	4,4 DDD	mg/kg	0.006	< 0,0004	< 0,0004	< 0,0004	< 0,0004	< 0,0004	< 0,0004
	4,4 DDT	mg/kg	< 0,0004	< 0,0004	< 0,0004	0.0004	< 0,0004	< 0,0004	< 0,0004
	2,4 DDT	mg/kg	< 0,0003	< 0,0003	< 0,0003	< 0,0003	< 0,0003	< 0,0003	< 0,0003
	Hexachlorobenzene	mg/kg	< 0,0004	< 0,0004	< 0,0004	< 0,0004	< 0,0004	< 0,0004	< 0,0004
Total Pesticide		mg/kg	0.006	< 0,0003	< 0,0003	0.0004	< 0,0003	< 0,0003	< 0,0003
Cadmium		mg/kg	< 0,3	< 0,3	< 0,3	< 0,3	< 0,3	< 0,3	< 0,3
Arsenic		mg/kg	< 0,3	< 0,3	< 0,3	< 0,3	< 0,3	1.9	< 0,3
Lead		mg/kg	1.6	2.5	2.4	5.9	1.5	3.1	1.1
Cromium		mg/kg	10.1	12.2	11	17.2	9	2.4	11.6
Copper		mg/kg	12	10.5	10.4	12.8	10.8	3.3	16.3
Nickel		mg/kg	6.4	6.8	6.4	7.1	6.5	2.3	7.4
Zinc		mg/kg	23.2	20.3	18.7	22.5	18.5	7.4	25.1
Mercury		mg/kg	< 0,02	< 0,02	< 0,02	< 0,02	< 0,02	< 0,02	< 0,02
Oil and Grease		mg/kg	37.0	25.0	29.0	24.0	24.0	12.0	27.0
Moisture Content		%	24.8	23.5	22.0	19.8	24.1	23.6	23.2

Parameter		Unit	STATION CODE						
			ENV-05N	ENV-NEW-11N	ENV-NEW-04N	ENV-16N-/ENV-11N	ENV-08N/ENV-04	ENV-NEW-15N/ENV-10	ENV-01N
Total Kjeldahl Nitrogen (TKN)		%	< 0,16	< 0,16	< 0,16	< 0,16	< 0,16	< 0,16	< 0,16
Aluminum		mg/kg	8419	7546	5828	6755	7612	1494	11325
Barium		mg/kg	16.4	18.4	17.7	27.5	21.8	32.1	26
Molybdenum		mg/kg	< 0,3	< 0,3	< 0,3	< 0,3	< 0,3	< 0,3	< 0,3
Antimony		mg/kg	< 0,5	< 0,5	< 0,5	< 0,5	< 0,5	< 0,5	< 0,5
Selenium		mg/kg	< 0,4	< 0,4	< 0,4	< 0,4	< 0,4	< 0,4	< 0,4
Tin		mg/kg	< 0,4	< 0,4	< 0,4	< 0,4	< 0,4	< 0,4	< 0,4
TPH (C10-C40)		mg/kg	0.13	0.21	0.25	0.17	0.15	0.18	0.20
Dibutyltin		mg/kg	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008
Tributyltin		mg/kg	< 0,007	< 0,007	< 0,007	< 0,007	< 0,007	< 0,007	< 0,007
PAH	Naphthalene	mg/kg	< 0,007	< 0,007	< 0,007	< 0,007	< 0,007	< 0,007	< 0,007
	Acenaphthylene	mg/kg	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008
	Acenaphthene	mg/kg	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008
	Fluorene	mg/kg	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008
	Phenanthrene	mg/kg	< 0,007	< 0,007	< 0,007	< 0,007	< 0,007	< 0,007	< 0,007
	Anthracene	mg/kg	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008
	Pyrene	mg/kg	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008
	Benzo (a) anthracene	mg/kg	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008
	Chrysene	mg/kg	< 0,007	< 0,007	< 0,007	< 0,007	< 0,007	< 0,007	< 0,007
	Benzo (b) fluoranthene	mg/kg	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008

Parameter		Unit	STATION CODE						
			ENV-05N	ENV-NEW-11N	ENV-NEW-04N	ENV-16N-/ENV-11N	ENV-08N/ENV-04	ENV-NEW-15N/ENV-10	ENV-01N
	Benzo (k) fluoranthene	mg/kg	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008
	Benzo (a) pyrene	mg/kg	< 0,009	< 0,009	< 0,009	< 0,009	< 0,009	< 0,009	< 0,009
	Indeno (1,2,3-cd) pyrene	mg/kg	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008
	Dibenzo (ah) anthracene	mg/kg	< 0,009	< 0,009	< 0,009	< 0,009	< 0,009	< 0,009	< 0,009
	Benzo (ghi) perylene	mg/kg	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008	< 0,008
Total PAH		mg/kg	< 0,009	< 0,009	< 0,009	< 0,009	< 0,009	< 0,009	< 0,009
Eluate analyses									
TPH		mg/L	0.38	0.49	0.37	0.22	0.24	0.34	0.66
Tributyltin		µg/L	< 0,076	< 0,076	< 0,076	< 0,076	< 0,076	< 0,076	< 0,076
Total organic carbon (TOC)		mg/L	3.90	5.60	5.09	6.34	3.86	5.75	3.38
Dissolved organic carbon		mg/L	3.71	4.80	2.96	3.50	3.86	2.94	3.20
Total dissolved solids		mg/L	958	906	786	758	1126	1072	729
Arsenic		mg/L	< 0,003	< 0,003	< 0,003	< 0,003	< 0,003	< 0,003	< 0,003
Barium		mg/L	0.004	0.007	0.006	0.003	0.003	0.004	0.003
Cadmium		mg/L	< 0,002	< 0,002	< 0,002	< 0,002	< 0,002	< 0,002	< 0,002
Cromium		mg/L	< 0,002	< 0,002	< 0,002	< 0,002	< 0,002	< 0,002	< 0,002
Copper		mg/L	0.008	0.006	0.002	< 0,002	0.003	< 0,002	0.002
Molybdenum		mg/L	< 0,002	< 0,002	< 0,002	< 0,002	< 0,002	< 0,002	< 0,002
Nickel		mg/L	< 0,002	0.003	< 0,002	< 0,002	< 0,002	< 0,002	< 0,002

Parameter	Unit	STATION CODE						
		ENV-05N	ENV-NEW-11N	ENV-NEW-04N	ENV-16N-/ENV-11N	ENV-08N/ENV-04	ENV-NEW-15N/ENV-10	ENV-01N
Lead	mg/L	< 0,003	< 0,003	< 0,003	< 0,003	< 0,003	< 0,003	< 0,003
Antimony	mg/L	< 0,004	< 0,004	< 0,004	< 0,004	< 0,004	< 0,004	< 0,004
Selenium	mg/L	< 0,004	< 0,004	< 0,004	< 0,004	< 0,004	< 0,004	< 0,004
Tin	mg/L	< 0,004	< 0,004	< 0,004	< 0,004	< 0,004	< 0,004	< 0,004
Zinc	mg/L	0.005	0.006	0.003	< 0,003	< 0,003	< 0,003	< 0,003
Mercury	mg/L	< 0,0001	< 0,0001	< 0,0001	< 0,0001	< 0,0001	< 0,0001	< 0,0001
Chloride	mg/L	303.7	327.9	227.6	261.3	408.0	369.8	304.4
Fluoride	mg/L	0.24	0.20	0.20	0.22	0.27	0.16	0.25
Sulphate	mg/L	55.05	46.53	45.45	43.92	69.70	61.10	59.32
pH	-	8.74	8.82	8.48	8.93	8.40	8.33	8.41

Table 6.62: Analysis Results of the Sediment Samples Gathered in the Second Tour

Parameter		Unit	STATION CODE				
			ENV-02N/ENV-03N	ENV-06N/ENV-07N	ENV-09N	ENV-13N	ENV-12N/ENV-07
pH		-	8,4	7,96	8,25	8,7	8,06
Total Organic Carbon (TOC)		%	0,10	0,30	0,30	0,30	0,10
Total PCB		mg/kg	0,0029	0,0060	0,0041	0,0016	0,0024
Pesticides	4,4 DDE	mg/kg	<0,0003	<0,0003	<0,0003	<0,0003	<0,0003
	4,4 DDD	mg/kg	<0,0004	<0,0004	<0,0004	<0,0004	<0,0004
	4,4 DDT	mg/kg	<0,0004	<0,0004	<0,0004	<0,0004	<0,0004
	2,4 DDT	mg/kg	<0,0003	<0,0003	<0,0003	<0,0003	<0,0003

Parameter		Unit	STATION CODE				
			ENV-02N/ENV-03N	ENV-06N/ENV-07N	ENV-09N	ENV-13N	ENV-12N/ENV-07
	Hexachlorobenzene	mg/kg	<0,0004	<0,0004	<0,0004	<0,0004	<0,0004
Total Pesticide		mg/kg	<0,0003	<0,0003	<0,0003	<0,0003	<0,0003
Cadmium		mg/kg	<0,3	<0,3	<0,3	<0,3	<0,3
Arsenic		mg/kg	<0,3	<0,3	<0,3	<0,3	<0,3
Lead		mg/kg	4	1,7	1,6	2,9	2,4
Cromium		mg/kg	16,8	8,7	8,2	12,4	9,7
Copper		mg/kg	13,9	8,7	6,3	14,5	8,8
Nickel		mg/kg	7,5	7,3	6	10,7	7,2
Zinc		mg/kg	25,8	24,5	21,7	37,1	21,3
Mercury		mg/kg	<0,02	<0,02	<0,02	<0,02	<0,02
Oil and Grease		mg/kg	<10	38,0	36,1	25,0	22,0
Moisture Content		%	27,9	31,2	28,7	29,7	28,2
Total Kjeldahl Nitrogen (TKN)		%	<0,16	<0,16	<0,16	<0,16	<0,16
Aluminum		mg/kg	7658	7972	5447	14283	5276
Barium		mg/kg	26,2	22,1	15	36,7	18,4
Molybdenum		mg/kg	<0,3	<0,3	<0,3	<0,3	<0,3
Antimony		mg/kg	<0,5	<0,5	<0,5	<0,5	<0,5
Selenium		mg/kg	<0,4	<0,4	<0,4	<0,4	<0,4
Tin		mg/kg	<0,4	<0,4	<0,4	<0,4	<0,4
TPH (C10-C40)		mg/kg	0,18	0,16	0,19	0,19	0,19
Dibutyltin		mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008

Parameter		Unit	STATION CODE				
			ENV-02N/ENV-03N	ENV-06N/ENV-07N	ENV-09N	ENV-13N	ENV-12N/ENV-07
Tributyltin		mg/kg	<0,007	<0,007	<0,007	<0,007	<0,007
PAH	Naphtalene	mg/kg	<0,007	<0,007	<0,007	<0,007	<0,007
	Acenaphtylene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Acenaphtene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Fluorene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Phenanthrene	mg/kg	<0,007	<0,007	<0,007	<0,007	<0,007
	Anthracene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Fluoranthene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Pyrene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Benzo(a)anthracene	mg/kg	<0,007	<0,007	<0,007	<0,007	<0,007
	Chrysene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Benzo(b)fluoranthene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Benzo(k) fluoranthene	mg/kg	<0,009	<0,009	<0,009	<0,009	<0,009
	Benzo(a)pyrene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Indeno(1,2,3-cd)pyrene	mg/kg	<0,009	<0,009	<0,009	<0,009	<0,009
	Dibenzo(ah)anthracene	mg/kg	<0,008	<0,008	<0,008	<0,008	<0,008
	Benzo(ghi)perylene	mg/kg	<0,009	<0,009	<0,009	<0,009	<0,009
Total PAH		mg/kg	<0,007	<0,007	<0,007	<0,007	<0,007
Eluate analyses							
TPH		mg/L	0,60	0,62	0,48	0,25	0,64
Tributyltin		µg/L	<0,076	<0,076	<0,076	<0,076	<0,076

Parameter	**Unit**	**STATION CODE**				
		ENV-02N/ENV-03N	**ENV-06N/ENV-07N**	**ENV-09N**	**ENV-13N**	**ENV-12N/ENV-07**
Total organic carbon (TOC)	mg/L	5,23	8,19	6,00	9,01	7,20
Dissolved organic carbon	mg/L	5,12	6,76	4,83	8,88	6,72
Total dissolved solids	mg/L	584	696	592	752	620
Arsenic	mg/L	<0,003	<0,003	<0,003	<0,003	<0,003
Barium	mg/L	0,005	0,005	0,003	0,007	0,005
Cadmium	mg/L	<0,002	<0,002	<0,002	<0,002	<0,002
Cromium	mg/L	<0,002	0,002	<0,002	<0,002	<0,002
Copper	mg/L	0,007	0,006	0,005	<0,002	0,002
Molybdenum	mg/L	<0,002	<0,002	<0,002	<0,002	<0,002
Nickel	mg/L	<0,002	<0,002	<0,002	<0,002	<0,002
Lead	mg/L	<0,003	<0,003	<0,003	<0,003	<0,003
Antimony	mg/L	<0,004	<0,004	<0,004	<0,004	<0,004
Selenium	mg/L	<0,004	<0,004	<0,004	<0,004	<0,004
Tin	mg/L	<0,004	<0,004	<0,004	<0,004	<0,004
Zinc	mg/L	0,007	0,007	<0,003	<0,003	0,003
Mercury	mg/L	<0,0001	<0,0001	<0,0001	<0,0001	<0,0001
Chloride	mg/L	205,3	257,2	231,8	391,4	251,8
Fluoride	mg/L	0,20	0,26	0,22	0,47	0,23
Sulphate	mg/L	32,8	40,0	31,0	91,4	39,0
pH	-	7,90	8,10	8,07	7,71	8,04

Table 6.63: Results of the Sieve Analysis Conducted on the Sediment Samples Gathered in the First Tour

Sieve Aperture	Unit	STATION CODE						
		ENV-05N	ENV-NEW-11N	ENV-NEW-04N	ENV-16N-/ENV-11N	ENV-08N/ENV-04	ENV-NEW-15N/ENV-10	ENV-01N
> 4,75 mm	%	0	0.8	1.3	15.2	0	ND	0
4.75-0.075 mm		98.2	97.1	97.6	79.9	98.6	ND	94.9
0.074-0.005 mm		1.7	1.9	1	4.6	1.3	ND	4.8
0.005-0.001 mm		0	0	0	0	0	ND	0
< 0,001 mm		0.1	0.2	0.1	0.3	0.1	ND	0.3

ND: Not detected (We could conduct the test because the sample is made entirely from sea shells.

Table 6.64: Results of the Sieve Analysis Conducted on the Sediment Samples Gathered in the Second Tour

Sieve Aperture	Unit	STATION CODE				
		ENV-02N/ENV-03N	ENV-06N/ENV-07N	ENV-09N	ENV-13N	ENV-12N/ENV-07
> 4,75 mm	%	0,6	1,1	1,4	0,9	1,1
4,75-0,075 mm		97,8	97,1	96,6	97,8	97,4
0,074-0,005 mms		1,5	1,6	1,9	1,2	1,3
0,005-0,001 mm		0	0	0	0	0
< 0,001 mm		0,1	0,2	0,1	0,1	0,2

Physio-Chemical Analyzes

Physio-chemical analyzes were carried out by TÜBİTAK MAM for preliminary identification in the samples. The results of the analyses made are given in

Table 6.565 below.

Table 6.565: Results of the Physio-Chemical Analysis of the Sediment Samples Gathered in the First Tour

Parameter	Unit	ENV-NEW 15N/ENV 10	ENV-08N/ENV-04	ENV-NEW 04N	ENV-NEW 11N	ENV-16N/ENV 11	ENV-05N	ENV-01N
Appearance/Odor		Brown/Bad odor	Grey/bad odor	Grey/bad odor	Grey/bad odor	Grey/bad odor	Grey/bad odor	Grey/bad odor
pH (aqueous solution)		9.36	8.87	8.85	8.90	9.09	9.16	9.01
Moisture content	%	16.8	30.67	28.42	27.16	25.72	28.45	23.84
Solid content	%	83.2	69.33	71.58	72.84	74.28	71.55	76.16
Amount of organic matter	%	< 0,01	7.87	7.47	6.92	7.80	6.55	8.22
Amount of inorganic matter	%	83.2	61.46	64.11	65.92	66.48	65.00	67.94
Upper calorific value	kcal/kg	ND	ND	ND	ND	ND	ND	ND
Total sulfur	%	0.24	0.35	0.36	0.36	0.40	0.36	0.35
Total organic carbon	mg/kg	ND	ND	ND	ND	ND	ND	ND

ND: Not Detected

Table 6.66: Results of the Physio-Chemical Analysis of the Sediment Samples Gathered in the Second Tour

Parameter	Unit	ENV-02N/ENV-03N	ENV-06N/ENV-07N	ENV-09N	ENV-13N	ENV-12N/ENV-07
Appearance/Odor		Gray- Brown/Mild odor	Gray/mild odor	Gray/mild odor	Brown/mild odor	Gray/mild odor
pH (aqueous solution)		8,12	7,14	7,52	8,38	7,52
Moisture content	%	26,47	39,94	26,92	31,60	22,97
Solid content	%	73,53	60,06	73,08	68,40	77,03
Amount of organic matter	%	2,15	2,17	2,37	2,68	2,10
Amount of inorganic matter	%	71,38	57,89	70,71	65,72	74,93
Upper calorific value	kcal/kg	45	47	38	54	47

Parameter	Unit	ENV-02N/ENV-03N	ENV-06N/ENV-07N	ENV-09N	ENV-13N	ENV-12N/ENV-07
Total sulfur	%	0,11	0,11	0,12	0,11	0,11
Total organic carbon	mg/kg	19.690 (%1,97)	21.400 (%2,14)	23.140 (%2,31)	28.100 (%2,81)	12.640 (%1,26)

According to the results, the samples of ENV-NEW 15N / ENV 10, ENV 16N / ENV 11, ENV-05N, ENV-01N are basic; ENV 08N / ENV 04, ENV NEW 04N and ENV NEW 11N are slightly basic. All of the samples are moist and inorganic in content and no calorific value or TOC were determined in any sample.

Concerning the sediment samples gathered during the second tour, it is determined that ENV-12N/ENV-07, ENV-09N, ENV-02N/ENV-03N ve ENV-06N/ENV-07N samples have neutral, moist and inorganic contents. Samples contain very low calorific value. It is determined that ENV-13N sample have slightly basic, moist and inorganic contents. The sample contains very low calorific value.

Inorganic Content Analysis

Mineralogical analyzes were carried out by the Rietveld method in order to determine the inorganic contents of the samples. The results of the analysis performed with the XRD device are given below in Table 6.577.Table 6.577: Qualitative Phase Analysis Results of XRD of Sediment Samples Gathered in the First Tour

ENV-NEW 15N/ENV 10			ENV-08N/ENV-04	ENV-NEW 04N	ENV-NEW 11N	ENV-16N/ENV 11	ENV-05N	ENV-01N
Compound	Content in Inorganic Phase (%)	Sample Content (%)	Compound					
Lime, CaO	88.0	73.2	Quartz, SiO_2	Quartz, SiO_2	Quartz, SiO_2	Quartz, SiO_2	Quartz, SiO_2	Quartz, SiO_2
Quartz, SiO2	4.1	3.4	Calcite, $CaCO_3$	Calcite, $CaCO_3$	Calcite, $CaCO_3$	Calcite, $CaCO_3$	Calcite, $CaCO_3$	Calcite, $CaCO_3$
Periclase, MgO	2.6	2.2	Aragonite, $CaCO_3$	Aragonite, $CaCO_3$	Aragonite, $CaCO_3$	Aragonite, $CaCO_3$	Aragonite, $CaCO_3$	Aragonite, $CaCO_3$
Feldispat	2.2	1.8	Feldispat	Feldispat	Feldispat	Feldispat	Feldispat	Feldispat
Calcite, CaCO3	1.9	1.6	Andradite, $Ca_3Fe_2(SiO_4)_3$	Andradite, $Ca_3Fe_2(SiO_4)_3$	Andradite, $Ca_3Fe_2(SiO_4)_3$	Andradite, $Ca_3Fe_2(SiO_4)_3$	Andradite, $Ca_3Fe_2(SiO_4)_3$	Andradite, $Ca_3Fe_2(SiO_4)_3$
Anhydrite, CaSO4	1.2	1.0	Illite, $(K,H_3O)Al_2Si_3AlO_{10}(OH_2)$	Illite, $(K,H_3O)Al_2Si_3AlO_{10}(OH_2)$	Illite, $(K,H_3O)Al_2Si_3AlO_{10}(OH_2)$	Illite, $(K,H_3O)Al_2Si_3AlO_{10}(OH_2)$	Illite, $(K,H_3O)Al_2Si_3AlO_{10}(OH_2)$	Illite, $(K,H_3O)Al_2Si_3AlO_{10}(OH_2)$

	Chlorite-Serpentine	Chlorite-Serpentine	Chlorite-Serpentine	Chlorite-Serpentine	Chlorite-Serpentine	Chlorite-Serpentine
	Magnesium Oxide, MgO	Magnesium Oxide, MgO	Magnesium Oxide, MgO	Magnesium Oxide, MgO	Magnesium Oxide, MgO	Magnesium Oxide, MgO
	Hematite, Fe_2O_3	Hematite, Fe_2O_3	Hematite, Fe_2O_3	Hematite, Fe_2O_3	Hematite, Fe_2O_3	Hematite, Fe_2O_3
	Wollastonite, $CaSiO_3$	Wollastonite, $CaSiO_3$	Wollastonite, $CaSiO_3$	Wollastonite, $CaSiO_3$	Wollastonite, $CaSiO_3$	Wollastonite, $CaSiO_3$
			Halite, NaCl			

Table 6.588: Qualitative Phase Analysis Results of XRD of Sediment Samples Gathered in the Second Tour

ENV-02N/ENV-03N	ENV-06N/ENV-07N	ENV-09N	ENV-13N	ENV-12N/ENV-07
Compound				
Quartz, SiO2	Quartz, SiO2	Quartz, SiO2	Quartz, SiO2	Quartz, SiO2
Calcite, $CaCO_3$	Calcite, $CaCO_3$	Calcite, $CaCO_3$	Calcite, $CaCO_3$	Calcite, $CaCO_3$
Aragonite, $CaCO_3$	Aragonite, $CaCO_3$	Aragonite, $CaCO_3$	Aragonite, $CaCO_3$	Aragonite, $CaCO_3$
Hastingsite, $(Ca,Na)_2(Fe_2Mg)_5(Si,Al)_8O_{22}(OH)_2$	Hastingsite, $(Ca,Na)_2(Fe_2Mg)_5(Si,Al)_8O_{22}(OH)_2$	Hastingsite, $(Ca,Na)_2(Fe_2Mg)_5(Si,Al)_8O_{22}(OH)_2$	Hastingsite, $(Ca,Na)_2(Fe_2Mg)_5(Si,Al)_8O_{22}(OH)_2$	Hastingsite, $(Ca,Na)_2(Fe_2Mg)_5(Si,Al)_8O_{22}(OH)_2$
Anorthite, $CaAl_2Si_2O_8$	Anorthite, $CaAl_2Si_2O_8$	Anorthite, $CaAl_2Si_2O_8$	Anorthite, $CaAl_2Si_2O_8$	Anorthite, $CaAl_2Si_2O_8$
Illite, $(K,H_3O)Al_2Si_3AlO_{10}(OH_2)$	Illite, $(K,H_3O)Al_2Si_3AlO_{10}(OH_2)$	Illite, $(K,H_3O)Al_2Si_3AlO_{10}(OH_2)$	Illite, $(K,H_3O)Al_2Si_3AlO_{10}(OH_2)$	Illite, $(K,H_3O)Al_2Si_3AlO_{10}(OH_2)$
Clinochlore, $(MgFe)_6(SiAl)_4O_{10}(OH)_8$	Clinochlore, $(MgFe)_6(SiAl)_4O_{10}(OH)_8$	Clinochlore, $(MgFe)_6(SiAl)_4O_{10}(OH)_8$	Clinochlore, $(MgFe)_6(SiAl)_4O_{10}(OH)_8$	Clinochlore, $(MgFe)_6(SiAl)_4O_{10}(OH)_8$
Gismondine, $Ca(Al_2Si_2O_8)$	Gismondine, $Ca(Al_2Si_2O_8)$	Gismondine, $Ca(Al_2Si_2O_8)$	Gismondine, $Ca(Al_2Si_2O_8)$	Gismondine, $Ca(Al_2Si_2O_8)$
Cristobalite, SiO_2	Cristobalite, SiO_2	Cristobalite, SiO_2	Cristobalite, SiO_2	Cristobalite, SiO_2
Anatase, TiO_2	Anatase, TiO_2	Anatase, TiO_2	Anatase, TiO_2	Anatase, TiO_2
Hematite, Fe_2O_3	Hematite, Fe_2O_3	Hematite, Fe_2O_3	Hematite, Fe_2O_3	Hematite, Fe_2O_3
Hedenbergite, $CaFeSi_2O_6$	Hedenbergite, $CaFeSi_2O_6$	Silicon oxide, SiO_2	Hedenbergite, $CaFeSi_2O_6$	Hedenbergite, $CaFeSi_2O_6$

ENV-02N/ENV-03N	ENV-06N/ENV-07N	ENV-09N	ENV-13N	ENV-12N/ENV-07
Compound				
		Cryptophylite, $K_2Ca(Si_4O_{10})_5H_2O$		

When the results are evaluated for all other sediment samples except the ENV-NEW 15N / ENV 10 sample, it is observed and reported that the inorganic contents of the samples are composed of various compounds with **low or no risk value**.

In addition to the inorganic content analyses made, metal analysis was carried out by the ICP-MS device in accordance with EPA 6020A method for the identification of possible metals in the samples. Prior to analysis, the samples were thoroughly dissolved by microwave application in a mixture of nitric acid and hydrochloric acid. The results of the analysis are given below in Table 6.599. Results below the analysis result of 100 mg/kg were not included in the report.

Table 6.599: Metal Analysis Results of the Sediment Samples Gathered in the First Tour

Parameter (mg/kg)	ENV-NEW 15N/ENV 10	ENV-08N/ENV-04	ENV-NEW 04N	ENV-NEW 11N	ENV-16N/ENV 11	ENV-05N	ENV-01N
Sodium, Na	4.832s	2.825	1.683	2.216	2.648	2.239	2.896
Magnesium, Mg	3.245	4.889	3.935	4.580	3.361	4.266	5.139
Aluminum, Al	1.835	11.733	11.788	13.834	8.426	13.003	14.036
Potassium, K	495.5	2.652	2.539	2.943	1.492	2.847	3.190
Calcium, Ca	87.072	21.865	14.491	13.941	38.232	12.280	14.839
Titanium, Ti	-	-	-	-	-	101.8	117.5
Manganese, Mn	126.2	248.9	286.9	343.7	288.0	263.6	285.6
Iron, Fe	5.458	10.713	22.845	21.797	23.069	17.328	20.168
Strontium, Sr	2.068	677.8	421.2	430.0	932.5	369.2	480.4

Table 6.70: Metal Analysis Results of the Sediment Samples Gathered in the Second Tour

Parameter (mg/kg)	ENV-02N/ENV-03N	ENV-06N/ENV-07N	ENV-09N	ENV-13N	ENV-12N/ENV-07
Sodium, Na	2.371	2.463	2.082	5.589	2.250
Magnesium, Mg	4.291	4.807	3.768	5.002	4.534
Aluminum, Al	9.324	10.995	8.496	13.064	11.919
Potassium, K	1.050	1.443	1.338	1.819	1427
Calcium, Ca	18.163	15.672	16.155	40.107	16.858
Titanium, Ti	131	135	-	126	171
Manganese, Mn	113	-	-	-	-
Iron, Fe	288	287	248	218	327
Strontium, Sr	28.458	15.546	12.605	11.657	19.044
Sodium, Na	479	454	416	1.103	416

When metal analysis results are evaluated, TÜBITAK reports that the metal composition of sediment samples is not at a level that should pose a risk. As a result of these studies (XRD and ICP-MS), it was concluded that the samples were **not hazardous** according to the Waste Management Regulation in terms of inorganic content.

Ecological Toxicity Test

Bioluminescence bacteria and ecotoxicity tests have been conducted on sediment samples by using the ToxAlert 100 device with regard to the ISO/EN/DIN 11348 method. The samples were diluted to set the sample concentration levels to 80%, 50%, 25%, 12.5% and 6.25%. In the coloured samples, the colour effect was eliminated by pre-diluting the sample and these dilutions were taken into consideration during the calculations. The contact duration of the test was 30 minutes and two readings were taken from each sample. At the end of the test, the inhibition % values for each concentration level and the EC50 values, which is the concentration level that inhibits 50% of the bacteria, were calculated. As a result of the analyses conducted, the results demonstrated in Table 6.6071 below, were gathered for all sediment samples.

Table 6.6071: Eco-Toxicity Analyses Results

EC 50 (%)*	Toxicity Level**	Result/Description
Not Found	0	Non-Toxic

EC50: the concentration rate, which inhibates the 50% of the bacteria

**Toxicity level: non-toxic (0), low-toxic (1), toxic (2), highly toxic (3), extremely toxic (4)

According to the analysis results, it is determined that the samples show no toxic effect on marine bacteria *vibrio fisheri* and have a low risk of causing negative ecotoxic effects in aqueous media.

Acute Toxicity Test (On Fish)

The sediment samples have been tested for Acute Toxicity- Toxicity Dilution Factor on Fishes. Acute toxicity is the irreversible effect, that the organism exposed to the substance in water, suffers in a short time. For this test, the acute toxicity is stated as the average lethal concentration (LC50) in which the 50% of the test subjects have died. This analysis is maintained for at least 96 hours. The fish deaths and LC50 values are recorded in 24-hour intervals.

The toxicity dilution factor (TDF) is defined as below in MoEU Water Pollution Control Regulation Sampling and Analysis Methods Notice (Official Gazette Dated/No 10.10.2009/27372*). Toxic effect can be determined in proportion to the volume of waste water's dilution with dilution water. According to this, based on the lowest dilution value which all of the fishes can survive, the toxic effect of waste water on fishes is shown as dilution factor (ZSF)*. In the tests conducted for fish bio-experiments in sediment samples, the result is reported as ZSF=1 for all samples Therefore, it is concluded that the samples are harmless for aquatic life in an acute perspective.

Acute Toxicity Test (On Mice)

The sediment samples were tested using the international testing protocols and their hazard classification was made in accordance with the OECD 423 and OECD Testing and Assessment No 33 Chapter 2.1 and United Nations, The Globally Harmonized System of Classification and Labelling of Chemicals (GHS) Health Hazards Chapter 3.1 During the tests conducted on the sediment samples gathered in the first tour, lab rat/Balb-c was used as experimental animal as suggested in the aforementioned protocol. 3 randomly selected 8-12-week-old female mice/Balb-c (no more than ±20% difference in weight) were used in the experiment.

During the acute toxicity tests, conducted on the sediment samples gathered in the second tour, lab rat/CD-1 was used as experimental animal as suggested in the aforementioned protocol. The sample was tested using a randomly selected 8-12-week-old 3 male rats/CD-1 (no more than ±20% difference in weight).After the samples were ground to 4mm particle size humidity rate and solid matter amounts were determined using the EN 12880 method. The samples extracted in 10-15^{o}C after being mixed with 1:10 dilution solution (1:1 distilled water+ maize oil) for 24 hours in 5-10 rpm rotation. Following the extraction, after the solid and liquid faze were separated, the liquid part was filtered through 0.45cm filter paper with vacuum and the extract was prepared. The sample tested in accordance with the OECD protocol was applied to the experiment animals in single dose via gavage and by a starting dosage of 2000mg/kg body weight. Following the application experiment animals were monitored and clinical findings regarding the 1, 2, 3, 7 and 14th days were recorded. In order to determine the toxic effect of the samples, the animals were euthanized in accordance with the animal ethic rules and the animals' livers were weighted and recorded.

It is reported in TÜBİTAK Analysis Reports (**Annex-6.F**) that after the analyses conducted it is concluded that the sediment samples are **non-hazardous**. **6.4.3.2 Current Circulation and Seasonal Cycles**

As stated in Chapter 6.4.4.2 above, the Shore Crossing Section is under the influence of southward currents throughout the year. This stream shows Jet features and flows to Bosporus passing from the Shore Crossing Section. In order to confirm the results gathered from the digital model with site observations, current measurements have been taken from the Shore Crossing Section. In the chapter below, the similarities and the differences between the model and the observations are presented by showing the results of these measurements.

6.4.3.2.1 Current speed and direction gathered by using Acoustic Doppler Current Profiler (ADCP) in the Shore Crossing Section of the Project

ADCP device is used in the Shore Crossing Section of the Project for current measurement. The data from the current was collected between August 20th 2015 and December 7th 2015. From a 19-deep water branch, current data from a total of 15 different depths, ranging from 3.5 meters to 17.5 meters with one-meter intervals, were collected. ADCP was programmed to collect data every 10 minutes. The current speed and direction for three depths (5.5, 12.5, and 16.5) in this timeline is shown in Figure 6.91 in the form of a pinwheel. According to the analyses, the flows in the study area come from the south and the results are in conformity with the digital current model. Most of the currents are between the 0.1 and 0.2 m/h band shown in yellow.

The results of the current measurements conducted in the Shore Crossing Section match with the digital current model results. Both results show the currents flowing to the south in the study area (Since the pinwheel is adapted from meteorology it shows the direction the current is coming from). These currents are relative volume currents and this feature of the area should be considered when conducting dredging activities in the frame of the Project.

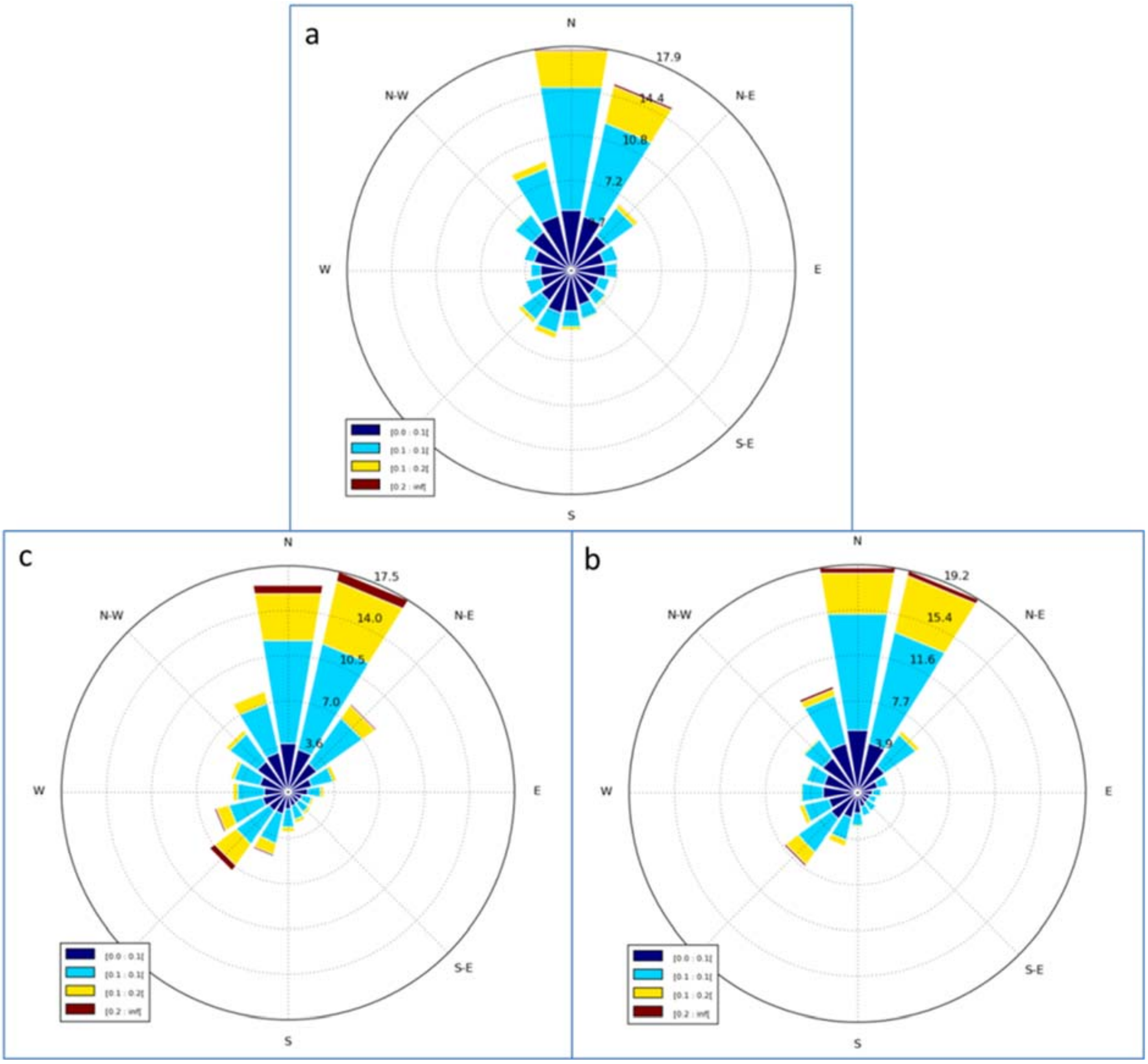


Figure 6.91: ADCP measurement results. Pinwheel of (a) 6.5m (b) 12.5m (c) 17.5 deep currents.

Atmospheric Conditions

The atmospheric features of the Project Area are evaluated using the wind speed in 10 meter, zonal and meridional wind speed data. The ERA-40 Atmospheric Re-Analysis data set of the ECMWF (European Centre for Medium Range Forecast was used for this purpose. Wind speed force shown in Figure 6.92(a) does not exceed 2 m/h during the examination period and the average wind speed is 1.5 m/h.

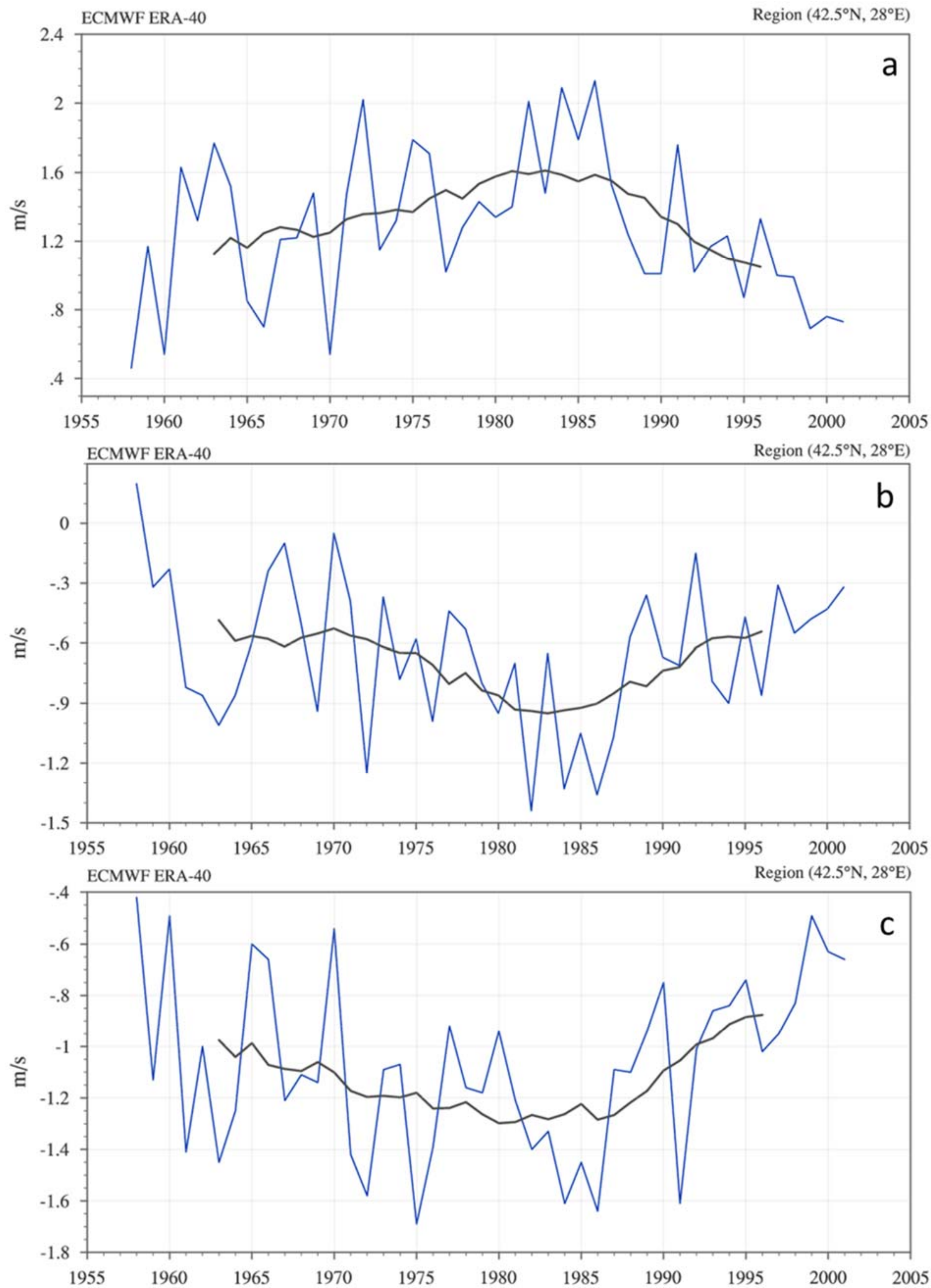


Figure 6.92: (a) wind speed (b) zonal and (c) meridional wind speed in 10m constituents of 1995-2005 gathered via ECMWF ERA-40 Atmospheric Re-analysis data set.

Figure 6.92 as seen on (b) and (c) eastern and southern winds are dominant over the area throughout the year. Southern speeds are stronger than eastern speeds. Wind patterns of this kind are appropriate to create southward currents.

6.5 Hydrogeological Features

6.5.1 Hydrogeological Features of the Region and the Project Area

According to the data of State Hydraulic Works 2013 data, the ground water potential of TR21 Thrace Region is 460.7 hm3/year. This amounts to the 3% of Turkey's total ground water potential 14 billion m^3/year. The water amounts of the basins are estimated as follows; Ergene Basin approx. 367.2 hm^3/year, Meriç Basin approx. 59 hm^3/year. (Ref. 6.43) The calcic fields in Kırklareli province surround the Pınarhisar and Vize districts starting from the southern foothills of Yıldız Mountains. The primary karstic formations [3] located in and around Kırklareli province are as follows:

- Limestone pavement: It is the formation of small channels, grooves and holes formed on the stone after the rainwaters melt the calcic stones in dip slopes. It is widely seen in the mountain areas of Vize and Pınarhisar districts;
- Cave: Underground spaces created by water in karstic areas. There are a lot of caves along the valley in Soğucak Village of Vize district.
- Mesa: In the Vize plateau, depending on the progress of the corrosion, the limestone which covered the whole area at the beginning cracked and took the resemblance of a table. These kinds of plains stoned with a hard layer over a horizontal structure are called "Mesas". There are a lot of mesas in the Dere Kayalıkları region of Vize district. The most interesting of these is the Göztepe Hill (450m). With the limestone on this hill melting, limestone pavements were formed. (Ref. 6.10).

The province of Kırklareli is located in the Yıldız Mountains and Ergene Lowland sections of Marmara Region and is surrounded by Bulgaria to its north, Black Sea to its northeast, Tekirdağ to its south and southeast and Edirne to its west. Especially Demirköy (including İğneada town) and Kıyıköy town of Vize district are located inside the Marmara basin. The amount of ground water allocated to be used for drinking, tap, industrial water by the residents of Marmara basin and to be used by irrigation cooperatives (for irrigation activities conducted via groundwaters) is (273,73 + 23,98) x 106 = 297,71 x 106 m^3/year and this number amounts to the total of present groundwater management reserve (296,96 x 106 m^3/year) (Table 6.72) (Ref. 6.33).

Table 6.72: Utilization of Marmara Basin Groundwater Potential

Groundwater Management Reserve (hm^3/year)	Utilization Document Allocations given to the people for drinking-tap, irrigation, industry etc. purposes (hm^3/year)	Reserve Allocated to Groundwater Projects (hm^3/year)	Groundwater Irrigation Projects and Estimated Irrigation Area (Decare)	Groundwater Irrigation Projects and Number of Estimated Wells (number)	Groundwater Irrigation Projects and Constructed and Assigned Wells (number)	Groundwater Irrigation Projects and Constructed and Assigned Irrigation Areas (Decare)
296.96	273.79	23.98	31.000	86	56	19.610

The information delivered to us and requested from the State Hydraulic Works via letter no 348517 dated 24.05.2017 in the frame of this EIA study is as follows (**Annex-6.G**):

Low outflows generated by rainfall on the pre-Permian and Triassic-Jurassic rocks forming high sections of the Project Site and its immediate vicinity via the crack systems and rivers formed by runoffs which the rainfall on the rocks created, feed the alluvials and are discharged to Black Sea. Also, the tertiary

[3] The molten formations created by the rainwaters melting the limestones are called Carstic formations".

age limestone formations formed by rainfall create groundwater actives. Other detritic and clay based formations in the basin contain partial groundwater. But their lithologic features have no importance in a hydrogeological aspect.

Eocene era limestone aquifer is the most important aquifer of the Project area and it is located under the Oligocene in high pressure conditions. The unit which has Karstic properties is permeable and show secondary porosity. The unit has outflows from the cracks and the contacts of impermeable units.

The Quaternary alluvial unit consists of unstuck matters (formations) such as block, gravel, sand, and silt, clay deposited in rifts, valleys and stream beds. 05.-1L/s of water can be drawn from the caisson wells opened by the people in the alluvials located in valley floor.

Since there is only a limited amount of wells on the actives around the Project area, the hydrogeology map is created considering the present well information and is presented in Figure 6.93 and **Annex-6.G**. Moreover, the information concerning the hydraulic properties of wells dug in near vicinity and actives is presented in Table 6.73 below.

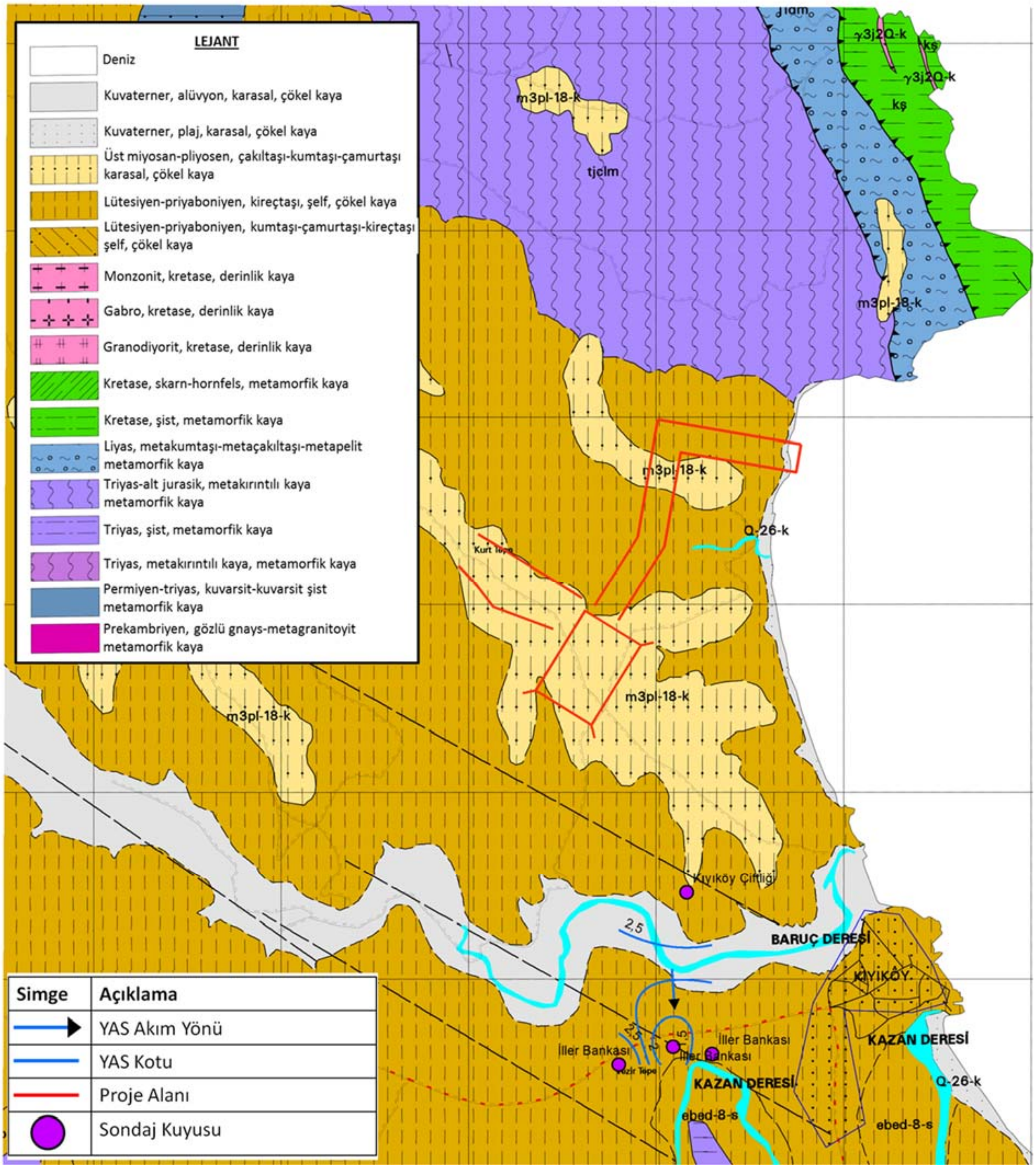


Figure 6.93: State Hydraulic Works Geology, Hydrogeology Map

Table 6.73: Hydraulic Features of the Wells in Project Area

Well_Name	X	Y	ELEVATION	GROUNDWATER LEVEL	GROUNDWATER ELEVATION	Yield	Hydrogeological Unit	Symbol	Well Depth (m)
Kıyıköy Farm	590163	4610464	37.97	35.3	2.67	1.50	Kırklareli Limestone (clayed-sandy, corrosion holes in some places)	ebed-8-s	120,00

Well_Name	X	Y	ELEVATION	GROUNDWATER LEVEL	GROUNDWATER ELEVATION	Yield	Hydrogeological Unit	Symbol	Well Depth (m)
İller Bankası (Provincial Bank of Turkey)	589802	4609548	74.03	71	3.03	7.50	Kırklareli Limestone (clayed-sandy, corrosion holes in some places)	ebed-8-s	152,00
İller Bankası (Provincial Bank of Turkey)	590091	4609642	52.15	51	1.15	7.35	Kırklareli Limestone (clayed-sandy, corrosion holes in some places)	ebed-8-s	152,00
İller Bankası (Provincial Bank of Turkey)	590298	4609604	43.29	41	2.29	8.50	Kırklareli Limestone (clayed-sandy, corrosion holes in some places)	ebed-8-s	152,00
Halil Ersöz	590585	4610278	6.99	0.5	6.49	1.00	Alluvial	Q-26-k	50.00

6.5.2 Hydrological Features of Surface Water Springs

The Region of Thrace consists of two major hydrological basin; Meriç-Engene and Marmara Basins. General hydrological information concerning the Marmara and Ergene basins are given in Table 6.74. Kıyıköy town of Kırklareli province's Vize district in which the project is located, is hydrologically inside the Marmara Basin Therefore the hydrological factors of the Marmara Basin are taken into consideration in the assessments made in this chapter.

Table 6.74: General Information Concerning the River Basins

River Basin Name	Precipitation Area (km^2)	Average Annual Flow (km^3)	Average Annual Yield (l/h/km^2)
Meriç-Ergene Basin	14.560	1.33	2.9
Marmara Basin	24.100	8.33	11.0

According to the information gathered from Marmara Basin Action Plan Final Report (2010) prepared by the Scientific and Technological Research Council of Turkey (TÜBİTAK) Marmara Research Center (MAM) Environment Institute, the average flow stated for Marmara Basin is 5.08 x 10^9 m^3 (6.69 L/h.km^2 and this amounts to the 2.77% of Turkey's potential surface waters. (Ref. 6.33). The usable part of this potential estimated to be ~2,54 x 10^9 m^3/year by using the average usable surface water ~50%. The groundwater management reserve of Marmara Basin is 297 x 10^6 m^3/year and it is estimated that its groundwater potential will be ~396 x 10^6 m^3/year (by accepting the management reserve is the ~75% of the groundwater potential). The total water potential is calculated to be 5,476 x 10^9 m^3/year when 5,08 x 10^9 m^3/year surface and ~396 x 10^6 m^3/year groundwater potential is taken into consideration.

In the Region of Thrace where the Project Area is situated, there are three dams on Kazandere, Pabuçdere and Sazlıdere (one on each) around the Project Area. By connecting Kazandere and Pabuçdere dams via a 2.507m long 4.5m wide tunnel the excess water in Kazandere was transferred to Pabuçdere's reserve and 60 million m³ of water from Yıldız Mountains is being supplied to İstanbul annually. The dam has a basin area of 178,5 kilometer-square. Sazlıdere dam is among the most important water sources of İstanbul with 55 million m³ annual capacity. Sazlıdere dam lies 20km long east to west, has a width of 9km north to south and has a 165 kilometer-square basin area (Ref.6.4).

The Project Area is situated inside the Pabuçdere basin. The basin area is mostly covered with Middle-Upper Eocene aged limestone. The limestone is bordered by Paleozoic and Mesozoic aged impermeable metamorphic base rocks (Figure 6.4394). Karstic formations such as dolines and caves are very common in the area. The thickness of the karstic limestone changes from 40m to 400m depending on the palaeotopography of underlying metamorphic units. It is recorded that the limestone over which the Pabuçdere river flows can reach up to 250m. The amount of limestone reduces towards the areas where the metamorphic rocks outcrop.

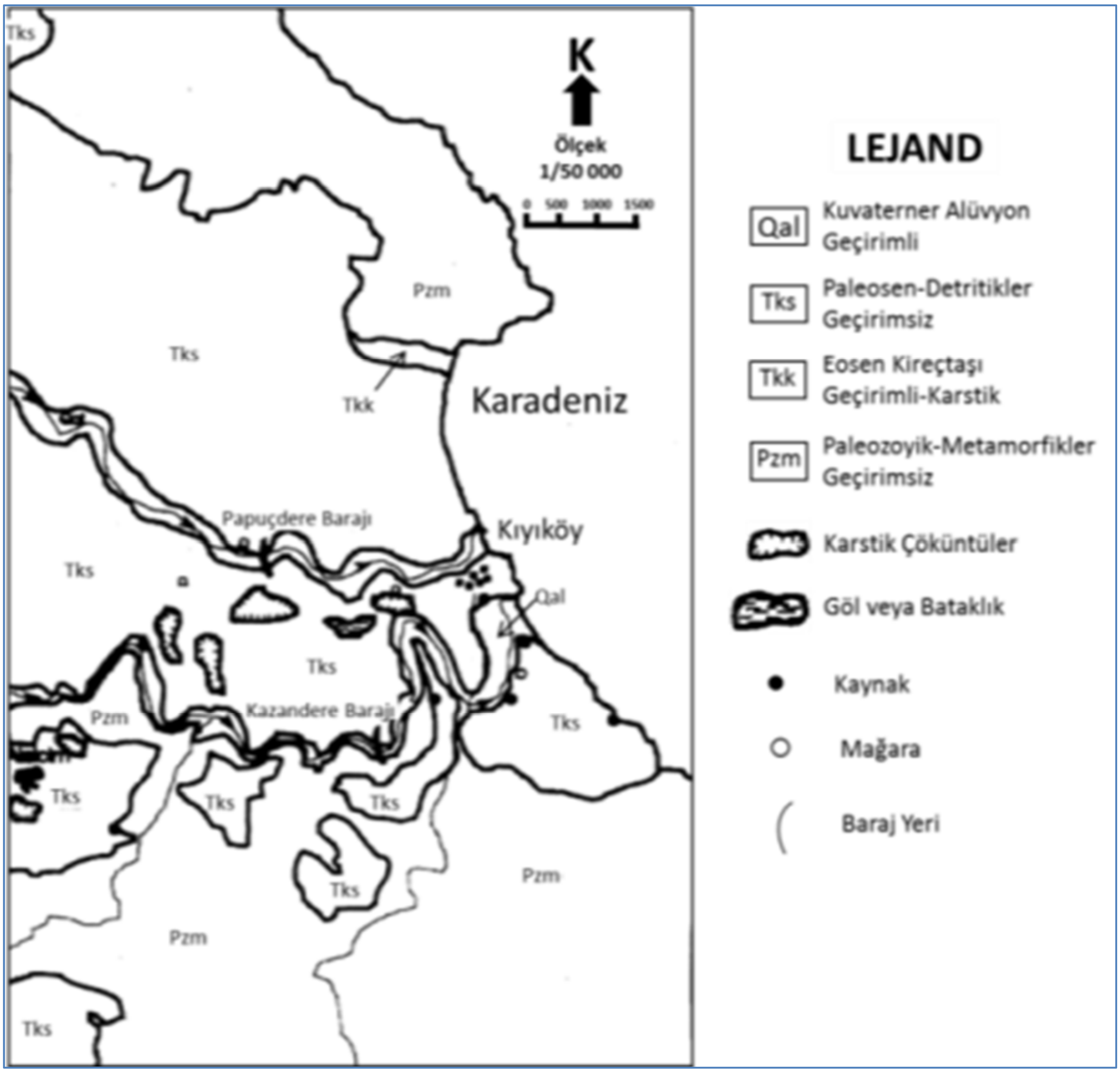


Figure 6.4394: Hydrogeology Map of the Basin

Dolines are commonly observed karstic formations in the area. Nevertheless, the drainage of the basin is provided mostly by surface drainage. There are 21 springs in the Basin with various flow rates which drain different lithologic units. The biggest internal spring (640l/h) in the Basin drains at 110m elevation. Hydrological analyses show that the water supply is balanced. This result may point out that the feed is equal to the surface flow and spring drainage in the basin and thus the drainage into the sea is non-existent or unimportant in this area near the sea shore.

It is observed that most of the dolines in the basin are either covered or about to be covered by surface waters (Figure 6.95). This situation is evaluated as an indication of surface drainage becoming dominant in the basin again. The existence of constantly submerged dolines is another indication. The deceleration or stopping of drainage caused these karstic formations to take the appearance of a lake or swamp. Morphologic evaluations made on the aerial photos led to the conclusion that even though the metamorphic units in the area are deep, the connection base is shallow. Especially in the areas where the submerged karstic depressions are present, the metamorphic base is extremely close to the surface (9m). On the other hand, it is determined that the surface drainage became dominant and the dolines contributing to the underground drainage became a part of the valleys after being covered by river branches (Figure 6.95). The limestone thickness does not exceed 50 meters in these sections where the dolines are covered by river branches. In these areas the karstification base in the Basin gets shallow. The presence of karstic rocks starting from sea level shows that the active karstification depth starts from this level. Even though the permeability is high in sections closer to the surface in the Basin, the impermeability of the limestone increases in deeper sections.

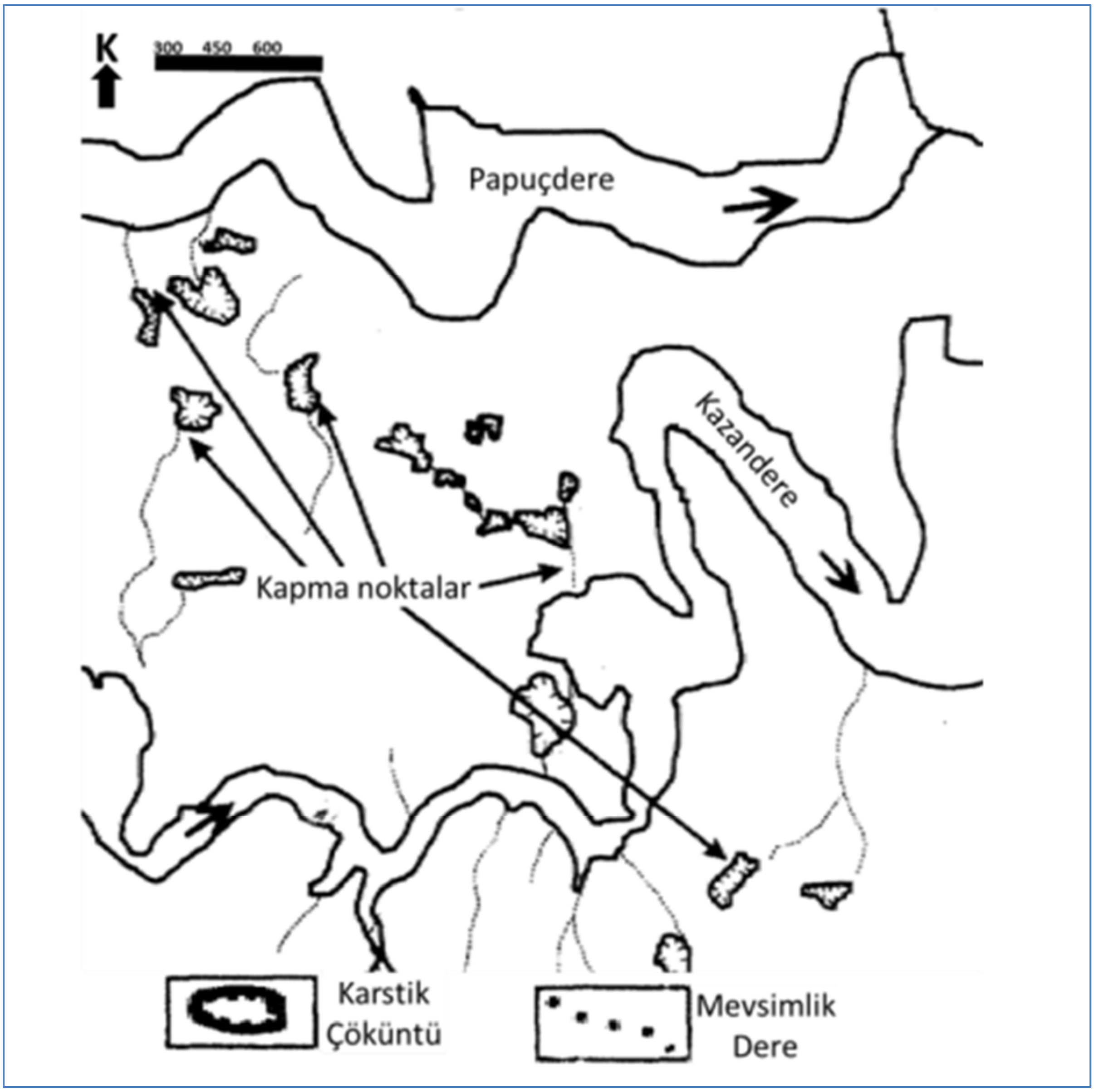


Figure 6.95: Karstic Depressions Being Covered by Branches of Pabuçdere and Kazandere Streams

6.5.3 Hydrogeological Features of Ground and Thermal Water Springs (water levels, volume, safe gravity values, spring flow rates, present and planned utilization)

6.5.3.1 Groundwater

The total groundwater potential of Kırklareli province is 125 hm^3/year. It is known that the drinking and tap water is supplied from Kırklareli dam which is 95% surface water according to the data of 2013. There are also Bademlik Quarter, Karahıdır Quarter, Pınar Quarter and Karacaibrahim Quarter water wells which have approximately 10lt/s capacity and which can be redirected to water network to be utilized as tap water if necessary in the province in addition to Kırklareli dam. Generally drinking and tap water sources consist of surface and groundwaters.

It is pumped from 20 deep (1.386 m^3) groundwater wells in Lüleburgaz Municipality. The drinking water storage is 8.400 tons (metric). The monthly and annual drinking water consumption is 318.087m^3 and 3.618.139 m^3 respectively.

There are 2 deep- wells in Pehlivanköy Municipality and they are distributed to the water network by being pumped to the water reservoir (300m^3). The monthly and annual drinking water consumption is 9.000m^3 and 108.000 m^3 respectively.

In Demirköy Municipality drinking water is being supplied from 6 springs in total, 5 deep underground and 1 surface springs. The monthly and annual drinking water consumption is 34.666 m^3 and 415.000 m^3 respectively.

In Babaeski Municipality, drinking water is being supplied from 5 deep-wells. The monthly drinking water consumption is 83.33 m^3 and the annual drinking water consumption is 1.000.000 m^3.

The distribution of water, depending on the source, supplied in order to be distributed via drinking and tap water networks by the municipalities in Kırklareli province in 2013 is as follows; 4% Streams, 5% Ponds, 40% Dams, 28% Wells and 23% Springs. The groundwater potential and utilization amount of Kırklareli province is shown in Table 6.75 and Table 6.616.

Table 6.75: Groundwater Potential of Kırklareli Province

Plant	Unit	Kırklareli
Groundwater Irrigation	Amount	21
	Number of Wells	136
	Allocation (hm^3/year)	45.1
	Yield (ha)	6.056

Table 6.6176: Name, Current Condition, Potential of the Sources Supplying Drinking Water

Water Sources Potential	
Groundwater	125 hm^3/year
Total water potential	1.262 hm^3/year
Natural lake surfaces	363 ha
Dam reservoir surfaces	1.907 ha

In order to determine the quality of groundwater sources near the Project Area, a water sample has been taken from a fountain located near the Project Area by Artek Laboratory and microbiological, chemical, indicator and radioactivity parameter analyses were conducted within the scope of Regulation Concerning Water Intended for Human Consumption. The results of these analyses are shown below in Table 6.627,Table 6.638,Table 6.649 and Table 6.80. The analysis reports are presented in **Annex-6.D**.

Table 6.627: Analysis Results Assessment According to the Parameters of Regulation Concerning Water Intended for Human Consumption and Limit Values (Microbiological Parameters)

Parameter	Regulation Limit Value	Analysis Result
E.coli	0/250 mL	0
Enterococcus	0/250 mL	0
Coliform Bacteria	0/250 mL	0
P.aeruginosa	0/250 mL	0
Anaerobic sporophyte sulfite-reducing bacteria	0/50 mL	0

Parameter	Regulation Limit Value	Analysis Result
Pathogen Staphylococci	0/100 mL	0
Enumeration of Colony in 22°C	20/mL	10
Enumeration of Colony in 37 °C	5/mL	< 1
Parasites	0/5 L	0

Table 6.638: Analysis Results Assessment According to the Parameters of Regulation Concerning Water Intended for Human Consumption and Limit Values (Chemical Parameters)

Parameter	Unit	Regulation Limit Value	Analysis Result
Acrylamide	µg/L	0.1	< 0,05
Antimon (Sb)	µg/L	5	< 5
Arsenic (As)	µg/L	10	< 5
Benzene	µg/L	1	< 1
Benzo(a)pyrene	µg/L	0.01	< 0,0000001
Boron (B)	mg/L	1	0.27
Bromate	µg/L	10	**3300**
Cadmium (Cd)	µg/L	5	< 0,5
Chromium (Cr)	µg/L	50	2
Copper (Cu)	mg/L	2	0.003
Total Cyanide	µg/L	50	10
1,2 Dichloracethane	µg/L	3	< 1
Epichlorhydrin	µg/L	0.10	< 0,1
Fluoride	mg/L	1.5	0.75
Lead (Pb)	µg/L	10	5
Mercury (Hg)	µg/L	1	0.08
Nickel (Ni)	µg/L	20	< 5
Nitrate	mg/L	50	1.999
Nitrite	mg/L	0.5	< 0,0066
Pesticides	µg/L	0.1	< 0,06
Total Pesticides	µg/L	0.5	< 0,7
PAHs (Polyaromatic Hydrocarbons)	µg/L	0.1	< 0,0000007
Selenium (Se)	µg/L	10	< 5
Tetrachlorethane	µg/L	10	< 1
Trichloroethane			< 1
Trihalomethanes-total	µg/L	100	< 4
Vinyl Chloride	µg/L	0.5	< 0,5

Table 6.649: Analysis Results Assessment According to the Parameters of Regulation Concerning Water Intended for Human Consumption and Limit Values (Indicator Parameters)

Parameter	Unit	Regulation Limit Value	Analysis Result
Aluminum (Al)	µg/L	200	34
Ammonium	mg/L	0.5	< 0,026
Chloride	mg/L	250	15.4
C.perfringens	number/100 mL	0	0
Color	Pt/Co	Acceptable for consumers and no abnormal changes	< 2,22
Conductivity	µS/cm	2500	879
pH	-	≤ 9.5-6.5 ≤	7.92
Iron (Fe)	µg/L	200	20
Manganese (Mn)	µg/L	50	6
Smell	TON	Acceptable for consumers and no abnormal changes	< 1
Oxidizability	mg/L O_2	5	< 0,5
Sulphate	mg/L	250	66.2
Sodium (Na)	mg/L	200	59.26
*Taste	FTN	Acceptable for consumers and no abnormal changes	-
Enumeration of Colony in 22°C	cfu/100 mL	No abnormal changes.	10
Coliform Bacteria	cfu/100 mL	0	0
Total Organic Carbon (TOC)	mg/L	No abnormal changes.	1.58
Turbidity	NTU	Acceptable for consumers and no abnormal changes	< 0,2

* No analysis of taste parameters was made because microbiological reproduction was observed in the sample.

Table 6.80: Analysis Results Assessment According to the Parameters of Regulation Concerning Water Intended for Human Consumption and Limit Values (Radioactivity Parameters)

Parameter	Unit	Regulation Limit Value	Analysis Result
Tiritium	Bq/L	100	< 10
Total Indicator Dosage	mSv/year	0.1	0.046

6.5.3.2 Geothermal

Geology and geophysics surveys were conducted in 2013 within the geothermal resources search license registered in and around Kırklareli province. In the light of data gathered from the studies, drilling operations were conducted in Central District Asılbeyli village.

The results of the drilling operations conducted near Central District Asılbeyli village of Kırklareli province are shown below in Table 6.81.

Table 6.81: Kırklareli Central Aslıbeyli (KMA-2014/07) Well

Temperature	Well Top: 57^0C
Flow Rate	30L/h with compressor
Depth	1.500m
Completion Date	November-2014

In addition to these, according to the geothermal resources and application map and geothermal resources and volcanic areas map of Turkey published by General Directorate of Mineral Research and Exploration (MTA), no geothermal resource was found in and around the project area (Ref. 6.50).

6.5.4 Hydro-geological Impacts in the Frame of Works and Operations within the Scope of the Project and Measures for Controlling and Reducing Them (Field Preparation, Construction, Operation and Post-Operation)

In order to protect the groundwaters in every stage of the Project (field preparation, construction, operation and post-operation);

- Even though there are no estimations towards a need to using groundwater during the Project, in case there is a need, there will be no groundwater usage until getting the necessary permits in the scope of relative legislation;
- Storage areas, designed to provide secondary protection for hazardous materials and wastes which will be stored in the field, will be formed.
- In order to prevent the fluids from mixing with groundwater in case of a spill, hazmat spill kits will be present in the areas where the liquid materials are stored, the drainage systems of the areas where these materials are stored will be designed so as to prevent the spills and leaks from reaching the rainwater system;
- It will be ensured that the personnel, responsible for the management of hazardous materials and wastes, have the necessary and appropriate training;
- Environmental Legislation, especially the guidelines of Water Pollution Control Regulations and the Regulation Concerning Soil Pollution Control and Point Source Polluted Areas, will be followed.

No gases will be released from the chimney during the regular operation. Ventilation shall normally be executed during the planned maintenance and shut-down activities and emergencies inwhich the gas located in specific areas of the RT is needed to be released to the atmosphere. In such cases, it is not expected that the methane gas shall mix with the atmosphere and indirectly cause a negative effect on the surface water sources near the Project Area, due to the fact that the methane gas, which constitutes the main component of the natural gas, is lighter than air.

6.6 Bathymetric and Topographic Features

6.6.1 Offshore Section Bathymetry

As explained under chapter 6.3.2.2.3. (Bathymetry), 2-dimensional high resolution (2DHR) seismic, Multi Beam Echo Sounder (MBES) and Subbotom Profiler (SBP) for sea seismic studies were conducted using a Heather Sea Research Vessel in order to determine the bathymetry of Offshore Section of the Project.

During the studies, Multibeam Echo Sounder (MBES) data and digital pre-modelling data of the terrain were gathered primarily. In the following stages, the final Digital Terrain Model was prepared and used in creating the bathymetry maps. The sizes of the units were determined depending on the sea depth in the study area. Digital Terrain Models with different sizes are shown as follows;10x10m in Figure 6.446, 20x20m in Figure 6.457, 30x30m in Figure 6.468.

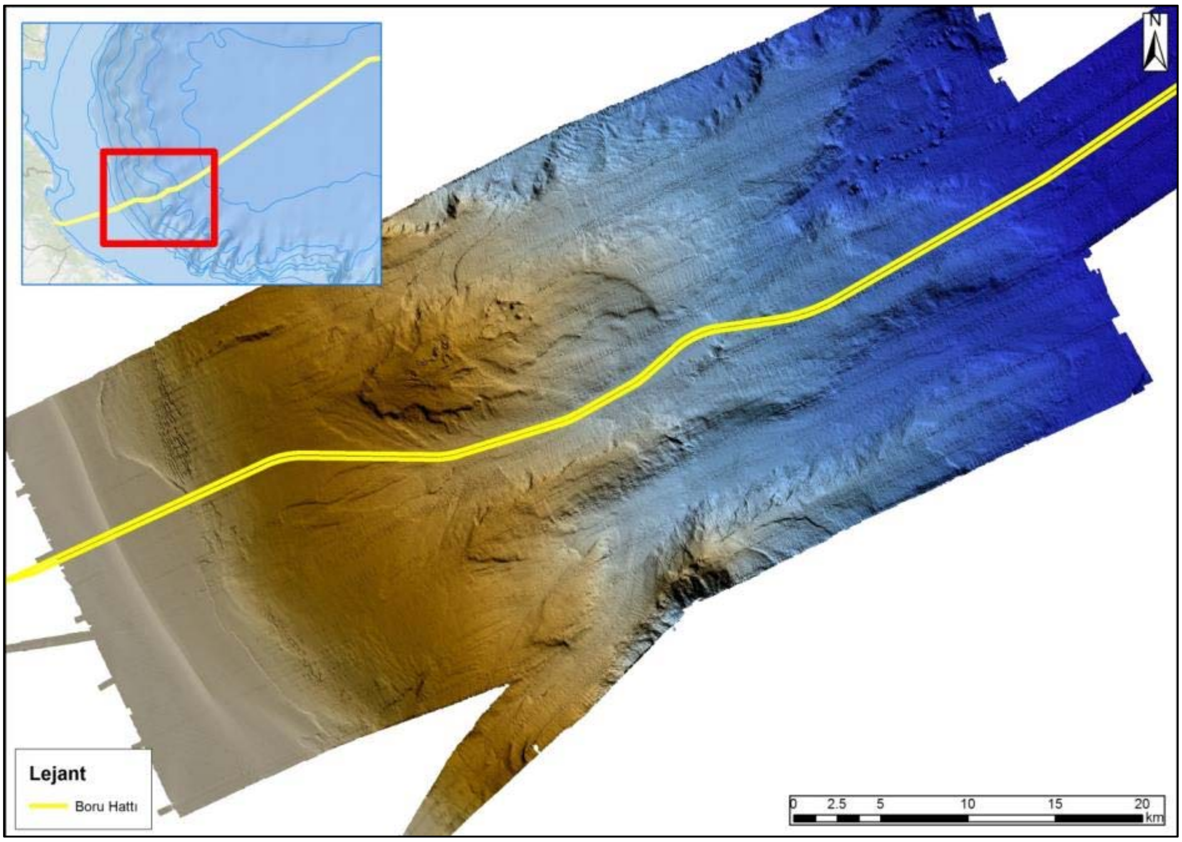


Figure 6.446: Unit size 10x10m and 20x20m

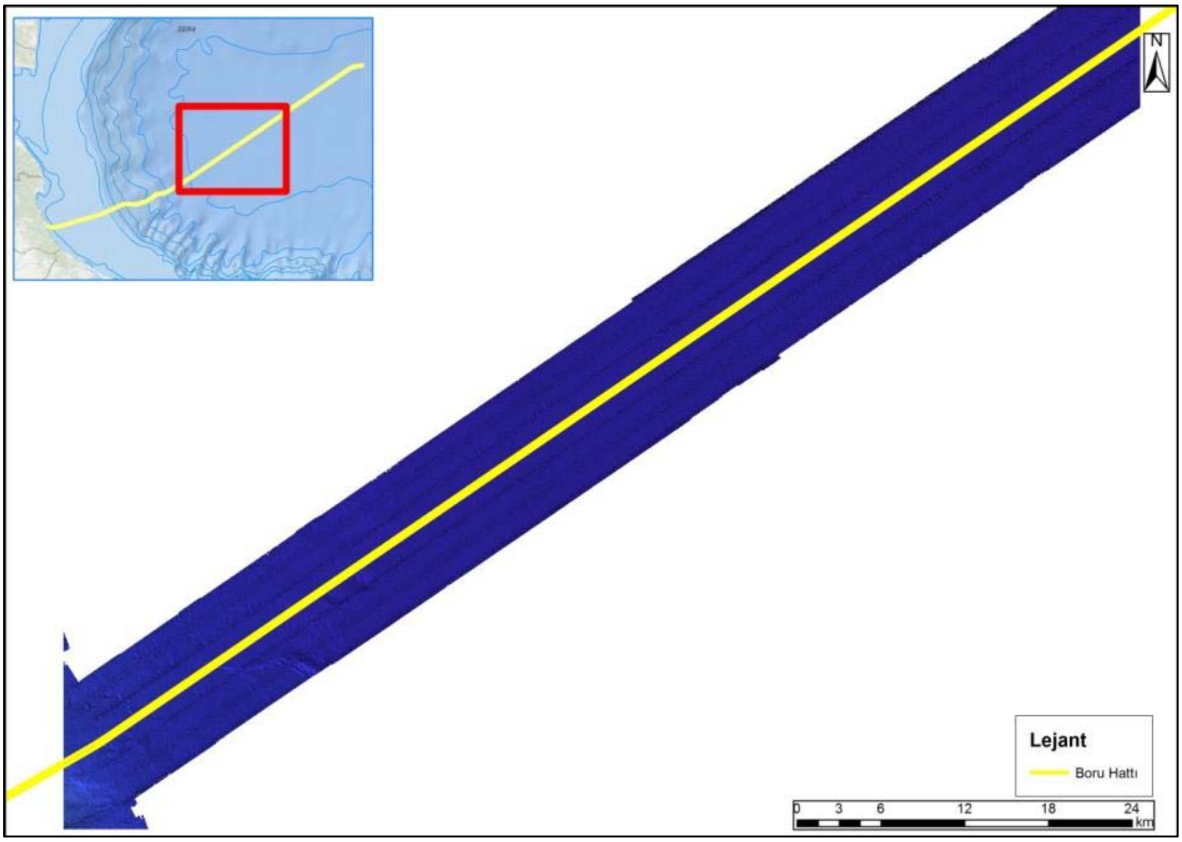


Figure 6.457: Unit size 20x20m and 30x30m

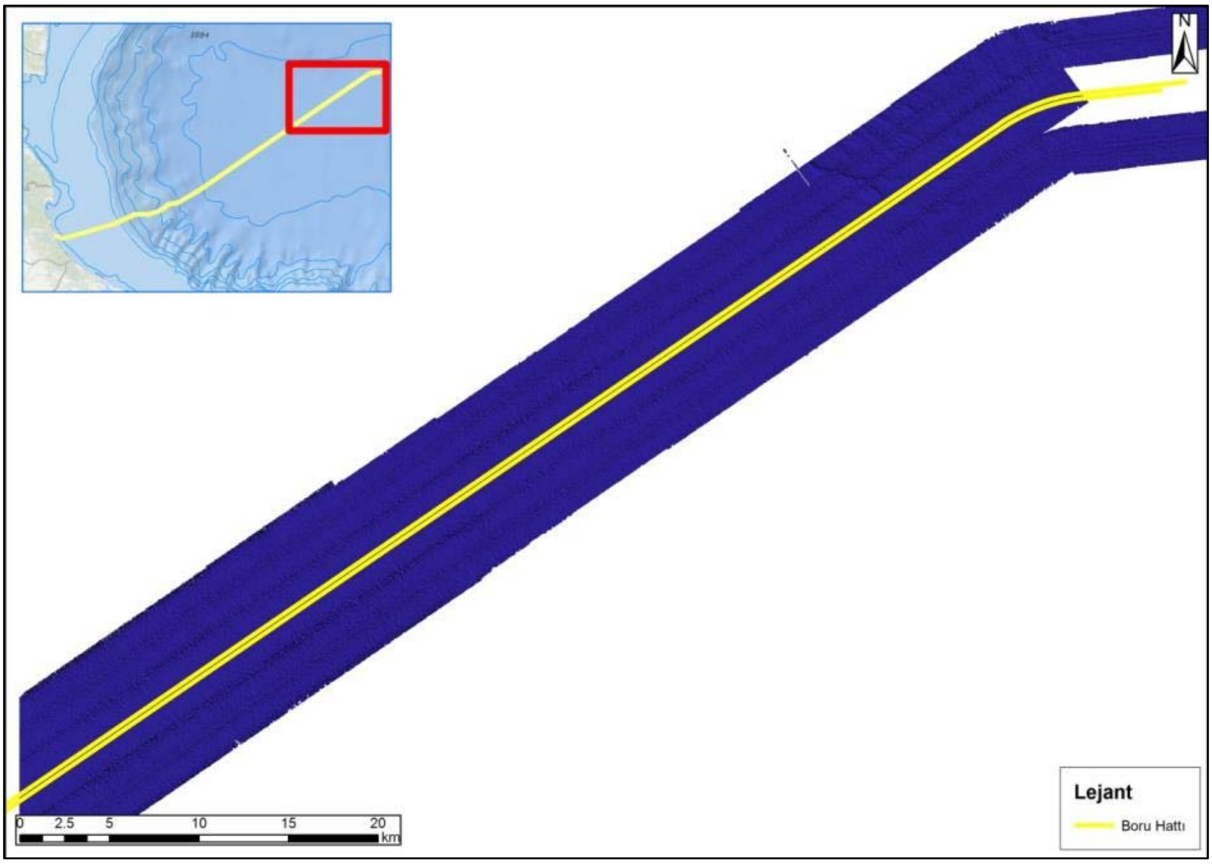


Figure 6.468: Unit size 30x30m

During the course studies, the geological risks below were observed on the seabed:

- Liquid exuding formations (mud volcanoes some of which may be gas exuding);
- Faults (some on the seabed);
- Gas stored sediments;
- Mass movements (different gravitational movements, mass transport talus); and
- Erosion channels.

The geological risks mentioned above are the results of preliminary assessment findings, detailed engineering surveys and the impact on the pipeline are continuing. After completion of this risk assessment, necessary design controls will be developed in order to avoid geological risks. A summary of the findings gathered in the preliminary assessments are presented below.

The visual of liquid exudation formations (possible mud volcanoes) detected on the seabed in Digital Terrain Model (DTM) is shown in Figure 6.479 and the gas exudation detected via Multibeam Echo Sounder monitors is shown in Figure 6.100.

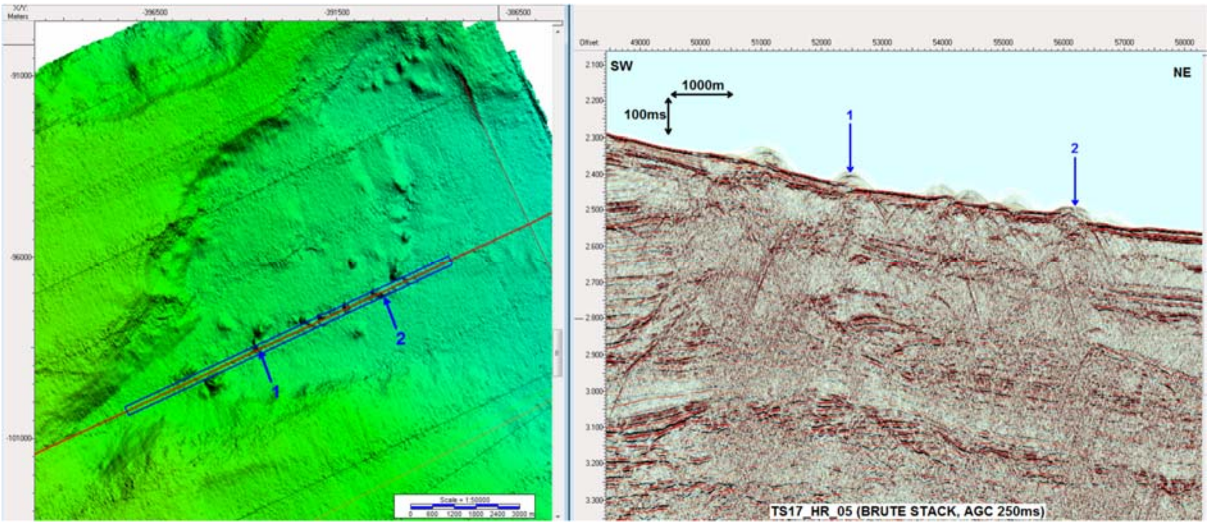


Figure 6.479: DTM (Left) and Liquid Exudation Formations on the Continental Slope Observed in High Resolution Seismic Data (Right)

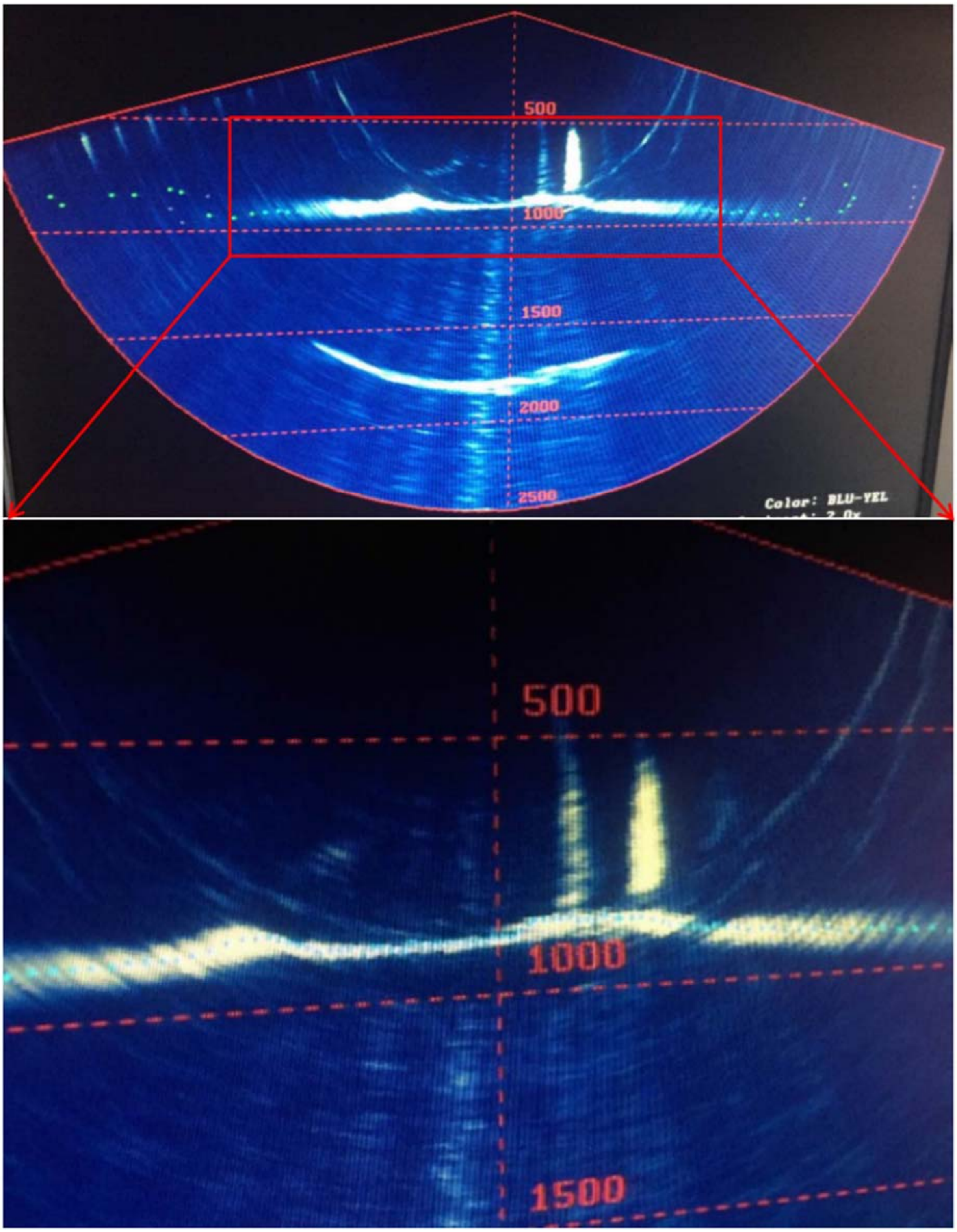


Figure 6.100: Gas Exudation Visuals Detected on the Multi-beam Echo Sounder Surveillance Monitor

The most distinctive gas storing sediments were observed on the upper levels of the continental slope. The gas storing sediments are shown as bright spot anomalies in the high resolution seismic (HRS) data (Figure 6.101).

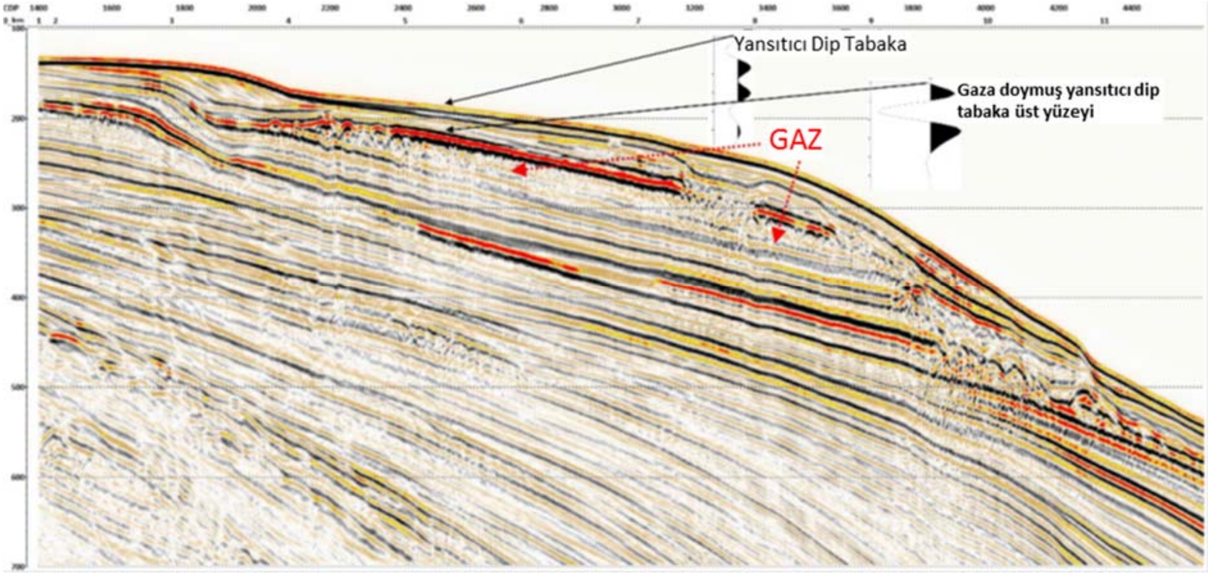


Figure 6.101: Gas Storing Sediments in HRS Data (Line TS17_HR_04)

On the continental slope different types of formations depending on the gravity were observed: In most Mass Transport Deposits (MTD) data these kinds of sediments are represented as acoustically transparent layers (frequently on upper levels, uneven big reflections). The MTD sample of Single Beam Echo Sounder data is given in Figure 6.102.

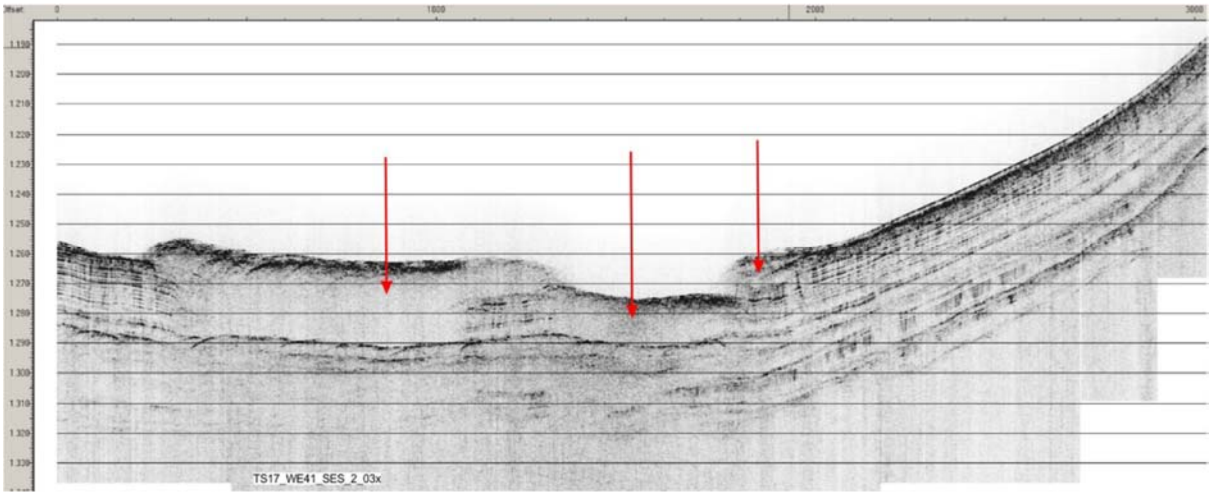


Figure 6.102: MTD sample of Single Beam Echo Sounder Data (Line TS17_WE41_SES_2_03x)

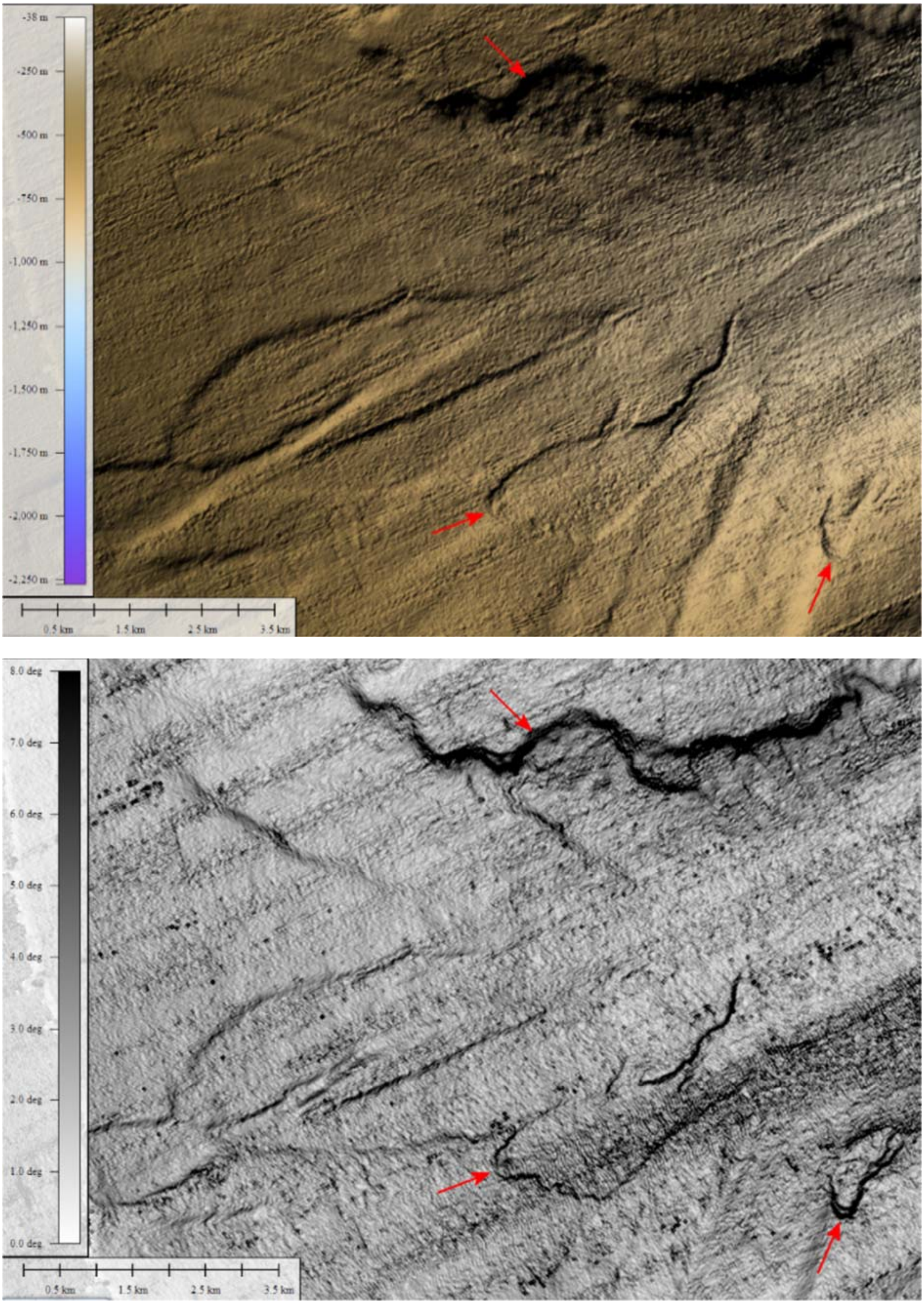


Figure 6.103: MTD (red arrow) in DTM data, Seabed Slope Angles

6.6.2 Shore Crossing Section Bathymetry

As explained under Chapter 6.3.2.2.3 (Bathymetry), MB Kemal Bey Research Vessel was used for determining the area from coastline to 5m water depth and MT Enad-1 research vessel was used for determining the area from 5m water depth to 30m water depth in order to determine de bathymetry of Shore Crossing Section. While the echo-sounder sensor was in MB Kemal Bey Research Vessel, the Multi Beam Echo Sounder (MBES), Side Scanning Sonar (SSS), Sub bottom Profiler (SBP); Sparker (SPK) and Magnetometer (MAG) sensors were mounted on MT Enad-1 research vessel.

Following the researches, the most important information about the Shore Crossing Section is the outcrop formation on the seabed (Figure 6.48104). The Shore Crossing Section is characterized with uneven seabed consisting of little northwest to southeast ridges exhuming or half exhuming on the seabed. The eastern sides of these ridges are usually steeper. In the remainder of the section the seabed is more even and becomes deeper towards east. The ridge being concentric towards the south indicates that there is a syncline towards the west. The seabed becomes deeper towards east and the water depth varies between 2 meters and 30 meters.

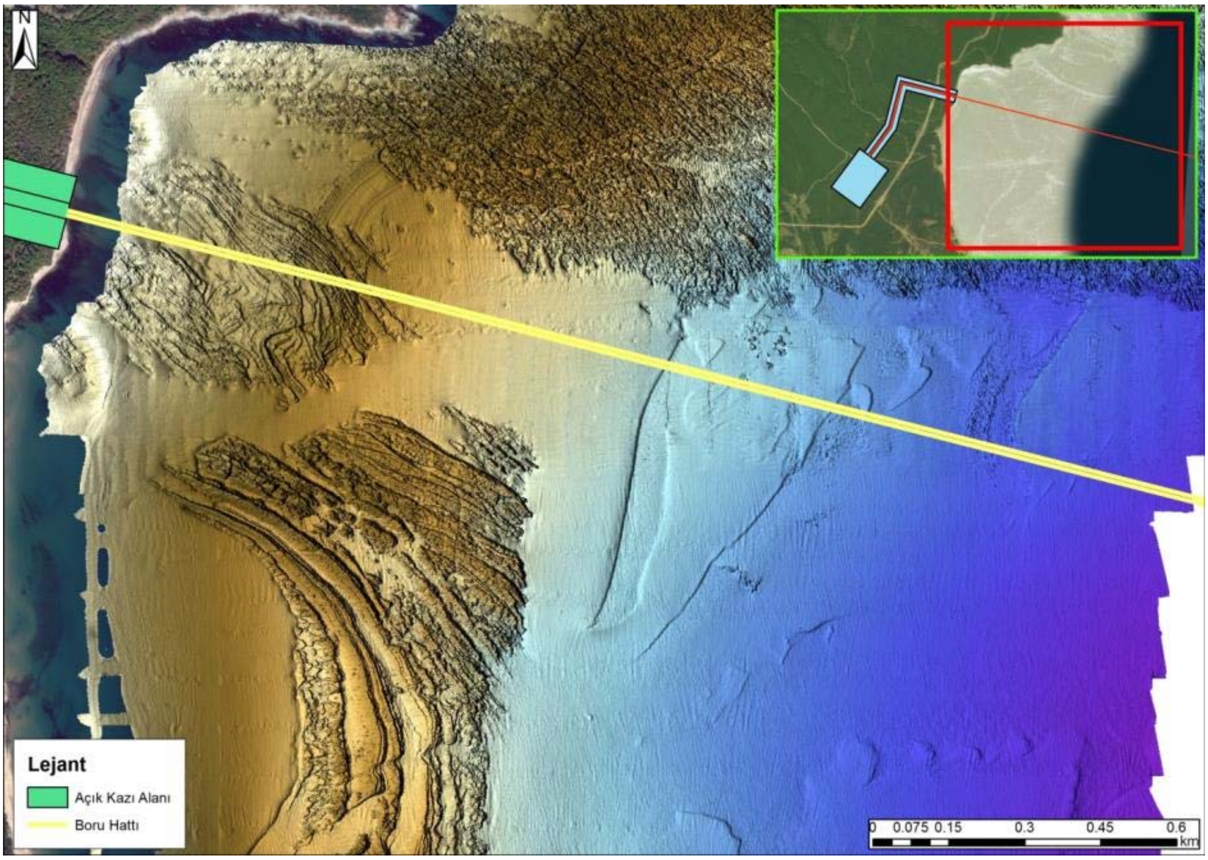


Figure 6.48104: Multi Beam Echo Sounder data: Shore Crossing Section

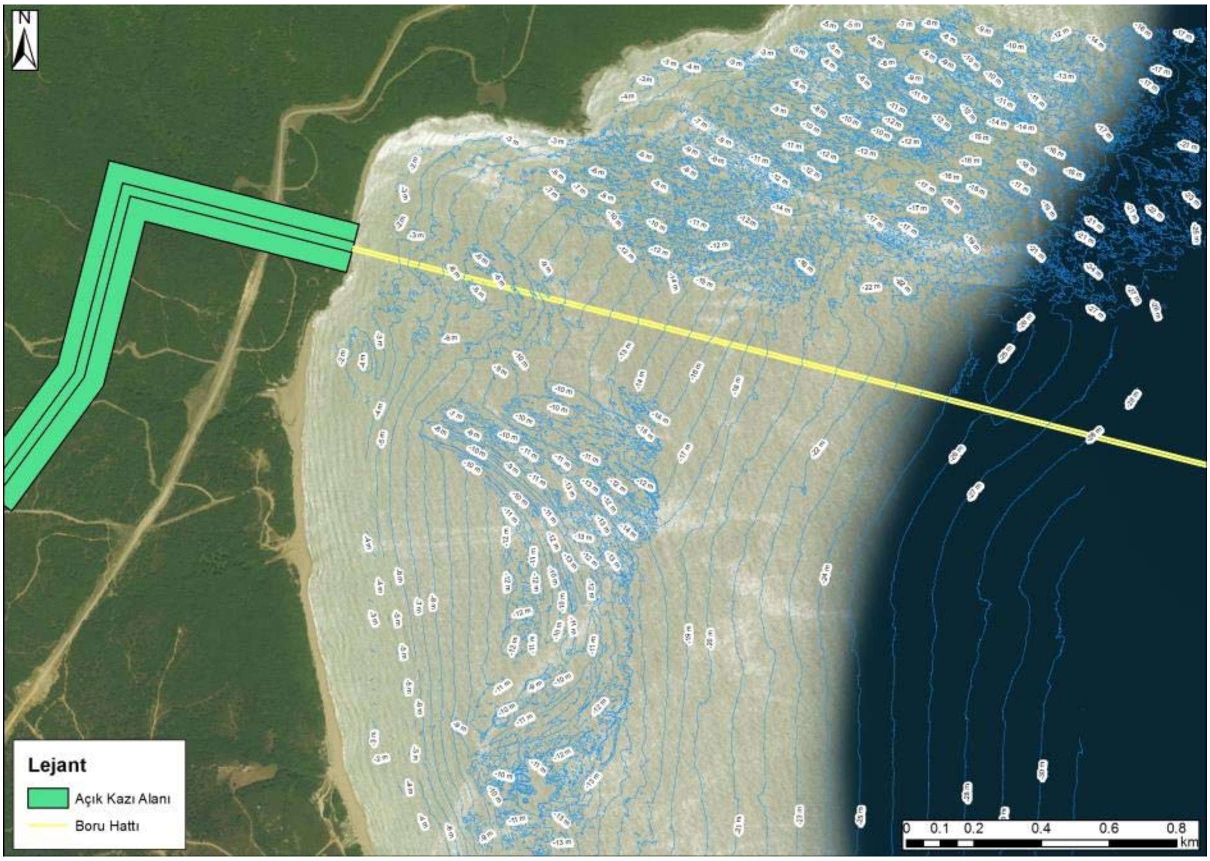


Figure 6.49105: Bathymetric Data: Shore Crossing Section

As a result of the assessments, the seabed of the Shore Crossing Section is characterized by three basic features:

- Fine-grained sand containing little hills formed by low back-reflection;
- Rock exhumations formed by mild and high back-reflections and which contains sea shells and bits within the fine-grained sand matrix; and
- Hills and large grained sand containing seashell bits formed by high back-reflection.

The North of the Shore Crossing Section is characterized with high-mild back-reflection. Some sand areas are defined as containing, exhuming or half exhuming bedrock. The south of the Shore Crossing Section is characterized with more fragmented low and mild-high backscattering areas. It is defined as fine and large grained sand containing little hills. It is more even that the north section except for two areas with exhumations.

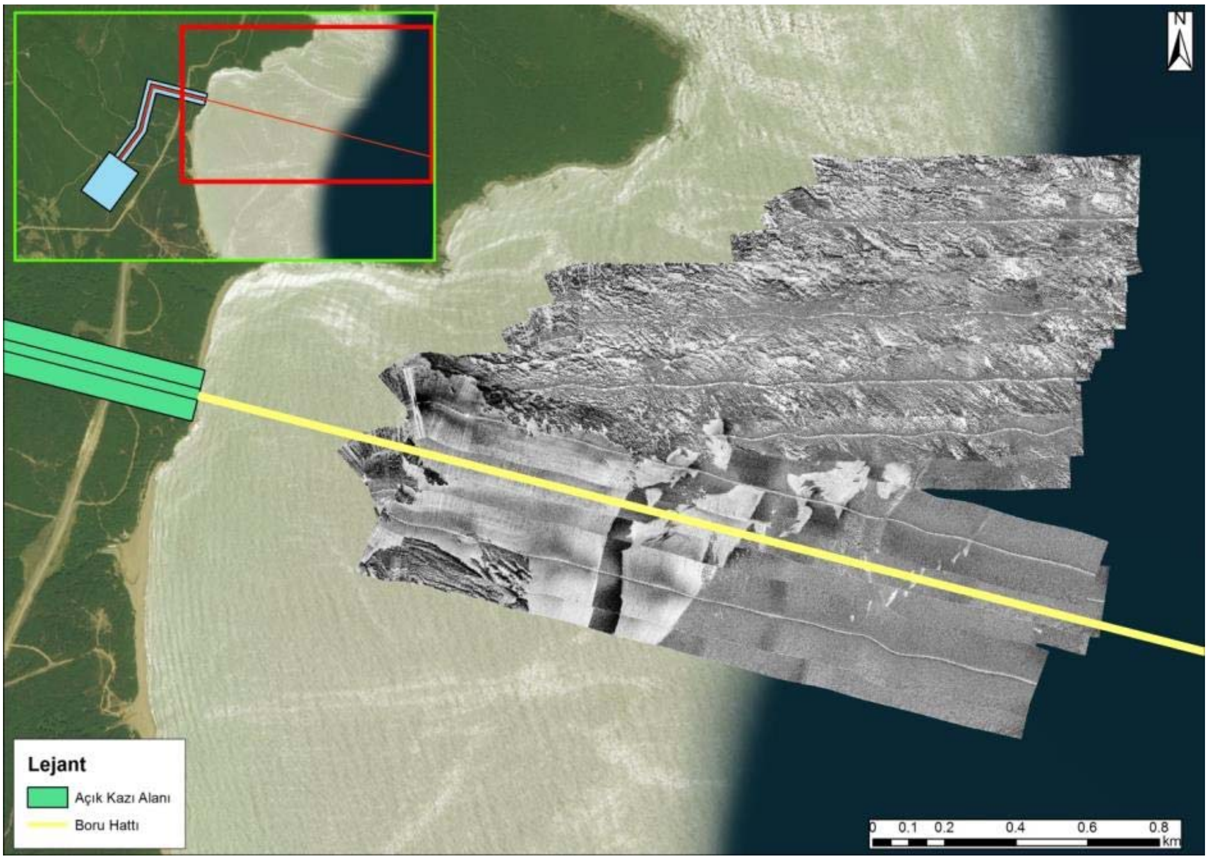


Figure 6.38 SSS MOSAIC Data Shore Crossing Section

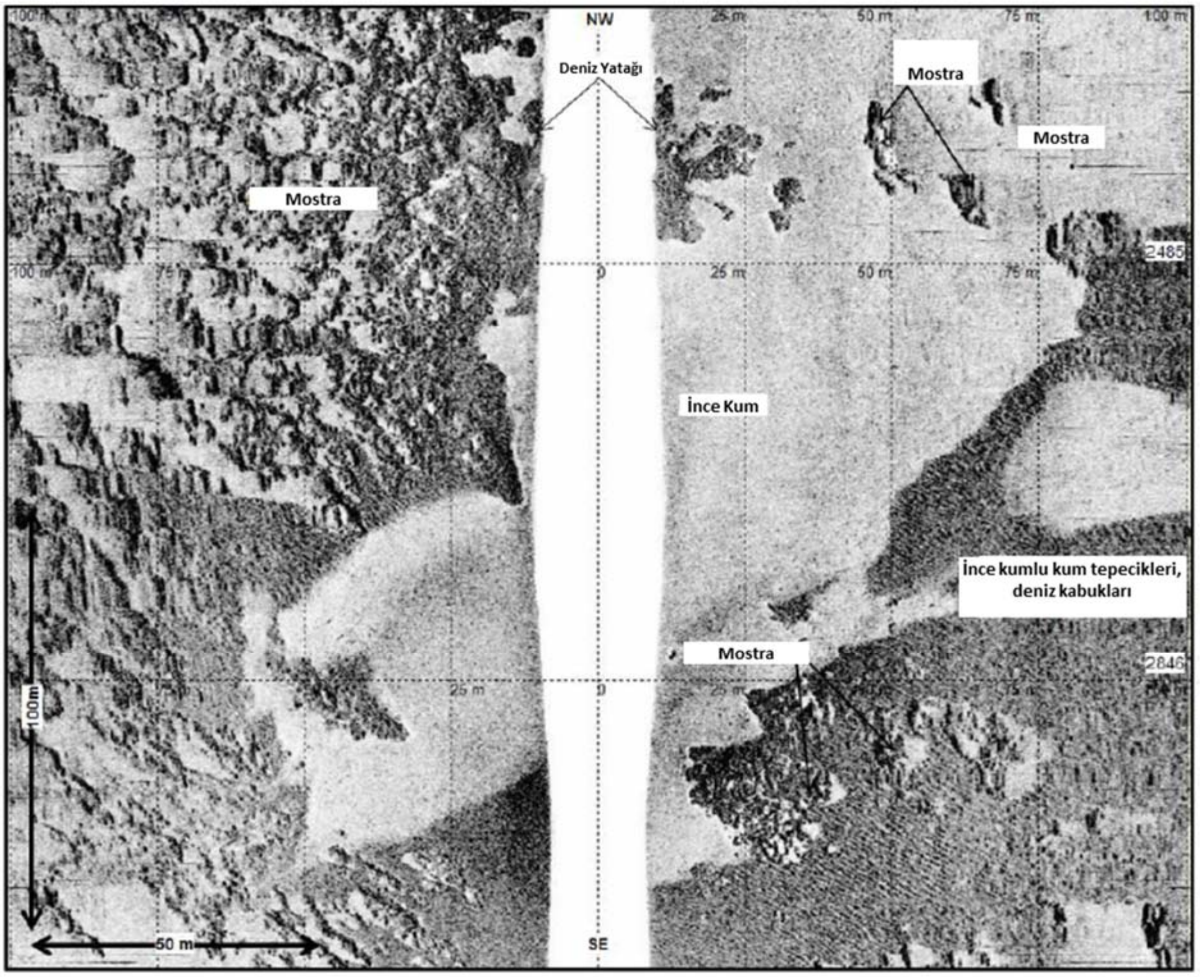


Figure 6.506: Sample of Side Scanning Sonar Data on the Line

Figure 6.517: Bedrock Exhumation

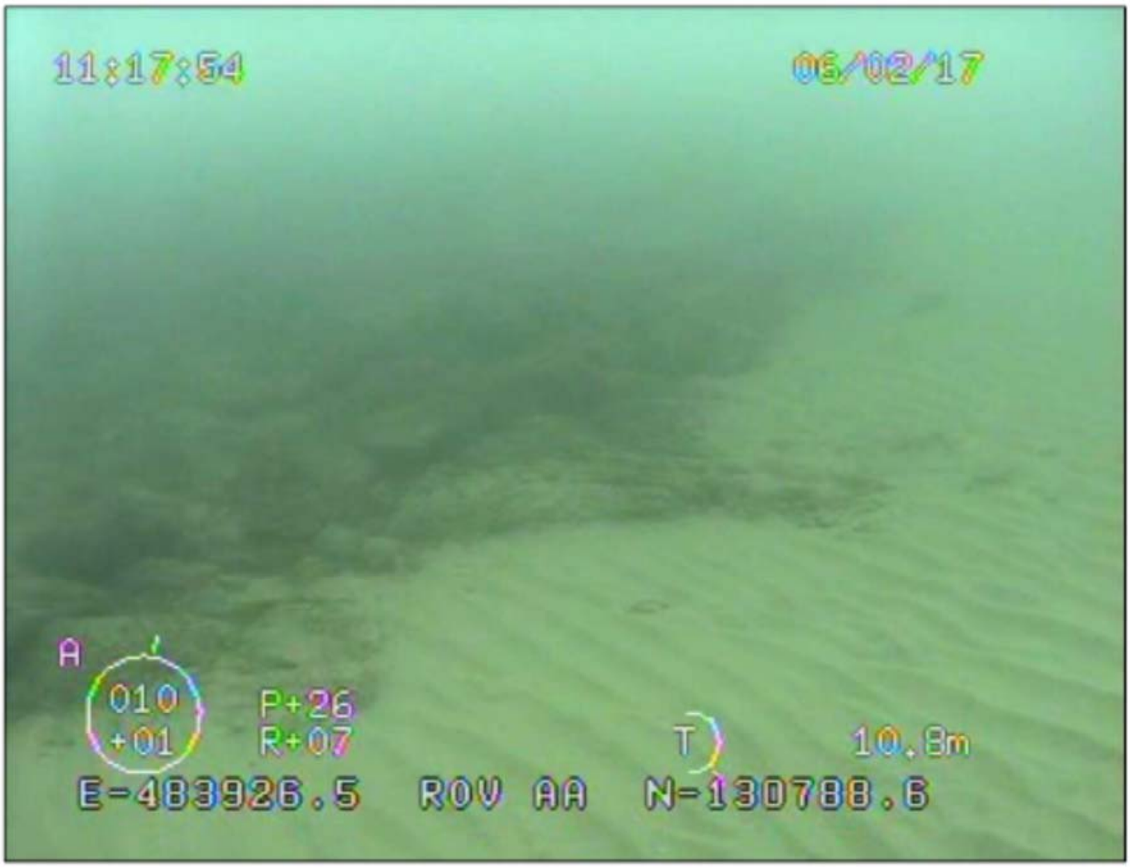


Figure 6.528: Fine-Grained Sand Hill and Bedrock Exhumation

Figure 6.539: Large Grained Sand Containing Seashell Bits

The shallow area geology which belongs to the Shore Crossing Section consists of three main units. These units are descripted below:

Unit QB: are the Anthropogene Tali. It is in transparent/ translucent seismic recording type which has discontinuities and weak internal reflectors. Usually accumulated via alluvials, conglomerate sediments, streams and coastal sands. The base of this unit is erosional surface and its thickness can vary from a few centimeters to 4,5 meters.

Unit 1: Its upper level dipping towards the west is cut by the erosional surface and it has Clinostratific reflectors. These internal reflectors are more distinctive towards the right section according to the signal absorption characteristic and they are constantly in a meandering state. Unit 1 has a structure-wise fragmented morphology where it exhumes on the seabed. It has medium-thick layering which consists of karstic reef limestone containing fossils and arenaceous limestone. It can be observed in the southwest and west of the Shore Crossing Section of the Project.

Unit Jsm: It is in transparent seismic recording type according to the acoustic signal absorption of the bedrock. It has a structure-wise fragmented morphology where it exhumes on the seabed. Turbiditic type alkaline ebonite consists of interbedded meta-greywacke, meta-psammite, meta-tuff and quartz schist units.

6.6.3 Onshore Section Topography

Kırklareli is a mountainous and plateaus terrain due to its geographic position and 48% of the province is covered by mountains. The most important elevation of the area is Yıldız (Strandzha) Mountains which lie in northwest to southeast direction. Even though there are structural differences between the North Anatolia Mountains and Yıldız Mountains, the Yıldız Mountains are considered an extension of the North Anatolia Mountains because they lie in the same direction. The highest peak of these mountains is the Mahya Peak (1031m) located between Pınarhisar and Demirköy districts. Other significant elevations of Yıldız Mountains are Karamanbayırı Peak (986m), Boyunduruk Peak (958 m), Fatmakaya Peak (901m), Paraşüt Peak (877 m), Sivri Peak (851m) and Kale Peak (846m). Towards the Ergene Lowland, mountains descend and are replaced by low elevation lowlands.

The topography of this zone can be characterized as hilled and mountainous. Towards the west of the Project Area, even though the valleys, forming over the metadetritic units, is shallow and has a "V" shape, they take step valley form by passing through sediment units towards the Black Sea. The shore strip of the study area consists of uneven perpendicular rocks. The rocks are 25m high on average. Capes formed out of more rigid rocks have tens of meters more height towards the sea. It forms a narrow wave-cut terrace on the metamorphic and sedimentary rocks located in front of the cliff. Karstic surface formations were developed in the Soğucak Formation which contains limestone and carbonated mudstone in and around the Project Area.

6.6.4 Coastal Marshalling Yards

Samsun and Trabzon ports are considered as marshalling yards. Detailed assessment concerning the Marshalling Yards is presented in **Chapter 1** (General Characteristics of the Project).

6.7 Meteorological and Climatic Features

6.7.1 Meteorological and Climatic Features of the Region and Project Area

6.7.1.1 General Climate Conditions of the Black Sea

The Black Sea is one of the biggest inland seas in the world with approx. 420.000 km^2 surface area, water depth above 2.200m and 534.000 km^3 total water volume (Ref. 6.38). It is surrounded by Europe, Anatolia and Caucasia and connects to Mediterranean Sea via Bosporus, Gallipoli Strait and Aegean Sea.

Studying the formation of the Black Sea is important in order to evaluate its current physical conditions. Big earth crust movements caused the formation of mountains and the occurrence of the Alps, the Carpathian Mountains, the Balkan Mountains and the Caucasus Mountains during the Miocene period (5-7 million years ago) As a result the Tethys Sea (giant ocean basin lying from west to east throughout Southern Europe and Central Asia) shrinked and caused several salt water basins to form. One of these basins, Sarmatic Sea, covered the Black Sea, Azov Sea, the Caspian Sea and the Aral Sea of today. At the end of Miocene Period and the start of Pliocene Period (3-5 million years ago) a connection to the ocean from the Sarmatic Sea was formed, the salinity level was increased and new marine species joined the medium. During the Pliocene Period (1.5-3 million years ago), the ocean connection was cut again and the salt water was almost replaced by the fresh water Pontic Sea-Lake (Ref.6.51)

Pontic Sea-Lake separated from the Caspian Sea, the Black Sea and the Azov Sea after that, however temporary connections were formed between these seas during this period in various intervals. The salinity and the marine life of developing Black Sea continued to change with the Anthropogene Period and the start of Northern Hemisphere Glaciation. At the end of Elsterian Glacial Period (approx. 400.000 - 500.000 years ago), when the glacials started to melt, the Sea-Lake started to fill with melting waters and its general vicinity transformed in to Paleocenian Basin resembling today's Black Sea and Azov Sea. This basin connected to the Caspian Sea in northeast via Kuma-Manych depression and the Sea of Marmara in southwest via the Bosporus. At the same time the salinity of the Sea of Marmara was decreased since it had no connection to the Mediterranean Sea (Ref. 6.51).

Riss-Wurm Interglacial Period (100.000-150.000 years ago) created a new stage in the history of the Black Sea. The Black Sea was connected to the Atlantic Ocean and the Mediterranean Sea for the first time since the formation of Tethys Sea when the Gallipoli Strait opened. Approximately 18.000-20.000 years ago at the end of Wurm Glacial Period, the sea was filled by melt waters. Once again it has lost its connection to the ocean and its salinity was decreased greatly. It connected to the Mediterranean Sea via the Bosporus approximately 7.000 years ago (some experts think it occurred approx. 5.000 years ago). After that a gradual increase in the salinity rate of the Black Sea was observed and it is considered that the salinity of the sea increased enough in 1.000-1.500 years to support many of the marine species in the Mediterranean (Ref. 6.51).

The climate of the Black Sea can be divided into three sub-climatic zones; Shores, Mountainous areas and internal climatic zones. During the winter months, the Black Sea region falls from the west and high-pressure systems coming from the northeast. During the summer months, the region falls under the influence of high pressure systems from the south and low-pressure systems from the west.

Summers and winters in the Black Sea Region usually pass genial. The air fronts along the Black Sea can move rapidly from west to east and as a result the climate conditions in the southeast regions of the Black Sea can change quickly. The Caucasus Mountains of Georgia prevents the cold weather fronts from Siberia to reach the Black Sea Region. Similarly, the Eastern Black Sea Mountains (Parhar Mountains) prevents cold fronts to enter the Anatolian Lowlands (to south) during the winter (Ref. 6.52).

Wind patterns are usually cyclical; the strong cold winter winds blowing from northeast are replaced by low-humidity genial winds in May and September. In the north and south ends of the Black Sea the temperature can be very different from the temperature in the central region.

6.7.1.1.1 Pressure

The atmospheric pressure regime in the Black Sea is affected by the Azores and Asia anticyclones. These are explained by cyclonic activity over the Mediterranean Sea during winter and temperature drop over North Africa and Asia during summer. Seasonal changes in air and sea surface temperatures also affect the pressure. Cyclones may cause instant and periodic changes in atmospheric pressure. Annual atmospheric pressure tendencies are represented with the distinct low pressure in July and

April (

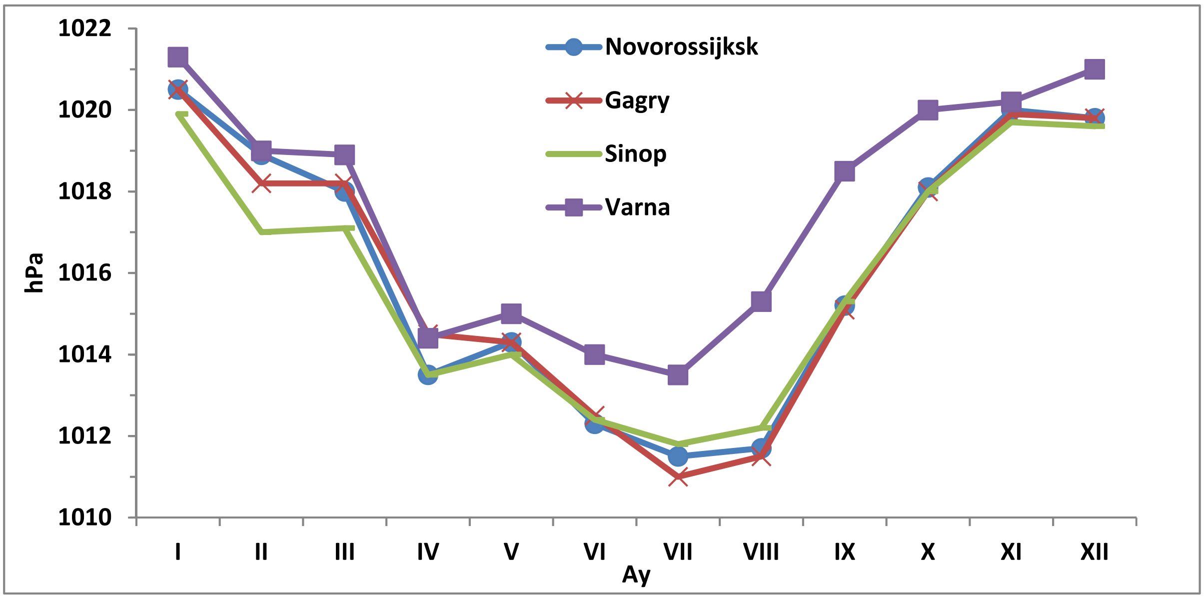


Figure 6.5410). The general pressure history is high during the winter months and similar throughout the Black Sea. In August and September, the pressure rises rapidly and high pressure continues until January then starts to drop. In the period between May to October, the average pressure in the western region of the Black Sea is higher that the eastern regions. In other months usually low pressure is observed in the central region of the Black Sea. The atmospheric pressure variability throughout the year is highest in the north and lowest in the south of the Black Sea. (Ref.6.42)

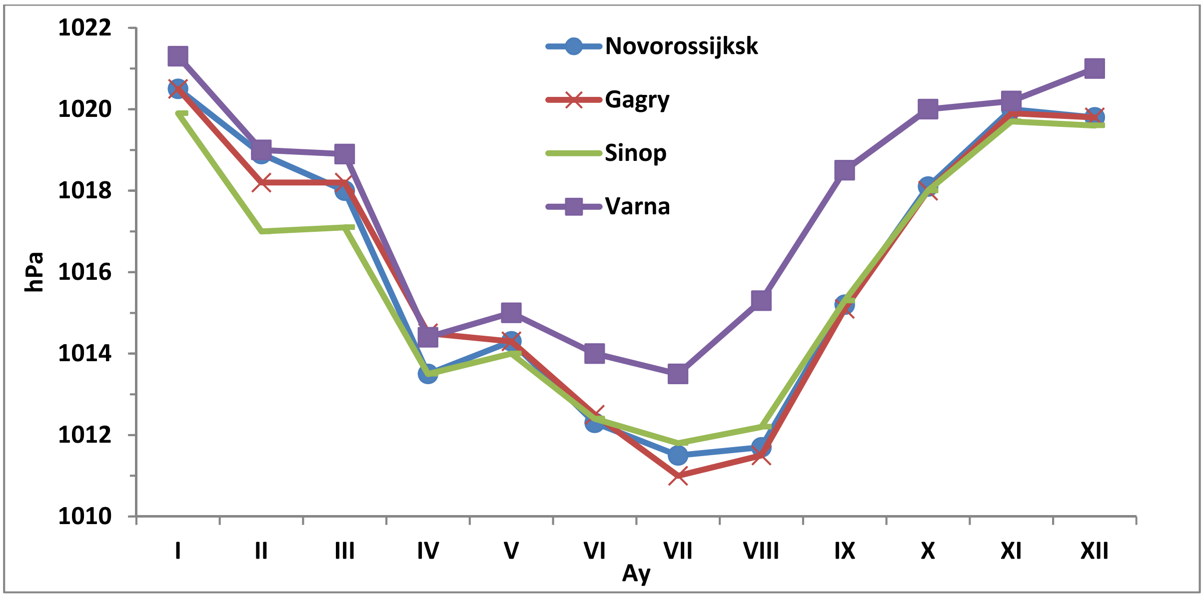


Figure 6.5410: Monthly Average Atmospheric Pressure in Hectopascal (hPa) in Hydro-Meteorological Stations

6.7.1.1.2 Temperature

The average annual weather temperature in the Black Sea varies from 10°C in northwest to 14–15°C southeast. From August until March the weather temperatures off shore is higher than the ones on shore and annual variability is higher in littoral regions. While the greatest temperature changes are exclusive to the northwest of the Black Sea, the least change is observed in the central and southeast regions. (Ref. 6.42).

Highest temperatures are observed in the southeast and southwest regions of the Black Sea. The lowest monthly temperature (-1 and -2°C on average) is usually observed in northwest in February; the highest figures (up to 24°C) are observed usually off the Caucasus shore in August (Table 6.82

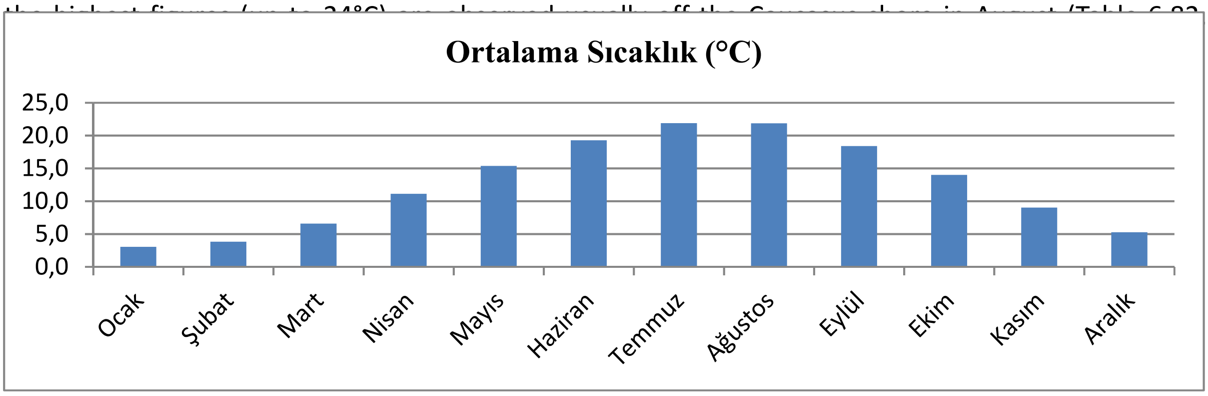


Figure 6.5511,Figure 6.5612 and Figure 6.5713). The annual temperature change trends in the Black Sea vary from -2°C in the northwest to 7.5°C in the southeast. Generally minus degrees can be observed throughout the Black Sea; temperatures between 0 to -5°C may be observed mostly during January and February for 6 to 10 days and most frequently in the northwest and northeast regions of the sea. While the number of days with minus temperature reaches up to 22 to 26 days in January and February, this figure becomes 13 to 15 days in December and March. (Ref. 6.54).

The most genial regions are the Caucasus and Anatolian shores of the Black Sea. The temperatures rarely drop below 0°C in these regions. While the number of these days is 5 to 8 in January and February, it is 1 to 2 in December and 13 to 15 in March. On average once every 10 or 20 years, an average temperature of below -5^{0}C may be observed in these regions. (Ref 6.54).

On the shores, an average temperature of -10°C cannot be observed regularly. These temperatures may be observed 7 to 14 days in January and February, 5 to 8 days in December and 2 to 3 days in March exclusive to the northwest and northeast regions. Big temperature changes are possible with warm air currents coming from the south. The period, in which an average of 20°C and above daily temperature can be observed, is shortest in the northwest and continues from the end of June until the beginning of September. The average duration of this period in the region is 70-80 days; this duration increases to 100-110 days towards the southeast. It is possible to observe above 30°C daily average temperatures during summer in most of the Black Sea shore (Ref. 6.42).

The number of days when the daily average temperature is between 20-25°C is highest in July and August and the monthly average is 20 days (up to 25 days in Anatolia and southern regions of the Caucasus shores). While the daily average temperature above 25°C can be observed 3 to 9 days in the north of the Black Sea shore, it can be observed 10 to 11 days in south shore of Crimea and 2 to 7 days in the southern section of Caucasus shore. The highest temperature values may climb up to 35 to 40°C in daily average temperatures above 30°C (Ref 6.42).

While the daily weather temperature variability is greater in winter than in summer throughout the Black Sea, in the eastern region, the daily temperature shows the most variability in autumn. Daily variations increase from southeast to northwest. Intra-day temperature variability usually decreases from north to south and it is 2 to 3 times more in summer than in winter. On average, cooling is more intensive than the heat up. While the intra-day temperature drop can reach up to 10-15°C, the heat ups rarely exceed 10°C (Table 6.82).

Table 6.82: Monthly Average Temperatures for the Shore of the Black Sea Region (°C) (the years 1960-2012)

Months	January	February	March	April	May	June	July	August	September	October	November	December
Average Temperature (°C)	3.0	3.8	6.6	11.1	15.4	19.3	21.9	21.9	18.4	14.0	9.0	5.3

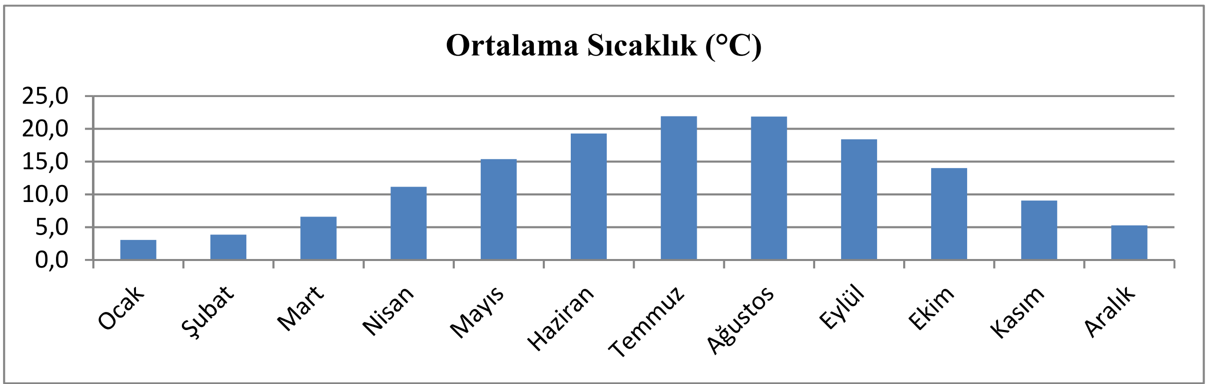


Figure 6.5511: Monthly Average Temperatures for the Shore of the Black Sea Region (°C) (the years 1960-2012)

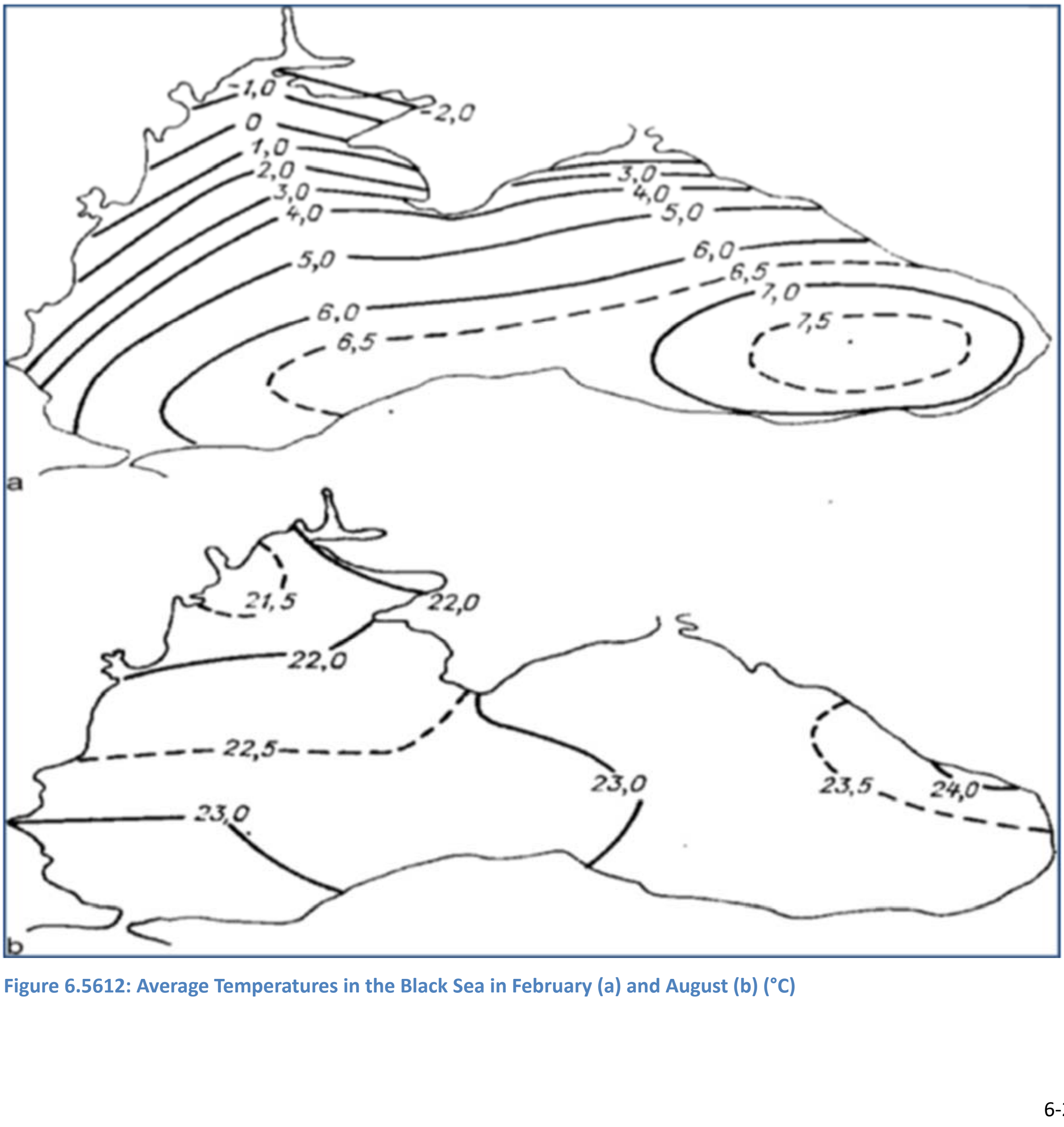


Figure 6.5612: Average Temperatures in the Black Sea in February (a) and August (b) (°C)

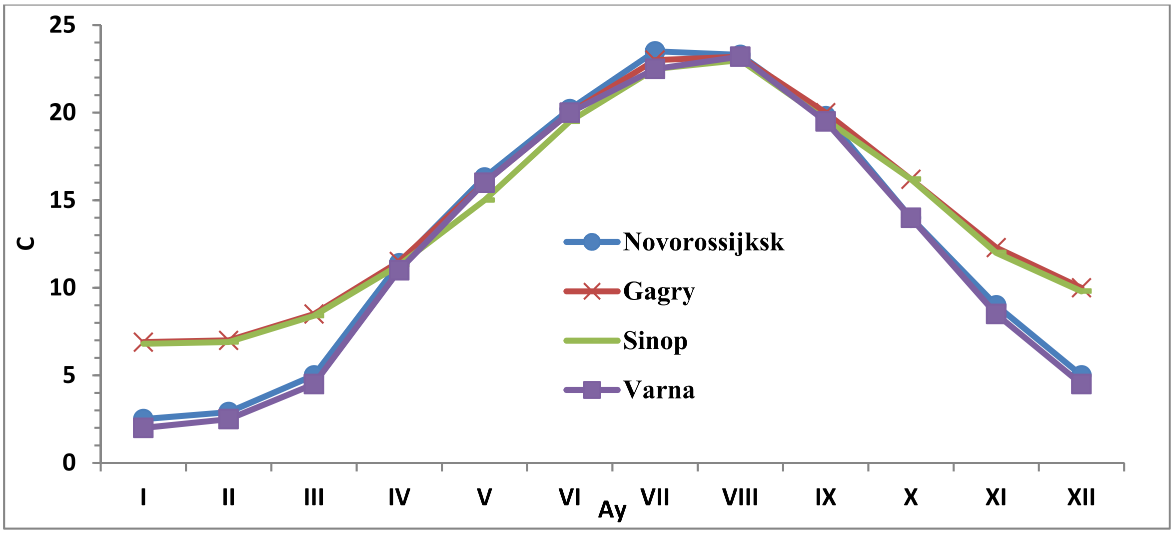


Figure 6.5713: Monthly Average Temperature (°C)

6.7.1.1.3 Precipitation

The precipitation over the Black Sea is usually connected to the cyclonic activity. Convective processes play a great role in the sections close to shore and along the shore. The amount of precipitation throughout the year increases from 380 to 420mm in northwest to 1.500 to 2.500mm in southeast (Figure 6.5814). While the amount of rainy days is 100 to 170 in the southeast, it is 100 to 125 days in the northwest and the shores of Crimea. The precipitation intensity is much higher during summer. In winter the precipitations can be in the form of snowfall especially in northern shore. On average in winter, a snowfall of up to 25 to 40 days in the northwest shore, 15 to 25 days in Crimea (not to exceed 15 days in the southeast shore), 14 to 17 days in the northeast and less than 15 days in southeast, can be observed. (Ref. 6.42).

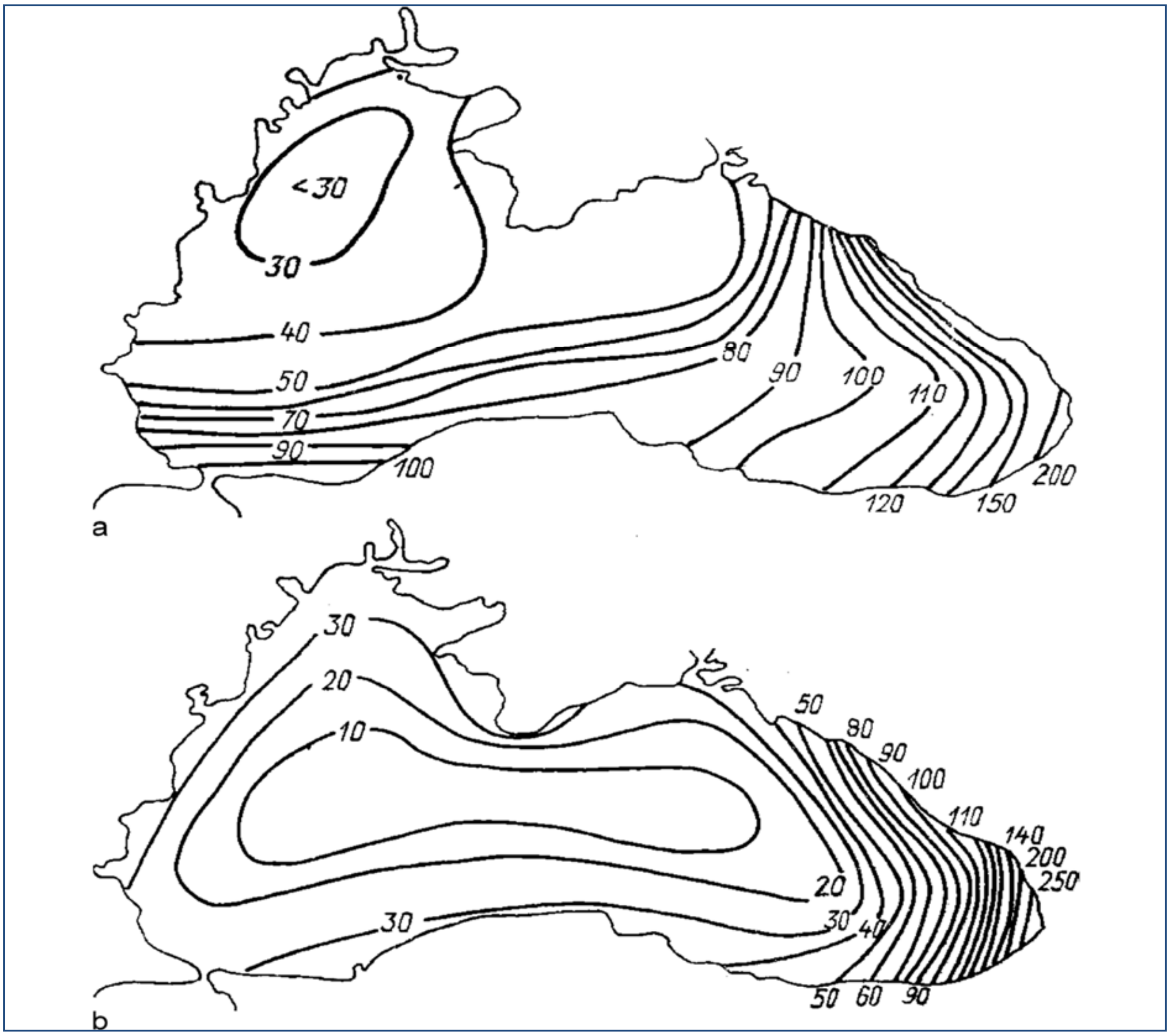
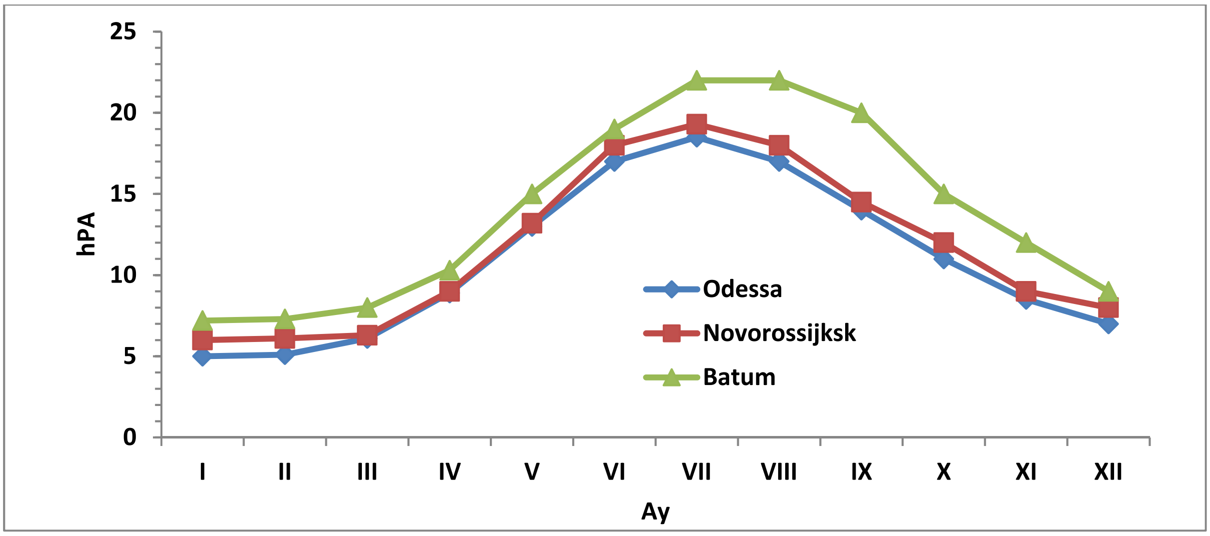


Figure 6.5814: Monthly Average Precipitation throughout February (a) and August (b) in the Black Sea (mm/month)

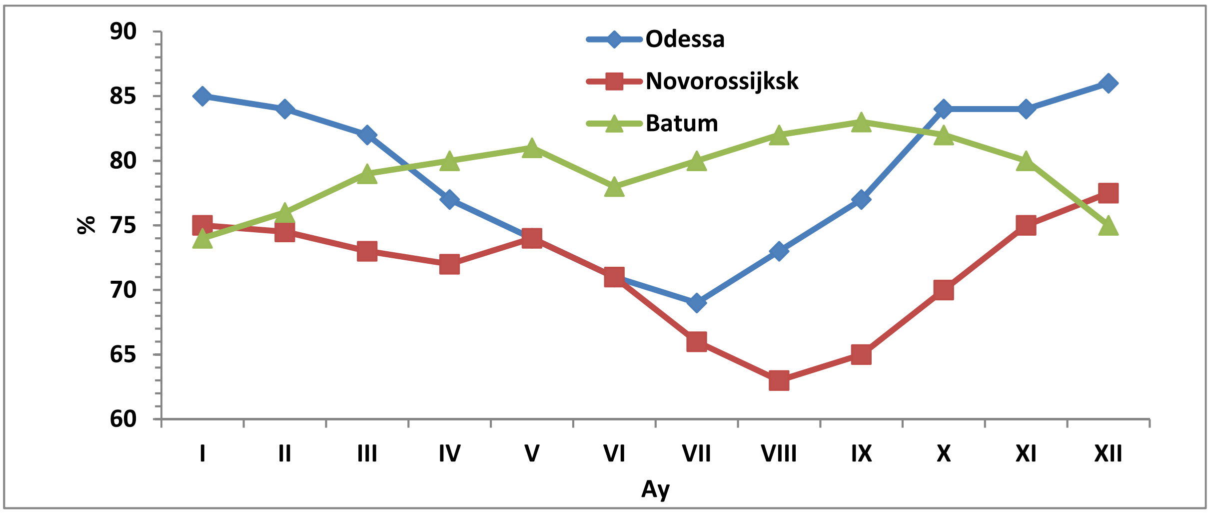
6.7.1.1.4 Humidity

The humidity regime in the Black Sea is determined via the interaction between the air and the surface of the sea. The daily variations of humidity are also affected by wind cycles in the coastal regions. The morning breeze provides humid air from the sea to the land. However, the night breeze carries dry air to the surface of the sea. The humidity variations, during the year, follow the annual conditions of the weather temperatures over the sea. While the lowest values can be observed in January and February, the highest values are recorded during July and August. The lowest humidity values are observed in northwest (4.7 to 20 hPa on the shore and 5.0 to 21.0 hPa on the sea). The humidity increases towards the southeast (7.2 to 23.4 hPa on the shore and 8.0 to 24.0 hPa on the sea) (Ref. 6.56).

The annual trend of relative humidity in most of the Black Sea shows its highest readings during the coldest time of the year and its lowest readings during the hottest time of the year (Figure 6.11515). The humid subtropical sections of the eastern shore have a unique regime in which the highest values are recorded during summer and in which the variations during the year is unimportant (Figure 6.11515). While the lowest values of relative humidity can be observed in northwest regions of the Black Sea, the highest values were recorded in the southeast and southwest. However, the humidity increases going from the southeast to northwest in winter (Ref. 6.42).



(a)



(b)

Figure 6.115: a) Partial Vapor Pressure of Water (hPa) and b) Annual Relative Humidity Oscillation (%)

6.7.1.1.5 Evaporation

While the evaporation rates in the Black Sea region follow a time course opposite to the precipitation rates, the highest rates are observed in the north and northwest and the lowest rates are observed in the south and southeast. The precipitation and runoff are more than the evaporation in the entire Black Sea basin. As a result, the Black Sea acts as a dilution basin where the excess freshwater is flowing to Aegean Sea via the Gallipoli Strait and the Bosporus. (Ref. 6.42).

6.7.1.1.6 Wind

Atmospheric circulation is the most important process which determines the movements of air masses over the Black Sea. The climate in the western and eastern sections located on the same latitude shows differences in scope of temperature regimes and humidity. The winters are warmer and there is more precipitation in the western section (Ref. 6.57).

The north of the Black Sea is a part of the southeast section of a Europe and Scandinavia centered giant anticyclone. In the northeast synoptic process in the Black Sea region, the center of the anticyclone is over the western regions of the European Russia.

Depending on the cold air advection, the cyclonic activity, in the eastern section of the Black Sea, intensifies. Strong eastern and northeastern winds, especially in the northeast and off the western shore of Crimea, accompany the transition of low air pressures over the southern section of the Black Sea. Whereas the southeast is usually under the effect of weak and genial winds from different directions. The center of the anticyclone, for the processes in the east, is usually located in the middle sections of the European Russia. Meanwhile, the cyclonic activity also forms over the Mediterranean and Turkey. As a result, the winds blowing from the east gain considerable strength in the southern sections of the Black Sea.

The air currents coming from the north, northeast and the east are dominant in winter and generally throughout the year. Southeastern air currents are related to the anticyclone area located over the European Russia and Kazakhstan. The cyclonic activity over the central section of European Russia causes the winds blowing from the west over the Black Sea to develop. (Ref. 6.57).

The wind speed is higher off the shore than on the shore of the Black Sea throughout the year. In all months, except for the southeast shores of the Crimea Peninsula, the highest wind speeds are recorded in the north. The lowest values are observed in the southeast. According to the data of the meteorological stations, weak winds with less than 5m/s speed are dominant in most of the shores. The number of days when strong winds (>15m/s) are effective is the highest in the northeast and the southwest shores (34-35 days a year). Such days are recorded the least in the southern shore of Crimea and the southeast sections of Caucasus shores (an average of 20-22 days per year). On average, the annual average wind speed over the sea increases from south to north and is approximately 4-6m/s. The highest possible wind speed over deep sea is 40m/s once every 100 years. The annual oscillation of the wind speed increases in winter and decreases in summer in most of the Black Sea (

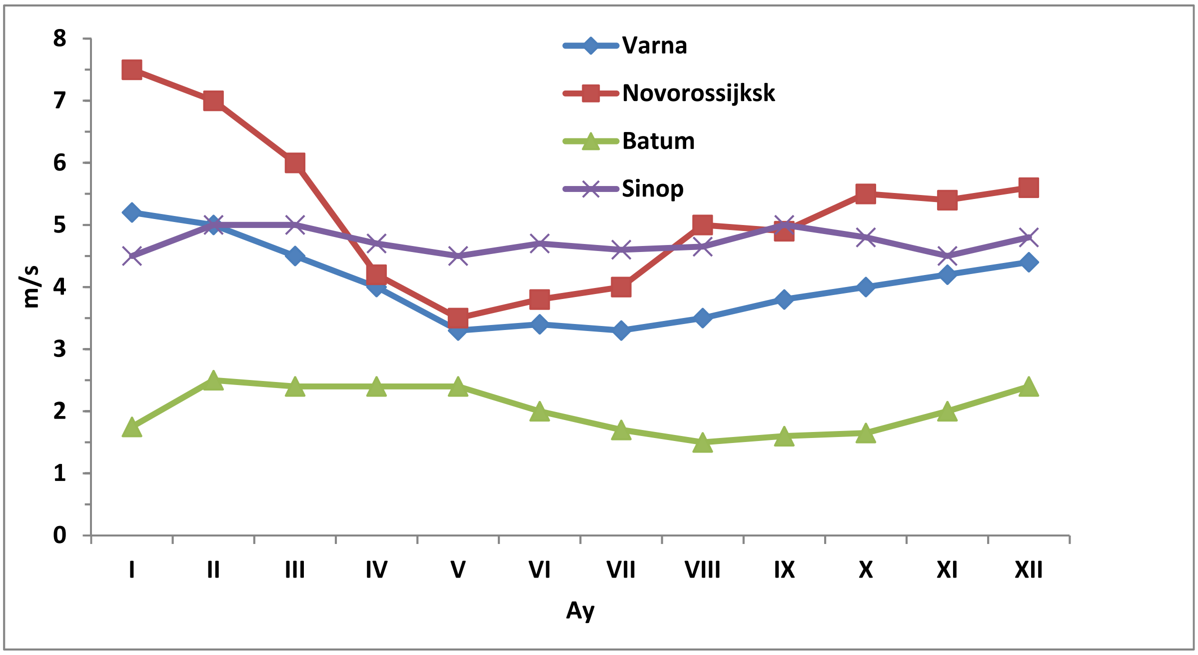


Figure 6.596).

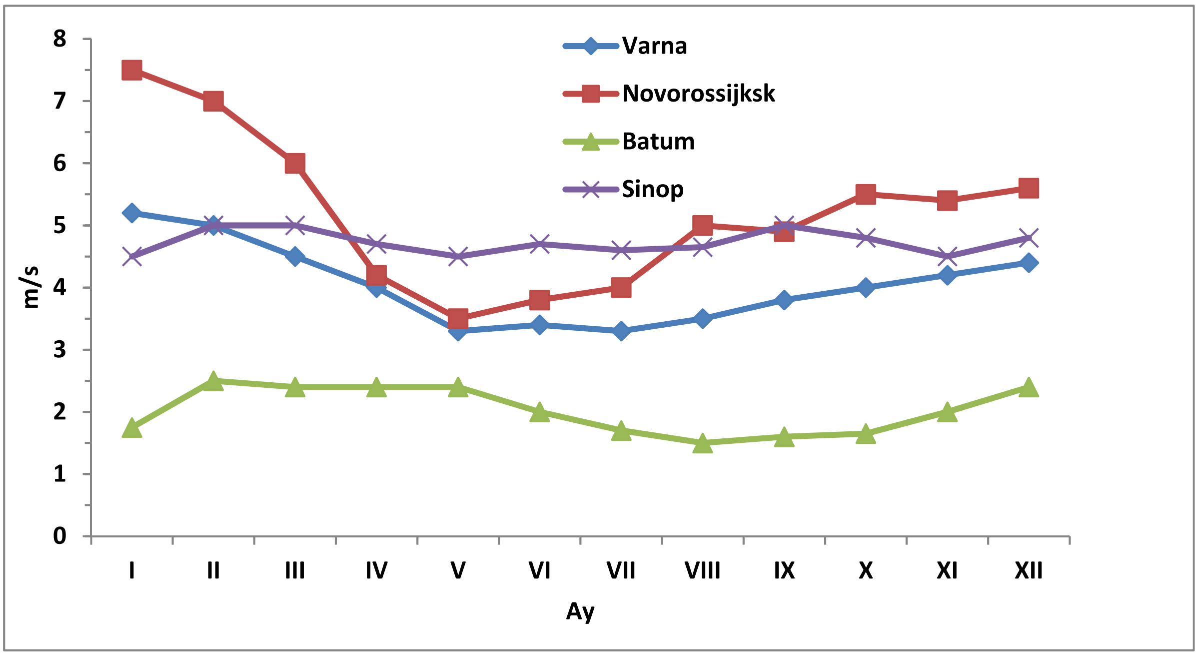

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Figure 6.596: Monthly Average Wind Speed, (m/s)

6.7.1.1.7 Fog

According to the data evaluation of meteorological station of the Black Sea Shore Strip, the southeast region of the Black Sea has the lowest range of visibility among the Turkish shores of the Black Sea. High humidity levels and usually rainy climate may cause significant fog formations, especially during spring. The fog in the area is typically an advection fog created when the genial, humid sea breeze pass over the colder land surface and cause condensation and fog. Upslope fogs are also common along the shore strip of the Black Sea.

6.7.1.2 Climate Conditions of the Shore Crossing Section and Onshore Section of the Project

The climate of Kırklareli shows differences depending on the region. In the sections north of the Yıldız Mountains, Black Sea climate is effective. Therefore, the weather is chilly during summer and cold during winter. The temperature difference is low between summer and winter seasons and the annual average precipitation per m^2 is around 800-900mm. Continental climate is effective in the interior regions far from the sea and the temperature difference is high between summer and winter seasons. While the interior regions receive rain every season, the amount of precipitation in the interior sections is much less than the coastal regions.

The average values, concerning the climatic events which took place in Kırklareli province through years, gathered from Directorate General of Meteorology are shown in Table 6.83; extreme precipitation and wind values are given in Table 6.84; highest and lowest temperatures are given in Table 6.85; and the daily average wind values are given in Table 6.86.

Table 6.83: Average Values Recorded in Kırklareli Through Years (1926-2016) (Ref. 6.55)

	January	February	March	April	May	June	July	August	September	October	November	December
Average Temperature (°C)	3.0	4.1	6.9	12.1	17.3	21.6	23.9	23.4	19.2	13.9	9.0	5.0
Highest Temperature on Average (°C)	6.7	8.4	12.0	17.8	23.4	27.9	30.6	30.5	26.0	19.7	13.6	8.6
Lowest Temperature on Average (°C)	0.0	0.8	2.9	7.1	11.6	15.4	17.7	17.5	13.9	9.7	5.7	2.0
Average Hours of Sunshine (hour)	2.3	3.2	4.4	5.4	8.1	8.6	9.6	9.5	7.1	4.5	3.2	2.2
Average Days with Precipitation	11.1	9.2	9.2	10.3	10.0	8.5	4.7	3.7	4.8	7.1	8.6	11.2
Average Total Amount of Monthly Precipitation (kg/m^2)	61.5	50.9	46.7	44.9	49.6	47.7	24.6	21.3	34.1	53.4	66.0	69.4

Table 6.84: Extreme Precipitation and Wind Values in Kırklareli Province (Ref.6.55)

Event	Amount/Force	Date of Occurrence
Daily Highest Amount of Precipitation	128,3 kg/m^2	03.03.1962
Daily Fastest Wind	123,8 km/h	05.08.1972
Highest Snowfall	30cm	08.11.1995

Generally, summers are hot and winters are cold in Vize district. The average temperature does not drop below 20°C in summer and the maximum temperature can climb up to 30°C and 35°C from time to time during this period. The temperature is generally above 0°C in winter. The lowest temperature was recorded as -15°C in January, 1969. Spring passes cool. The temperatures drop after the first half of October in the Fall season.

Table 6.85: Highest and Lowest Values Recorded in Kırklareli Through Years (1926-2016) (Ref. 6.55).

	January	February	March	April	May	June	July	August	September	October	November	December

Highest Temperature (°C)	18.6	23.1	25.7	31.5	36.0	39.8	42.5	40.4	38.8	37.4	33.4	21.6
Lowest Temperature (°C)	-15.8	-15.0	-11.8	-3.0	1.4	5.8	8.8	8.7	3.0	-3.4	-7.2	-11.1

Table 6.86: Kırklareli Province Daily Average Wind Values

	Wind Speed (m/s)	Wind Direction (degree)
Lowest	1.1	12
Highest	3.6	27
Average	2.0	18
Standard Deviation	0.6	4.5

The highest precipitation amount is recorded in winter in the Vize district where the Shore Crossing Section of the Project is located. Spring season is rainy. The highest amount of precipitation is observed in November and the lowest amount is observed in June and July. While the average snowfall is 7 days/year in the district, the snowfalls can cause strong floods caused by rainfall beginning with southwester wind. The precipitation distribution among the seasons in percentage is as follows; Spring 26%, Summer 10%, Autumn 29%, Winter 35%. The main characteristic of the district carries continental climate features. The Black Sea shores of the district receive more precipitation and it is more genial than the interior sections. Generally, summers are hot, winters are cold in Vize.

The amounts of annual precipitation which occurred between 1981 and 2016 in Kırklareli province is given in Figure 6.607 below.

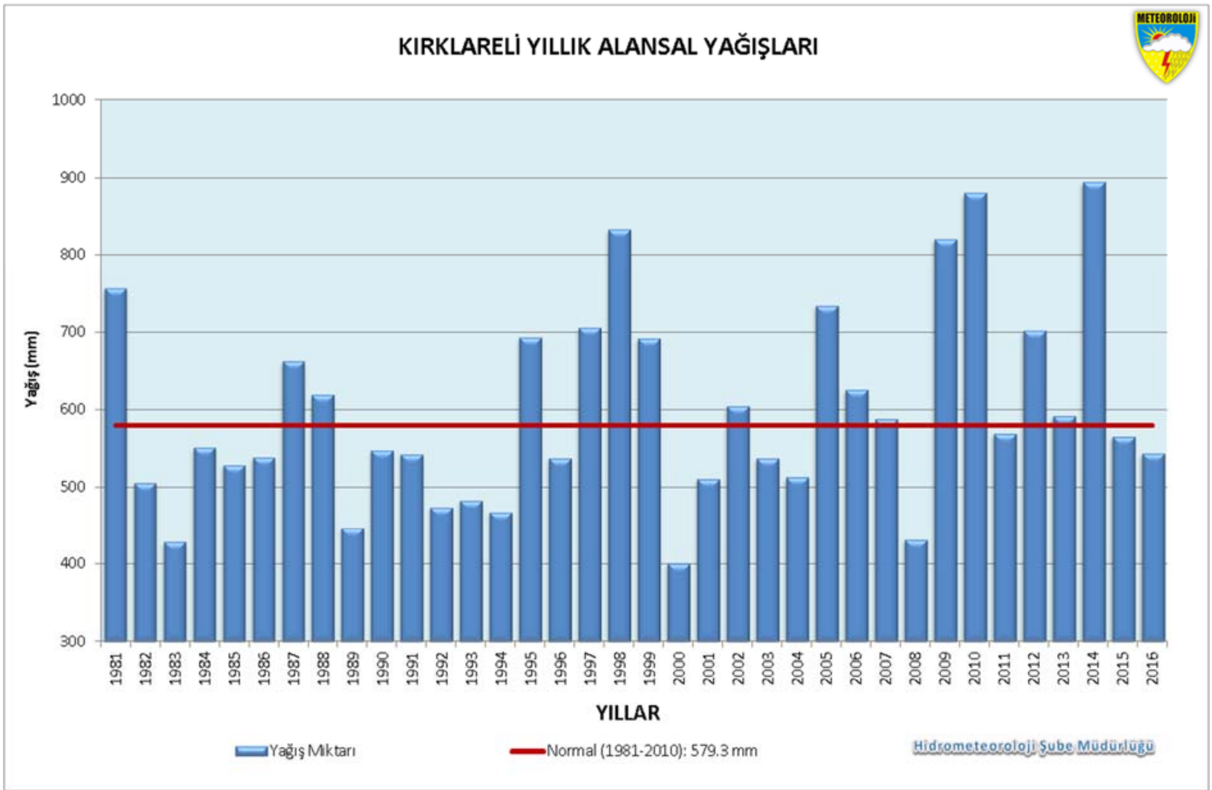


Figure 6.607: The Amounts of Annual Precipitation Which Occurred Between 1981 and 2016 in Kırklareli Province

According to the observation data provided by the Kırklareli Province Meteorological Station, annual relative humidity is measured to be 69.7%. The minimum relative humidity in the region was 10% and was recorded in a November.

The most characteristic features of the climate of Vize present itself with pressure and winds. Different pressures created by three different regions such as the Black Sea, Strandzha Mass and Ergene lowland, cause air currents different in position in Vize. The Strandzha Mountains descending as far as near Vize and providing passage cause strong winds (northwester, northeaster and norther) to blow over Vize. From time to time winds reach very high intensity and create storms. One of the features of the wind in Vize is that sometimes it can continue to blow with strength up to one week.

The wind speed distribution (in 50m) map of Kırklareli province is given in Figure 6.618. It can be seen in the map that, in the area where the Onshore of the Project is located the wind speed in 50m vary from 50 to 7.0m/s in general.

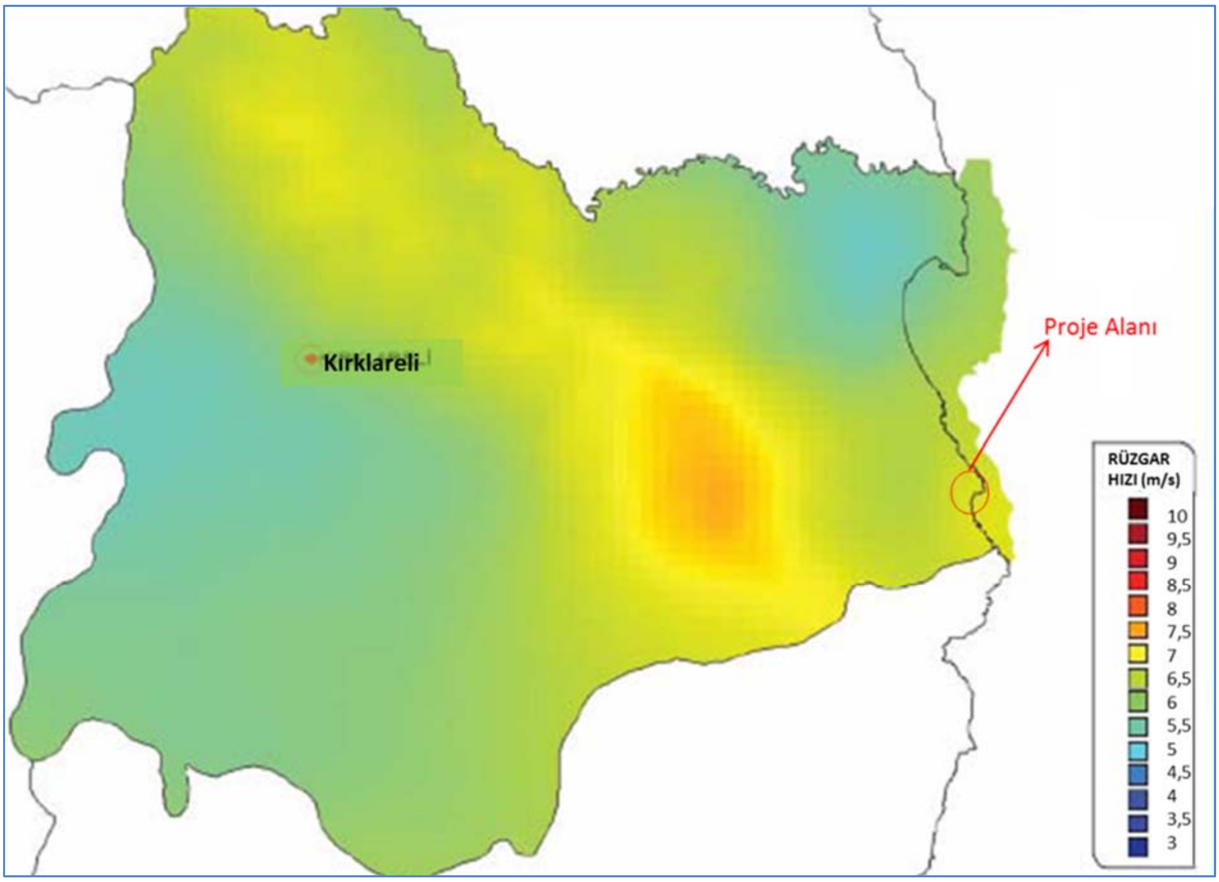


Figure 6.618: Kırklareli Province Wind Speed Distribution (in 50m) (Ref. 6.58)

6.7.1.3 The Meteorological Conditions Over Years of Kumköy-Kilyos Meteorological Station Located Nearest to the Project Area, the Meteorological Data of Which Will Be Used

Meteorological data exclusive to the project area must be used in order to the calculations and models can be applied during the process of assessment of meteorological and climatic effects. The station with the most similar climate conditions was preferred while evaluating the meteorological stations located around the Project Area. The information about the station, which will be used in calculations and modeling, is given in Table 6.657.

Table 6.657: The Information About the Meteorological Station from Which the Meteorological Data Is Gathered.

Station No	Province	District	Station Name	Observation Group	Observation Type
17059	Istanbul	Sarıyer	Kumköy-Kilyos	206	Automatic Meteorological Observation Station -Synoptic-Daily Climate

Kumköy Climate: is under the effect of Mediterranean, Black Sea, Balkan and Anatolia continental climate. The southwester winds from Mediterranean are followed by cold air crossing over the Balkans in the winter. Since the average precipitation is very low and the average temperature is not very high, it can be stated that the continental climate is dominant in the area.

6.7.1.3.1 Pressure Values Through Years

The variation of pressure through years of the station, which was put together according to the 1960-2016 bulletin data of Kumköy meteorological station, is presented in Table 6.668. According to the table the average pressure value is 1011 hPa. The highest-pressure value recorded in many years is 1041.6 hPa measured in a January. The minimum pressure value was observed to be 978.3 hPa in a January. The pressure variation graphic on a monthly basis is presented in

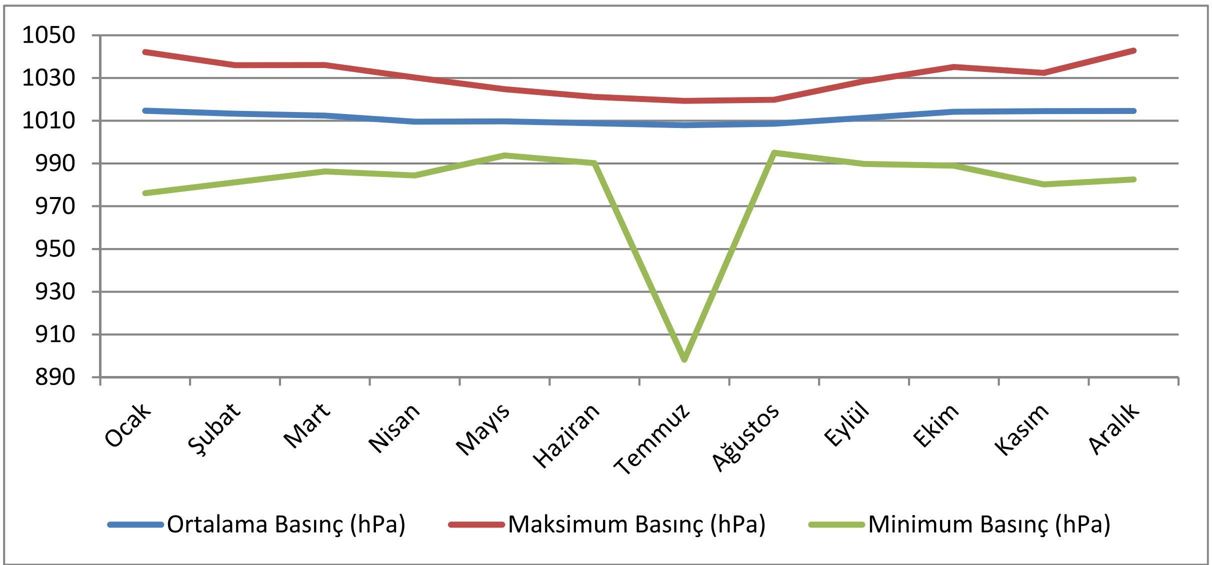


Figure 6.629.

Table 6.668: Pressure Values on a Monthly Basis

	January	February	March	April	May	June	July	August	September	October	November	December	Annually
Average	1.014,7	1.013,3	1.012,4	1.009,6	1.009,7	1.008,8	1.007,9	1.008,6	1.011,4	1.014,2	1.014,5	1.014,6	1.011,6
Maximum	1.042,1	1.036,0	1.036,1	1.030,2	1.024,8	1.021,2	1.019,3	1.019,8	1.028,5	1.035,2	1.032,4	1.042,8	1.029,0
Minimum	976.1	981.2	986.3	984.4	993.8	990.2	898.2	995.0	989.8	989.0	980.2	982.5	898.2

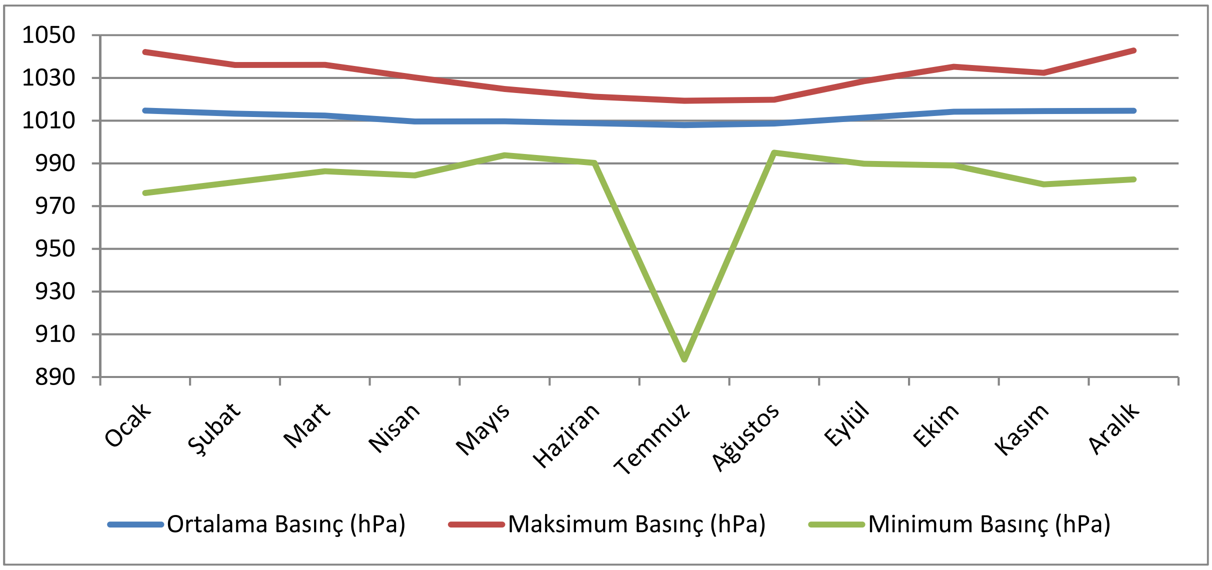


Figure 6.629: Pressure Variation Graphic on a Monthly Basis

6.7.1.3.2 Temperature Through Years

The variation of temperature through years of the station, which was put together according to the 1960-2016 bulletin data of Kumköy meteorological station, is presented in Table 6.679. According to the table annual average temperature is 14°C. The highest measured temperature is 41.4°C in July and them minimum temperature is measured to be -11.7°C in January. The temperature variation graphic on a monthly basis is presented in

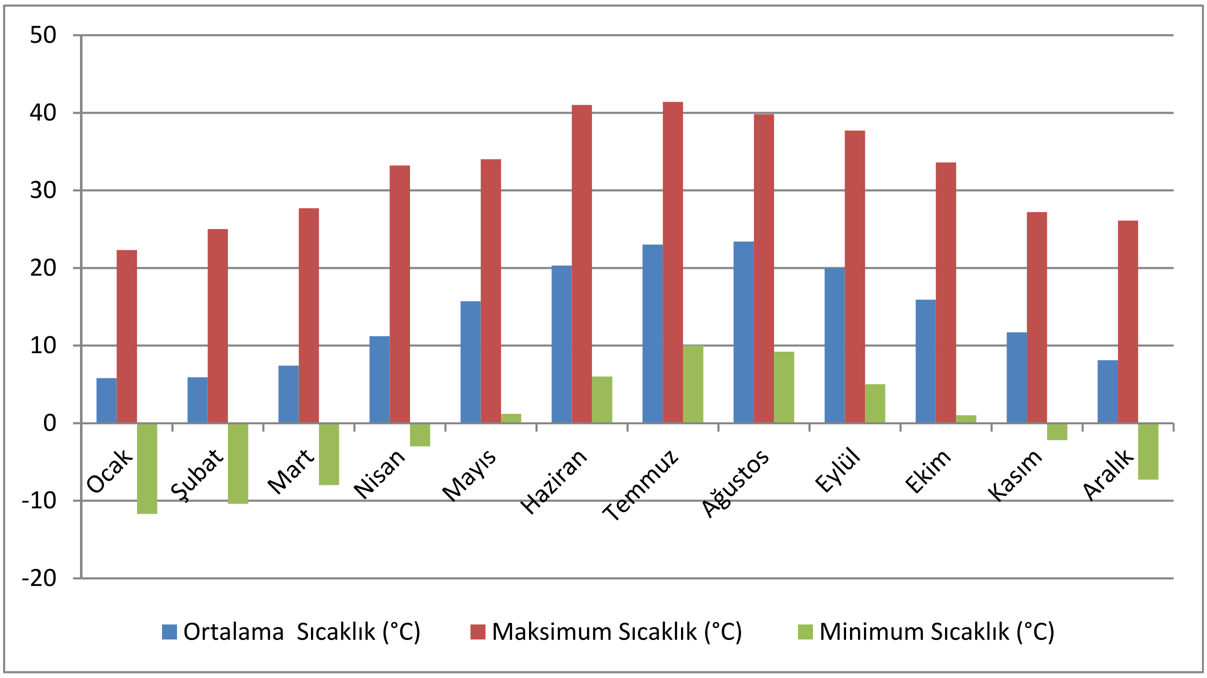


Figure 6.63120.

Table 6.679: Temperature Variation on a Monthly Basis (1960-2016)

	January	February	March	April	May	June	July	August	Septembe r	October	Novembe r	December	Annual Average
Average Temperature (°C)	5.8	5.9	7.4	11.2	15.7	20.3	23.0	23.4	20.0	15.9	11.7	8.1	14.0
Maximum Temperature (°C)	22.3	25.0	27.7	33.2	34.0	41.0	41.4	39.8	37.7	33.6	27.2	26.1	32.4
Minimum Temperature (°C)	-11.7	-10.4	-8.0	-3.0	1.2	6.0	10.0	9.2	5.0	1.0	-2.2	-7.3	-0.9

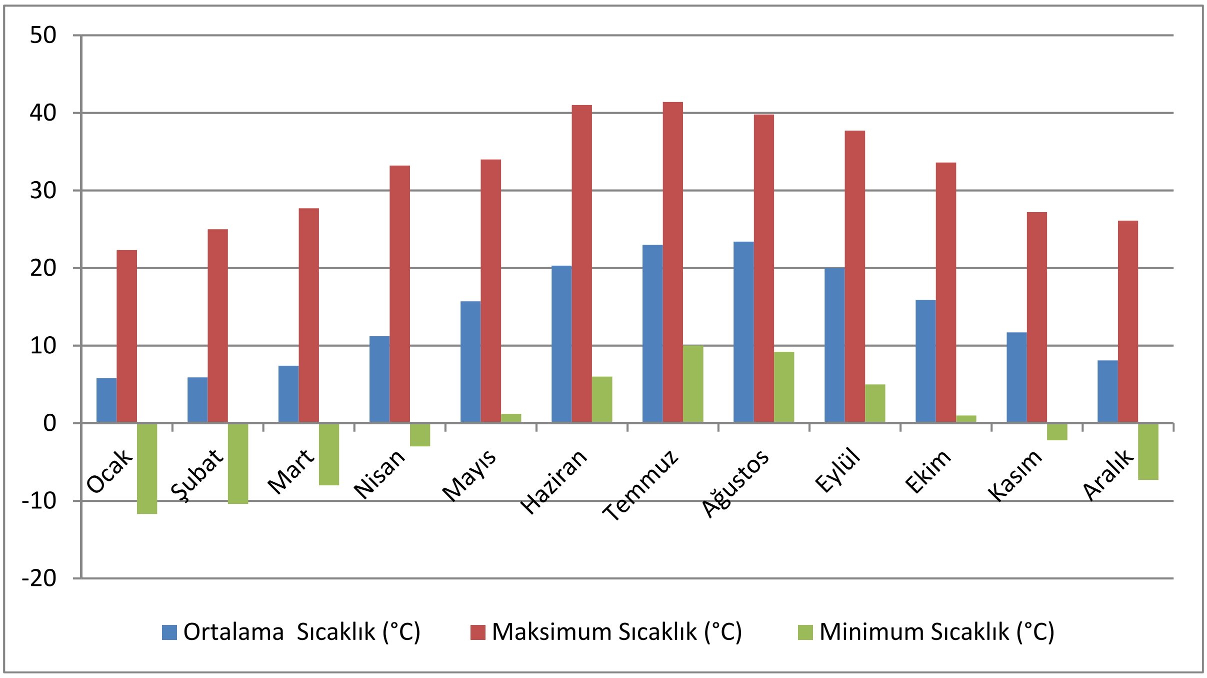


Figure 6.6320: Temperature Variation Graphic on a Monthly Basis

6.7.1.3.3 Precipitation Through Years

The variation of precipitation through years of the station, which was put together according to the 1960-2016 bulletin data of Kumköy meteorological station, is presented in Table 6.90. According to the table annual average precipitation is 67,9 mm. Maximum precipitation measured in a single day through years is recorded to be 179.4mm in a September. The annual precipitation variation graphic on a monthly basis is presented in

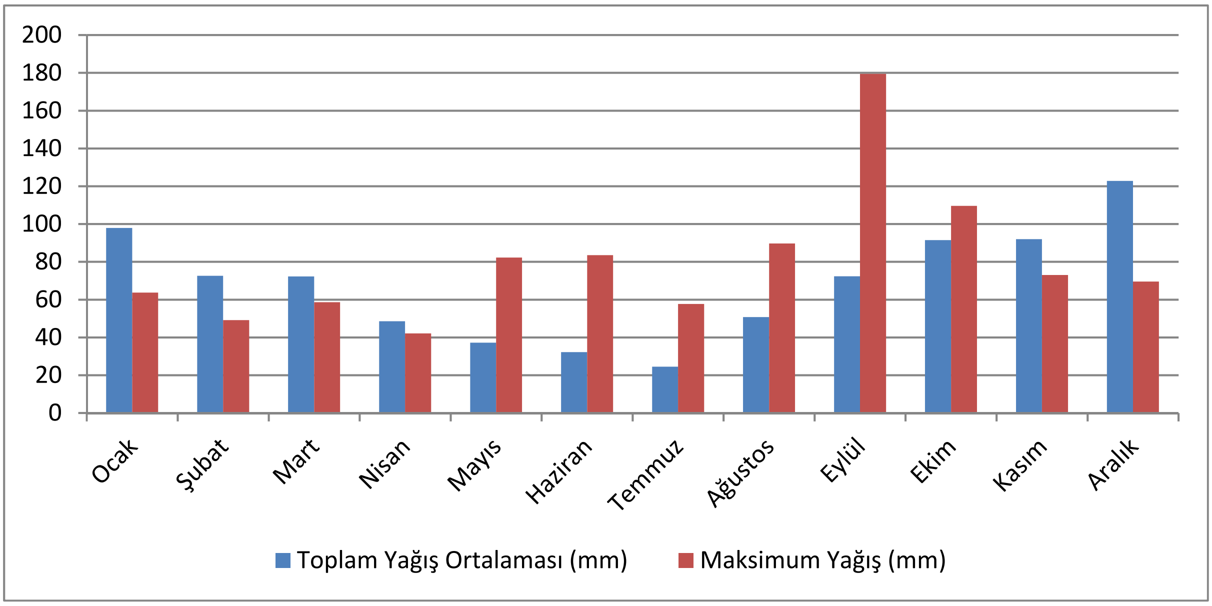


Figure 6.6421.

Table 6.90: Precipitation on a Monthly Basis (1960-2016)

	January	February	March	April	May	June	July	August	Septemb er	October	Novembe r	Decembe r	Annual Average
Total Average Precipitatio n (mm)	97.9	72.6	72.2	48.5	37.2	32.2	24.5	50.7	72.3	91.5	92.0	122.8	67.9
Maximum Precipitatio n (mm)	63.7	49.1	58.6	42.1	82.2	83.5	57.7	89.7	179.4	109.6	73.0	69.5	79.8

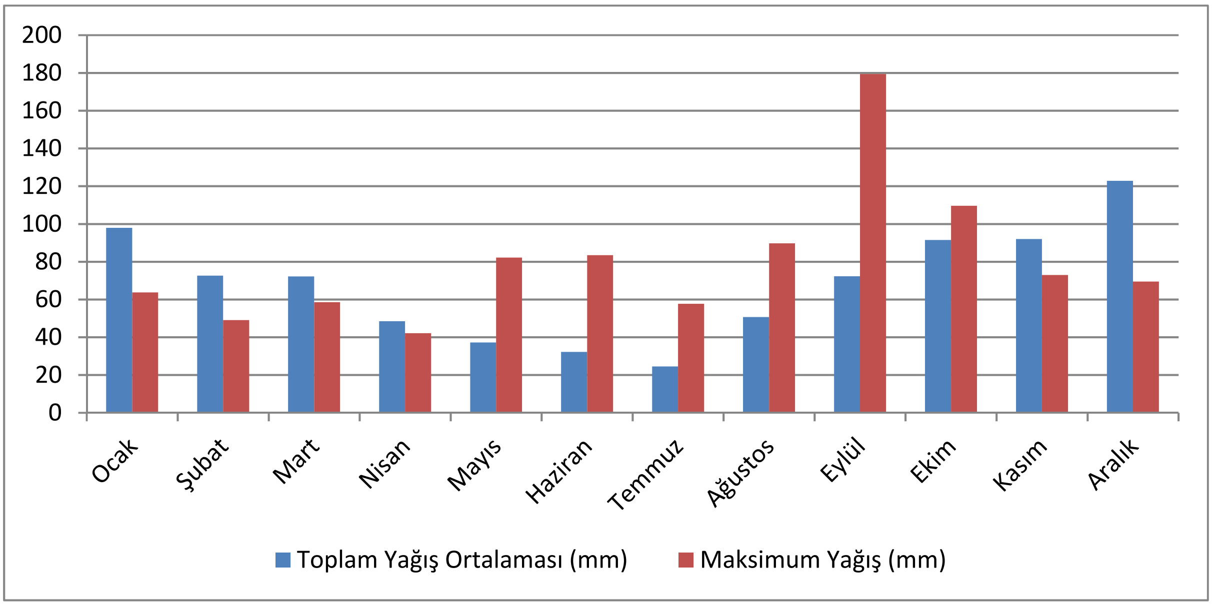


Figure 6.6421: Annual Precipitation Variation on a Monthly Basis

6.7.1.3.4 Average Relative Humidity and Maximum Snow Depth

The variation of average humidity and maximum snow depth through years of the station, which was put together according to the 1960-2016 bulletin data of Kumköy meteorological station, is presented in Table 6.91. According to the table annual average humidity is 78.5%. Maximum snow depth measured through years is 55cm recorded in March. The average humidity variation graphic on a monthly basis is presented in Figure 6.6522; and the average snow depth variation graphic on a monthly basis is presented in Figure 6.6623.

Table 6.91: Average Humidity and Maximum Snow Depth on a Monthly Basis (1960-2016)

	January	February	March	April	May	June	July	August	Septemb er	October	Novembe r	Decembe r	Annual Average
Average Humidity (%)	80.2	79.3	78.8	78.1	80.1	78.1	77.1	76.6	76.5	78.6	79.1	79.5	78.5
Maximum Snow Depth (cm)	16.0	39.0	55.0	-	-	-	-	-	-	-	1.0	10.0	10.1

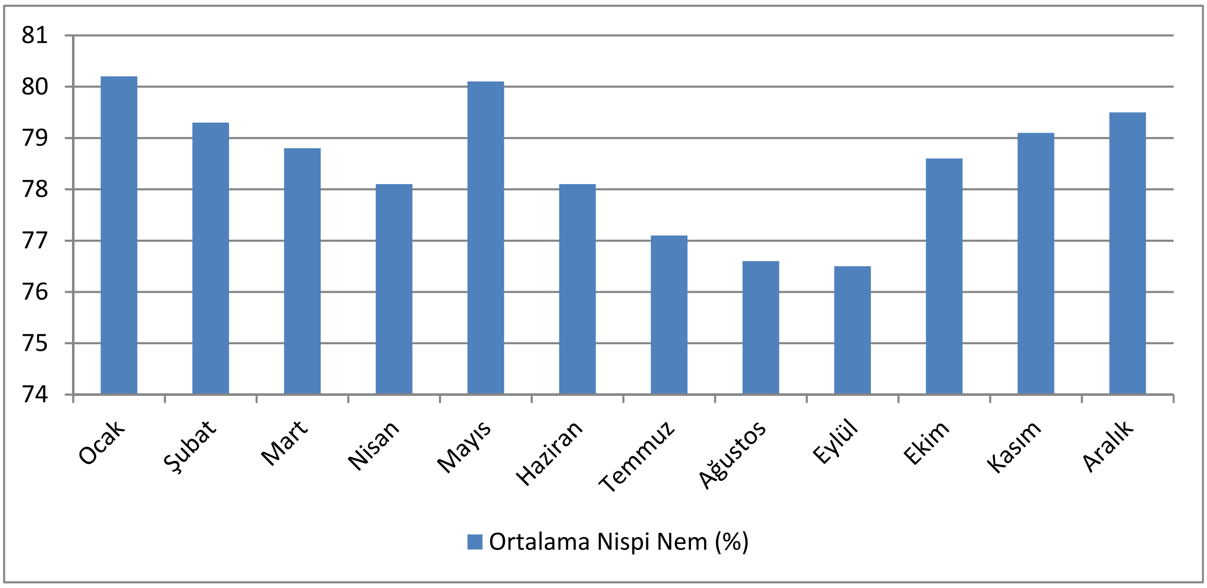


Figure 6.6522: Average Humidity Variation Graphic on a Monthly Basis

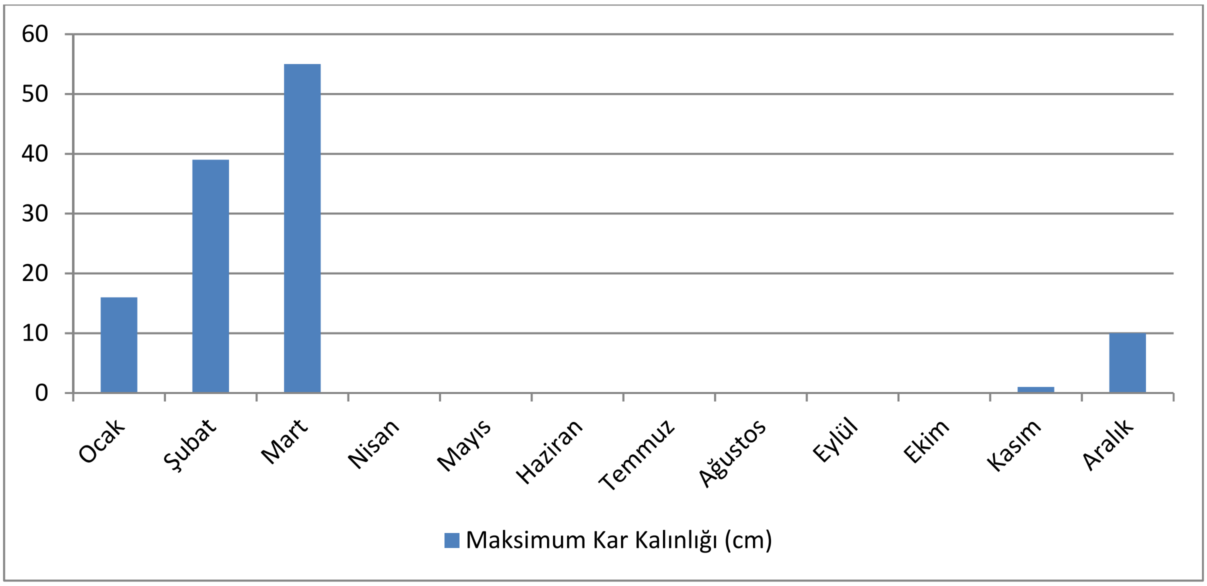


Figure 6.6623: Maximum Snow Depth Variation Graphic on a Monthly Basis

6.7.1.3.5 Number of Days

The variation on a monthly basis in some of the values of the number of days through years of the station, which was put together according to the 1960-2016 bulletin data of Kumköy meteorological station, is presented in Table 6.92. According to Table 6.92, it is observed that the annual average number of days with snowfall is 0.5; the number of days covered in snow is 1.3; the number of days with fog is 1.4 on average; the number of days with hail is 0.1 on average; the number of days with hoarfrost is 0.4 and the total number of days with thunderstorm is 1.4. The variation of the number of days graphic on a monthly basis is given in

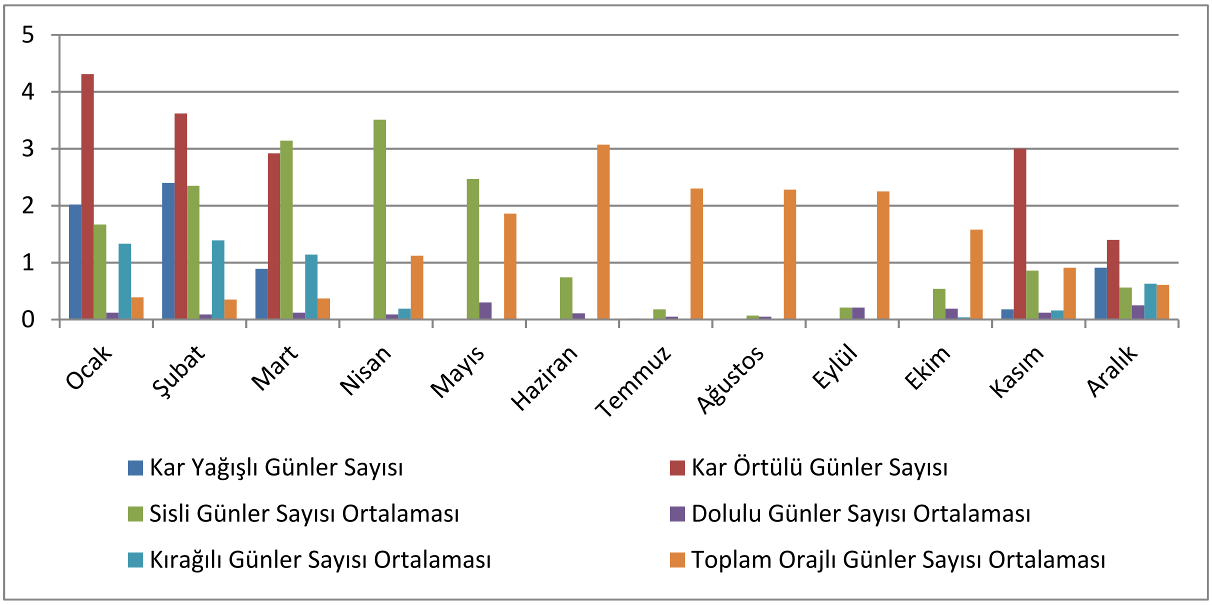


Figure 6.6724.

Table 6.92: Variation of the Number of Days on a Monthly Basis

	January	February	March	April	May	June	July	August	Septemb er	October	Novemb er	Decembe r	Annual Average
Number of Days With Snowfall	2.02	2.40	0.89				0.02			0.02	0.18	0.91	0.5
Number of Days Covered in Snow	4.31	3.62	2.92								3.00	1.40	1.3
Average Number of Days With Fog	1.67	2.35	3.14	3.51	2.47	0.74	0.18	0.07	0.21	0.54	0.86	0.56	1.4
Average Number of Days With Hail	0.12	0.09	0.12	0.09	0.3	0.11	0.05	0.05	0.21	0.19	0.12	0.25	0.1
Average Number of Days With Hoarfrost	1.33	1.39	1.14	0.19						0.04	0.16	0.63	0.4
Total Number of Days With Thunderstorm	0.39	0.35	0.37	1.12	1.86	3.07	2.30	2.28	2.25	1.58	0.91	0.61	1.4

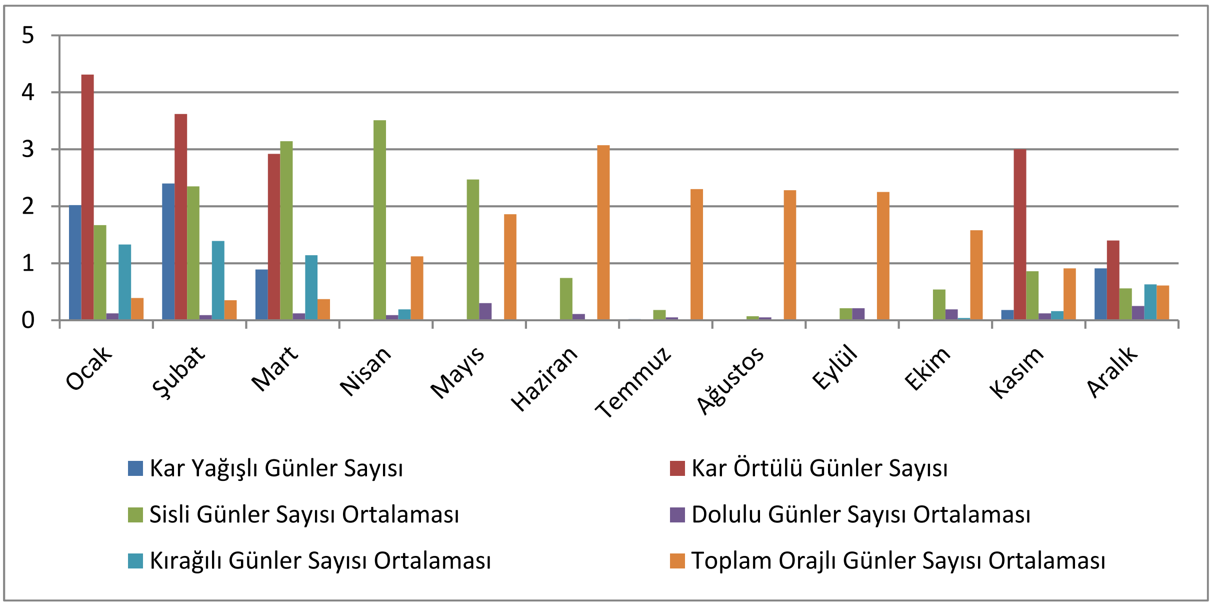


Figure 6.6724: The Variation of the Number of Days Graphic on a Monthly Basis

6.7.1.3.6 Wind

The analysis information concerning the wind data for Kumköy is presented in Table 6.93. The months with high wind speed are December, January and February. The average wind speed and the number of days with storm in the winter is higher than summer. While the month with the highest occurrence of strong winds is January with 0.25 days on average, the month with the least occurrence is May and June with 0.13 days on average.

Table 6.93: Variation of Wind on a Monthly Basis (1960-2016)

	MONTHS											
	January	February	March	April	May	June	July	August	Septemb er	October	Novemb er	Decembe r
Average Wind Speed (m/h)	5.2	4.9	4.3	3.6	3.1	3.1	3.4	3.6	3.8	4.2	4.6	5.3
Maximum Wind Speed (m/h) and Direction	36,0 SSW	33,0 WNW	35,7 SSW	34,0 SSW	30,0 NNE	27,1 WNW	37,0 ENE	28,0 NNW	40,1 WNW	34,3 WNW	33,2 SSW	37,5 SSW
The Average Number of Days With Storm	0.15	0.12	0.10	0.06	0.05	0.04	0.03	0.04	0.05	0.08	0.11	0.15
The Average Number of Days With Strong Winds	0.25	0.23	0.24	0.19	0.13	0.13	0.14	0.16	0.17	0.21	0.22	0.24

The variation of average speed of winds in a year, depending on their direction, is given in Table 6.94. The directions, where the wind speed is generally fast throughout the year, are Northwest and North-Northwest. Wind speed is higher in winter in these directions.

Table 6.94: Direction and Force of Wind Through Years.

Average Wind Speed (m/s)	MONTHS											
	January	Februar y	March	April	May	June	July	August	Septem ber	October	Novemb er	Decemb er
In N Direction	5.2	4.4	3.7	2.6	2.4	2.9	3.2	3.4	3.6	4.1	4.2	5.3
In NNE Direction	4.4	3.7	3.1	2.5	2.4	2.6	2.9	3.2	3.3	3.8	3.5	4.6
In NE Direction	3.0	2.9	2.6	2.1	2.1	2.3	2.6	2.8	2.9	3.1	2.5	3.0
In ENE Direction	2.9	2.9	2.8	2.5	2.4	2.5	2.6	2.9	3.0	3.1	2.8	3.1
In E Direction	2.4	2.6	2.7	2.4	2.2	2.3	2.4	2.5	2.6	2.5	2.4	2.5
In ESE Direction	2.3	2.6	2.4	2.3	2.1	2.2	2.2	2.3	2.3	2.3	2.4	2.6
In SE Direction	2.6	2.6	2.5	2.3	2.1	2.1	2.1	2.2	2.4	2.5	2.6	2.6
In SSE Direction	3.7	3.6	3.4	3.0	2.6	2.3	2.3	2.4	2.6	3.0	3.4	3.7
In S Direction	4.3	4.1	3.8	3.5	2.9	2.5	2.2	2.5	3.0	3.4	3.7	4.3
In SSW Direction	5.0	4.8	4.6	4.1	3.3	3.0	2.7	2.8	3.4	3.9	4.6	5.0
In SW Direction	3.4	3.6	3.8	3.5	2.9	2.4	2.2	2.5	2.8	3.1	3.6	3.6
In WSW Direction	3.4	3.3	3.4	3.2	2.7	2.9	2.8	3.0	3.4	3.5	3.4	3.4
In W Direction	3.5	3.2	3.0	2.9	2.5	2.5	2.6	2.8	3.4	3.5	3.4	3.4
In WNW Direction	4.6	4.5	3.6	3.2	2.8	3.0	3.4	3.6	4.1	4.1	4.3	4.8
In NW Direction	5.7	5.1	4.2	3.3	2.9	3.3	4.1	4.4	4.6	4.8	5.5	6.0
In NNW Direction	6.2	5.3	4.3	3.3	2.9	3.5	4.0	4.2	4.4	5.1	5.7	6.5

The wind values according to their direction, gathered from Kumköy station is presented in Table 6.95. As stated in the tables, the ratios of wind direction are close in every direction, and the dominant wind blows in North-Northeast direction. The second most dominant wind direction is North-Northwest.

Table 6.95: Total Seasonal and Annual Wind Numbers According to the Directions

Annually		Winter		Spring		Summer		Autumn	
N	29.656	N	6.432	N	6.416	N	9.679	N	7.129
NNE	55.255	NNE	11.002	NNE	10.012	NNE	18.569	NNE	15.672
NE	32.668	NE	4.456	NE	6.784	NE	12.140	NE	9.288
ENE	42.272	ENE	6.672	ENE	10.133	ENE	13.354	ENE	12.113
E	24.274	E	4.498	E	7.269	E	6.904	E	5.603
ESE	32.498	ESE	6.884	ESE	8.495	ESE	8.511	ESE	8.608
SE	42.753	SE	10.251	SE	9.521	SE	9.645	SE	13.336
SSE	36.943	SSE	12.550	SSE	9.655	SSE	5.709	SSE	9.029
S	20.030	S	7.821	S	5.300	S	1.809	S	5.100
SSW	36.672	SSW	14.225	SSW	10.790	SSW	3.211	SSW	8.446
SW	10.792	SW	3.113	SW	3.852	SW	1.199	SW	2.628
WSW	11.760	WSW	3.129	WSW	4.429	WSW	1.902	WSW	2.300
W	10.981	W	2.584	W	4.368	W	2.477	W	1.552
WNW	23.625	WNW	5.767	WNW	7.981	WNW	6.046	WNW	3.831
NW	32.968	NW	9.241	NW	8.347	NW	8.786	NW	7.778
NNW	50.787	NNW	13.771	NNW	10.501	NNW	14.272	NNW	12.243

6.7.2 Meteorological and Climatic Impacts of the Works and Operations within the Scope of the Project on the Local and Regional Climate and Measures for Controlling and Reducing Them (Construction, Operation and Post-Operation)

6.7.2.1 Offshore and Shore Crossing Sections

Emissions caused by the ships operating in the construction of the Offshore and Shore Crossing Sections of the Project might cause local and temporary impairments in the air quality. The most of the emissions will be caused by the fuels which the engines of these ships use. The main pollutants will be Nitrogen Oxides (NO_X), Carbon Monoxide (CO), Sulphide Oxides (SO_X) and Particulate Matter (PM). The fact, that all of the burning processes on the ship will be in accordance with the MARPOL 73/78 (International Convention for the Prevention of Pollution from Ships) and the International Maritime Organization (IMO) specifications, since the contamination is expected to be limited, and the emissions will be temporary and in short term due to the fact that there will be a great amount of distance between the vessels operating in deep sea and the precision sensors, was taken into consideration.

Emissions caused by the activities concerning the operation stage may cause local and temporary impairments in the air quality in the Offshore and Shore Crossing Sections of the Project. These impairments are limited to the emissions caused by the ship activities regarding the periodic inspections and the maintenance of the pipes; therefore, they will be much less than the emissions of the construction activities. During the operation stage, the NO_2, CO, SO_2 and PM_{10} emissions in the Offshore and Shore Crossing Sections of the Project will be significantly below the determined limit values for the Construction Stage.

Separate scenarios were modeled for the NO_2, CO, SO_2 and PM_{10} emissions in scope of the Offshore and Shore Crossing Sections of the Project by Ennotes Environment Engineering Counseling co. ltd. using the AERMOD software and the results of the modelling shows no parameter exceeding the limit values of the Industrial Air Pollution Control Regulation parameters.

The limit value of 3.5% of sulfur ratio determined (until January 1st 2020) in the MARPOL Annex VI and the Regulation Concerning Reduction of Sulfur Ratio in Some Types of Fuel was used and comparisons were made to the limit values determined via the Industrial Air Pollution Control Regulation. Air Quality Assessment Report is presented in **Annex-10.A** and the results are presented in **Section 10.5** (Air Quality Assessment).

The effect reducing measures of the Offshore and Shore Crossing Sections of the Project are presented in Table6.6 below.

Table6.68: Air Quality Design Controls During the Construction Stage of Offshore and Shore Crossing Sections

Stage	Activity	Impact	Impact Reducing Measures / Design Controls
Pre-construction and Construction	Ship operations with the purposes of inspection and construction	• Impairing the local air quality conditions by the emission of NOx, SOx, CO, VOCs and particles which affect the human health and ecologically sensitive habitats • Local air quality change resulting from the emissions of greenhouse gasses which might contribute to climate change	• Ships acting in accordance with MARPOL emission requirements and emission standards of relative international legislation • Regular maintenance of the fleet • Choosing the ship fuels which will be used in accordance with the international legislation
Operational Stage	Operation of ships for maintenance purposes	• Impairing the local air quality conditions by the emission of NOx, SOx, CO, VOCs and particles which affect the human health and ecologically sensitive habitats • Local air quality change resulting from the emissions of greenhouse gasses which might contribute to climate change	• Ships acting in accordance with MARPOL emission requirements and emission standards of relative international legislation • Regular maintenance of the fleet • Choosing the ship fuels which will be used in accordance with the international legislation

6.7.2.1.1 Onshore Section

The list of equipment which will be used in the construction of the Onshore Section of the Project and the auxiliary equipment are presented in Chapter 1.11 (Project Features) in detail. It is estimated that the construction activities will continue 24 hours uninterrupted.

Separate scenarios were modeled for the NO_x, CO, SO_2 and PM_{10} emissions in the Shore Crossing Section by Ennotes Environment Engineering Counseling co. ltd. using the AERMOD software and the results of the modelling shows no parameter exceeding the limit values of the Industrial Air Pollution Control Regulation parameters (Table 6.697). Detailed information concerning the air quality evaluation of the Project Area is presented in Section 10.5 (Air Quality Evaluation).

Table 6.697: Air Quality Design Controls During the Construction Stage of Onshore Section

Stage	Activity	Impact	Impact Reducing Measures / Design Controls
Pre-construction and Construction	Operation of construction equipment, generators, earth-moving trucks and other vehicles,	• Impairing the local air quality conditions by the emission of NOx, SOx, CO, VOCs and particles which affect the human health and ecologically sensitive habitats • Air quality impairment due to dust • Local air quality change resulting from the emissions of greenhouse gasses which might contribute to climate change	• Ensuring conformity with the relative international legislation and emission standards • Providing appropriate construction and traffic management in order to minimize the equipment and vehicle emissions • Regular maintenance of the vehicle and equipment fleet • Applying suppressing methods for the dust caused by the construction movements and excavation works • Monitoring the Complaint mechanism, which was developed by the Project Owner, evaluating the complaints and providing solution
Operational Stage	• Starting the combined compressors, diesel pumps and air-dry units for the tests before the commissioning in the Receiving Terminal • Management of the Receiving Terminal	• Impairing the local air quality conditions by the emission of NOx, SOx, CO, VOCs and particles which affect the human health and ecologically sensitive habitats • Local air quality change resulting from the emissions of greenhouse gasses which might contribute to climate change	• Ensuring conformity with the relative international legislation and emission standards • Conducting regular controls and maintenances of the isolation joints of the systems in the Receiving Terminal • Regular maintenance of burning equipment • Monitoring the pipeline with a Leak Detection System (a component of the Pipeline Performance System) which works on the basis of monitoring the flow, pressure and temperature in real time and therefore detects the gas losses automatically

6.7.2.2 Decommissioning Stage

The "Decommissioning Strategy" of the Project has not yet been determined when the EIA Report was prepared in order to evaluate the conditions which shall be present during the decommissioning period (50 years) and benefit from the technological developments in the best way. In case the pipelines were not moved, the emissions will be limited to those belong to the survey vessels. If the pipelines are decided to be removed from the seabed, it is expected that the design controls for the emissions caused by post-operational activities shall be similar to those of the construction activities.

6.7.2.3 Emergencies

The RT design includes process isolation, ventilation and gas discharge factors. So that the system can be isolated independently when and as necessary (e.g. in case of emergency such as a leak in the pipeline) and the gas entry/exit can be prevented. The ventilation system also enables the pressure in the pipeline and the RT to be reduced in order to conduct repair and maintenance activities.

Low and high-level alarms will be installed at the RT to ensure that gas inventory requirements are within the specified limits (e.g. 100 and 120 MMCSM at maximum efficiency). In the event of an irregularity (or deviation) in the levels, this information will be transmitted to the Central Control Room (CCR) / Backup Control Room (BUCR) and the Russkaya Compressor Station in Russia so that the operators can perform balancing operations (increase or decrease of gas inventory). As a result of these operations, it may be necessary to make an operational decision regarding the interruption of the gas flow from the Pipeline. Alarms will also be inserted to detect changes in gas pressures and temperatures.

Further to the alarm systems, trip systems will be installed at the RT. This system will be designed to automatically shut down the TurkStream Pipeline if operating parameters (for gas pressure, temperatures or flows) outside the defined limits are detected by the SCADA system.

Some of the security features which will be installed in the RT for normal operation conditions are; high and low pressure, temperature and flow alarms and shut down systems. The alarms generally notice the operators first about the problem. At this stage the alarm will not shut down the system. If the problem continues and it reaches the pre-determined shut down value, The TurkStream Pipeline System will be automatically shut down by the SCADA system.

Emergencies may occur caused by the ship accidents which may occur in Offshore and Shore Crossing Sections. It is considered that if the presence of, "Safety Management System", required to be on board according to the Emergency Response Plan prepared for the Offshore and Shore Crossing Sections by an institution authorized by the ministry and the Risk Evaluation (Annex-5.A) approved by relative authorities, the Emergency Procedure which will be developed by the Project Owner; and the International Convention for the Safety of Life at Sea, 1974 (SOLAS 74) on board is checked by the Project Owner, the effects of the possible emergencies can be reduced to minimum. The design, which was developed in the scope of the Project for emergencies, is presented in Section 1.11 (Features of the Project).

6.8 Ecology

This chapter provides an assessment regarding the impacts of the Project on both terrestrial and marine biological environment (biological recipients). In the assessment, all the impacts are included throughout every stage of the Project. Furthermore, the potential impacts of unexpected/emergency situations on biological recipients in marine environment are evaluated. Most of the impact is expected to affect the environment in the construction stage. The assessments within the scope of the Project regarding the identification of the marine environment in the Project area are explained in **Chapter 7 (**Biological Environment Assessment) thoroughly.

6.8.1 Identification of Natural Environment in the Black Sea (Methodology, Sampling Stations, Field Study Findings, General Evaluation and Protection Measures, Evaluation of Migration Routes and Times)

In the Black Sea there are two different layers of water with different salinity rates. The less salty top layer with an average salinity of 17 ‰ is formed by large amounts of fresh water flow originating from many rivers, including the Danube, Dnieper and Don rivers via the Sea of Azov. Beneath this water is a layer of seawater from the Mediterranean that has higher salinity (20-30 ‰). This stratification, which forms a distinct and permanent pycnocline[4] between about 150 and 200 m depth, creates a unique chemical and biological environment by restricting vertical water movement between surface water and deep water.

The upper water layers of the Black Sea form a thin (biotic) layer suitable for living. Under natural conditions, the fauna biodiversity of the Black Sea in this biotic layer is about one third of the Mediterranean, due to its low salinity. However, thanks to the high input of river-based foods, the biological productivity in the Black Sea is much higher than in the Mediterranean (Ref. 6.59).

Throughout the Black Sea, the following types of marine habitat are found:

- Surface water up to about 50 m deep has high level of oxygen and relatively low salinity (generally 17‰). Since the surface water layer is a photic[5], it is biologically productive and hosted very large populations of pelagic fish in the past. In these shallow waters, there are different kinds of habitats:
    - There are substrates of rock including Supralittoral cliffs in this shallow area. Hard substrates are significant due to their ability to form macroalgal beds that support a great variety of fauna species;
    - In shallow areas, sandy sediments are also available; these are formed via dissociation from fine materials by sedimentation and wave action. These layers contain a wide variety of internal faunal assemblages, especially those with bivalve molluscs; and
    - sludge sediments located in some stationary areas at depths of 10 to 20 m contain internal faunal assemblages.
- In the water at about 50 to 100 m depth (medium depth water), decreasing oxygen concentrations and increased salinity rates are present owing to the influence of the lower layer;
- This layer is generally called as suboxic. Concentration levels of oxygen (O_2) and hydrogen sulphide (H_2S) are extremely low in this layer and there are no detectable changes in vertical or horizontal directions (Ref. 6.59). Benthic zone habitats in these depths where wave energy is not present on the seabed usually consist of sludge sediments; and
- In deep water (below about 150 to 200 m) oxygen-free conditions emerge and H_2S concentrations increase. These conditions restrict the vertical distribution of both pelagic species and bottom organisms. Since the sludge sediments are dominant in deep water, microbial organisms live in those sediments. This lower water layer constitutes a high volume of 87% of the Black Sea. Although the information about life in the deep water of the Black Sea is limited, it is known that protozoa and bacteria live among the bottom creatures. For example, the deep oxygen-free shelf of the north-western Black Sea is covered with methanotrophic[6] microbial coat that can form a reef-like structure due to numerous gas leaks (Treude et al., 2005).

The seabed of the Black Sea is divided into three subjects as continental shelf, continental slope and abyssal plain. The area of the Black Sea basin is much wider than the sea surface area and is very vulnerable to pressure from human activities due to the concentration of population on the shores. Due to rapid economic growth in the late 20th century and the inability to manage marine resources

[4] Pycnocline is the layer where the density gradient is greatest within a body of water. The formation of pycnocline can be caused by salinity or temperature changes.
[5] Top layer with enough light for photosynthesis.
[6] The name given to bacteria that use methane gas as a carbon source by oxidizing it in order to produce energy.

properly, major environmental and ecological changes have taken place in the Black Sea ecosystem. In particular, eutrophication caused by excess nitrogen from land-based sources has led to a series of negative processes that have altered flora and fauna diversity and distribution throughout the Black Sea ecosystem. Uncontrolled fishing has also contributed to the changes in the structure and the dynamics of the Black Sea biology (Ref. 6.59).

In the past, eutrophication has caused large increases in the primary production of phytoplankton species in the Black Sea and changes in the abundance and composition of these species. Larger and more frequent algae proliferation has led to a significant reduction in the amount of dissolved oxygen and the covering of the benthic assemblages in many areas with organic matter by increasing the progress of organic matter to the seabed. The increasing number of harmful algal proliferations (red tides) has led to the death of many fish (Black Sea Flood Diagnostic Analysis, 2007).

Since the 1990s, the governments of countries that have a coast to the Black Sea have adopted policies to develop cooperation between coastal and non-coastal countries in order to implement a basin-wide approach to reduce pollution and to achieve the strategic goal of making the ecological situation of the Black Sea similar to that of the 1960s. Although pollution from land-based sources is still intense, it is in a decreasing trend and some improvement in the ecological situation is observed. For example, it has been observed that some species with decreasing numbers have shown an increase in their populations again and the frequency and intensity of algal proliferation has decreased (Ref. 6.59).

Detailed information on the identification of the natural environment in the Black Sea is provided in **Chapter 7** (Biological Environment Assessment, Chapter 7.1.1). While, information on evaluation of fish migration routes and times is provided in **Chapter 7** (Biological Environment Assessment, Chapter 7.1.2) and **Chapter 6** (Assessment of Current Environmental Characteristics, Chapter 6.9).

6.8.2 Identification of the Natural Environment in the Project Area and Assessment of the Current Situation (Methodology, Sampling Stations, Field Study Findings, General Evaluation and Protection Measures, Evaluation of Migration Routes and Migration Times)

6.8.2.1 Offshore Section

Offshore Section of the Project is similar to the general characteristics of the Black Sea which is summarized above, in Chapter 6.8.1. A comprehensive literature survey on the general hydrographical characteristics of the Black Sea, phytoplankton and zooplankton assemblages in the Black Sea, pelagic fishes, marine mammals and sea birds has been carried out in order to identify the marine flora and fauna species in the Offshore Section and to assess current situation. Within the scope of the research, species compositions, distributions and seasonal variations of phytoplankton and zooplankton assemblages in the Black Sea have been examined in detail. General biological characteristics of marine mammals distributed in the Black Sea have been defined; the distribution of these species in the world, their abundance levels in different regions of the Black Sea, whether they are the species with protection priority within the Bucharest Convention, whether they are in the Black Sea Red List and CITES List, their IUCN protection status and the threats they face in the Black Sea have been assessed. Information regarding bird migration routes that can be encountered in or around the Black Sea and bird species that can be found in the part of the Black Sea that covers the offshore section of the Project area, whether they are listed in the Black Sea Red List and their IUCN protection status is given in detail.

The fishes found in the Offshore and NearShore Crossing Sections are of great importance in terms of especially fishing activities in the Black Sea. Anchovy, which is Turkey's critical source of fish due to its commercial value, migrate to Northern Black Sea in February-April to spawn and feed. Having spawned and fed, with cold weather in October-December, anchovies return to Turkish shores. Anchovies are known to spawn widely in Southern Black Sea. Since the number of ships fleets to be utilized in the construction stage of Offshore and Shore Crossing Sections are significantly fewer from fishing fleet with 5.000 ships in the region resulting fewer ship activity, it is expected that ship activity of the Project is not going to change marine environment with the implementations developed for the Project such as design controls and measures for reducing the impact. Thus, it seems not quite possible that the vessel activity in relation with the Project would lead to any alterations of the migration patterns of the anchovy which is already under considerable stress from hunting activity. Furthermore, the Black Sea basin is used by almost 600.000 commercial ships per annum. Compared to underwater noise and vibration, water and waste discharges caused by the activities of ships and construction machinery and intensive ship traffic in the region, it is anticipated that the impacts of the Project will be quite low. When it is taken into consideration that the number of ships and work machines that will operate in the Offshore and NearShore Crossing Sections during the preparation and the construction stage will be considerably lower than the number of ships already in operation in the Black Sea, disturbances caused by the ships and machinery of the Project are estimated not to make any significant change in the fish behavior.

Detailed information on the identification of the natural environment in the Offshore Section of the Project and the assessment of the current situation are given in **Chapter 7**(Biological Environment Assessment, Chapter 7.1).

6.8.2.2 Shore Crossing Section

As stated in the opinion letter (**Annex-5.A**) of Directorate General of Environmental Management, MoEU regarding identification of the biological environment and assessment of current situation in the Shore Crossing Section of the Project, a marine biology study was conducted by Dokuz Eylül University the Institute of Marine Science and Technology (DEU-IMST) in the coastal waters (within 1 nautical mile) where the Project route passes.Shore Crossing According to the opinion letter, it is necessary to take samples from 500, 1,000 and 1,800 meters starting from the shore where the pipeline passes and the both sides of the pipeline along 500 m. In addition to the points suggested by the opinion letter, in the meetings with the Directorate General of Environment Management, MoEU it is agreed that samples from 250 meters from the shore and samples from 500 meters from each side of the line should be taken. As a result, marine physical oceanography, geology, biology and fishery studies were carried out in the Shore Crossing Section of the Project by the K. Piri Reis research ship between 4 and 6 April 2017 in the study area including the stations shown in Figure 6.6825 and Table6.708 in the Shore Crossing Section of the Project.

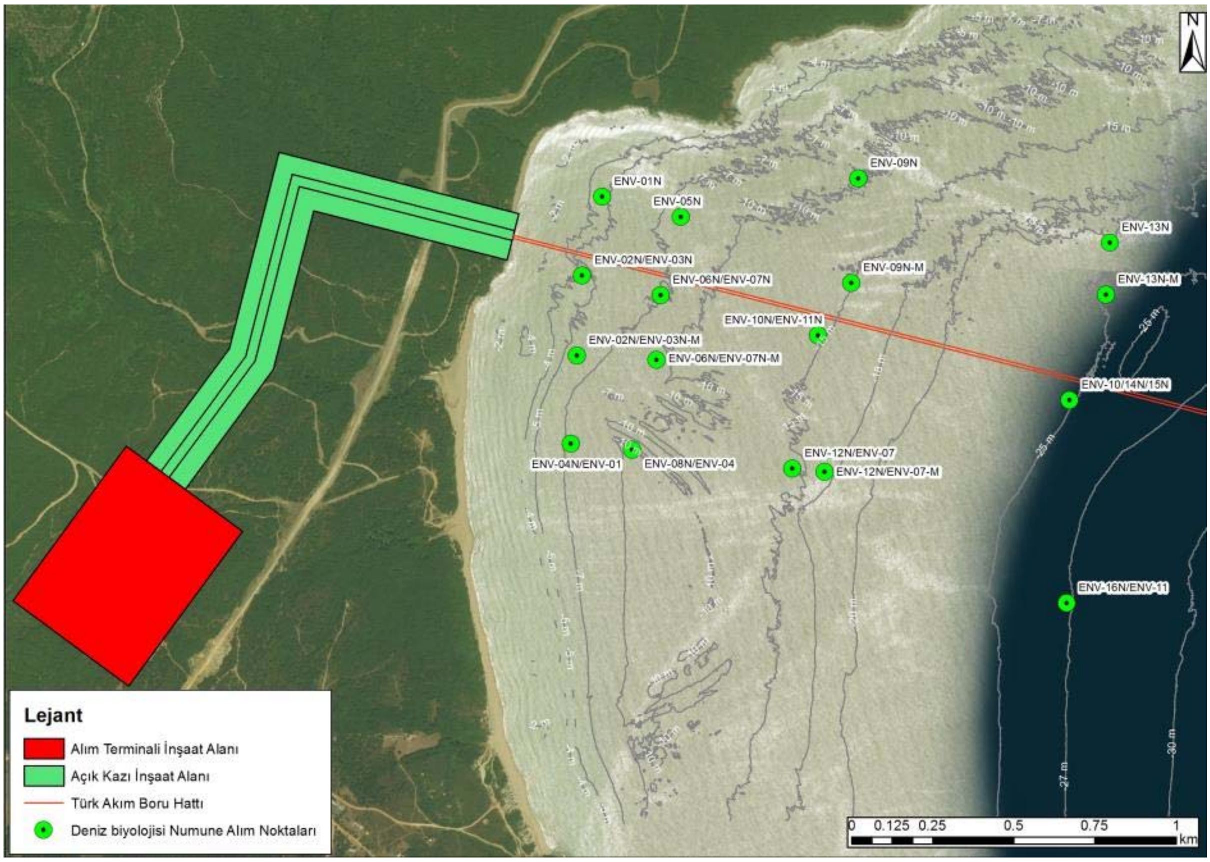


Figure 6.6825: Marine Biology Sampling Points

Table6.708: Parameters from Marine Biology Sampling Points

STATION CODE	X	Y	DEPTH (m)	CTD	SECCHI DISC	SEDIMENT	PHYTOPLANKTON	ZOOPLANKTON	BENTHIC
ENV-01N	28.092785	41.661300	5	√	√		√		√
ENV-02N/ENV-03N	28.092228	41.659053	5	√	√		√		
ENV-05N	28.095781	41.660881	8	√	√		√		√
ENV-06N/ENV-07N	28.095223	41.658636	8	√	√		√		
ENV-09N	28.102329	41.662292	11	√	√		√		
ENV-10N/ENV-11N	28.101214	41.657800	15	√	√		√		√
ENV-13N	28.111914	41.660953	21	√	√		√	√	
ENV-04N/ENV-01	28.092216	41.654303	8	√	√		√		√
ENV-08N/ENV-04	28.094545	41.654247	10	√	√		√		√
ENV-12N/ENV-07	28.100586	41.654014	13	√	√		√		
ENV-10/14N/15N	28.110797	41.656460	25	√	√		√	√	√
ENV-16N/ENV-11	28.111203	41.650753	27	√	√		√	√	√
ENV-12N/ENV-07-M	28.101797	41.653983	18			√			
ENV-13N-M	28.111907	41.659494	26			√			

STATION CODE	X	Y	DEPTH (m)	CTD	SECCHI DISC	SEDIMENT	PHYTOPLANKTON	ZOOPLANKTON	BENTHIC
ENV-09N-M	28.102328	41.659341	15			√			
ENV-06N/ENV-07N-M	28.095229	41.656814	10			√			
ENV-02N/ENV-03N-M	28.092234	41.656788	6			√			

A summary of the results obtained regarding the marine biology examination is presented below. The methodology and detailed results of the study are given in **Chapter 7** (Biological Environment Assessment).

6.8.2.2.1 Physical Oceanography

The range of physical-oceanographic parameters (temperature, salinity and density values) varies depending on the seasons and regions. For this reason, high-resolution space-time-based studies have been carried out in order to demonstrate the physical and oceanographic characteristics of seawater in the study area. In these studies, January[7] and April 2017 data were used.

According to the results obtained, in January 2017 there was a water column which is nearly vertically homogeneous depending on the temperature values ranging from 3.8-4.6 ° C. In April 2017, the temperature values increased with the warming air and temperatures ranging from 8.6-9.8 ° C on the surface and 7-7.5 ° C on the bottom were measured. In summary, water temperatures around 4 ° C in January warmed up to 9 ° C in April. In January the water column was observed to be completely mixed; however, stratification began in April. The mixture layer on the surface reached 10 m and seasonal thermocline was formed at 10 m. With the increasing warmth, this stratification will be clearer.

The methodology and detailed results of the study are given in **Chapter 7** (Biological Environment Assessment, Chapter 7.1.2).

6.8.2.2.2 The range of sediments in the study area

There are two dominant classes on the seabed of the study area: rocky and sandy sedimentary fields. Large stones containing gravel were observed only at one station (ENV-16N / ENV-11N) and again only one station (ENV-13N-modified) showed relatively high clay + silt content (Table 6.719).

Table 6.719: Findings of screen analysis and sediment class of every station

Station	Gravel (> 4,75mm) (%)	Sand (4,75-0,075 mm) (%)	Silt (0,074 - 0,005 mm) (%)	Clay (0,005 - 0,001 mm) (%)	Colloids (< 0,001 mm) (%)	Sediment class (Shepard)
ENV-05N	0.0	98.2	1.7	0.0	0.1	Sand
ENV-NEW 11N	0.8	97.1	1.9	0.0	0.2	Sand
ENV-NEW 04N	1.3	97.6	1.0	0.0	0.1	Sand

[7] January data was provided by Düzen Norwest for DEU-IMST.

Station	Gravel (> 4,75mm) (%)	Sand (4,75-0,075 mm) (%)	Silt (0,074 - 0,005 mm) (%)	Clay (0,005 - 0,001 mm) (%)	Colloids (< 0,001 mm) (%)	Sediment class (Shepard)
ENV-16N/ ENV-11N	15.2	79.9	4.6	0.0	0.3	Gravelly sand
ENV-08N/ENV-04	0.0	98.6	1.3	0.0	0.1	Sand
ENV-NEW-15N/ENV-10	NA (shell)	NA (shell)	NA (shell)	NA (shell)	NA (shell)	NA
ENV-01N	0.0	94.9	4.8	0.0	0.3	Sand
ENV-02N/ENV-03N (modified)	1.4	95.6	3.0	0.0	0.0	Sand
ENV-06N/ENV-07N (modified)	1.9	92.8	5.4	0.0	0.0	Sand
ENV-09N (modified)	2.8	93.4	3.8	0.0	0.0	Sand
ENV-13N (modified)	1.5	65.7	14.7	1.9	16.2	Clayey sand
ENV-12N/ENV-07 (modified)	0.1	95.5	4.4	0.0	0.0	Sand

As shown in Table 6.99, the sand content is in the range of 65.7% -98.6% at all stations. This high sand content, which is 91.8% in average, naturally causes sand dunes on the seabed. The gravel content is generally low, less than 15.5% at all stations, and the average value is 2.3% indicating the effect of the non-sampling of shallow areas which is not deeper than 5 m in the study area. Fine grades of silt and clay have separated this location (ENV-13N modified) from others by reaching the maximum value at the same station. In this station silt reached to value of 18.1% and clay reached 14.7%. Also, it should also be emphasized that the shell content is high in some locations in the sandy sediment areas.

The methodology and detailed results of the study are given in **Chapter 7** (Biological Environment Assessment, Chapter 7.1.2).

6.8.2.2.3 Phytoplanktons

As a result of the analyses conducted, it was detected that the phytoplankton abundance values were homogeneously distributed among the groups and the species diversity was low. A total of 42 taxa have been identified: Diatom (14), Dinoflagellate (24), Prymnesiophyceae (Coccolithophorids) (1), Cryptophyceae (1), Chrysophyceae (1) and Dictyochophyceae (1). The average percentages of dominant groups were defined as: Diatom 11%, Dinoflagellate 10%, Cryptophyceae: 23% and Nanoplankton:46%. As it is indicated, nanoplankton groups have the highest rate. There are 4 different size classifications in this group; < 5 µm, 5-6 µm, 7-8 µm and 9-10 µm and they were shown to have avarage abundance value of 205.000, 90.000, 65.000, 28.000 cells l^{-1} respectively.

The highest number of phytoplankton abundance was detected in stillage of the station ENV 13N (1.600.000 cells l^{-1} and the noplankton in this station have reached 1.078.000 cells l^{-1} levels and dominantly represented by < 5 µm size. Nanoplanktons are followed by Cryptophyceae (245.000 cells l^{-1}), Nanoflagellate (100.000 cells l^{-1}) and Dinoflagellate (80.000 cells l^{-1}) respectively and the most commonly observed Dinoflagellate species are *Heterocapsa circularisquama*, *Protoperidinium pellucidum* and *Protoperidinium sp.*

The methods used in the study and detailed results are presented in Chapter 7 (Evaluation of Biological Environment, Section 7.1.2).

6.8.2.2.4 Zooplanktons

Masozooplankton is the most important component of the pelagic ecosystem which involves the organisms in the 200 µm - 2 mm size groups. This group involves holo and meroplanktonic organisms such as Copepoda, Cladocera Appendicularia, Chaetognatha and Polychaeta. The groups, which constitute the mesozooplankton in the sampling area, are collected from four stations representing the sampling period. The collected zooplankton samples were inspected via Zeiss 508 sterio microscope. The sample results, which were inspected in standard volumes, were calculated in individual/m^3 format. As a result of the analyses conducted, the group, which was represented by most species in all stations, is determined to be copepods. It is observed that the number of copepod species is higher in the deep stations.The methodology and detailed results of the study are given **in Chapter 7** (Biological Environment Assessment, Section 7.1.2).

6.8.2.2.5 Macrobenthos

A total of 165 species, 96 of which in soft substratum and 86 of which in solid substratum, were discovered as a result of the faunistic analyses of the benthic samples which were collected from different biotopes during the marine biology study conducted in the scope of the Project. While the Mollusca have the highest amount of species (51 species) in soft substratum, Polychaeta is the group which has the highest amount of species in the solid substratum (33 species). 9 polychaeta species (*Pterocirrus macroceros*, *Erinaceusyllis belizensis*, *Salvatoria dolichopoda*, *Glycera tridactyla*, *Aricidea* (*Strelzovia*) *suecica meridionalis*, *Paradoneis armata*, *Polydora cornuta*, *Magelona mirabilis* and *Branchiomaldane vincenti*), 1 crustacea specie (*Medorippe lanata*), 1 tunicata specie (*Pyura dura*), 1 echinodermata specie (*Astropecten* sp.) and 1 bryozoa specie (*Collarina balzaci*) was first recorded in the Turkey shores of the Black Sea for the first time in this study. In addition, 1 Polychaeta specie (*Orbinia latreillii*) was recorded for the first time for the Turkey shores.

Ecrobia ventrosa, *Bittium reticulatum*, *Caecum trachea*, *Chamelea gallina*, *Rissoa splendida* and *Donax trunculus* are the mollusc species which constitute the 88.5% of the total individual amount in the soft substratum samples. *Ecrobia ventrosa* is the most dominant specie among these species in the area (46.4%). However, the most dominant species detected in the solid substratum samples are the species which belong to the Mytilidae familia (Mollusca, 65.7%), *Bittium reticulatum* (Mollusca, 14.9%), *Mytilaster lineatus* (Mollusca, 4.6%), *Tricolia pullus* (Mollusca, 4.5%) and *Ampithoe ramondi* (Crustacea, 2.5%). *Bittium reticulatum*, which is a Mollusc specie was observed in both soft and solid substrata.

Biomass values of the invertebrates vary from 2.2g to 101.9g in soft substratum and from 0.6g to 31g in solid substratum. The fact that the Mollusca group has the highest biomass in both soft and solid substrata originates from the high number of individuals that the *Chamalea gallina* and*Donax trunculus* species have.

The collected species were evaluated in accordance with the Berne Convention and IUCN Red List and no species under threat was observed.

The methodology and detailed results of the study are given in **Chapter 7** (Biological Environment Assessment, Chapter 7.1.2).

6.8.2.2.6 Fish and Fishery

Only a few numbers of fish and a few fish species (only 6 species in total) could be caught in the samplings via beam trawls in the area. Almost all of the material obtained in the samplings with beam trawls consists of benthic invertebrates and their dead shells. The fish caught in the beam trawl samplings are juvenile (young or offspring) individuals except for the species *Syngnathus tenuirostris*. According to the biomass estimations made with the beam trawl samplings, the relative amount of bony fish distributed at depths shallower than 20 m is 1.27 kg / km^2 in the study area. This is a quite low value. The situation is not so different regarding the samples gathered with bottom trawling in the area. In the samplings, large amounts of invertebrate benthic organisms and shells (dead shell fragments) were caught. The number and amount of the species were pretty few in the trawl samplings.

In the bottom trawl samplings, 16 bony fish species were caught. Biomass quantities of bony fish, which accounted for 54% of total catches, were estimated to be approximately 65 kg / km^2. Although this value is higher than the samples gathered with beam trawl, it is still much lower than expected. The small size range of the fish species caught by both the beam trawl and bottom trawl samplings indicates that Kıyıköy coastal area is a feeding and growing ground for fish. During the sampling period, the groundwater temperature (5-8 ˚ C) was very low. This causes adult fish to leave the coast and go to offshore waters where they are likely to have warmer waters for winter. The abundance of young fish in the study area, especially the whiting juveniles constituting a large part of the haddock population with large commercial value for the Black Sea, indicates that the region is an important growth area where the fish go through adolescence. Different sizes of whiting caught in the samplings shows that the reproductive function of the said species is carried out throughout the period.

The methodology and detailed results of the study are given in **Chapter 7** (Biological Environment Assessment, Section 7.1.2).

6.8.2.2.7 Marine Mammals

Random observations in the area during field work revealed many dolphin individuals belonging to three different dolphin species. Especially during the trawl samplings, they were observed to get too close to the trawling net. Observed species: *Phocoena phocoena* (Harbour porpoise), *Delphinus delphis* (Short-beaked common dolphin) and *Tursiops truncatus* (Common bottlenose dolphin). Detailed results of the study are given in **Chapter 7** (Biological Environment Assessment, Section 7.1.2).

6.8.2.2.8 Water and Sediment Quality Assessment Results

Analyzes of the water and sediment samples taken from the study area were made by Düzen Norwest.

The results obtained from the water analyzes are below the limit values stated in the related regulations for all microbiological parameters. The results obtained from the cadmium, arsenic, lead, chromium, copper, nickel, zinc and mercury analyzes measured at all sampling stations show that heavy metal concentrations do not pose any ecological risk to the benthic organisms in the study area. Detailed results of the study are given in **Chapter 7** (Biological Environment Assessment, Section 7.1.2).

6.8.2.2.9 Habitat Types in the Study Area

A total of 6 habitat types were identified in accordance with the 3rd level of EUNIS marine habitat classification in the study area. Four of these represent rocky habitats of the Black Sea and two represent sandy habitats (Figure 6.696). The study found that "sublittoral sediments" (A5.13 and A5.23) contains the most commonly found marine habitat types with a 61% distribution ratio.

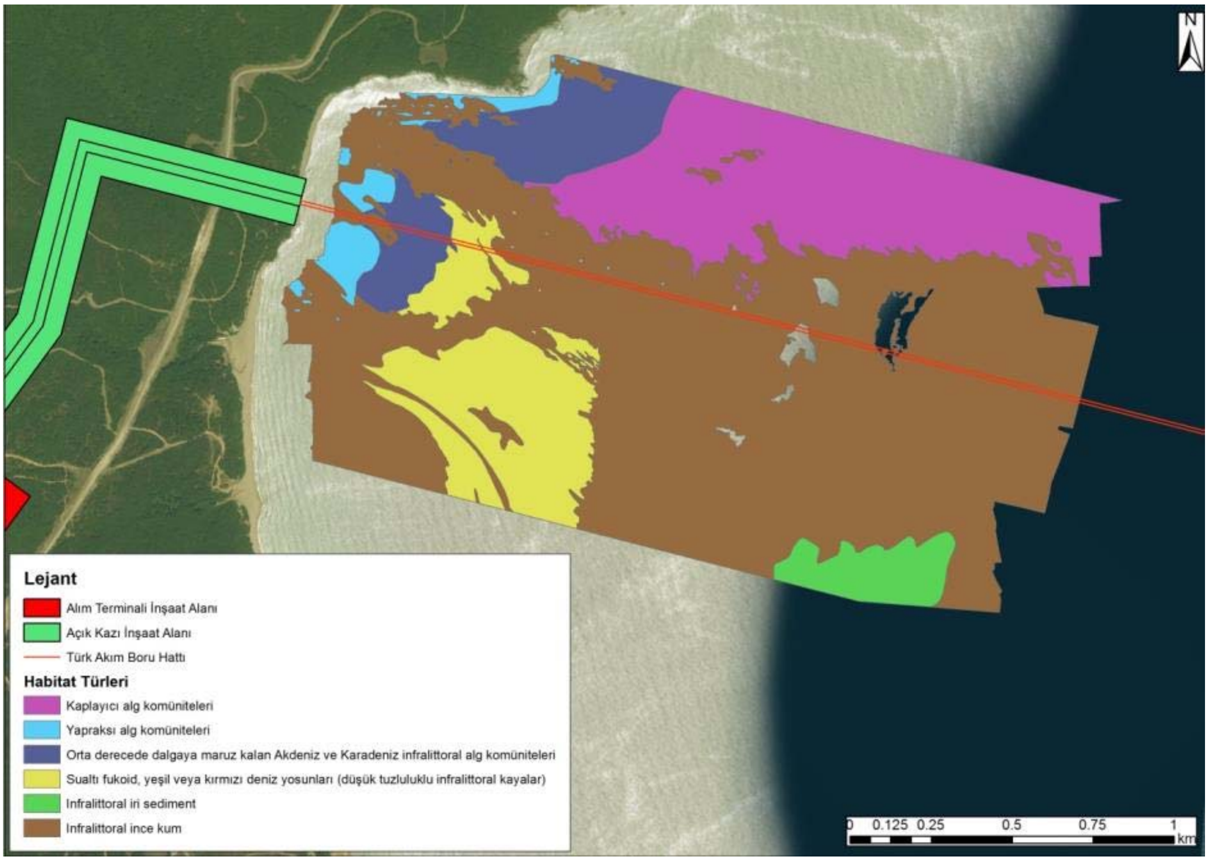


Figure 6.696: Habitat Types in The Study area.

The methodology of the identification of the habitats and studies on the habitats are provided in detail in **Chapter 7** (Biological Environment Assessment, Section 7.1.2).

6.8.2.3 Onshore Section

6.8.2.3.1 Flora

In order to identify the flora in the vicinity of the Onshore Section, Gazi University flora specialists carried out a total of 8 days of field work 1 day in February, 3 days in May and June, and 1 day in August 2015. In addition, field studies were conducted in the regions that were not previously reviewed in the Onshore Section of the Project because the pipeline route and the selected open excavation technique were changed due to the reasons described in **Chapter 1** (General Characteristics of the Project).

The flora of the Onshore Section was examined in two parts. First part covers the sandy area of the Onshore Section. This area contains stationary coastal sand dune and ahead of it stony-bushy habitats. The second part includes the Receiving Terminal, the open excavation pipeline route and the transportation routes. This area includes habitat types such as mixed oak forests, riparian forests and marsh habitats that grow in creek lengths and plain marsh.

The floristic lists prepared within the scope of the study are arranged based on the collected plants and observations during the field studies and it is considered that they cover all the flora species that can be assigned in the Project area. The plants collected in the project area were appointed with the help of the work "Flora of Turkey and East Aegean Islands" (Ref 6.60). The Turkish names of the plants were predominantly based on the work "Turkish Plant Names" (Ref. 6.61). The "Red Data Book of Turkish Plants" (Ref.6.62) was used as reference for endemic plants and non-endemic but rare spreading plants, to identify their danger category and furthermore, these danger categories were reinterpreted after taking into account of the population and the threat factors of the endemic species identified according to the IUCN 2001 criteria.

A total of **297** taxa belonging to **68** plant families of **5** different vegetation types were detected in the study conducted in February, May, June and August 2015 in the study area. Among these taxa, there are **3** rare endemic plant species (*Centaurea hermannii, Jurinea turcica* and *Euphorbia amygdaloides var. robbiae*) and **5** non-endemic but rare spreading plants (*Ferulago confuse, Lilium martagon, Linum hirsutum* subsp. *byzantinum, Heptaptera triquetra, Symphytum tuberosum* subsp. *nodosum*). While *Centaurea hermannii* and *Jurinea turcica* species of endemic taxa are defined as **EN**: Endangered, *Euphorbia amygdaloides* var. *robbiae* species is categorized as **NT**: Near Threatened by IUCN danger category.

All of the non-endemic but rare spreading species, *Lilium martagon, Ferulago confusa, Linum hirsutum* subsp. *byzantinum, Heptaptera triquetra* and *Symphytum tuberosum* subsp. *nodosum,* are categorized as **VU**: Vulnerable by IUCN. **8** species of both endemic and non-endemic but rare spreading are seen in similar habitats outside the Project area. *Jurinea turcica* species with especially local distribution which was defined in 2010, spreads to the area starting from rocky beaches inside Kıyıköy towards both north and south and their population is healthy.

The methodology and details of the study on the identification of land flora in the Onshore Section of the Project are given in **Chapter 7** (Biological Environment Assessment, Section 7.1.3.1).

6.8.2.3.2 Fauna

In order to identify the land fauna in the vicinity of the Onshore Section of the Project, Bülent Ecevit University fauna experts conducted a total of 17 days of field work; 8 days between 26 May-2 June and 9 days between May 15-23 June in 2015. In addition, field studies were conducted in order to identify land fauna in May 2017 in the pipeline route which is changed due to the reasons described in **Chapter 1** (General Characteristics of the Project).

Within the scope of the study, fauna groups in the vicinity of the Onshore Section such as the arthropods (butterflies, dragonflies, odonata), amphibians, reptiles, birds and mammals were examined and some remarkable insect species which were found by chance were included in the study.

Two studies were conducted to identify the movement of migratory birds in Fall 2015 and Spring 2017 in order to emphasize the importance of Onshore Section for migratory birds and to record bird migration. In order to observe and record the Fall migration of the birds, 9 days of observation in 15-23 August 2015, 9 days of observation in 01-09 September 2015, 7 days of observation in 21-27 September 2015, 7 days of observation in 05-11 October 2015 and 11 days of observation in 19-29 October 2015 was conducted. A total of 43 days of bird migration observations were conducted in the five periods with the aforementioned intervals. A total of 20 days of bird migration observations were conducted in the scope of observation studies of Spring migration of the birds which includes, 6 days of observation between 26th of April and 1st of May 2017, 7 days of observation in 06-12 May 2017 and 7 days of observation in 22-28 May 2017.

With the field studies, **34** mammals, **34** butterflies, **16** dragonflies, **8** odonata, **18** reptiles and **7** amphibian species were identified in the study area

11 of the mammal species are included in Annex II of the Bern Convention, **14** are in Annex III of the Bern Convention, **5** are in Annex II of Habitat Directive, **3** are in Annex IV of Habitat Directive and **1** is in Annex V of Habitat Directive. Among mammal species, *Myotis capaccinii* is categorized as **VU**: Vulnerable; *Rhinolophus blasii*, *Rhinolophus ferrumequinum, Myotis bechsteini, Miniopterus schreibersii and Lutra lutra* are categorized as **NT**: Near Threatened by IUCN danger categories. Among dragonfly species identified in the study, *Somatochlora borisi* is categorized as **VU:** Vulnerable, while *Libellula pontica* is categorized as **NT:** Near Threatened by IUCN. **3** of amphibian species are included in Annex II of Bern Convention, other **3** of them are in Annex III of Bern Convention, **4** are in Annex IV of Habitat Directive, **1** is in Annex V of Habitat Directive. All amphibian species are categorized as **LC:** Least Concern by IUCN categorization. **13** of reptile species are included in Annex II of Bern Convention, **3** of them are in Annex III of Bern Convention, **1** is in Annex II of Habitat Directive, **14** are in Annex IV of Habitat Directive. Among reptile species, *Testudo graeca* is categorized as **VU:** Vulnerable; *Emys orbicularis, Testudo hermanni and Darevskia praticola* are categorized as **NT**: Near Threatened by IUCN.

A total of 112 bird species were observed during the field studies and bird migration observations in the Onshore Section. **80** of these species are included in Annex II of Bern Convention, **23** are in Annex III of Bern Convention, **12** are in Annex I of CHC(2016-2017), **12** are in Annex II of CHC(2016-2017), **3** are in Annex I of CITES, **23** are in Annex II of CITES.

The results showed that Kıyıköy region was used by especially Buteos, Lesser Spotted Eagles, White Storks and Black Storks during the fall migration period; and by Stork, Honey Buzzard and Bee-Eater in the spring period. According to IUCN, none of the identified bird species is categorized as **CR**: Critically Endangered but *Neophron percnopterus* (Egyptian vulture) and *Aquila nipalensis* (Steppe eagle) are categorized as **EN**: Endangered. In line with the surveys carried out, the two said species of birds do not flock the area for reproduction but are just trespassers during migration.

The methods followed and the studies conducted while determining the fauna located in the Onshore Section of the Project is presented in Chapter 7 (Evaluation of Biological Environment, Section 7.1.3.2) in detail.

6.8.3 Impacts of the Works and Operations within the Scope of the Project on the Biological Environment and Measures for Controlling and Reducing Them (Construction, Operation and Post-Operation)

Impacts of the works and operations within the scope of the Project on the biological environment and measures for controlling and reducing them are explained in **Chapter 7** (Biological Environment Assessment).

6.8.4 Other Issues

There is nothing else to be assessed under this heading.

6.9 Fishery and Aquaculture

In this chapter, a general evaluation of fishery and aquaculture within the Project is provided. A marine biology study was started in April 2017 by Dokuz Eylül University, The Institute of Marine Science and Technology in order to assess the current status of the biological environment in the coastal waters (within 1 nautical mile) on the route of the Project. Findings of literature surveys and studies are given in detail in **Chapter 7** (Biological Environment Assessment). The economic and employment conditions in fishery and the impacts of the Project on fishery are examined in detail under **Chapter 9** (Socio-Economic Environment Assessment) within the socio-economic study carried out by socioeconomic experts for the Project.

6.9.1 Fish Migration Routes and Feeding Grounds

Zaitsev and Mamaev (1997) reported that 168 fish species are distributed throughout the Black Sea, while Bilecenoğlu et al. (2014) stated that they identified 154 fish species in Turkish Coast of Black Sea. Some of these fishes spend their entire life span in the Black Sea, while some of them migrate through the Bosporus to the Sea of Marmara and some species (bluefish, bonito) from here to the Aegean and Mediterranean. The most known of these migrating fish are the ones which form a herd such as anchovy, bonito, bluefish and horse mackerel with high commercial importance in the Black Sea. This immigration, in the Black Sea itself and from the Black Sea via the Bosporus to the Sea of Marmara, is of great importance in terms of many aspects (biological, ecological and economic), thus it has attracted the attention of researchers since 1950 and many studies regarding the species have been conducted. However, these studies on the Turkish side of the Black Sea mostly focus on the issue of when and where the immigration event began and ended in the Straits System. The studies carried out in other parts of the Black Sea are mostly related to the migration of small pelagic species such as anchovy, horse mackerel and sprat in Black Sea itself. In this chapter, the current literature on fish migration patterns is provided with the studies conducted by our country and other studies conducted in the Black Sea.

6.9.1.1 Anchovy

The anchovy forming great herds in coastal waters is a form of euryhaline (which can live in a wide range of salinity) and can be found in a wide range from brackish water with salinity of 5 ‰ to environments with 41 ‰ salinity. The anchovy in the western and north-western Black Sea basins breeds between 0 and 25 m depths as the hottest layers of the sea from May to the end of August, when the water temperature changes between 16 and 28°C; however, the peak months for breeding are June and July, and the optimum temperature range is between 19-24 ° C. The results obtained from the Turkish shores correspond with the results from other parts of the Black Sea (Ref. 6.63). According to the results of the scientific research (Ref.664) of 1985, which is respected by many researchers regarding the breeding of the Black Sea anchovy, they migrate to the northern basin of the Black Sea in February and April for breeding and feeding then with the colds in October-December, they return to Turkish coasts after breeding and feeding. In addition to the North Black Sea, a detailed investigation (Ref 6.65) conducted in 1994 revealed that the anchovy was also intensively breeding in the southern Black Sea (ie Turkish Coast) (Ref 6.65) (Figure6.707).

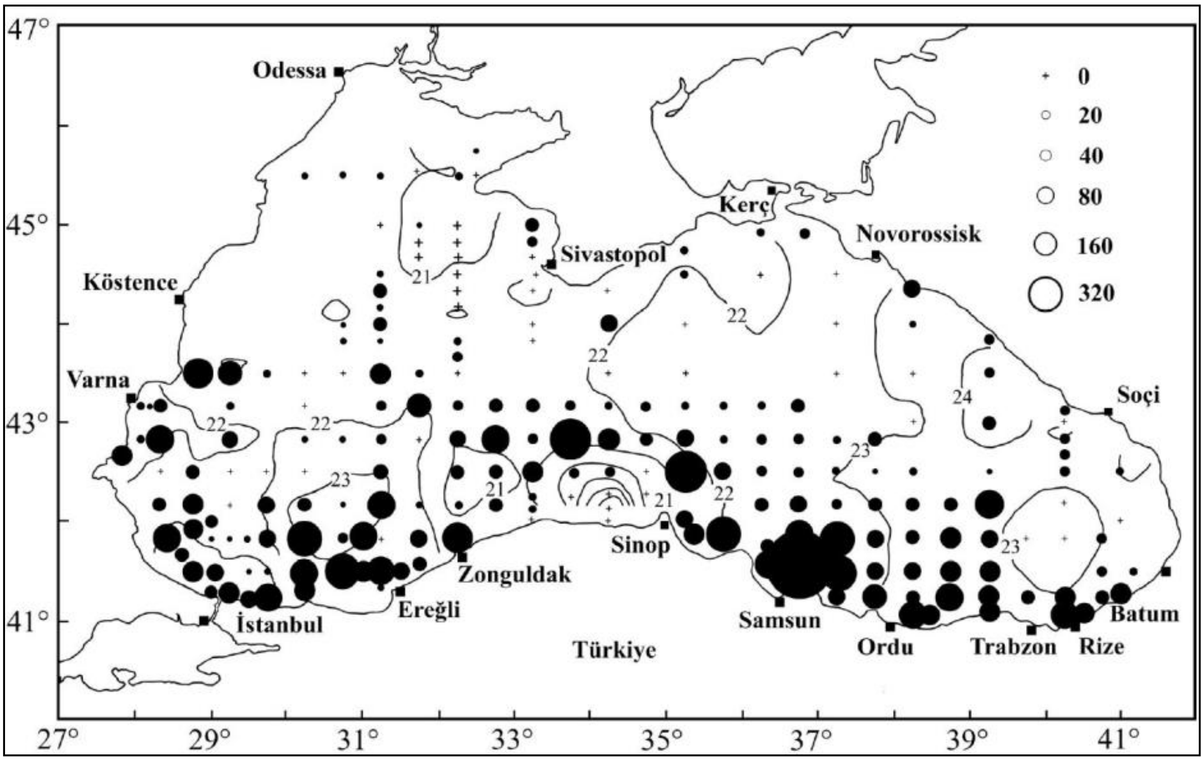


Figure6.707: Distribution of Anchovy Eggs in the Black Sea (number.m^{-2}) (The largest dot is 1167 Eggs.m^{-2})

6.9.1.2 Bonito

In terms of economic value, one of the most important pelagic fishes in the Black Sea is the bonito. This species, which was hunted 20,000 tons from the entire Black Sea basin in 1969, cannot be hunted by any country other than Bulgaria and Turkey for the last 45 years, mainly due to pollution in the northern Black Sea waters, changes in oceanographic conditions that seriously affect the migration route and in addition to overfishing (Ref. 6.66). With a typical breeding and feeding migration pattern, the bonito migrates from the Aegean Sea to the Black Sea starting from April to the middle of August, then returning to the Aegean Sea again during the winter season (Ref 6.67). Bonito has an extremely fast growth performance. It reaches 35-40 cm at the end of the first year and reaches 50-60 cm at the end of the second year, reaching up to 70 cm (and rarely 90 cm) on our shores (Ref. 6.68; Ref.7.72; Ref. 6.70).

6.9.1.3 Bluefish

Following anchovies and bonitos, one of the most hunted species in the western Black Sea is the bluefish which has extremely high economic value. To date, a limited number of researches have been conducted on the biology of this species. After laying eggs to the Sea of Marmara, bluefish passes initially to the western Black Sea, where they migrate again towards the Aegean Sea; on the other hand, the eastern Black Sea population probably does not participate (Ref. 6.68; Ref. 6.69; Ref. 6.70).

6.9.1.4 Trachurus

Horse mackerel, migrating north in order to breed and feed in the spring, is distributed throughout the entire continental shelf (especially over the seasonal thermocline) during the summer season and moves south and southeast of the Black Sea in fall season to spend winter (Ref. 6.64).

Information on the migration routes and feeding grounds of pelagic fish is given in **Chapter 7** (Biological Environment Assessment).

6.9.2 Fish Species and Annual Numbers

The fishing activities in the province of Kırklareli are concentrated on a small number of species and turbot, red mullet and whiting are hunted with bottom trawl; bonito, bluefish and anchovy is caught via seine net. Since most of the herding fish move counterclockwise during their migrations in the Black Sea, a large number of high-tech boats come from other ports to the coast of Kırklareli with the beginning of the hunting season.

Within the scope of the Project, a marine physical oceanography, geography, biology and fishery study with the K. Piri Reis research ship between April 4th and 6th 2017 was carried out on a wide area of study (Figure 6.718) selected by experts of the Dokuz Eylül University the Institute of Marine Science and Technology, covering the Shore Crossing Section. Findings and results related to fish species and fishery in the "Preliminary Report of the Near Shore Marine Biology Survey" (May 2017) are presented in this chapter. Other parts of the aforementioned report regarding marine biology are covered in detail in **Chapter 7** (Biological Environment Assessment).

Among approximately 3.800 plant and animal species identified in the Black Sea, fungi, algae and plants cover 42,9%; invertebrates constitute 52,5%, while 4,5% belongs to fish and sea mammals cover 0.1%. (Zaitsev And Mamaev, 1997). Although marine fishes constitute a small part of the Black Sea biodiversity, large stocks of species such as anchovy, bluefish and bonito are significant because of their high commercial value. When we look at fishery studies, a lot of them were carried out in the central and eastern Black Sea basins. A limited number of studies were conducted in the coasts of Thrace (YMBP, 2010). It is aimed to reveal the fundamentals about biological characteristics of Shore Crossing Section with the marine biology studies.

The fishes hunted by Turkey in the Black Sea are pelagic and demersal (bottom) species which migrate. Sampling was carried out using the beam trawls [8]and bottom trawls on 5-6 April 2017 in the study area in order to determine the current status of the fishery resources which are distributed on the seabed (on the surface) and over the seabed (demersal). Prior to the sampling, the bottom structure was checked with a scientific depth meter (Simrad EK60) to determine whether it was suitable for bottom or beam trawling and a total of 8 samples were taken with 4 being beam trawl sampling and the rest being bottom trawl sampling. At the shallow depths less than 20 m in the study area, beam trawling was preferred as sampling device. Two of the beam trawl samplings were performed at depths less than 20 m, while the other two samples were taken from depths starting from 16-17 m and continuing up to 31-33 m. Samplings were carried out in daylight. The mesh width of both sampling tools was 20 mm (full mesh size 40 mm) from knot to knot. The study area and the route between starting and ending positions for towing of trawls are given in Figure 6.718.

[8] A hunting device which is towed at the bottom, is composed of an iron frame and a net sack attached to it, (Hoşsucu, 1991).

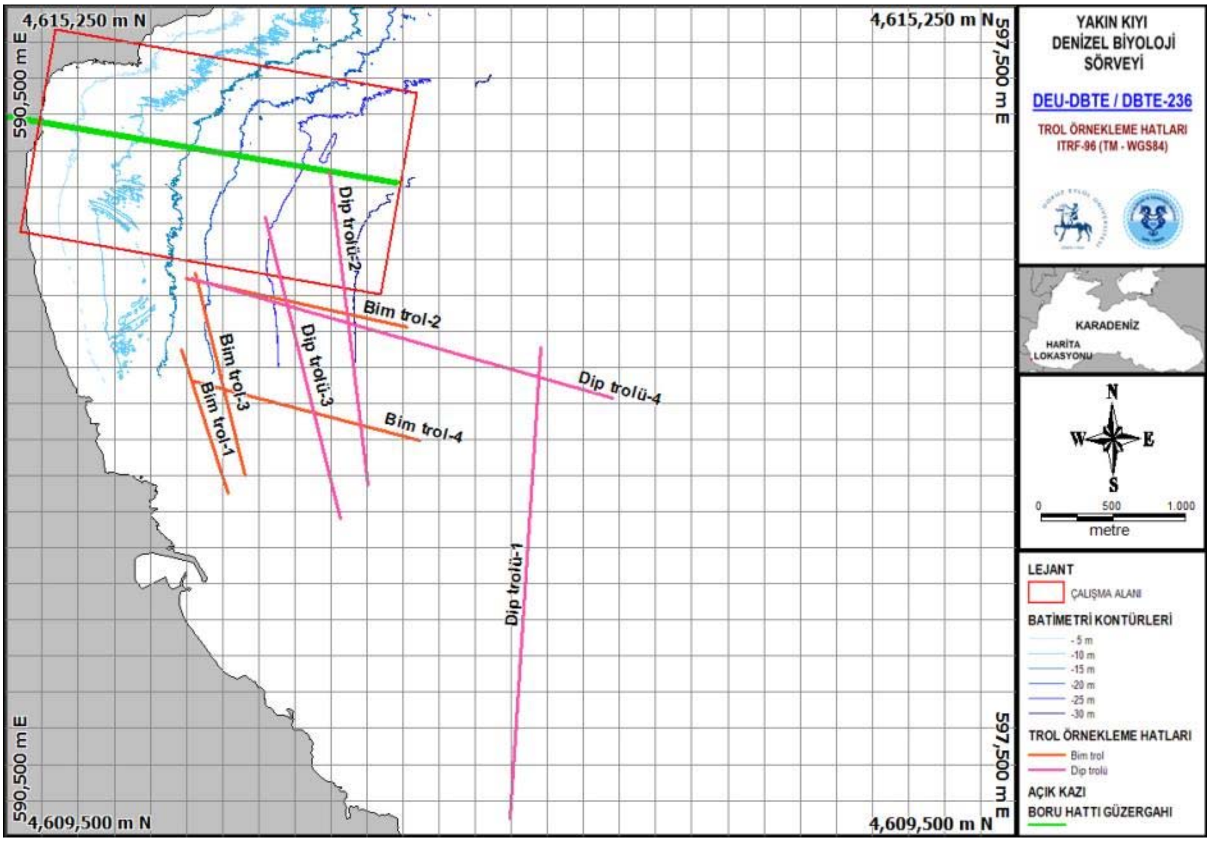


Figure 6.718: Starting and Ending Positions of Trawling Routes in Kıyıköy Shore and the Study Area

Only six kinds of fish species were caught by beam trawl samplings in the study area and those were sprat, anchovy, long-snouted seahorse, narrow-snouted pipefish, round goby and tentacled blenny. The fish caught in the beam trawl samples were juvenile (young or offspring) individuals, except for the narrow-snouted pipefish species. According to the biomass estimations made with the beam trawl samples, the relative amount of bony fish distributed at depths shallower than 20 m in the area was a very low value of 1.27 kg / km^2. For example, the bony fish biomass estimation of bottom trawl samplings made between November 2006 and October 2007 in Western Black Sea was approximately at 1.611 kg / km2 (Keskin, 2012). According to the samplings made in the West Black Sea during the period between October 2010 and April 2011 at depths between 30-100 m, the average amount of fish caught in one hour was found to be about 136 kg (Yıldız et al., 2013). In addition, in another study conducted in the Central Black Sea (Sinop-Yakakent Region), these values were estimated to vary between 327-16.940 kg/km^2 (Gönener and Bilgin, 2006). In a study conducted on the coast of Trabzon in the Eastern Black Sea, the total biomass amounts of demersal fishes were estimated to be between 1.703 kg/km^2 and 8.255 kg /km^2 (Ak et al., 2011).

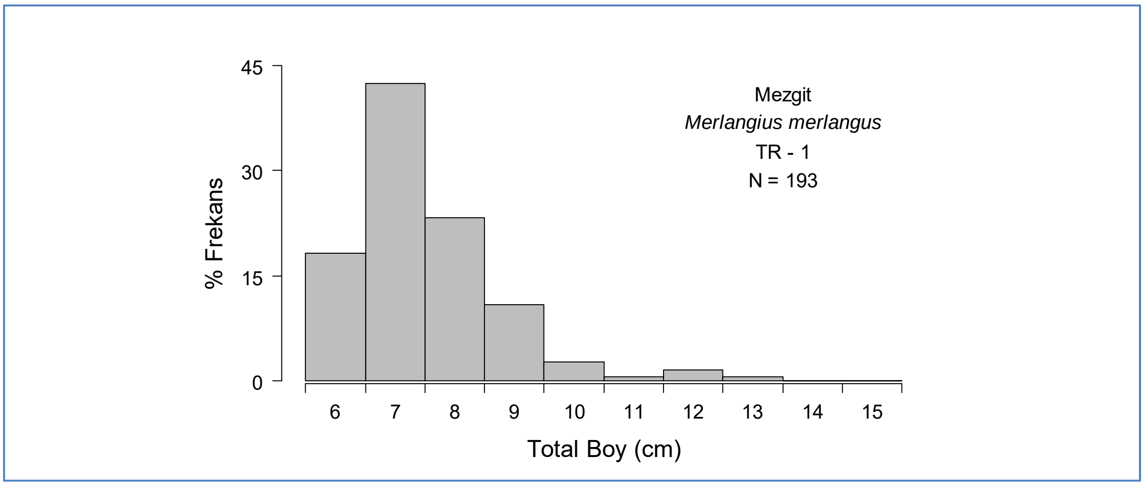
16 bony fishes including sprat, anchovy, long-snouted seahorse, narrow-snouted pipefish, broadnosed pipefish, whiting, red mullet, greater weever, stargazer, black goby, toad goby, round goby, black scorpionfish, turbot, scaldback and connemarra clingfish were found in the bottom trawl samplings (Figure 6.729). Biomass quantities of bony fish, which accounted for 54% of total catches, were estimated to be approximately 65 kg / km^2. Although this value is a much more reasonable value than the samplings carried out with beam trawls, it is still much lower than expected.

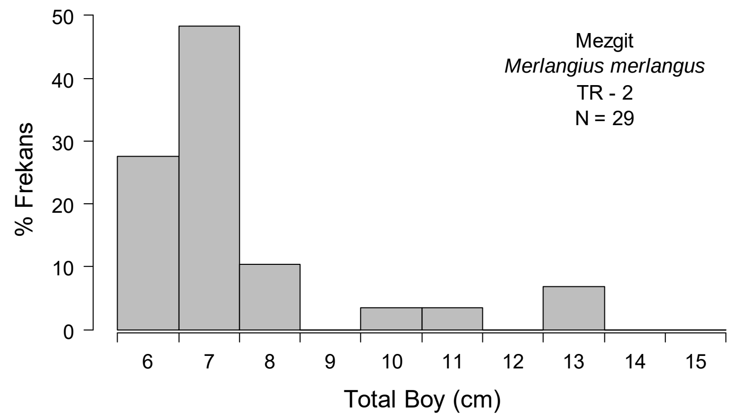
Figure 6.729: General Images of Materials Obtained in the Trawl Samplings (1, 2, 3 and 4)

Among the demersal species caught in trawl samplings, one of the highest commercial value belongs to turbot. It was observed that two turbots caught during sampling were small and juvenile individuals. The small size range of the fish species caught by both beam trawl and bottom trawl samplings indicates that Kıyıköy coastal area is a feeding and growing ground for fish. During the sampling period, the groundwater temperature (5-8°C) was very low. This causes adult fish to leave the coast and go to offshore waters where they are likely to have warmer waters for winter. The abundance of young fish in the study area, especially the whiting juveniles constituting a large part of the whiting population with large commercial value for the Black Sea, indicates that the region is an important growth area where the fish go through adolescence. Different sizes of whiting caught in the samplings shows that the reproductive function of the said species is carried out throughout the period. (Figure 6.7330)

Figure 6.7330: The size of whiting caught in the Project area.

Figure 6.7431 shows the height-frequency distribution graphs of whiting caught in the trawl samplings depending on the trawl sampling stations. Approximately 90% of the whiting is composed of small individuals of 6-8 cm length. A similar case applies to other fish species caught in the region. Another noteworthy finding is that no specimen of Chondrichthyes was caught in the samplings. It is possible that some shark and stingray species, which are known to be found in the region, are distributed in warmer depths at offshore due to the low temperature of sea water.





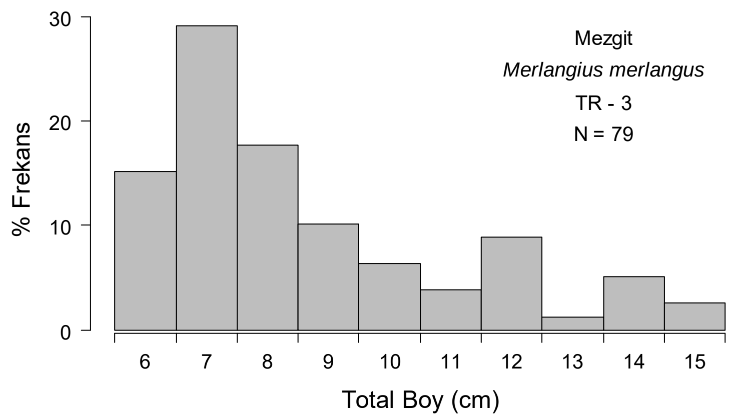


Figure 6.7431: Height-frequency distribution of whiting in the trawl samplings

In the samplings, no specimen of Chondrichthyes was caught. It is thought that some shark and stingray species, which are known to be found in the region, are distributed in warmer depths at offshore due to the low temperature of sea water.

The caught fish were evaluated in compliance with "IUCN Red List of Threatened Species" (IUCN, 2017) (Ref 6.74), but none of the species was threatened. The results of this evaluation are shown in Table 6.100, below.

Table 6.100: IUCN Statues of the Fish Caught by Beam and Bottom Trawls

Type	English Name	IUCN category
Sprattus sprattus	Sprat	Listed but not evaluated
Engraulis encrasicolus	Anchovy	LC (Least Concerned)
Hippocampus guttulatus	Long-snouted seahorse	DD (Data Deficient)
Syngnathus tenuirostris	Narrow-snouted pipefish	DD (Data Deficient)
Syngnathus typhle	Broadnosed pipefish	LC (Least Concerned)
Merlangius merlangus	Whiting	LC (Least Concerned)
Mullus barbatus	Red mullet	LC (Least Concerned)
Trachinus draco	Greater Weever	LC (Least Concerned)

Type	English Name	IUCN category
Uranoscopus scaber	Stargazer	LC (Least Concerned)
Gobius niger	Black goby	LC (Least Concerned)
Mesogobius batrachocephalus	Toad goby	LC (Least Concerned)
Neogobius melanostomus	Round goby	LC (Least Concerned)
Parablennius tentacularis	Tentacled Blenny	LC (Least Concerned)
Scorpaena porcus	Black scorpionfish	LC (Least Concerned)
Scophthalmus maximus	Turbot	Listed but not evaluated
Arnoglossus kessleri	Scaldback	DD (Data Deficient)
Lepadogaster candollei	Connemarra clingfish	Listed but not evaluated

Most active period for fishery in the region starts from 1 September following the removal of the industrial hunting ban and continues until the end of the year. As of January, with the cooling water, fishing activities almost come to a standstill since fish in coastal waters probably migrate to deeper or relatively hot waters.

6.9.2.1 Annual Numbers of Fish

The four small pelagic species caught in the Turkish coast of the Black Sea, which is important for both in terms of the amount captured and of economic value are Anchovy, Sprat, Black Sea Horse Mackerel and Bonito. All other species (demersal and pelagic) constitute 9% of total prey.

All of the fish species in the Black Sea, which is less than 12, have economic value and they corresponded to 98% of the total amount of fish caught in Turkey between 1996 and 2008 (Ref. 6.54). Most hunted 10 fishes in the Turkish coast of Black Sea are given in Table 6.**101**.

Table 6.101: Most hunted 10 fishes in the Turkish coast of Black Sea (Ref. 6.54)

Common name	Scientific name	in 2013 %	in 2014 %
Anchovy	*Engraulis encrasicolus*	73	44.04
Sprat	*Sprattus sprattus*	5	26.03
Black sea horse mackerel	*Trachurus mediterraneus ponticus*	8	5.78
Whiting	*Merlangius merlangus*	3.94	5.51
Bonito	*Sarda sarda*	5	10.50
Atlantic horse mackerel	*Trachurus trachurus*	1.32	0.02
Striped Red Mullet	*Mullus surmuletus*	0.15	1.86
Sardine	*Sardina pilchardus*	0.62	0.37
Bluefish	*Pomatomus saltator*	1.44	3.79
Mullet	*Mugil cephalus*	0.32	0.22

Anchovy is a migratory deep-water species and the most common species in the Black Sea (Ref. 6.54). Turkey fishes 85% of all the anchovy (by weight) in the Black Sea (Ref. 6.75). In 2013, anchovies accounted for 73% of all marine fish caught in the Black Sea by Turkish fleets. Between 2000 and 2014, the rates of anchovy caught in the Black Sea by Turkey and other countries (Bulgaria, Georgia, Romania, Russia and Ukraine) having a coast on the Black Sea are shown in

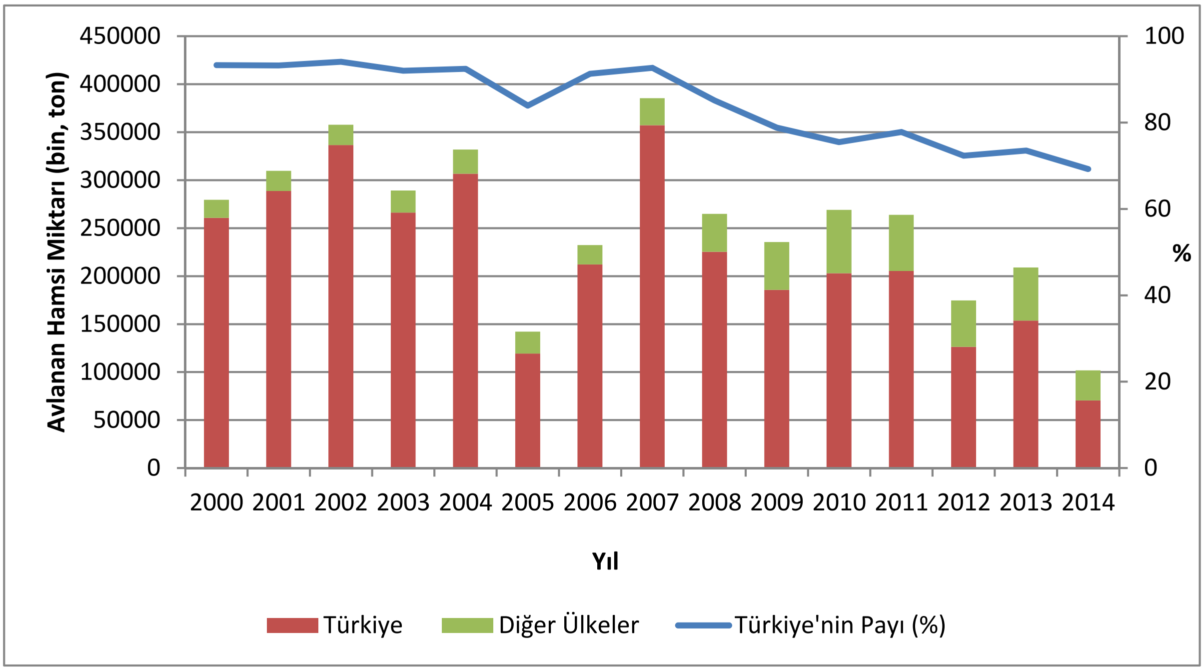


Figure 6.7532.

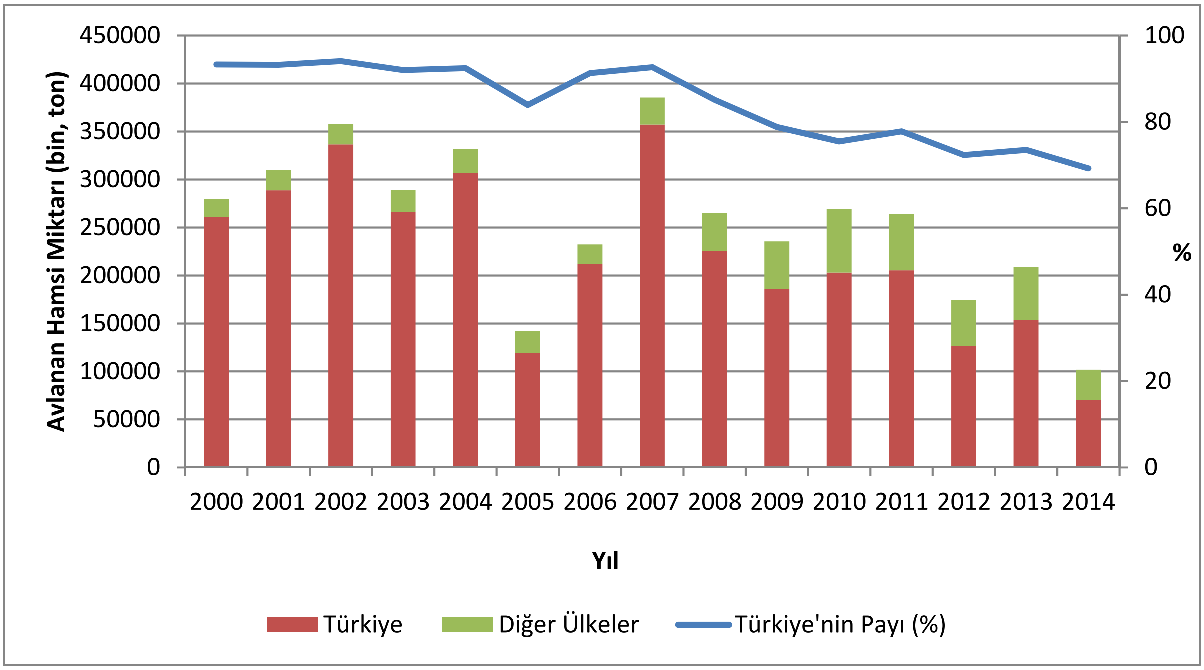


Figure 6.7532: Distribution of Anchovy Caught by Turkey between 2000-2014 (Ref 6.49)

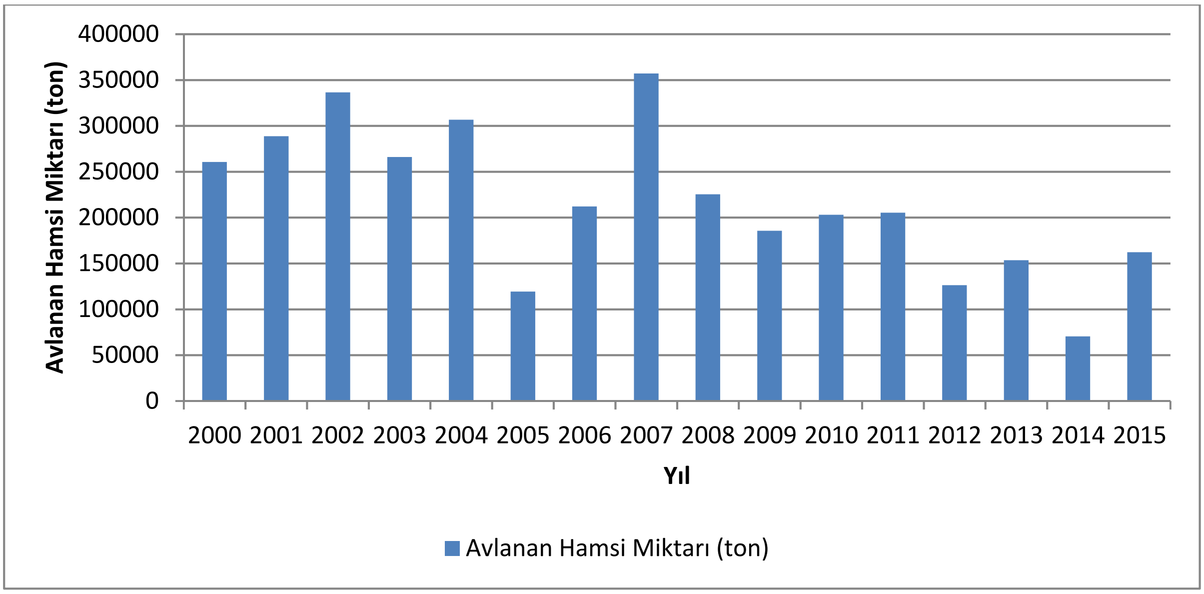


Figure 6.7633 The development of anchovy catching in the Black Sea from 1970 to 2015 is shown in Figure 6.126 for Turkey. The fish stock in the Black Sea was partially restored from 1995 to 2005 (Ref 6.76). In 2005, the bonito hunt peaked at over 70,000 tons (Ref. 6.54). As a result of the fact that the fishery activity concentrated on bonito rather than anchovy, a decrease in the catch of the anchovy was observed. However, since 2007, the amount of fish caught has declined again, which may be the result of seasonal changes, climate change, and increase in predatory species or overfishing. The actual cause of the decreasing quantities has not yet been understood by the scientists. However, anchovy was thought to be overfished and there were various recommendations regarding the reduction of anchovy fishery by 41% in 2013 by the Expert Working Group of Scientific, Technical and Economic Committee for Fisheries (STECF) within the European Commission on Assessment of Black Sea Stocks (Ref. 6.76).

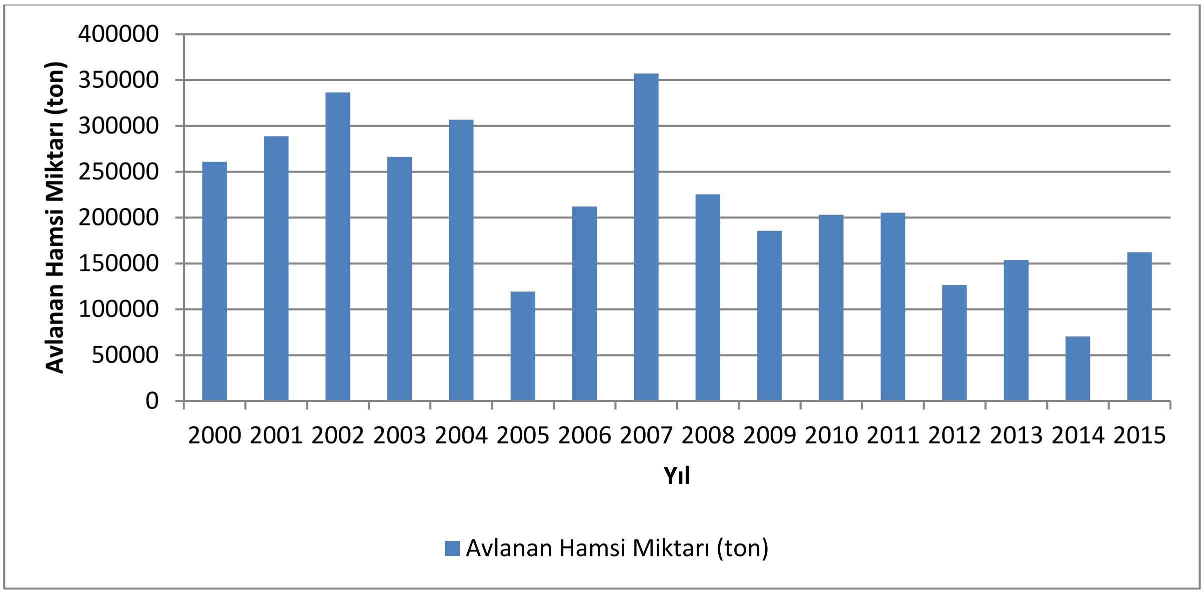


Figure 6.7633: Numbers of Anchovy fishery in the Black Sea 2000 - 2015 (Turkey)(Ref. 6.54)

The anchovy fishery takes place in the coastal waters of Turkey where a great amount of fish gathers for wintering grounds.

With the exact dates changing from year to year, the hunting season begins in October and continues until April. Anchovy is mostly hunted by commercial purse seiners targeting the wintering grounds in the coastal waters of Turkey, but in recent years offshore trawl fishing has begun (Ref 6.76).

Black Sea Horse Mackerel (*Trachurus mediterraneus*) is a subspecies of Atlantic horse mackerel. In 2013, Black Sea horse mackerel was the second most valuable small pelagic species among the 10 species caught most in the Turkish waters of the Black Sea but there was a sharp decline in the hunting rate in 2014 (Ref. 6.76). After this decline in the rate of hunting, Black Sea Horse Mackerel in 2014 and 2015 was the fourth most valuable pelagic species caught most in the Turkish waters of the Black Sea. Turkey fished an average of 95% of Black Sea horse mackerel from 2000 to 2014 throughout the Black Sea (Ref. 6.75).

The amounts of horse mackerel catch in the Black Sea by Romania, Ukraine, Georgia, Bulgaria and Russia between 2000 and 2014 is given in

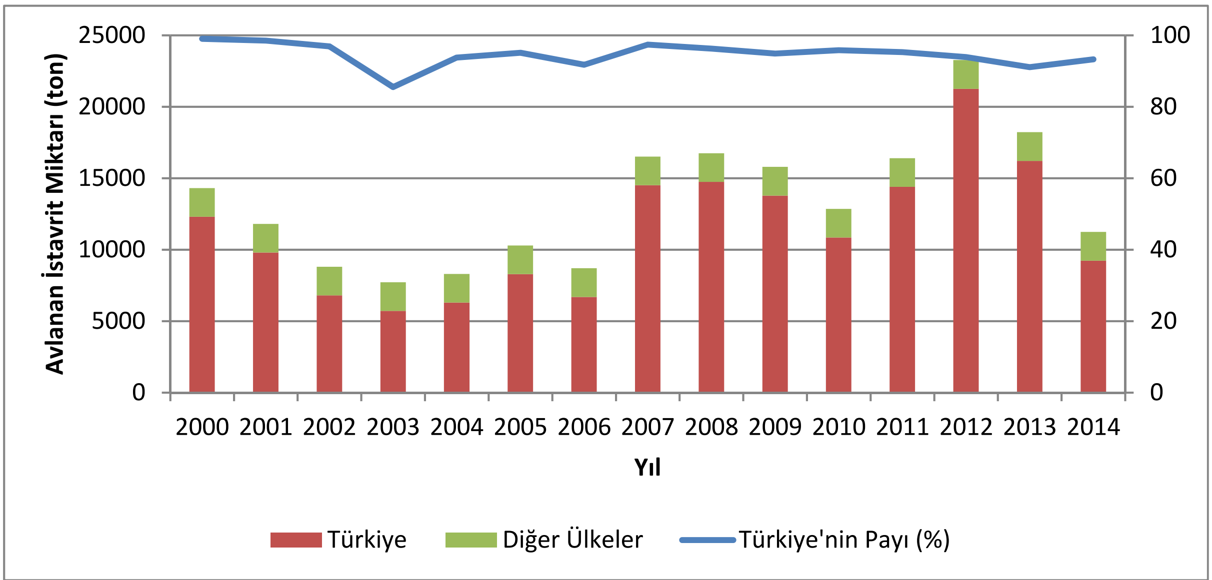


Figure 6.7734. While the total amount of horse mackerel catches in 2013 in Turkey's both eastern and western Black Sea coast was 16.211 tons, it was 9.234 tons in 2014 (Ref. 6.54).

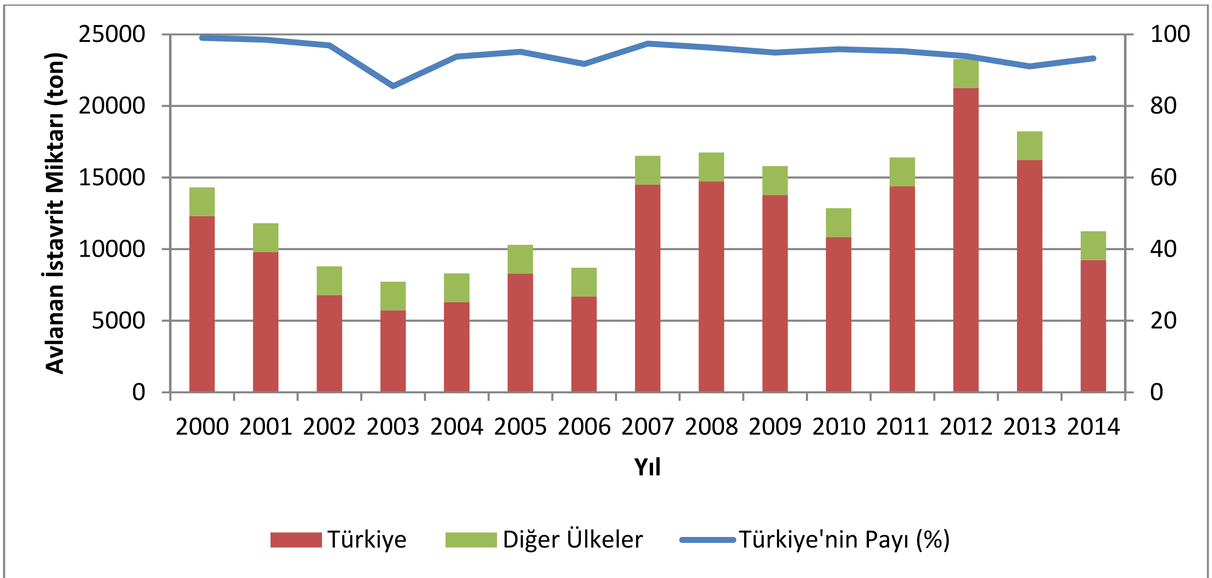


Figure 6.7734: Distribution of horse mackerel catches among the Black sea coast of Turkey and other countries, 2000-2014 (Ref 6.50)

Figure 6.135 shows the change in the horse mackerel fishery for Turkey from 2000 to 2015 in the Black Sea. It is known that the horse mackerel populations in the Black Sea usually spend their winter months on the shores of Crimea, Caucasus and Anatolia and warmer shores of the Sea of Marmara. Similarly, the horse mackerel population is found in the Eastern Black Sea region and especially on the eastern shores of Trabzon during the winter. Population migrates between Marmara and Eastern Black Sea.

When the number of horse mackerel catches of Turkey is compared to the other countries, It is seen that most of the fish (about 80-100%) is caught within the borders of Turkey. Black Sea horse mackerel is caught on the shores of the Turkish waters where the fish gathers in large quantities for wintering grounds; there is no fishery activity in the proximity of the Project. It is primarily fished in the winter and generally by purse seiners, but also bottom trawls, offshore trawls, gill nets and long-distance vessels are used (Ref 6.76).

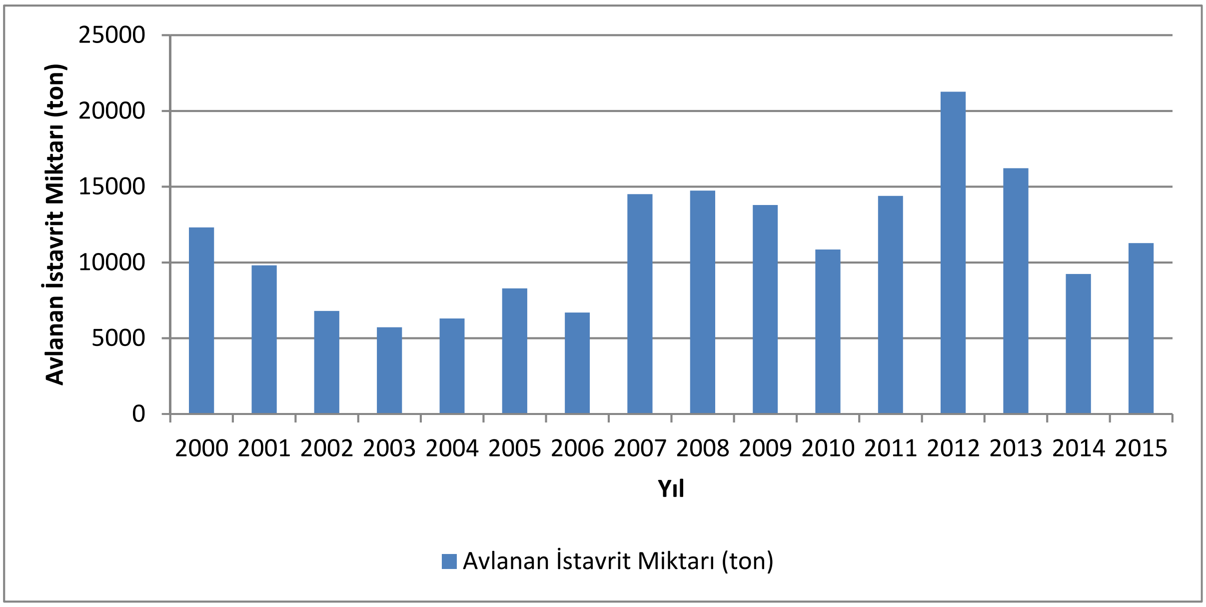


Figure 6.7835: Numbers of horse mackerel caught in the Black Sea 2000 - 2015 (Turkey) (Ref. 6.54)

The second most fished species in Turkish waters of the Black Sea in 2014 and 2015 was the Sprat. Turkey's dominance in the historical development of sprat fishery numbers in the Black Sea and recent fishery activities of the species is shown in

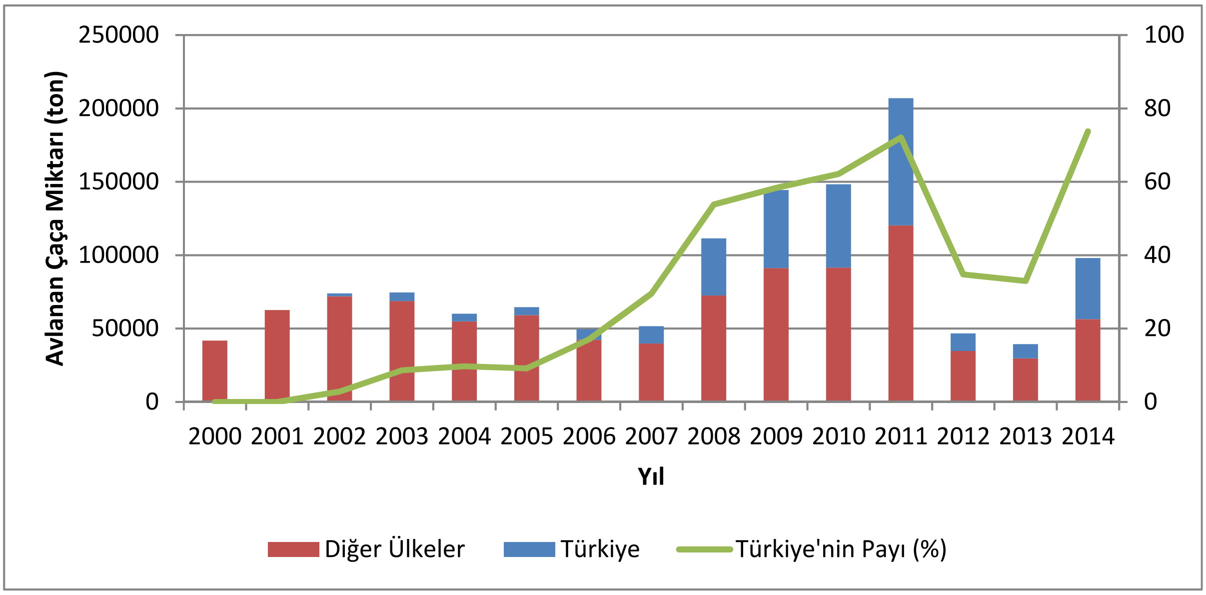


Figure 6.796. Since 2007, with the increasing popularity of sprat fishery in Turkey the numbers of fish caught has doubled and it reached its peak in 2011 with 86,676 tons (Ref. 6.54). The Expert Working Group (EWG) of the Scientific, Technical and Economic Committee for Fisheries (STECF) has indicated that it is caught above the sustainable levels (Ref 6.76).

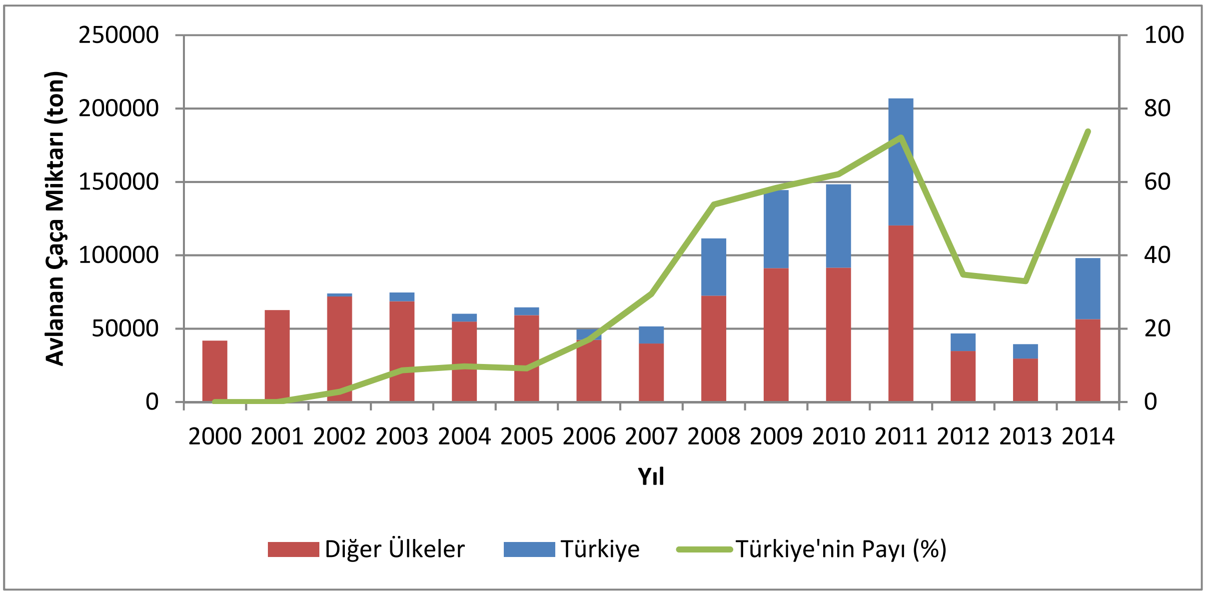


Figure 6.796: Distribution of sprat catch among the Black sea coast of Turkey and other countries, 2000-2014 (Ref 6.75)

Figure 6.137 shows the change in sprat fishery from 2000 to 2015 for Turkey in the Black Sea.

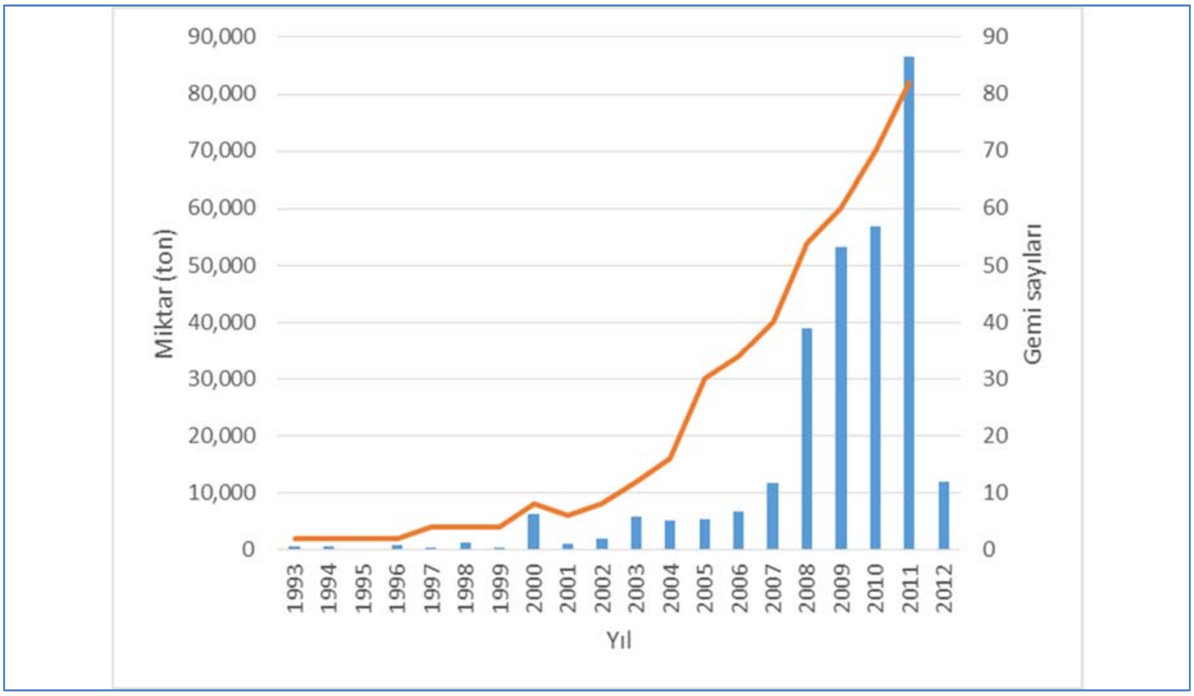


Figure 6.818 gives the number of Turkish vessels used for sprat fishery with the Turkish sprat fishery data from 1993 to 2012 in the Black Sea. The number of vessels increased significantly between 2008 and 2011 to 82 ships initially from 8 ships (Ref. 6.76). This indicates a boom in fishery activities and might be caused by the changes in the fishing techniques of the vessels or by the fact that inactive registered vessels started to fish again. While the total amount of sprat catches in 2014 in Turkey's both eastern and western Black Sea coast was 41.609 tons, it was 76.915 tons in 2015 (Ref. 6.54). Among the most caught 10 fishes by Turkish vessels in the Black Sea, sprat showed a great increase in 2014. While the proportion of sprat caught in Turkish coast of the Black Seas was 5% in 2013, it reached 26% in 2014 (Ref. 6.54).

The sprat is caught at 15 to 110 meters deep on the continental shelf of Turkish waters in daytime when the fish tends to gather in greater numbers. The fishing season begins in September and ends in May and it is subject to depth restrictions on some dates to protect breeding adult fish and their offspring in the coastline. The main fishing vessels used in sprat fishery in Turkey are offshore double trawler boats operating at depths of 20 to 40 m in the spring and 40 to 80 m in the fall (Ref. 6.76).

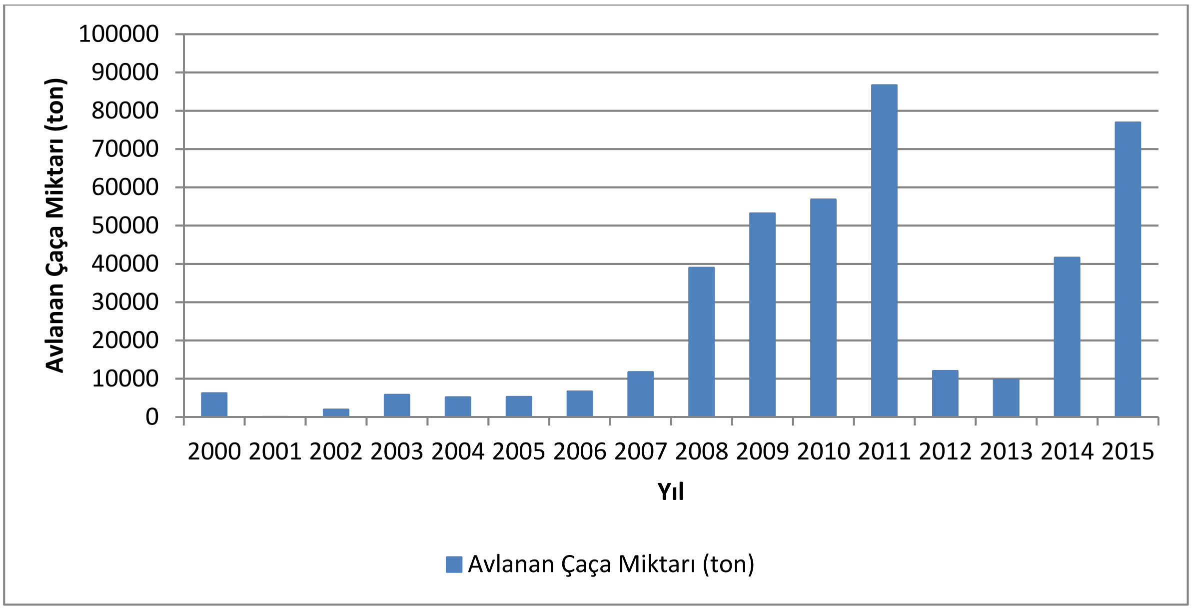


Figure 6.807: Numbers of sprat caught in the Black Sea 2000 - 2015 (Turkey) (Ref. 6.54)

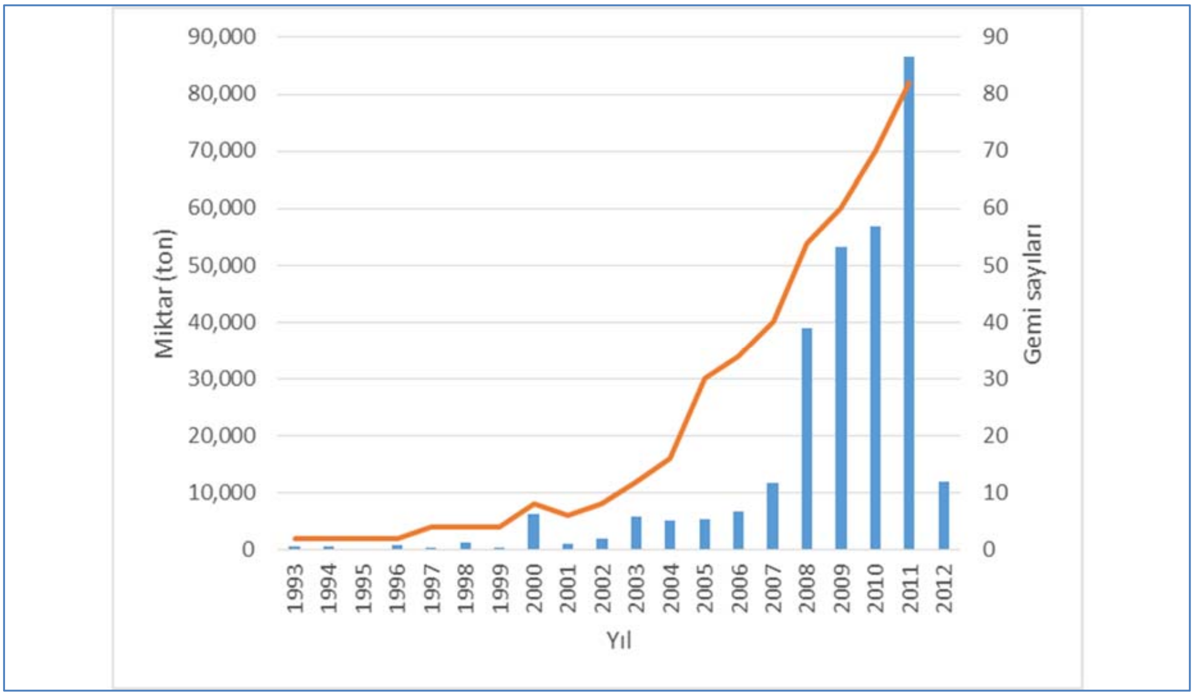


Figure 6.818: Data of sprat caught in the Black Sea 1993-2012 (Türkiye) (Ref 6.50)

The third most caught fished species in Turkish coasts of the Black Sea in 2014 was bonito (*Sarda Sarda*). While the proportion of bonito caught by the vessels in the Black Sea was 5% in 2013, it increased to 10.5% in 2014. When we look at the numbers of Bonito caught in Turkey since 2000, it is seen that the amount of catch reached to the highest level with 63,896 tons in 2005 and it showed a decreasing trend in the following years. Total bonito catch in Turkish waters of the Black Sea in 2014 was 16.793 tons. Despite the lack of a definitive explanation, it is thought that the fluctuations of the bonito catches may depend on the combination of socio-economic factors (such as state aids) and overfishing (Ref. 6.77).

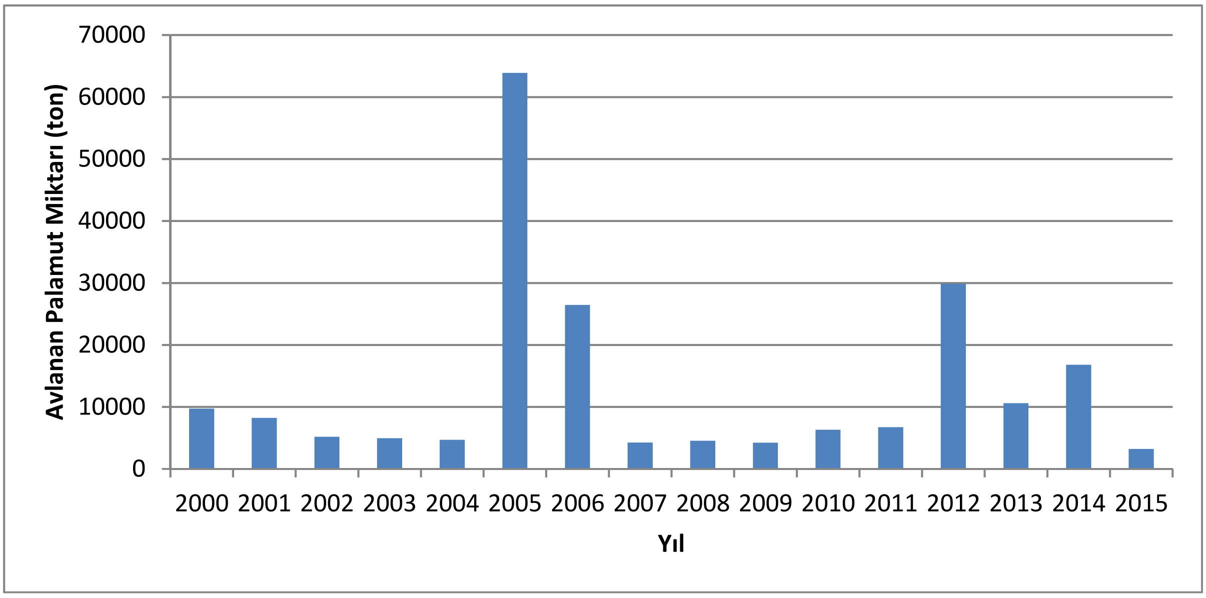


Figure 6.829 shows the data of bonito fishery of Turkey in the Black Sea from 2000 to 2015.

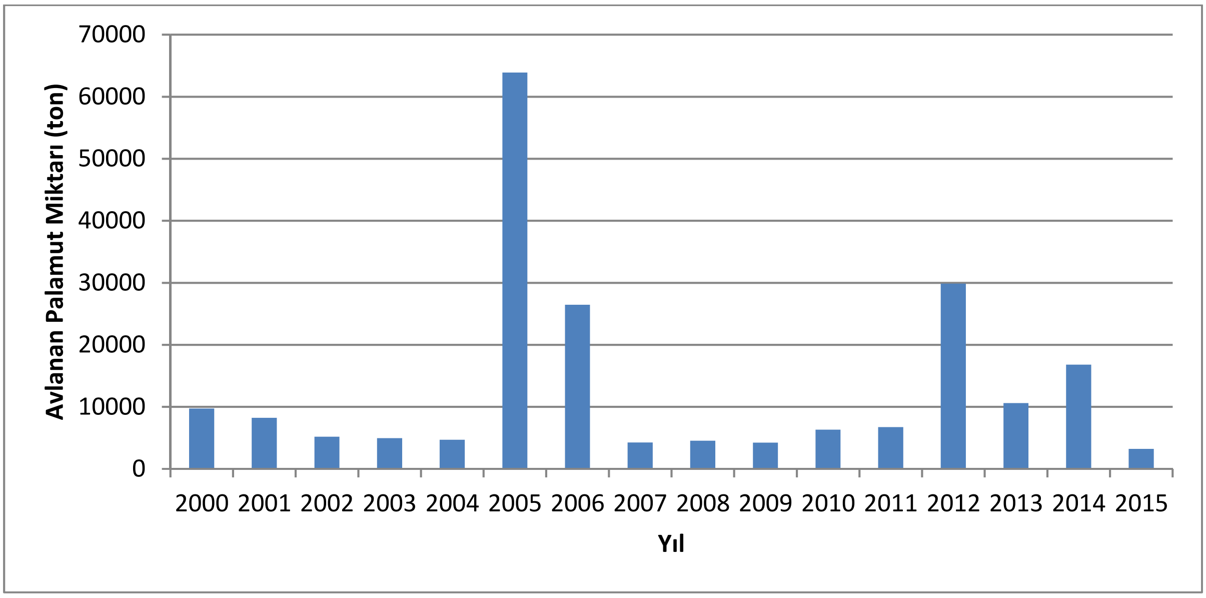


Figure 6.829: Numbers of bonito caught in Turkish coasts of the Black Sea 2000 - 2015 (Ref. 6.54)

Bonito is caught on the shores of Turkish waters where fish form intensive gatherings in the wintering grounds, thus it is not possible to catch bonito in the proximity of the Project. While large-scale vessels use purse seines, small-scale ones use gill nets to catch bonito. Within the scope of the Notification No. 2016/35 on commercial fishing, bonito fishing is banned from 1 April to 31 August. However, between August 15th and 31st bonito is free to catch with line trawls.

Among the species found in the area and the proximity of the Project, *Labrus viridis* (Green Wrasse) is categorized as vulnerable (VU) by IUCN Red List and *Sciaena umbra* (Brown Meagre) is protected by the Annex II of the Bern Convention. In addition, among the species found in the area and the proximity of the Project Long-snouted seahorse (*Hippocampus hippocampus* (Linnaeus, 1758)) is categorized as "Data Deficient" by the Red List of International Union for Conservation of Nature (IUCN). Although this species was categorized by the same institution in the category of "VU - Vulnerable" until 1996, its status was changed to "Data Deficient" due to insufficient research. Fishing, gathering, keeping on board, landing, transporting and selling this species in all waters, including inland waters, is prohibited (Ref 6.78).

Detailed information on fishery within the Project is given in Chapter 9.2 (Economic Conditions in Fishery).

6.9.3 Impacts of the Works and Operations within the Scope of the Project on the Biological Environment and Measures for Controlling and Reducing Them (Construction, Operation and Post-Operation)

Measures (design controls) for reducing the potential impacts of the operations on fishery and aquaculture during construction, operation and decommissioning stage are summarized in this chapter.

All of the wastes created in the scope of the Project will be disposed in the Offshore Section located in the Turkey’s EEZ in accordance with the relative legislation and the provisions of MARPOL 73/78. Necessary measures shall be taken, in order to prevent construction wastes from falling into the sea and oil and petroleum products from leaking into the sea, during the construction stage. Since the details of the measures which will be taken can only be determined during the detailed engineering works, information regarding the subject will be delivered to MoEU upon request, before the construction stage.

A Risk Evaluation and Emergency Response Plan, which involves the Offshore and Shore Crossing Sections of the Project, was prepared by an authorized organization on behalf of the Project Owner and was approved by the relative authorities (Annex-5.A) before the construction stage, in accordance with the "Act On Guidelines For Response To Emergencies And Compensation Of Losses In Case Of Pollution Of The Marine Environment From Oil And Other Harmful Substances" and its regulations, as stated in the opinion letter of MoEU Directorate General of Environment Management Department of Marine and Coastal Area Management dated July 2017 (**Annex-5.A**). In case of an emergency this plan shall be executed as fast as possible.

In the opinion letter dated 27.07.2015 (**Annex-5.A**) sent by Coast Guard Command, the Ministry of Interior to our part regarding the Project, waste management implementations that will minimize waste production and maximize recycling through the reuse of wastes, will be developed in order to prevent marine pollution.

In addition, the Project Owner will provide financial liability insurances for the Turkish Government required by International and National legislation.

6.9.3.1 Impacts of the Construction and Reducing Measures

6.9.3.1.1 Offshore and Shore Crossing Sections

During the construction operations of the Project, underwater noise and vibration caused by vessels and construction machinery, water and waste discharges, light sources, vessel traffic and obligatory operations requiring seabed intervention might have an impact on the marine biota in the Offshore and Shore Crossing Sections of the Project. In addition, it is expected that the impacts of the preparations prior to the construction stage and the activities to be carried within the scope of the pipeline route survey will be similar to the impacts of the construction stage but only for a shorter period of time in the Offshore and Shore Crossing Sections of the Project (Table 6.102).

Table 6.102: Project Activities, Impacts, Design Controls - Offshore and Shore Crossing Sections

Stage	Activity	Potential Impact	Impact Reducing Measures / Design Controls
Pre-construction, construction	• Pre-Construction route surveys and ROV surveys • Ordinary vessel activities (operating engines, lightings, bilge and ballast formation during supply of pipes and material from/to field and within the construction fleet and crew changes) • Pipe laying	• Physical impacts of vessel activities on marine species including marine mammals and marine birds • Impacts on fish populations including species with a commercial value • Possible loss of habitat and species with the introduction of invasive species into marine environment • Impacts on marine ecology and water quality caused by accidental hydrocarbon leakage, bilge and non-hazardous waste discharge • Direct habitat loss in the area covered by the pipeline • Seabed disturbance caused by anchors	• To avoid marine birds and mammals on the surface of the water during vessel activities of the Project • To ban to approach, feed or throw anything to marine mammals • To ban to hunt marine mammals and birds for the personnel of the Project • To apply the rules regarding the storage of food residue • To avoid the utilisation of noisy equipment whenever possible and not to leave auxiliary equipment in a "standby" or "on" position unnecessarily • To give utmost priority and care to lighting measures especially between late-March and late-May and between mid-September and late-October which are the most active period for the bird migration, during low-visibility conditions or at night to prevent bird flocks colliding with the vessels. • Not to use unnecessary exterior lightings of the vessels • To develop and put into practice a ballast water and sediment management plan covering quality standards for ballast procedures and ballast discharges and requirements of the Protection and Management Guidelines for Invasive Species and Oil and Gas Industry wherever applicable and based on the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) of the International Maritime Organization (IMO) • For all relevant vessels to comply with MARPOL and to have the necessary certificates and suitably qualified crew • To develop a waste management plan and emergency response plan for every vessel • To train the personnel for emergency response to leakage • To observe and confirm that all the pipe laying activities are performed within the approved construction corridor • Monitoring the anchoring activities
Construction	• Seabed Intervention; • Fabrication of causeways and trenching • Dredging and management of dredged material	• Seabed disturbance and habitat loss • Potential impacts on benthic habitat and fauna	• To carry out the dredging operations in the Shore Crossing Section within the scope of the dredging management plan • To analyze bathymetry data obtained from dredging area and to make a schedule for

Stage	Activity	Potential Impact	Impact Reducing Measures / Design Controls
		• Impacts on the photosynthesis of the marine flora due to the increase in the hanging sediment during dredging operations and negative impacts on fish, marine mammals, flora and fauna in the region caused by dredged materials • Impacts on water quality with the mobilization of sediment • Increase in the amount of hanging sediment during backfill operations • Habitat loss during backfill operations	dredging with the captain of the dredging vessel and the inspector • To observe dredging operations with a software by the operating firm • Not to carry out any dredging or removal operations outside of the designated area by reaching highest level of efficiency in dredging operations with the help of a satellite based vessel monitoring system placed in dredging equipment • To develop and implement an environmental monitoring program in order to minimize the impacts of dredging operations on the environment in line with the opinion of Directorate General of Environment Management • To use equipment to reduce turbidity when it is necessary • Following the completion of dredging activities, marine work sites (including temporary storage areas) shall be offset/restored as per the provisions of respective environmental permits. Such restoration work shall comprise disassembly of access roads, fillin-in of trenches and levelling of the temporary storage areas for dredged materials. • To minimize the contamination of water column by the dredged materials via a draining pipe located as close as possible to the seabed when using a floating pipe to transfer dredged materials to temporary storage areas

Anchovy, which is considered to be Turkey's critical source of fish due to its commercial value, migrate to Northern basin of Black Sea in February-April to breed and feed. Having spawned and fed, with cold weather in October-December, anchovies return to Turkish shores. Anchovies are known to spawn widely in Southern Black Sea. Since the number of vessel fleets to be utilized in the construction stage of offshore and Shore Crossing sections of the Project are significantly fewer from fishing fleets with 5.000 vessels in the region, resulting fewer ship activity, it is expected that ship activity of the Project is not going to change marine environment with the implementations developed for the Project such as design controls and measures for reducing the impact. Thus, it seems not quite possible that the vessel activity in relation with the Project would lead to any alterations of the migration patterns of the anchovy which is already under considerable stress from hunting activity. Furthermore, the Black Sea basin is used by almost 600.000 commercial ships per annum. Compared to underwater noise and vibration, water and waste discharges caused by the activities of vessels and construction machinery and intensive vessel traffic in the region, it is anticipated that the impacts of the Project will be quite low. When it is taken into consideration that the number of vessels and work machines that will operate in the offshore and Shore Crossing sections of the Project before and during construction stage will be considerably lower than the number of vessels already in operation in the Black Sea, disturbances caused by the vessels and machinery of the Project are estimated not to make any significant change in the fish behavior.

A monitoring program will be developed in order to protect biodiversity in the impact range of the Project and to minimize the impact for the construction and operational stage of the Project.

In addition, there is also the possibility that foreign invasive species which is found on the biofilm of the ballast waters or tanks or on the bodies of the vessels due to vessel activities, might enter into to marine environment accidentally. Despite the low possibility, if undesirable foreign invasive species enter the marine environment, this might have an impact on the entire population or community-wide ecology of the Black Sea. For this reason, the dirty ballast water will not be discharged in the EEZ of Turkey in order to minimize the possibility of the invasive species entering the marine environment and the negative effects on potentially affected marine habitats and related species. Besides, all of the vessels to be utilized in the Project will practice a voluntary ballast water and sediment control management implementation in line with the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) of the International Maritime Organization (IMO) Plans will be prepared as per IMO and BWM requirements.

6.9.3.2 Impacts of the Operational Stage and Reducing Measures

While no impact on the marine ecosystem is expected in the Operational Stage, the impacts of the maintenance vessels to be used during the pipeline surveillance activities planned for 15 days every 5 years are similar to the construction stage impacts but will be temporary and short duration.

A monitoring program will be developed in order to protect biodiversity in the impact range of the Shore Crossing Section of the Project and to minimize the impact of the construction and operational stage of the Project.

Hydrotest activities are assessed in this chapter and are summarized in Table 6.103 before the Project is operational.

Table 6.103: The Activities Before and During Operational Stage, The Impacts and Reducing Measures

Stage	Activity	Impact	Impact Reducing Measures / Design Controls
Before Operational Stage	Hydrotests	Change in the quality of seawater caused by the liquid discharge from hydrotests	To discharge the water which is to be utilized as hydrotest liquid, after being cleansed physically
Operational Stage	Surveillance and maintenance activities of maintenance vessels for every 5 years	• Loss of habitat / seabed disturbance • Change in the composition of the species • Entrance of invasive species into seawater	• For all relevant vessels to comply with MARPOL and to have the necessary certificates and suitably qualified crew • To develop a waste management plan and emergency response plan for every vessel • To train the personnel for emergency response to leakage • To prohibit vessels to release dirty ballast water • To develop and put into practice a ballast water and sediment management plan covering quality standards for ballast procedures and ballast discharges and requirements of the Protection and Management Guidelines for Invasive Species and Oil and Gas Industry wherever applicable and based on the International Convention for the Control

			and Management of Ships' Ballast Water and Sediments (BWM) of the International Maritime Organization (IMO)

6.9.3.3 Impacts of the Decommissioning Stage and Impact Reducing Measures

In this stage, the strategy of decommissioning stage of the Project for the following 50 years is unknown and it is not expected that there will be an impact if the pipelines are left in place. In case of the removal of the pipeline from the seabed, decommissioning stage is expected to have the same impacts as the construction stage explained above. However, Good International Industrial Practices will be adopted.

6.9.3.4 Unexpected Events/Impacts of Emergency Situations and Impact Reducing Measures

During pre-construction, construction and operational stages, possible fuel or chemical leakage caused by vessels, the possibility of invasive species entering into marine environment and any disintegration throughout the pipeline might have negative impacts on Offshore and Shore Crossing Sections of the Project. However, it is considered that such kind of unexpected incidents are unlikely to happen owing to the design control and impact reducing measure implementations (Table 6.104).

Table 6.104: Unexpected Events and the Impacts of Emergency Situations and Reducing Measures - Offshore and Shore Crossing Sections

Stage	Activity	Impact	Impact Reducing Measures / Design Controls
Pre-construction and Construction	Vessel activities at offshore for construction works and surveying such as pipe laying and dredging	Impacts on water quality and thus ecology and marine environment by the fuel or hazardous material leakage	• To dispose wastewaters which will be created on the ships in the EEZ of Turkey in accordance with the Water Pollution Control Regulations and "the International Convention for the Prevention of Pollution from Ships" (MARPOL 73/78) Annex IV, • To have an emergency response plan approved by the Ministry of Environment and Urbanization • To have necessary equipment and trained personnel ready for the implementation of emergency response plan • For all relevant vessels to comply with MARPOL and to have the necessary certificates and suitably qualified crew
	Fire on the vessels	Potential loss and disturbance of habitat, flora and fauna	• To have firefighting water, Emergency Response Plan covering measures for emergency response and trained personnel with predetermined responsibilities ready
Pre-operational and Operational	Hydrotests	Impact on marine ecology and marine environment caused by uncontrolled discharge of non-treated hydrotest liquids with additives due to leakage from hydrotest section discharging hydrotest liquids (with	• To have necessary equipment and personnel ready at all times for the implementation of Emergency Response Plan in case of any leakage • To carry out periodical maintenance by experts and to schedule regular breakdown maintenance

Stage	Activity	Impact	Impact Reducing Measures / Design Controls
		additives) or failures in the hydrotest liquid purification system	
	Gas leakage from the pipeline (underwater)	Seabed disturbance with impacts on sediment and turbidity	• To implement shut down and automatic pipeline isolation procedures with decompression and safeguarding system • Continuous monitoring and measuring for detecting any leakage

A Risk Evaluation and Emergency Response Plan, which involves the Offshore and Shore Crossing Sections of the Project, was prepared by an authorized organization on behalf of the Project Owner and was approved by the relative, in accordance with the "Act On Guidelines For Response To Emergencies And Compensation Of Losses In Case Of Pollution Of The Marine Environment From Oil And Other Harmful Substances" and its relevant regulations, as stated in the opinion letter of MoEU Directorate General of Environment Management Department of Marine and Coastal Area Management dated July 2017 (**Annex-5.A**). After the relative plan requirements are met, the construction activities will start.

In the opinion letter dated 27.7.2015 (**Annex-5.A**) of Coast Guard Command, the Ministry of Interior regarding the Project, Emergency Response Plan will be put into action in order to prevent potential negative impact on water quality in case of any accidental fuel leakage caused by the Project activities.

Any liquid or solid waste materials created during the works conducted in sea shall be disposed of in accordance with the relevant national legislation in Turkish territorial waters and in accordance with the provisions of MARPOL 73/78 in the EEZ of Turkey where the Offshore Section of the Project is located. Necessary precautions shall be taken in order to prevent construction wastes from falling into the sea. The waste management in the scope of the Project shall be conducted in accordance with the national legislation and the provisions of the International Legislation when relative. The closest and most appropriate facilities licensed by the Ministry of Environment and Urbanization and licensed equipment shall be used during the recycling and the disposal of the wastes.

There is also the possibility that foreign invasive species which is found on the biofilm of the ballast waters or tanks or on the bodies of the vessels due to vessel activities, might enter into to marine environment accidentally. Despite the low possibility, if an undesirable foreign invasive species enter the marine environment; this might have an impact on the entire population or community-wide ecology of the Black Sea. For this reason, the dirty ballast water will not be discharged in the EEZ of Turkey in order to minimize the possibility of the invasive species entering the marine environment and the negative effects on potentially affected marine habitats and related species. Besides, all of the vessels to be utilized in the Project will practice a voluntary ballast water and sediment control management implementation in line with the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) of the International Maritime Organization (IMO) Plans will be prepared as per IMO and BWM requirements.

6.10 Cultural and Archaeological Heritage

As stated in Law No. 2863 on the Protection of Cultural and Natural Assets, all cultural and natural assets that should be under protection are considered as government property. For this reason, regional conservation councils have the power to approve or reject any activity such as construction, road construction, destruction and excavation with the potential of having a negative impact on such protected areas. In the scope of the Project, the responsible council is Cultural Assets Protection Board of Edirne. All movable and immovable cultural assets in Turkey are under protection by Law No. 3386 amending the Law No. 2863 on the protection of cultural and natural assets.

Within the scope of the project's route determination studies, a desk-based assessment was conducted to determine the cultural heritage objects (CHO) of the Project area. Resources are given below:

- National and regional data of General Directorate of Cultural Assets and Museums; Republic of Turkey Ministry of Transport, Maritime Affairs and Communications and TAY Project: The Archaeological Settlements of Turkey
- Data obtained from the Cultural Assets Protection Board of Edirne; ONHO bathymetry and wreck data;
- Relevant publications regarding offshore archeology of the Black Sea; and
- Data obtained from relevant archeology institutions and museums.

Archaeological studies, conducted in the marine environment of offshore waters of Kırklareli included in the Offshore and Shore Crossing Sections, are limited. Vize District, Kırklareli Province covering the Onshore Section of the Project is a region rich in cultural heritage.

In this chapter, both the current data obtained from official institutions (as part of the desk-based assessment) and the results of the field studies are given.

6.10.1 Offshore and Shore Crossing Sections

Data on cultural heritage in the Offshore and Shore Crossing Sections was based on the data obtained from the desk-based assessments including extensive feasibility and preliminary engineering surveys concluded around 2015-2017 for the Project. These studies focusing on gathering engineering and environmental data were carried out within the corridor covering suggested pipeline route. In the marine assessments, equipment such as side-scan sonar (SSS) and autonomous underwater vehicle (AUV) were used to investigate the seabed and obtain digital images of the seabed.

The locations of the objects exhibiting anthropogenic properties during the investigations were recorded and briefly analyzed to determine if further investigation is required. In addition, a visual inspection of potential cultural heritage objects in the marine area will be conducted prior to the construction stage, using a remote-controlled vehicle (ROV) with an underwater video camera to identify and assess potential CHO.

The shores of the Black Sea in Anatolia are the least known in terms of Hellenistic and Roman ceramic archeology, especially archeometry, when compared to other countries having a coast on Black Sea such as Bulgaria, Romania, Moldova, Ukraine, Russia and Georgia. The scarcity of researches and instability and low quality of the researches in the region created a poor impression for the region. (Ref. 6.79). The oldest settlements on the Black Sea shores are predicted to be around 10.000 BC. On the Black Sea coast of Bulgaria, there are about 50 sunken cities and coastal settlements dating from the Neolithic to the Iron Age. Since there are no sufficient underwater researches in Turkish coasts of the Black Sea in terms of cultural heritage, no sunken city has ever been found in this region. However, the central region of the Black Sea is rich in terms of archaeological materials, especially maritime discoveries and wrecks. As a consequence of oxygen-free conditions that prevent erosion and microbial deterioration, the protection of any cultural heritage objects at depths below 120-200 m is highly possible (Ref 6.80).

Also, according to the maps obtained from the Department of Navigation, Hydrography and Oceanography in February 2017 regarding the Offshore Section of the Project, no cultural heritage has been identified on the route of the pipeline. In addition, a study was carried out by the Project Owner to identify potential CHO in the Offshore Section. In this respect, an identification study was carried out with the help of sensors mounted on the ship, Heater Sea. This study was carried out using seismic, single-beam echo sounder, multi-beam echo sounder, seabed viewer, side-scan sonar and magnetometer. A more detailed examination was made with multi-beam echo sounder sensors, seabed viewer and side-scan sonar mounted on an autonomous underwater vehicle (AUV) on the Heather Sea ship. The results of the completed works are evaluated and coordinates and general information of the unknown objects which cannot be clarified as potential cultural heritage object are given in Table 6.105 and

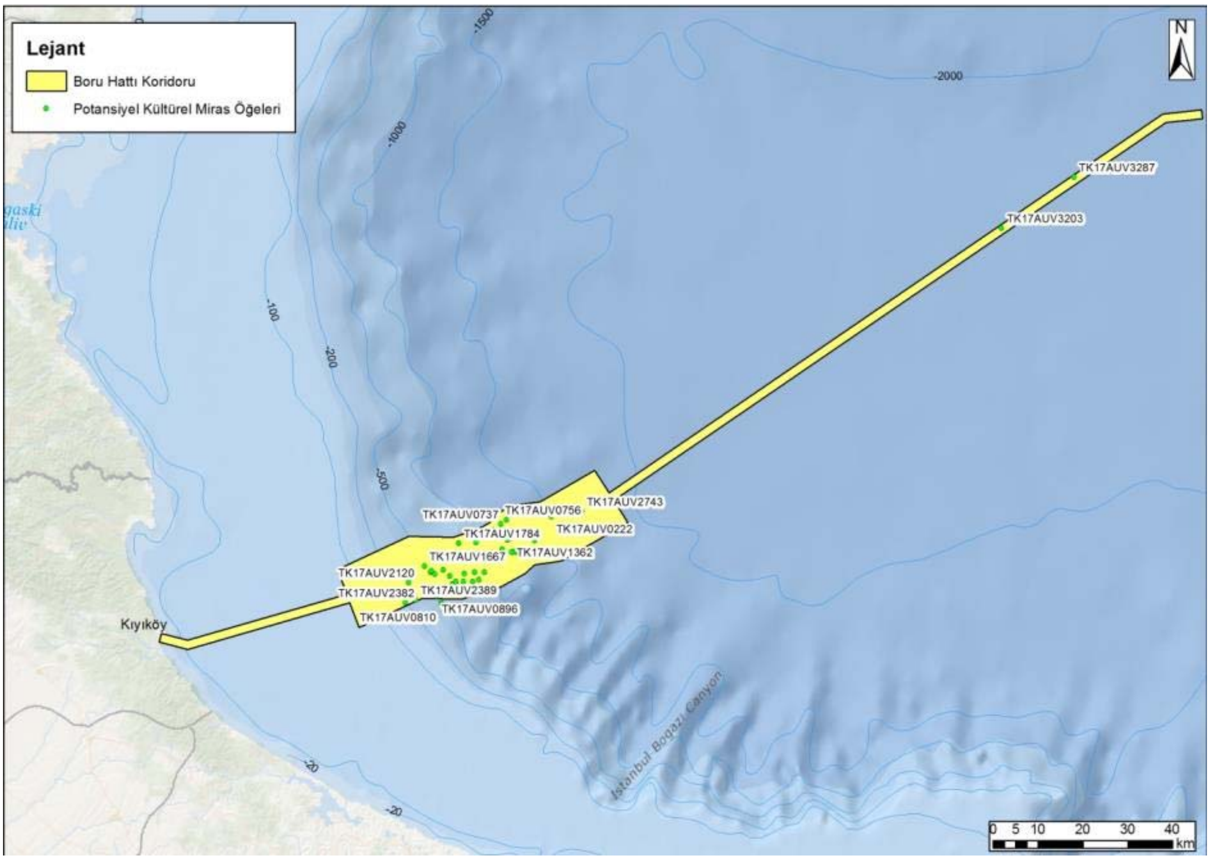
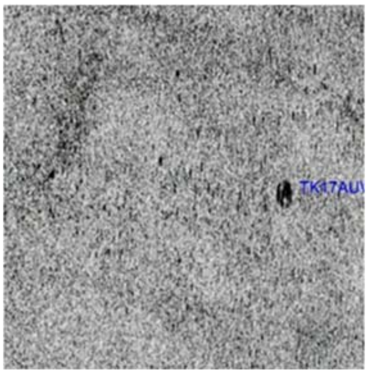
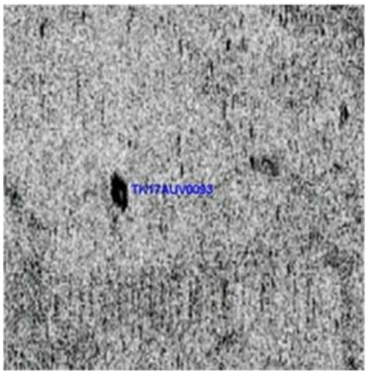
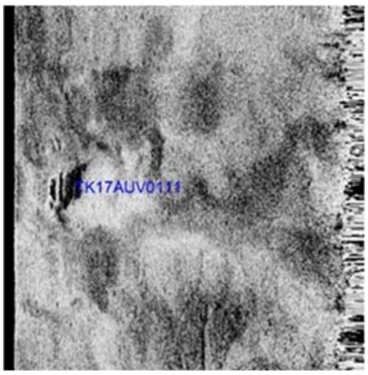
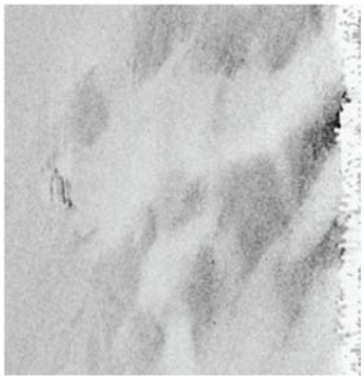
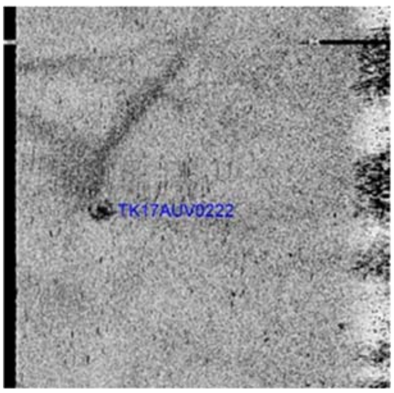
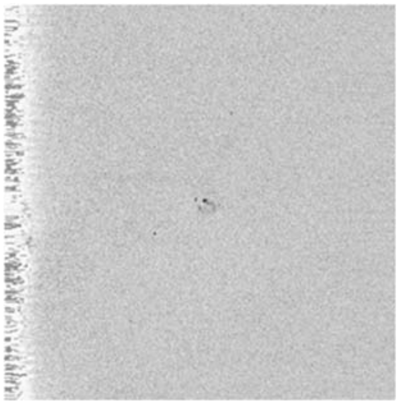
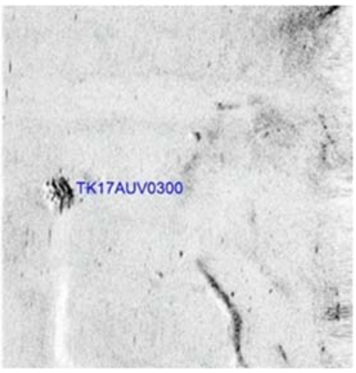
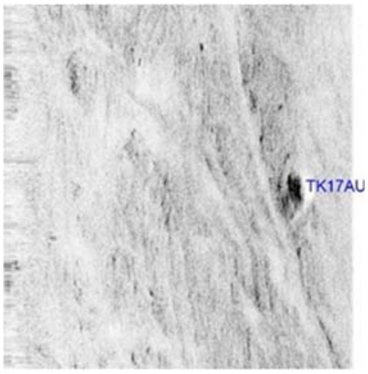
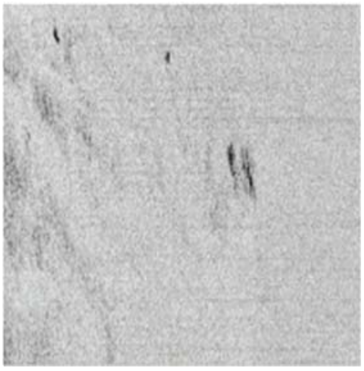
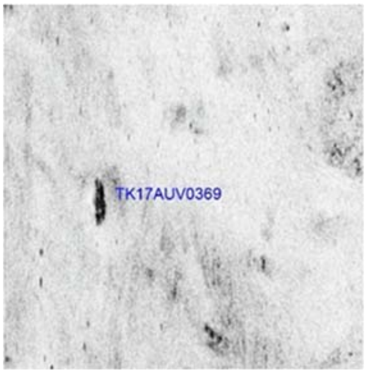
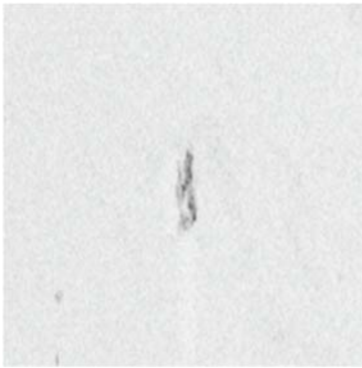
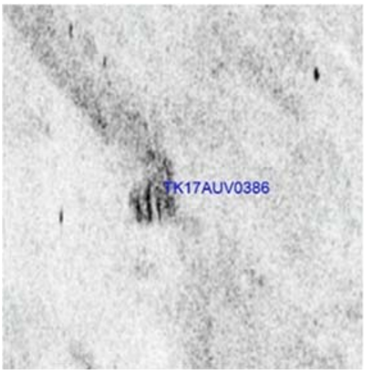
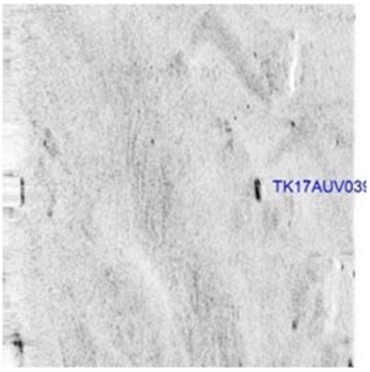
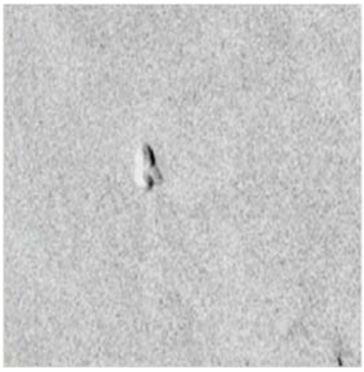
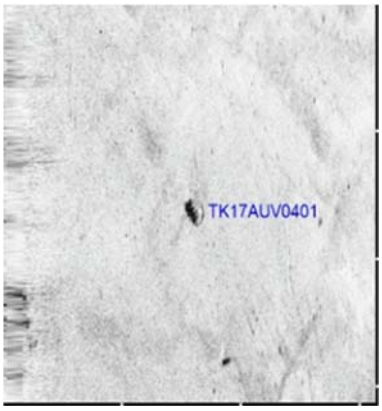
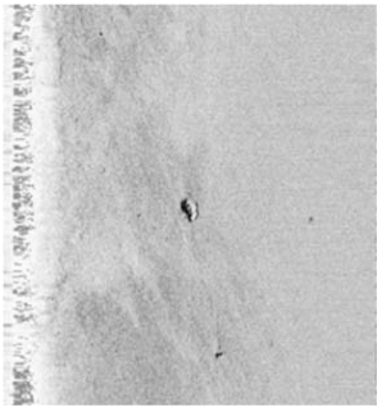
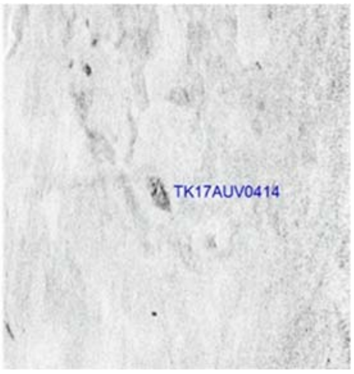
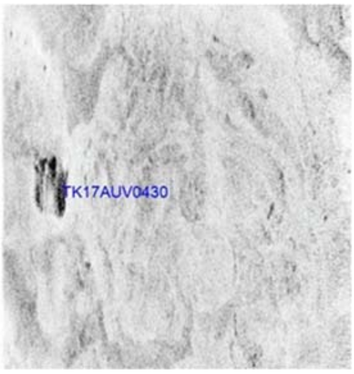


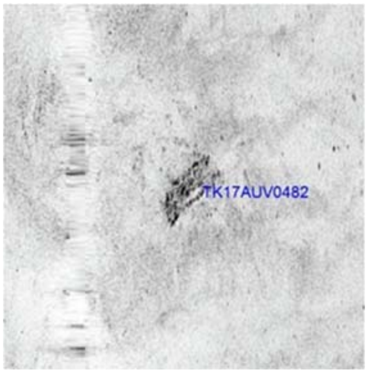
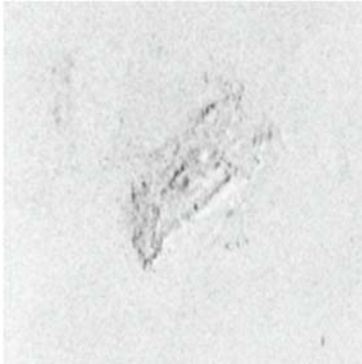
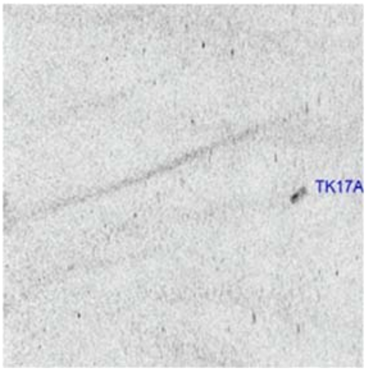
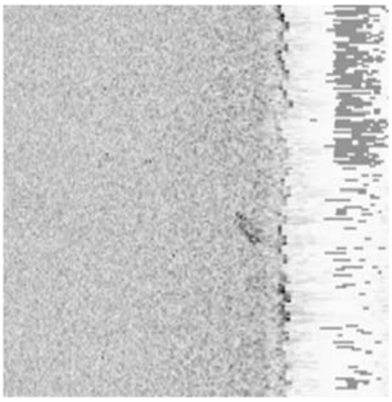
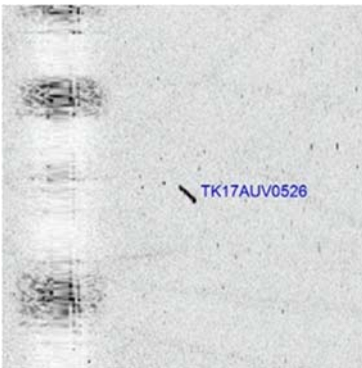
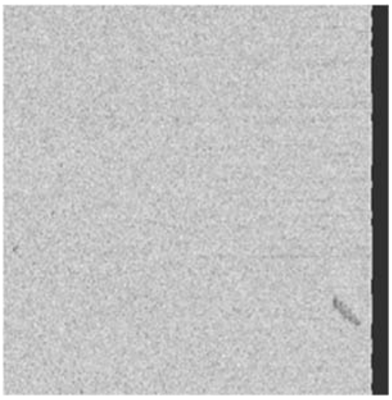
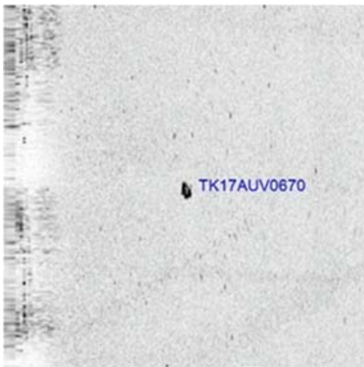
Figure 6.83140 shows their location with the Project Area.

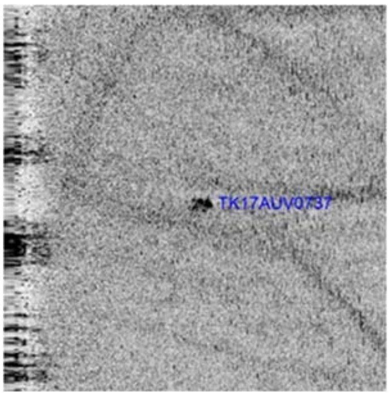
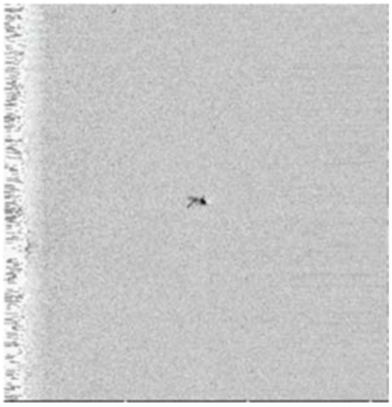
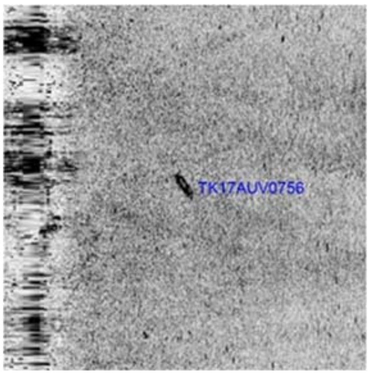
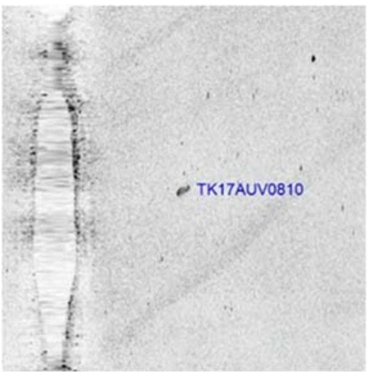
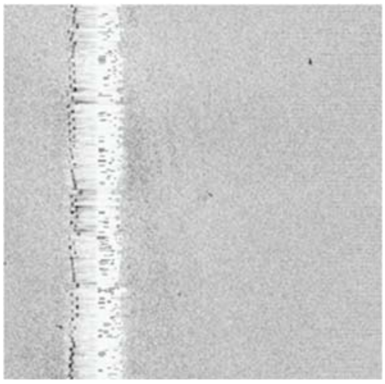
Table 6.105: Findings in Offshore Section

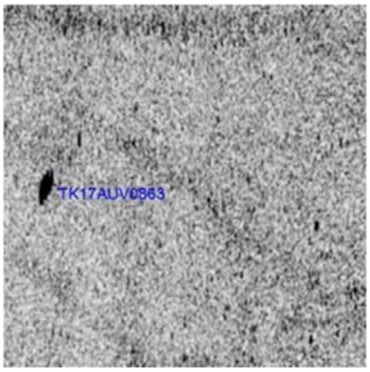
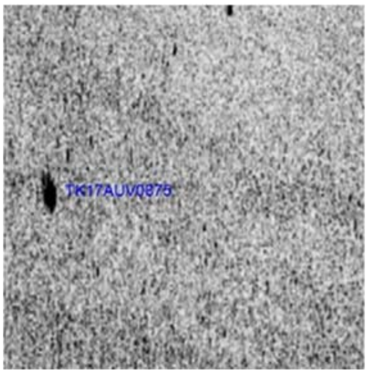
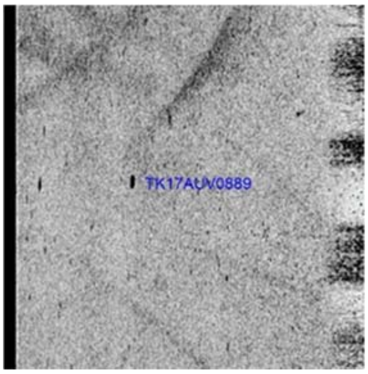
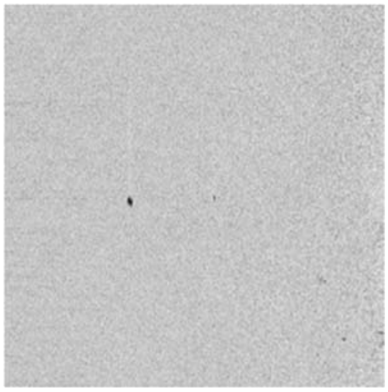
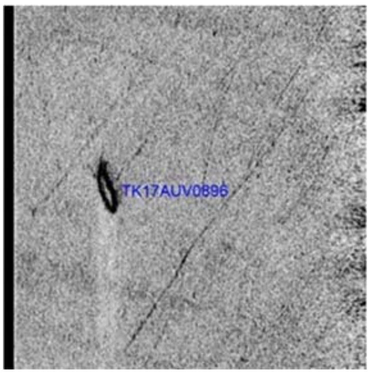
No	Information on the Findings	Image	
		Low Frequency	High Frequency
1	TK17AUV0016 General information on the wreck which is thought to be a ship Coordinates; 41° 54.86109' N 029° 05.22028' E Width: 4,26 m Height: 0,00 m Length: 7,35 m		
2	TK17AUV0093 General information on the wreck which is thought to be a ship Coordinates; 41° 54.27685' N 029° 05.50521' E Width: 2,91 m Height: 0,00 m Length: 7,49 m		
3	TK17AUV0111 Wreck which is thought to be a ship Coordinates; 41° 53.08963' N 029° 03.71967' E Width: 13,08 m Height: 0,00 m Length: 25,67 m		
4	TK17AUV0222 Undefined object Coordinates; 41° 57.32146' N 029° 08.02562' E Width: 9,42 m Height: 0,00 m Length: 7,61 m		

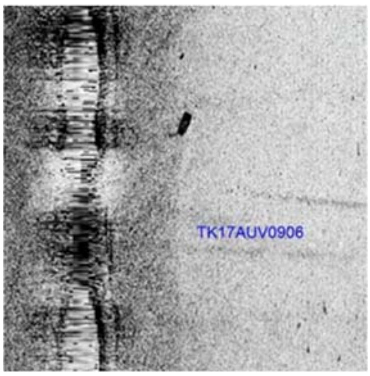
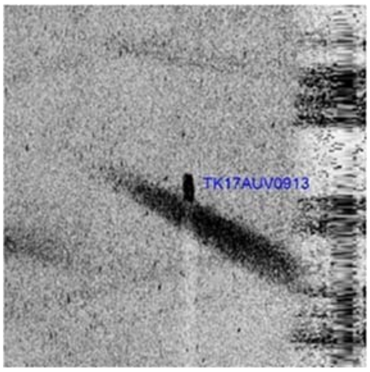
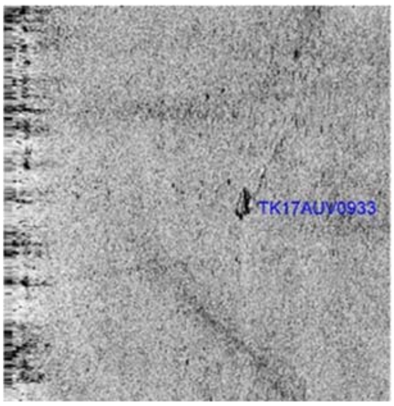
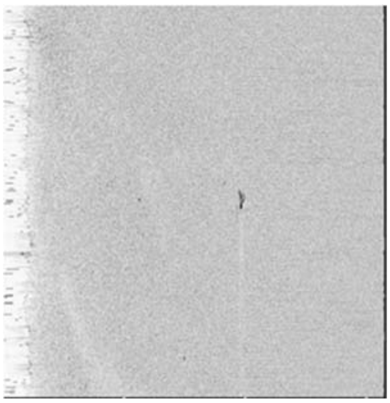
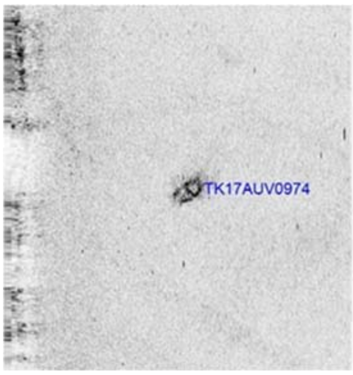
No	Information on the Findings	Image	
		Low Frequency	High Frequency
5	TK17AUV0300 Undefined object which is classified as a wreck Coordinates; 41° 50.06180' N 028° 57.57166' E Width: 9,12 m Height: 0,49 m Length: 15,12 m		
6	TK17AUV0361 Undefined object which is classified as a wreck Coordinates; 41° 52.86974' N 029° 03.62397' E Width: 4,91 m Height: 1,80 m Length: 14,05 m		
7	TK17AUV0369 Wreck which is thought to be a ship Coordinates; 41° 52.88122' N 029° 03.46635' E Width: 3,58 m Height: 0,38 m Length: 14,34 m		
8	TK17AUV0386 Wreck which is thought to be a ship Coordinates; 41° 53.05481' N 029° 03.55313' E Width: 6,62 m Height: 0,00 m Length: 10,80 m		

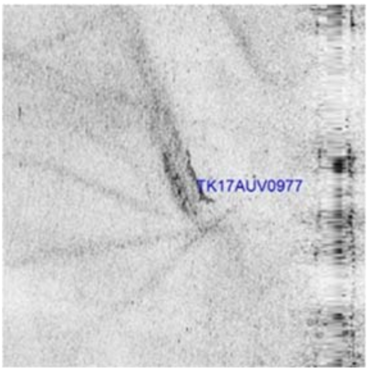
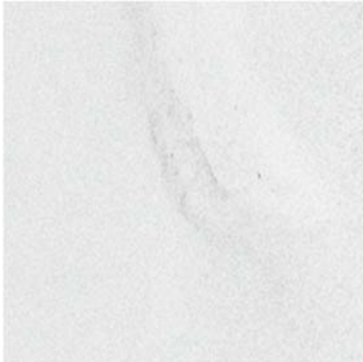
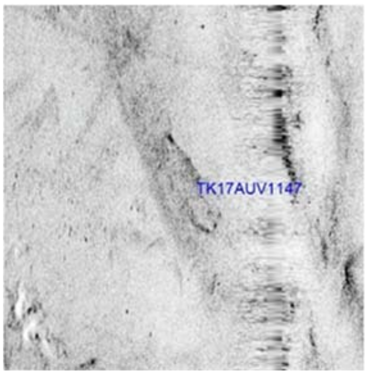
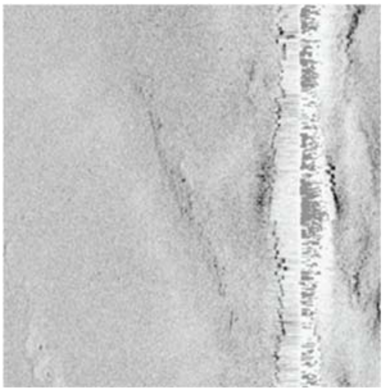
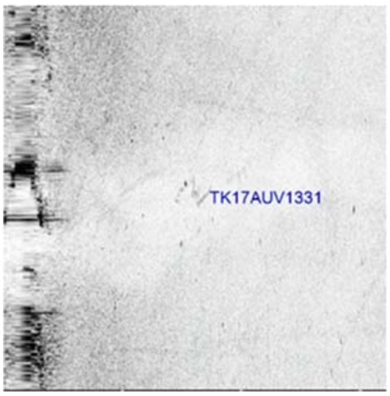
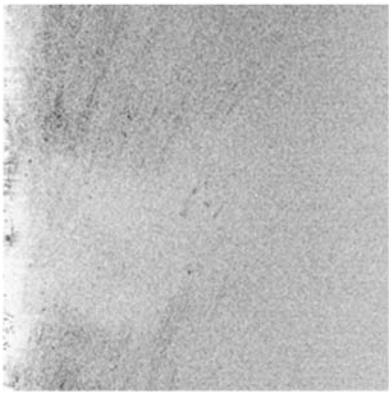
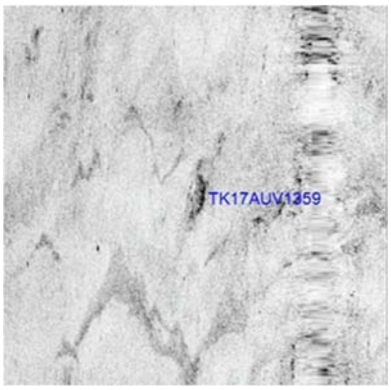
No	Information on the Findings	Image	
		Low Frequency	High Frequency
9	TK17AUV0398 Undefined object which is classified as a wreck Coordinates; 41° 52.74303' N 029° 02.63585' E Width: 2,92 m Height: 0,45 m Length: 9,72 m		
10	TK17AUV0401 Wreck which is thought to be a ship Coordinates; 41° 52.77266' N 029° 02.24776' E Width: 4,25 m Height: 1,03 m Length: 10,32 m		
11	TK17AUV0414 Undefined object which is classified as a wreck Coordinates; 41° 51.56903' N 028° 58.77096' E Width: 7,71 m Height: 0,00 m Length: 16,70 m		
12	TK17AUV0430 Object classified as wreck Coordinates; 41° 52.15219' N 028° 59.39466' E Width: 13,19 m Height: 0,26 m Length: 25,17 m		

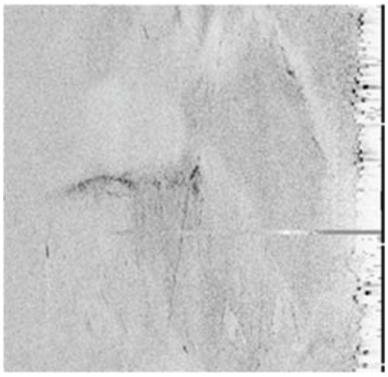
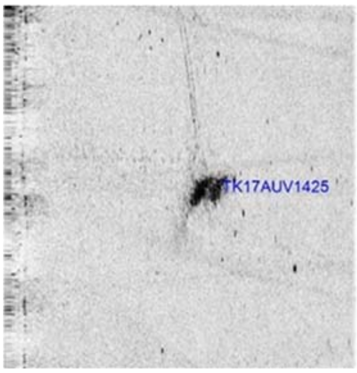
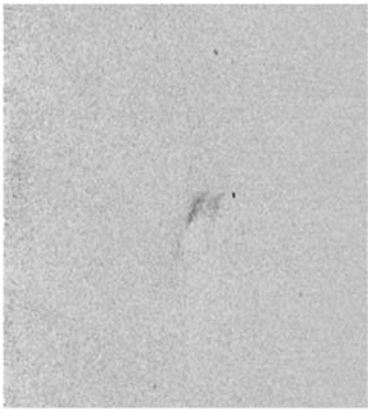
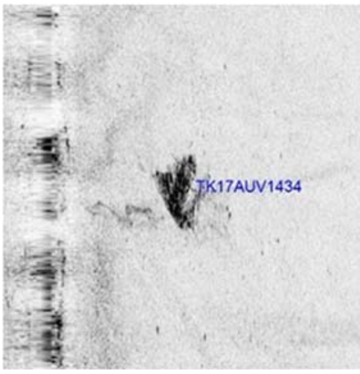
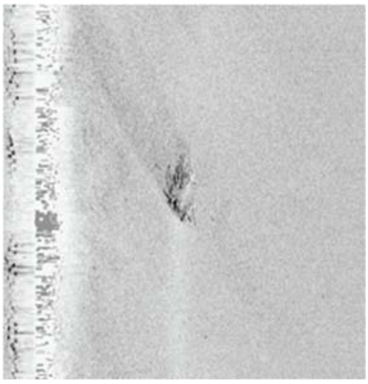
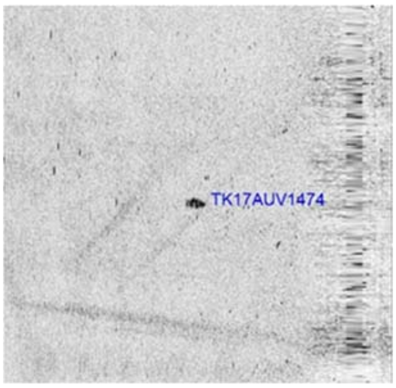
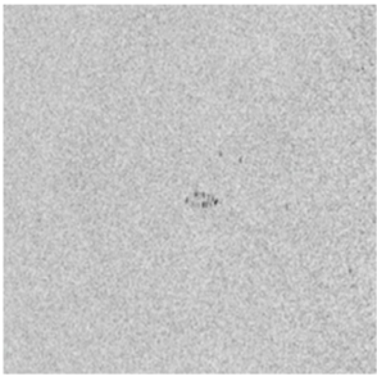
No	Information on the Findings	Image	
		Low Frequency	High Frequency
13	TK17AUV0482 Undefined object which is classified as a wreck Coordinates; 41° 52.96543' N 029° 00.24120' E Width: 12,54 m Height: 0,00 m Length: 29,78 m		
14	TK17AUV0525 Undefined object which is classified as a wreck Coordinates; 41° 54.16864' N 029° 01.00001' E Width: 2,20 m Height: 0,00 m Length: 6,16 m		
15	TK17AUV0526 Undefined object which is classified as a wreck Coordinates; 41° 54.33369' N 029° 01.52743' E Width: 1,58 m Height: 0,00 m Length: 9,79 m		
16	TK17AUV0670 Wreck which is thought to be a ship Coordinates; 41° 53.64190' N 028° 55.91118' E Width: 3,78 m Height: 0,00 m Length: 6,14 m		

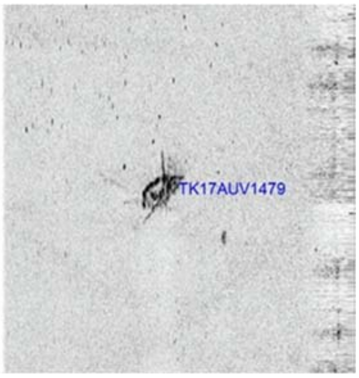
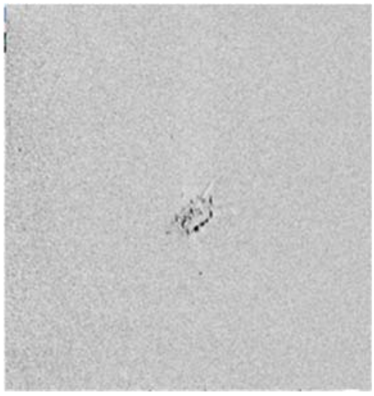
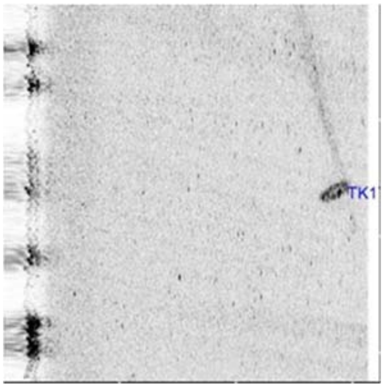
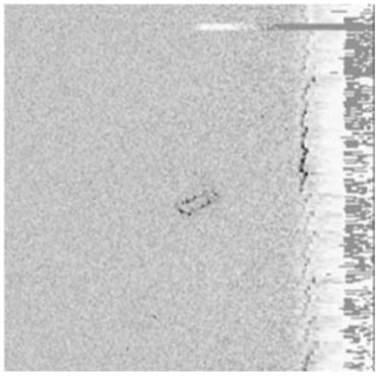
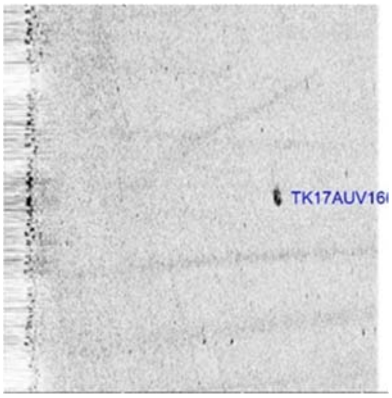
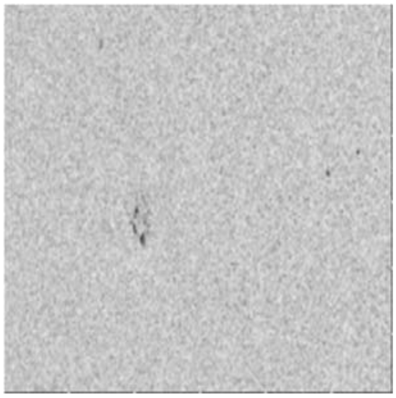
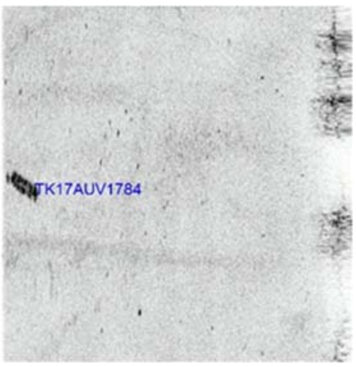
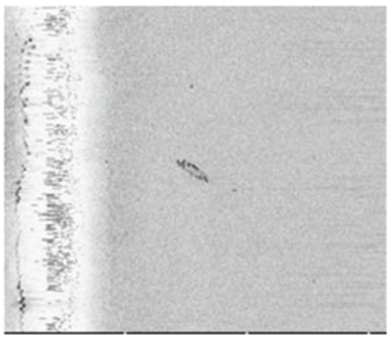
No	Information on the Findings	Image	
		Low Frequency	High Frequency
17	TK17AUV0707 Undefined object which is classified as a wreck Coordinates; 41° 55.23945' N 028° 58.76013' E Width: 4,61 m Height: 0,00 m Length: 11,99 m		
18	TK17AUV0737 Undefined object which is classified as a wreck Coordinates; 41° 56.04548' N 028° 59.84907' E Width: 5,50 m Height: 0,00 m Length: 7,42 m		
19	TK17AUV0756 Wreck which is thought to be a ship Coordinates; 41° 56.59698' N 029° 00.66402' E Width: 3,88 m Height: 0,00 m Length: 9,77 m		
20	TK17AUV0810 Undefined object which is classified as a wreck Coordinates; 41° 45.96647' N 028° 50.82346' E Width: 3,20 m Height: 0,00 m Length: 6,21 m		

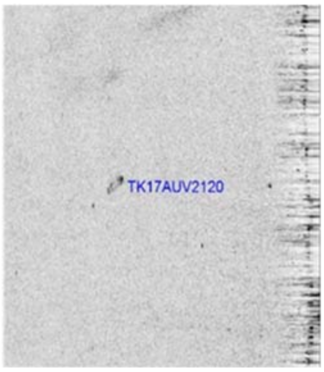
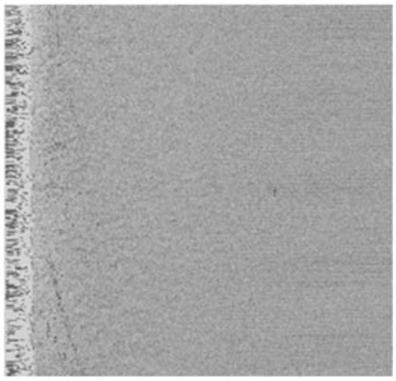
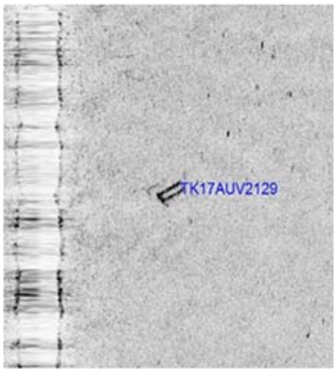
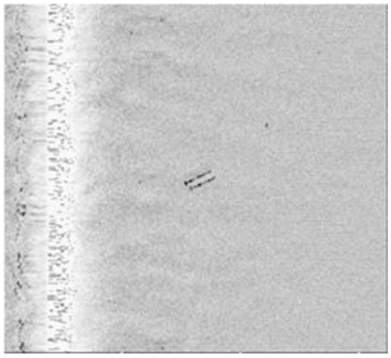
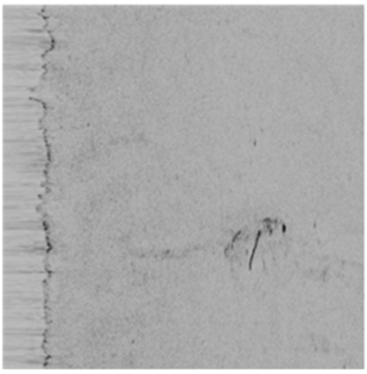
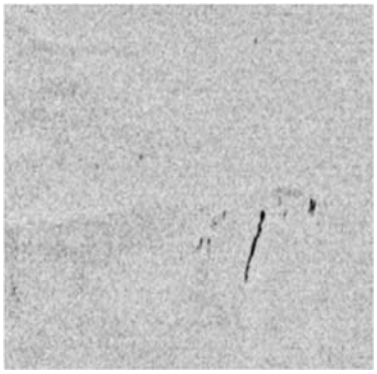
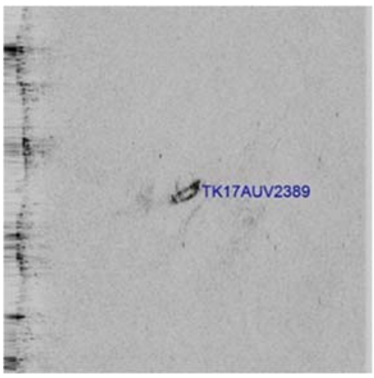
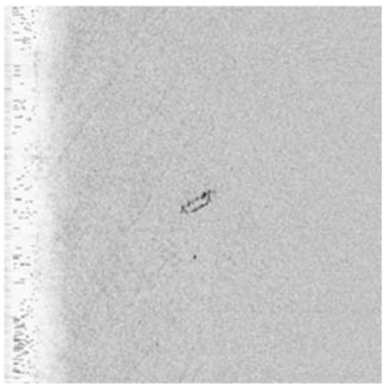
No	Information on the Findings	Image	
		Low Frequency	High Frequency
21	TK17AUV0863 Wreck which is thought to be a ship Coordinates; 41° 49.10401' N 028° 56.73356' E Width: 2,36 m Height: 0,00 m Length: 6,39 m		
22	TK17AUV0875 Wreck which is thought to be a ship Coordinates; 41° 48.79333' N 028° 55.79400' E Width: 1,57 m Height: 0,00 m Length: 7,16 m		
23	TK17AUV0889 Undefined object which is classified as a wreck Coordinates; 41° 48.13971' N 028° 53.31018' E Width: 1,56 m Height: 0,00 m Length: 5,36 m		
24	TK17AUV0896 Wreck which is thought to be a ship Coordinates; 41° 46.77354' N 028° 50.00058' E Width: 4,37 m Height: 0,00 m Length: 19,60 m		

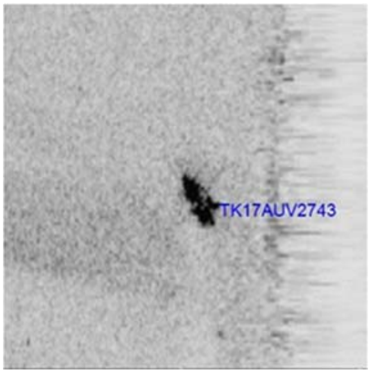
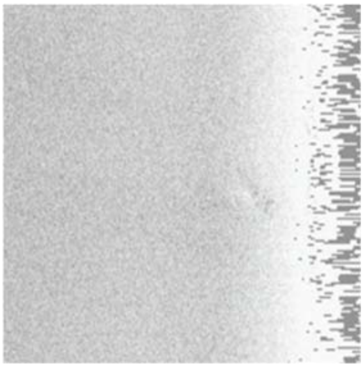
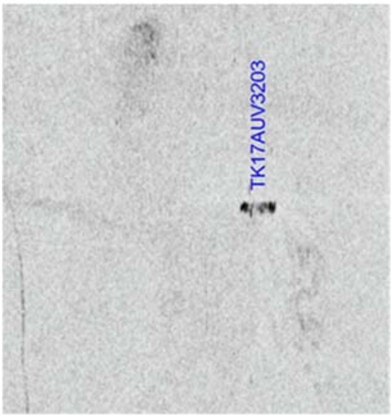
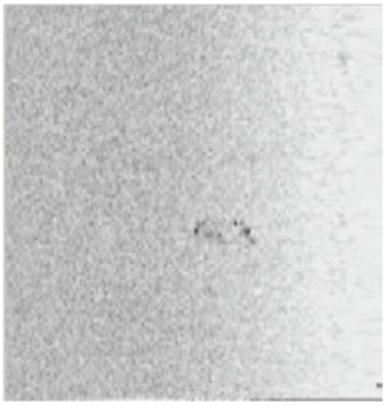
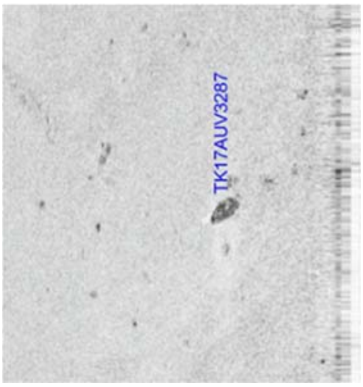
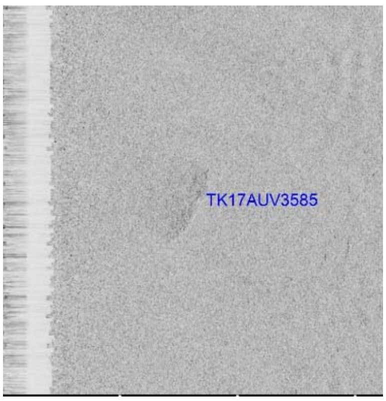
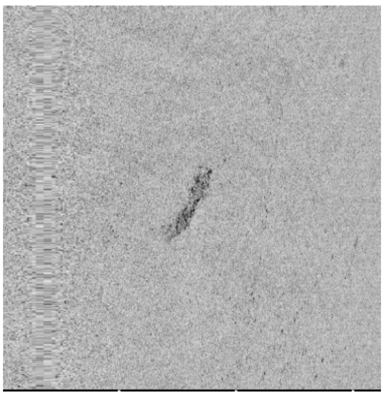
No	Information on the Findings	Image	
		Low Frequency	High Frequency
25	TK17AUV0906 Undefined object which is classified as a wreck Coordinates; 41° 47.13363' N 028° 50.65347' E Width: 3,18 m Height: 0,00 m Length: 9,58 m		
26	TK17AUV0913 Wreck which is thought to be a ship Coordinates; Coordinates; 41° 48.72584' N 028° 54.24225' E Width: 4,10 m Height: 0,00 m Length: 11,39 m		
27	TK17AUV0933 Wreck which is thought to be a ship Coordinates; 41° 48.36588' N 028° 52.47548' E Width: 3,73 m Height: 0,00 m Length: 12,33 m		
28	TK17AUV0974 Wreck which is thought to be a ship Coordinates; 41° 49.98045' N 028° 56.00486' E Width: 6,46 m Height: 0,00 m Length: 12,30 m		

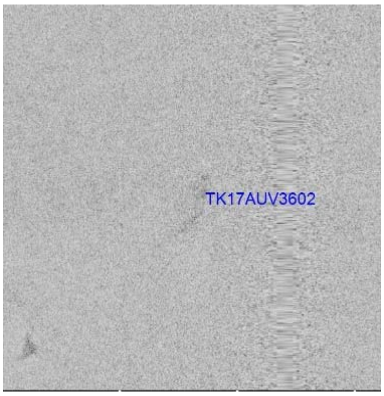
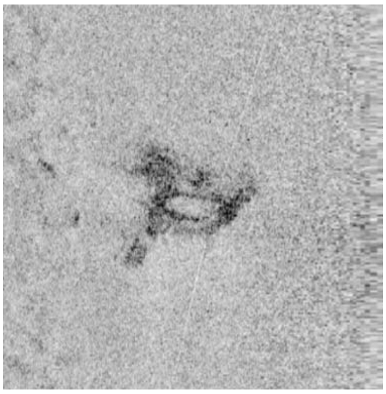
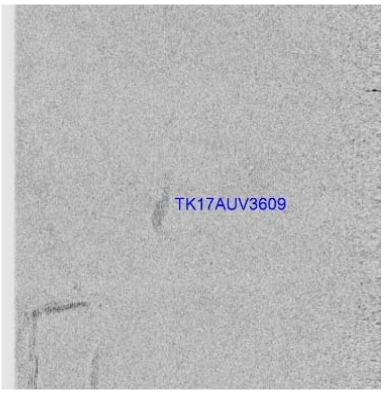
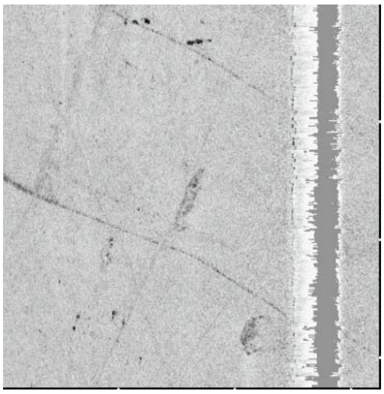
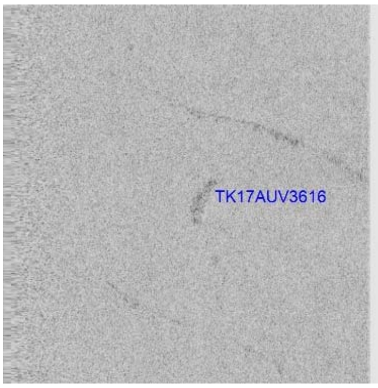
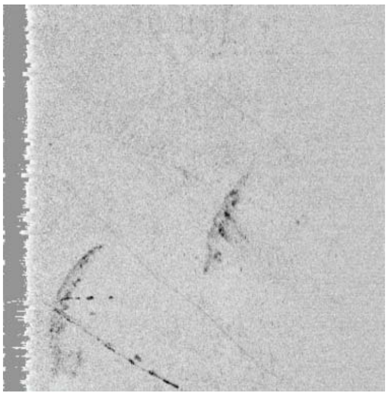
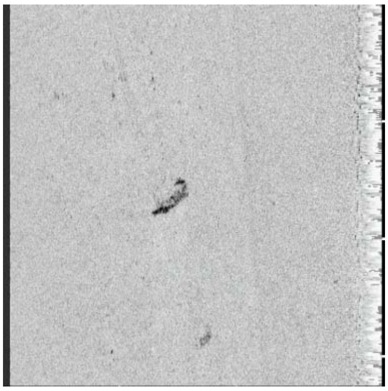
No	Information on the Findings	Image	
		Low Frequency	**High Frequency**
29	TK17AUV0977 Wreck thought to be a rectangle object Coordinates; 41° 48.70798' N 028° 52.97904' E Width: 9,55 m Height: 0,00 m Length: 25,96 m		
30	TK17AUV1147 Wreck which is thought to be a ship Coordinates; 41° 49.74005' N 028° 54.34588' E Width: 9,46 m Height: 0,00 m Length: 48,11 m		
31	TK17AUV1331 Undefined object which is classified as a wreck Coordinates; 41° 47.59761' N 028° 50.22976' E Width: 2,71 m Height: 0,00 m Length: 34,22 m		
32	TK17AUV1359 Wreck thought to be a ship or a huge rock Coordinates; 41° 49.31560' N 028° 51.97042' E Width: 6,37 m Height: 0,54 m Length: 17,80 m		

No	Information on the Findings	Image	
		Low Frequency	High Frequency
33	TK17AUV1362 Undefined object which is classified as a wreck Coordinates; 41° 52.69428' N 029° 01.82181' E Width: 6,42 m Height: 0,00 m Length: 38,26 m		
34	TK17AUV1425 Wreck which is thought to be a ship Coordinates; 41° 49.43871' N 028° 49.52793' E Width: 13,12 m Height: 0,00 m Length: 19,51 m		
35	TK17AUV1434 Wreck which is thought to be a ship Coordinates; 41° 50.04369' N 028° 50.80670' E Width: 20,88 m Height: 0,00 m Length: 28,00 m		
36	TK17AUV1474 Wreck thought to be a ship or a huge rock Coordinates; 41° 49.67858' N 028° 48.76057' E Width: 4,44 m Height: 0,00 m Length: 8,30 m		

No	Information on the Findings	Image	
		Low Frequency	High Frequency
37	TK17AUV1479 Undefined object which is classified as a wreck Coordinates; 41° 49.83252' N 028° 48.91440' E Width: 10,80 m Height: 0,00 m Length: 21,08 m		
38	TK17AUV1662 Wreck which is thought to be a ship Coordinates; 41° 52.08599' N 028° 52.11363' E Width: 6,06 m Height: 0,00 m Length: 13,80 m		
39	TK17AUV1667 Undefined object which is classified as a wreck Coordinates; 41° 50.35764' N 028° 47.72872' E Width: 3,34 m Height: 0,00 m Length: 7,57 m		
40	TK17AUV1784 Wreck which is thought to be a ship Coordinates; 41° 53.40389' N 028° 53.10521' E Width: 6,04 m Height: 0,00 m Length: 14,88 m		

No	Information on the Findings	Image	
		Low Frequency	High Frequency
41	TK17AUV2120 Wreck which is thought to be a ship Coordinates; 41° 48.27269' N 028° 45.26822' E Width: 3,46 m Height: 0,00 m Length: 10,06 m		
42	TK17AUV2129 Wreck which is thought to be a ship Coordinates; 41° 47.15964' N 028° 44.42127' E Width: 4,42 m Height: 0,00 m Length: 12,19 m		
43	TK17AUV2382 Wreck which is thought to be a ship Coordinates; 41° 45.74994' N 028° 44.97756' E Width: 8,00 m Height: 0,00 m Length: 23,00 m		
44	TK17AUV2389 Wreck which is thought to be a ship Coordinates; 41° 46.17482' N 028° 46.58162' E Width: 5,06 m Height: 0,00 m Length: 14,02 m		

No	Information on the Findings	Image	
		Low Frequency	High Frequency
45	TK17AUV2743 Wreck which is thought to be a ship Coordinates; 41° 58.16120' N 029° 12.93695' E Width: 5,62 m Height: 0,00 m Length: 15,86 m		
46	TK17AUV3203 Undefined object which is classified as a wreck Coordinates; 42° 35.24325' N 030° 19.76405' E Width: 4,01 m Height: 0,00 m Length: 13,83 m		
47	TK17AUV3287 Undefined object which is classified as a wreck Coordinates; 42° 41.85513' N 030° 31.40121' E Width: 7,94 m Height: 2,73 m Length: 17,34 m		
48	TK17AUV3585 Gemi olduğu tahmin edilen enkaz: Koordinatları; 41° 42.40491' N 028° 22.56540' E Genişlik: 8,00 m Yükseklik: 0,00 m Uzunluk: 31,90 m		

49	TK17AUV3602 Gemi olduğu tahmin edilen enkaz: Koordinatları; 41° 42.11946' N 028° 22.10788' E Genişlik: 8,20 m Yükseklik: 0,00 m Uzunluk: 23,00 m		
50	TK17AUV3609 Enkaz olarak sınıflandırılan ancak tanımlanamamış obje: Koordinatları; 41° 42.17057' N 028° 21.08666' E Genişlik: 4,08 m Yükseklik: 0,00 m Uzunluk: 15,91 m		
51	TK17AUV3616 Enkaz olarak sınıflandırılan ancak tanımlanamamış obje: Koordinatları; 41° 41.44114' N 028° 19.49940' E Genişlik: 3,80 m Yükseklik: 0,00 m Uzunluk: 19,86 m		
52	TK17AUV3617 Enkaz olarak sınıflandırılan ancak tanımlanamamış obje: Koordinatları; 41° 41.28217' N 028° 18.91668' E Genişlik: 4,85 m Yükseklik: 0,00 m Uzunluk: 18,88 m		

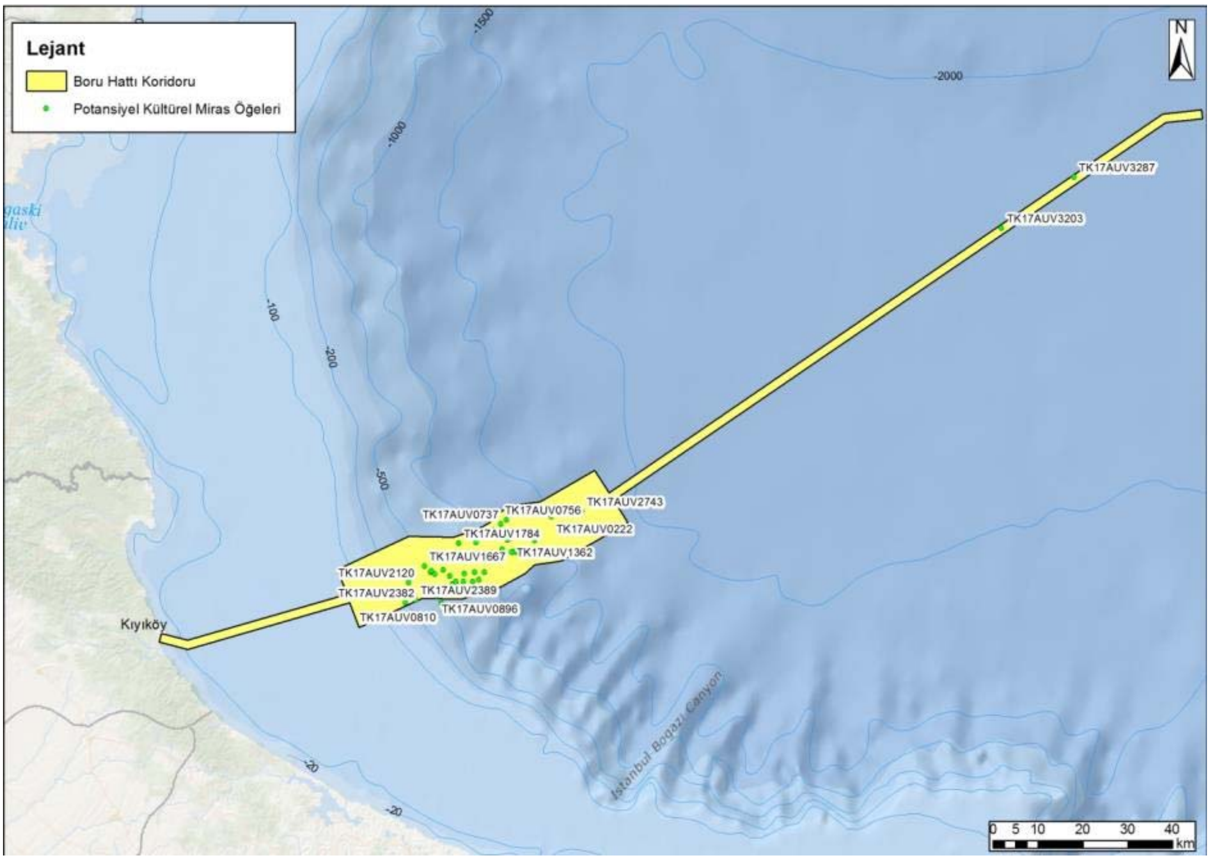


Figure 6.83140: The Location of Cultural Heritage Items with the Project Route in the Offshore Section

Regarding the Shore Crossing Section of the Project with the desk-based assessments, an underwater archeology survey has been carried out between the dates of 07.11.2015 and 13.11.2015 upon the request and with the coordination of the Excavations and Research Department of the General Directorate of Cultural Assets and Museums under the Ministry of Culture and Tourism and with the participation of a team from the Institute of Marine Science and Technology of Dokuz Eylül University and an expert from each of the Underwater Archeology Museum of Bodrum and the Kırklareli Museum. Following the 7-day marine survey, office work comprising of mapping and data interpretation has been completed and the scientific report dated 11.12.2015 has been published. According to the report prepared, neither remains nor artifacts which fall under Law No. 2863 and 3386 have been revealed apart from natural formations spotted during seismic and sonar surveys and scuba dives which have been carried out in the area covering the Selves Beach and the pipeline. Due to the change in the project route, it has been stated that the work done in 2015 was validated by the opinion letter of the Ministry of Culture and Tourism dated 30.03.2017 (**ANNEX-5.A**) and the General Directorate of Cultural Assets and Museums within the Ministry of Culture and Tourism did not find any inconveniences in carrying out the studies required within the scope of the Project in accordance with the results of the survey conducted underwater at the sea side of the pipeline-land connection area and Kırklareli Governorate was informed about the situation (**ANNEX-5.A**)

6.10.2 Onshore Section

Thrace is considerably rich in historical structures and stone houses. Edirne, Enez, Ereğli on Marmara, central Kırklareli and the district of Vize are the foremost locations regarding archaeology-tourism in the area. There is little information that can illuminate the prehistoric times in Kırklareli. Due to the fact that it was a small settlement and it was located in the shade of large settlements around it, Kırklareli, which does not have much information about Roman and Byzantine periods, was heard and prospered during the Ottoman Empire period (Ref. 6.81). In the geography of Kırklareli, material cultural assets belonging to the earlies periods and especially the Ottoman civilization has come to light Recent mound and tumulus excavations with increasing numbers have revealed new information about the early periods of Kırklareli that were unknown until recently and many valuable historical works have been added to the Provincial Museum (Ref. 6.82).

The Archaeological Settlements of Turkey (TAY) project is being carried out in order to extract the findings of cultural assets in Turkey, create a chronological inventory and to share this information on the international platform. This project started its studies in 1993 and is still continuing today. With the help of this study, archaeological settlements, mounds, tumuli, monuments, grave sites and archaeological sites of Turkey are documented. In this respect, it is reported that cultural assets included in the inventory of the Archaeological Settlements of Turkey (TAY) Project and found in Kırklareli Province belong to the neolithic age (new stone / polished stone age), chalcolithic age (copper stone age), the first bronze age and iron age. There are some important archaeological excavations carried out in the area in the past. Many tumuli, in large and small sizes which are called "yığma tepecikler" and contain graves, were found in the province of Kırklareli (Ref. 6.84). During the field studies conducted by Prof. Dr. Arif Müfit Mansel's important archaeological excavations in Kırklareli, Lüleburgaz and Vize provinces between 1936 and 1939 yielded important information. A group of tumuli at Aşağıpınar 3 km from Kırklareli, one tumulus at Karakoç and one from Eriklice villages were investigated in 1938 and 1939 and it was found that those tumuli belonged to 5th Century BC. The research, conducted by Prof. Dr. Arif Müfit Mansel, confirms that this area was an old settlement (Ref 6.81).

The oldest settlement in the region was found in 1980 in Aşağıpınar location 3 km away from Kırklareli by the studies conducted by Prof. Dr. Mehmet Özdoğan and artifacts found indicates to the Neolithic period around 5800 B.C. The archeological site of AşağıPınar is seen as one of the important settlements in the Chalcolithic Age. During the field studies conducted by Prof. Dr. M. Özdoğan in 1981, many artifacts belonging to the Chalcolithic Age were encountered on the Tilkiburnu hill, located to the east of Şeytanderesi and approximately 18 km from Kırklareli. Apart from these, settlement area at Kanlıgeçit site, 500 m west of Aşağıpınar settlement and dating back to 3000 BC, consisted of an inner castle surrounded by stone walls and a lower city spread around it. In the settlement where simple wooden structures were used, local pots were used (Ref. 6.81).

In the city center of Vize District, there are 2 significant mounds. Findings indicate that the Çömlektepe Mound was used from the beginning of the Bronze Age to the end of the Roman period. During the excavations, a Roman theater and many precious works with it was found. In the ancient settlement area, also called as Vize mound, with Vize Castle in it, roman historical ruins stand out. It is also suggested by researchers that Karakoçaktepe, located about 3 km north of Vize, was also a prehistoric settlement area. The existence of many ancient settlement centers is known in the vicinity of the Vize. It is known that 92 tumuli are registered and protected within the provincial borders of Kırklareli. However, as a result of the surface surveys conducted, it was concluded that this number was more than 200 with the appearance of small sized tumuli. There are numerous tumuli found in the borders of Babaeski, Demirköy, Kofçaz ve Pınarhisar Districts. Besides, Vize and its immediate vicinity are the areas where the tumuli are most concentrated in Eastern Thrace. As a result of the work carried out in Vize and its villages, over 40 tumuli were found (Ref 6.84). Kırklareli has natural sites, archaeological sites, historical sites and urban sites, which are considered valuable in terms of tourism. As of the end of 2016, registered site statistics of Kırklareli province and Turkey are summarized in Table 6.726.

Table 6.726: Information on Registered sites, 2016 (Ref. 6.85)

Province	Archaeological Sites	Urban Sites	Historical Sites	Crossing Sites	Urban Archaeological Sites	Mixed Sites
Turkey	15.559	282	196	359	32	89
Kırklareli	433	1	2	5*		1

*Archaeological and natural sites (4) and natural-historical-urban sites (1) .

Since Kıyıköy is a well-known religious center of the Byzantine Empire, many relics from this era can be seen in or around the port of Kıyıköy and Kıyıköy itself. The valley between the two hills near Pabuçdere creek is filled with the sediments of the nearby river but the remains from Roman and Byzantine era (pottery fractures) are still known to exist.

According to E20-d4 numbered sheet of 1/25.000 scaled Environmental Plan provided by the formal letter dated 30.01.2017, numbered 81158300 and issued by Sub-directorate Responsible for the Protection of Natural Assets, Kırklareli Provincial Directorate of Environment and Urbanisation, there are areas identified as historical site, archaeological site and mixed site within the immediate proximity of the Project (Figure 6.8441). Regarding these sites, Kırklareli Provincial Directorate of Culture and Tourism and Cultural Assets Protection Board of Edirne has made a site survey upon our request for opinion within the scope of the Project. With the findings of the said site survey, the opinion letter dated 25.05.2017 (**Annex-5.A**) by the Board reads as follows: "As a result of the inspection of the site, neither necropolises nor church remains have been found outside of the route of the pipeline, inside the Project site. It is for this reason that no interventions are deemed required in the area the coordinates of which have been specified in the attachment to this letter. No immovable cultural assets have been found outside of the said coordinates, inside the Project Area, which need to be protected. Thus, there are no concerns regarding the implementation of the 'Turkstream Gas Pipeline - Offshore Section' Project under the condition that activities are halted in the event of encountering any artefacts or remains during activities, which fall in the scope of the Law No. 2863, and that the closest Administrative Office or the Museum Directorate is notified."

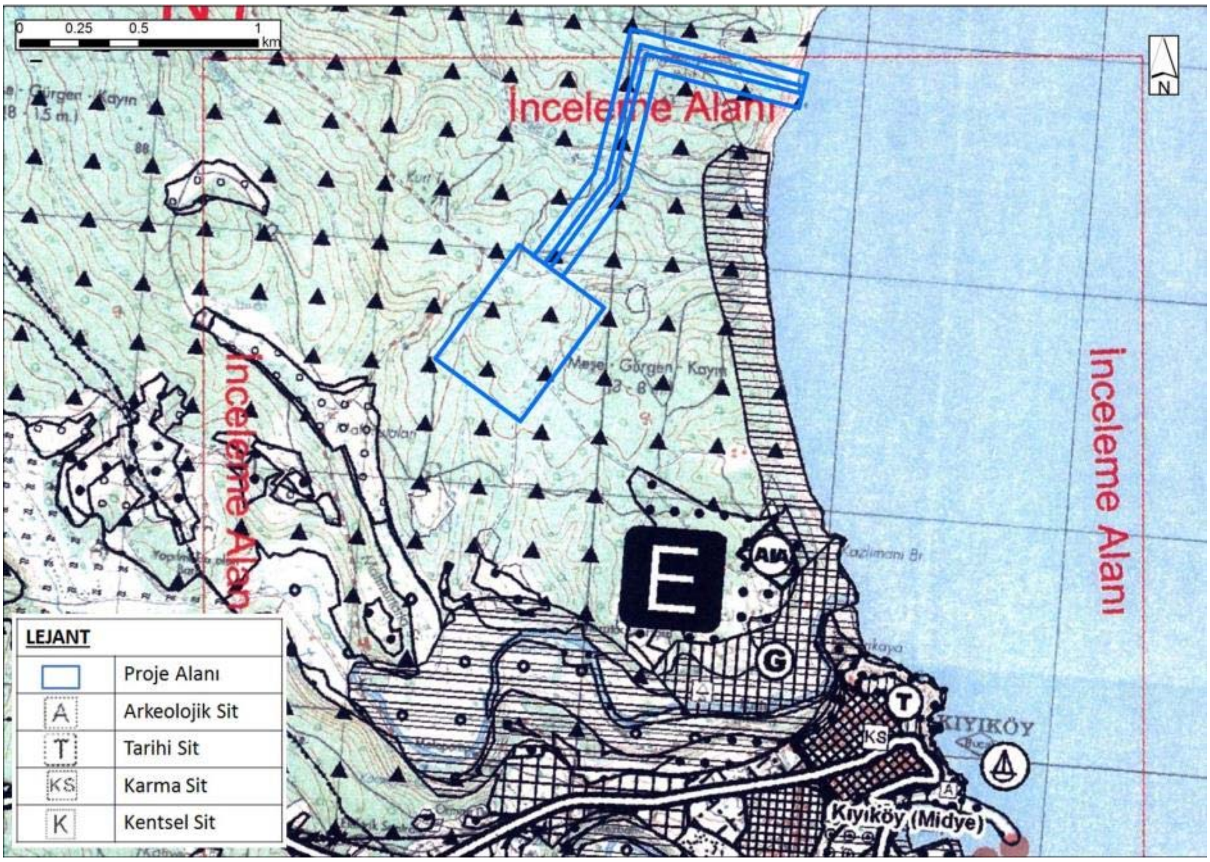


Figure 6.8441: Historical, Archaeological and Mixed Sites in the Immediate Proximity of the Project within Kırklareli Provincial Special Administration

In addition to archaeological sites and monuments in Kırklareli province, it is known that there are stone and wooden houses left by people who had to migrate to Bulgaria and Greece, especially in the province center. According to the letter of the Board of Edirne dated 13.03.2017 (**ANNEX-5.A**), there are a total of 21 houses with one belonging to the municipality and others to individuals, one mosque and an old PTT building all declared as 2nd degree preservation district.

Within the scope of the desk-based assessments with the purpose of determining the archaeological potential of the Project Area, archaeological publications related to the Project Area and its immediate surroundings were examined and it was examined to find out whether there is a recorded cultural existence by negotiating with the related conservation council. All the archaeological sites determined by the literature review were studied on the map and the possible relations with the Project Area were examined. Academic publications, historical maps, present cultural heritage studies and reports on the results of the surface surveys and inventory records of the Cultural Assets Protection Board of Edirne were utilized in the desk-based assessments.

As a result of the desk-based assessments, it was determined that there is neither archaeological nor cultural heritage objects registered in the Project Area by the Ministry of Culture and Tourism. In the immediate proximity of the Project, there are plenty of registered archaeological sites by the Cultural Assets Protection Board of Edirne (Board of Edirne). Numerical data (e.g. GPS coordinates) obtained from the meetings with the Board were transferred to the Geographical Information System and the interaction between the known archaeological sites and the construction site of the Project was evaluated.

According to the letter of the Board of Edirne dated 13.03.2017 (**ANNEX-5.A**), It is stated that there are 15 registered archaeological sites around the Project Area. These areas are concentrated in the southern part of the Project Area. The nearest sites to the project area are the Kaz Limanı Tumulus and Vezirtepe E Tumulus, which are located approximately 1.1 km away. None of the 15 archaeological sites mentioned are directly influenced by existing Project activities. The location of these sites with the Project Area is shown in Figure 6.8542 and details and images of the sites are given in Table 6.7307.

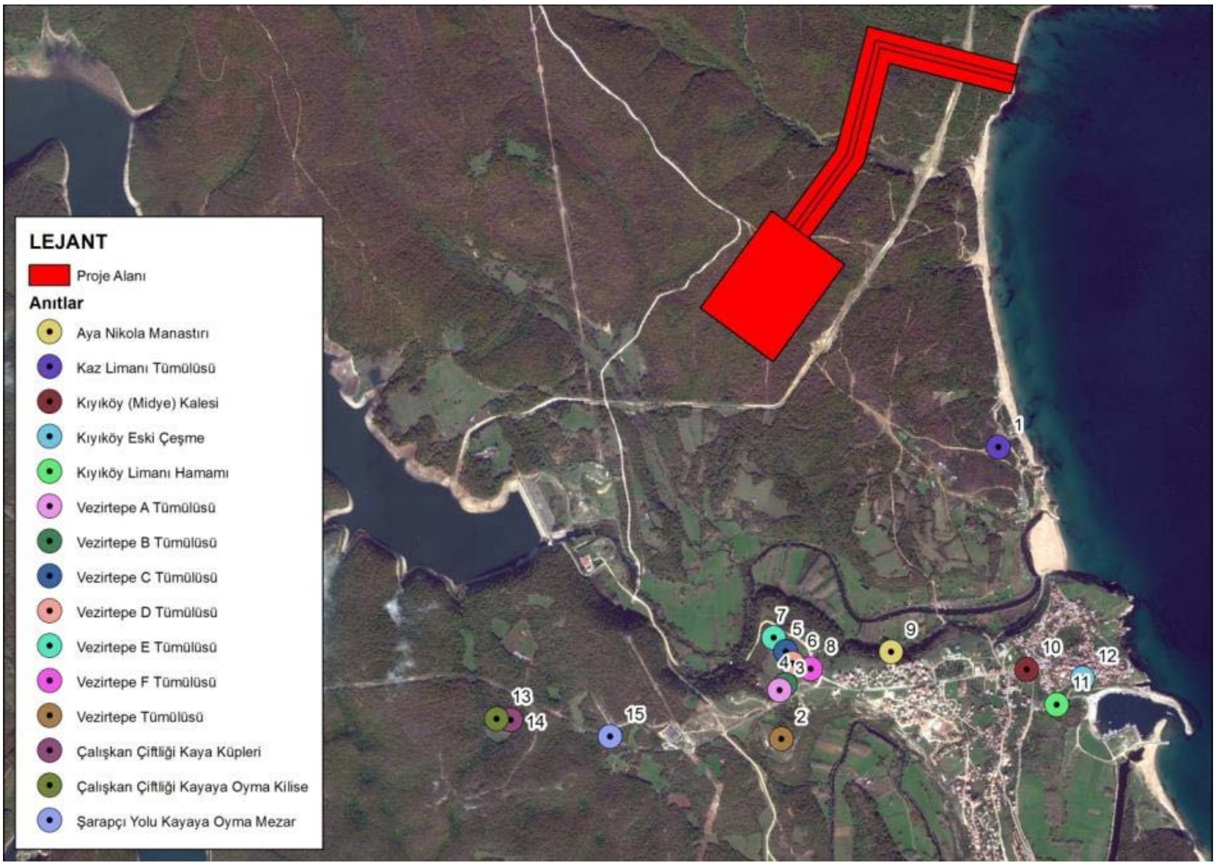


Figure 6.85142: Project Area and Archaeological Sites in the Proximity

Table 6.737: Archaeological Sites in the Proximity of the Project

No	Name of the site	Image
1	**Kaz limanı Tumulus:** The area in Kıyıköy, Vize District, Kırklareli Province is approximately 1.1 km away from the Project Area. It is declared as 1. degree archaeological site by the decision of the Board of Edirne dated 20.01.2016, numbered 290. It is 4-5 m high, 25-30 m in diameter. This tumulus dating back to the Early Iron Age is damaged by treasure hunters.	

No	Name of the site	Image
2	**Vezirtepe Tumulus:** The area in Kıyıköy, Vize District, Kırklareli Province is approximately 1.6 km away from the Project Area. It is declared as 1. degree archaeological site by the decision of the Board of Edirne dated 10.07.1991 and numbered 942. It dates back to Early Iron Age. This tumulus which is 1.6 km west of the center of the town is destroyed. A water tank was built on it and thus its form is distorted.	
3	**Vezirtepe A Tumulus:** The area in Kıyıköy, Vize District, Kırklareli Province is approximately 1.4 km away from the Project Area. It is declared as 1. degree archaeological site by the decision of the Board of Edirne dated 11.05.2000 and numbered 6092. It dates back to Early Iron Age. It is approximately 3 m high and 18 m in diameter. There are holes caused by the damage on the tumulus.	
4	**Vezirtepe B Tumulus**: The area in Kıyıköy, Vize District, Kırklareli Province is approximately 1.3 km away from the Project Area. It is declared as 1. degree archaeological site by the decision of the Board of Edirne dated 11.05.2000 and numbered 6092. It dates back to Early Iron Age. South edges of this tumulus declared as 1. degree archaeological site is damaged and it is 16 m in diameter and approximately 3,5 m.	
5	**Vezirtepe C Tumulus:** The area in Kıyıköy, Vize District, Kırklareli Province is approximately 1.3 km away from the Project Area. It is declared as 1. degree archaeological site by the decision of the Board of Edirne dated 11.05.2000 and numbered 6092. It dates back to Early Iron Age. It is approximately 3 m high and 20 m in diameter. There are signs of illegal excavations on the tumulus.	

No	Name of the site	Image
6	**Vezirtepe D Tumulus:** The area in Kıyıköy, Vize District, Kırklareli Province is approximately 1.2 km away from the Project Area. It is declared as 1. degree archaeological site by the decision of the Board of Edirne dated 20.01.2016 and numbered 2901. It dates back to Early Iron Age. It is approximately 2m high and 25-30 m in diameter (Image 13). It is damaged by illegal excavations.	
7	**Vezirtepe E Tumulus:** The area in Kıyıköy, Vize District, Kırklareli Province is approximately 1.1 km away from the Project Area. It is declared as 1. degree archaeological site by the decision of the Board of Edirne dated 20.01.2016 and numbered 2901. It dates back to Early Iron Age. The tumulus, with threes on it, is approximately 4-5 m high and 30-35 m in diameter. There are signs of illegal excavations on the tumulus.	
8	**Vezirtepe F Tumulus:** The area in Kıyıköy, Vize District, Kırklareli Province is approximately 1,3 km away from the Project Area. It is declared as 1. degree archaeological site by the decision of the Board of Edirne dated 20.01.2016 and numbered 2901. It dates back to Early Iron Age. The tumulus with threes on it, is approximately 3 m high and 25-30 m in diameter. There are signs of illegal excavations on the tumulus.	
9	**St. Nicholas' Monastery:** The area in Kıyıköy, Vize District, Kırklareli Province is approximately 1.4 km away from the Project Area. It is declared as 1. degree preservation district by the decision of the Board of Edirne dated 16.03.1969 and numbered 4537. It dates back to Byzantine period at 6th century. The monastery is dedicated to Saint Nicholas who is believed to protect marine. The monastery is made up of three parts, all of which are built by carving rock mass. It is consisted of church, spring and the two consecutive spaces adjacent to the narthex. The monastery is well preserved	

No	Name of the site	Image
	when compared with similar examples of its period (e.g. the examples of Thracian-influenced Bulgarian works).	
10	**Kıyıköy Castle:** The area in Kıyıköy, Vize District, Kırklareli Province is approximately 1.7 km away from the Project Area. It is declared as 1. degree archaeological site by the decision of the Board of Edirne dated 13.05.1988 and numbered 36. The castle was first built in the 6th century and is located on a ridge extending to the sea between Kazandere in the south and Pabuçdere in the north. Western walls and two main gates have survived to our days. The walls were repaired in 9th and 10th century. Kıyıköy Castle is included in a 1. degree archaeological site and the Kıyıköy settlement where the modern people of Kıyıköy live, is included in a 3. degree archaeological site.	
11	**Kıyıköy Limanı Hamamı (Kıyıköy Port's Bathhouse):** The area in Kıyıköy, Vize District, Kırklareli Province is approximately 2.1 km away from the Project Area. It is declared as 1. degree archaeological site by the decision of the Board of Edirne dated 13.05.1988 and numbered 7 . It is completely destroyed and ruined. Its walls are made of rubble stones with lime mortar and arches, domes and vaults are brick-braided. The domes and vaults are supported with pointed arches. The interior is filled with earth until impost level of the arches.	
12	**Kıyıköy Eski Çeşme (Kıyıköy's Ancient Fountain):** The area in Kıyıköy, Vize District, Kırklareli Province is approximately 2.1 km away from the Project Area. It is declared as 1. degree archaeological site by the decision of the Board of Edirne dated 13.05.1988 and numbered 7 . It is ruined and its upper-structure is completely destroyed. The walls of its water tank reaches 1,5 m.	

No	Name of the site	Image
13	**Çalışkan Çiftliği Kayaya Oyma Kilise:** The area in Kıyıköy, Vize District, Kırklareli Province is approximately 2.2 km away from the Project Area. It is declared as 1. degree archaeological site by the decision of the Board of Edirne dated 20.01.2016 and numbered 2901. The structure located in the east-west direction has a rectangular plan with south facing entrance and is approximately 4x7 m in dimensions and 3 m in height. On the east side there is an apse. It is covered with a vault. Two niches carved side by side on the north wall have arches over them. There are little niches both side of the apse. Its interior was damaged by treasure hunters who burrowed holes in the walls and ground.	
14	**Çalışkan Çiftliği Kaya Küpleri:** The area in Kıyıköy, Vize District, Kırklareli Province is approximately 2.2 km away from the Project Area. It is declared as 1. degree archaeological site by the decision of the Board of Edirne dated 20.01.2016 and numbered 2901. Stone jugs with circular opening, reaching 1.5 or 2 m in depth were carved in natural rocks attached to the ground. 7 independent jugs were found with 5-6 m space between them. They are thought to be used for storage or as a tomb. Their interiors were damaged by the excavations of treasure hunters.	
15	**Şarapçı Yolu Kaya Oyma Mezarı:** The area in Kıyıköy, Vize District, Kırklareli Province is approximately 1.7 km away from the Project Area. It is declared as 1. degree archaeological site by the decision of the Board of Edirne dated 20.01.2016 and numbered 2901. The structure with south facing entrance is approximately 2,5x3 m in dimensions and its inside height is approximately 1.5m. There is a little nich in the north wall. Recently, the front part was covered with rubble stone and a section with a concrete plate roof. It belongs to Byzantine era.	

Within the scope of the Project's detailed route determination studies and with the Project Owner's request, a site survey was carried out on 25-26 April 2017 by Region Cultural Heritage Management Consultancy in order to detect any potential cultural heritage objects in the Project Area in the form of an observation study and hiking. In the scope of this site survey, hikes and visual observations were performed as far as the land allowed.

It was conducted by two senior field archaeologists and a geological engineer with using hiking and observation technique. The existing vegetation covering a large part of the Project Area was an important factor restricting the survey based on observations. It was aimed to observe, record and evaluate visible archaeological traces on the ground (traces of ceramic fragments, architectural remnants and/or traces, traces of burials and/or graves, bumps and tumuli etc.), taking into account the geological and archaeological characteristics of the site during the survey.

As a result of the observations made in the study area, intensely eroded sedimentary rocks such as limestone, sandstone and conglomerate units and metamorphic rocks such as schist and marble units were found in general. It was observed that limestone and sandstone units were deposited on the surfaces where roads cross. Macro Fossils were generally encountered during the site survey. Nummulites (Figure 6.8744-a), Gastropod (Figure 6.8744-b), Pelecypod (Figure 6.8845-a), Coral and Algae fossils (Figure 6.8845-b) could be observed in the limestone units due to intense wear and tear (Figure 6.8643).

Figure 6.8643: Intensely Eroded Limestone with Macro Fossils

Figure 6.8744: Nummulites and Gastropod Fossils

Figure 6.8845: Pelecypod Fossils (a), Coral and Algae fossils

The geomorphological structure, paleontology and archaeological or immovable cultural assets of the region were investigated during the desk-based assessments. As a result of these assessments, it was determined that the fossils belonging to especially sea shells in the region were common. The results of the previous desk-based assessments in the region supports the observations made in the site survey. These studies provide general information for the Project Area in terms of geological and paleontological aspects.

During the site survey within the scope of the Project, areas, which are not registered by the Cultural Assets Protection Board of Edirne, were found. Information on these areas is given below.

Çingene İskelesi: This area around Çingene İskelesi, is located to the north of the section where the pipeline leaves the sea and runs on land. A large number of illicit digging pits were also observed in the area. This area included architectural elements carved into the main rocks, including the basic remains of a quadrangular structure, hillocks that might be tumuli of small diameters, wall fragments and numerous pieces of ceramics. Most of these hillocks that might be tumuli are damaged by illicit diggings of treasure hunters. It was observed that these hillocks were placed on the land in clusters in the sections where topographical structure and archaeological traces can be followed. A large number of tile pieces were found around the hillocks that were destroyed by illegal diggings. There were also platforms and structural complexes that were carved into the main rock by hand in the northern part of the open excavation area of the archaeological site and possibly related to water or different cults (sacrifice etc.). Beyond these structures, a marble slab with a "cross motif" was also found.

Mahmutalan: At the site of Mahmutalan, glazed and thinly walled Early Byzantine ceramics fragments were found in the area where temporary access roads were planned to be built within the scope of the Project. The archaeological value of this region is unknown because of the low numbers of the material found.

6.10.3 Impacts of the Works and Operations within the Scope of the Project on the Biological Environment and Measures for Controlling and Reducing Them (Construction, Operation and Post-Operation)

In the event of encountering any remains or artefacts which may qualify for the scope of the Law No. 2863 on the Protection of Cultural and Natural Assets during the Construction Stage of the Project, works in this area shall be stopped and the nearest Administrative Office or the Museum Directorate shall be notified.

The Coincidental Findings Procedure to be developed for the Project includes a series of measures such as stopping the activities, protection of the findings, evaluations to be made by competent authorities and if necessary, expert archaeologists, and keeping the findings under protection while designing and implementing the impact reducing measures (reconfiguration of the design/route, archaeological excavation or work).

Detailed measures (design controls) for reducing the potential impacts of the activities on cultural heritage objects during construction, operation and decommissioning stage are given in this chapter.

6.10.1.1 Impacts of Construction Stage and Measures for Reducing Impacts

Table 6.748: Project Activities, Impacts, Design Controls - Offshore and Shore Crossing Sections

Stage	Activity	Impact	Impact Reducing Measures / Design Controls
Pre-construction	Pre-Construction route surveys	The damage on cultural heritage objects such as shipwrecks, coincidental findings and artifacts during sampling or core sampling	• To implement the Coincidental Findings Procedure in case of potential cultural heritage object discovery during route surveys • To train related personnel for awareness on cultural heritage items
	Design of the pipeline route	To design the route over or near the cultural heritage objects in the sea	• To design the route with taking into consideration of cultural heritage objects registered in Offshore and Shore Crossing Sections of the Project during engineering and design stage • To revise the route in case cultural heritage objects are located within 150 m of the suggested route on both sides

Stage	Activity	Impact	Impact Reducing Measures / Design Controls
Construction	Pipe laying on seabed	The damage on cultural heritage objects such as shipwrecks, coincidental findings and historical artifacts during pipe laying activities on seabed	• To complete route surveys before construction • To carry out activities on the seabed at a distance of at least 150 m from known cultural heritage objects • To implement the Coincidental Findings Procedure in case of potential cultural heritage object discovery • To train the crew for awareness on cultural heritage items • To record and avoid CHO during the surveys for pipe laying activities on seabed in case of a discovery
	Dredging	The damage on cultural heritage objects such as shipwrecks and coincidental findings during dredging activities underwater	• To implement the Coincidental Findings Procedure in case of potential cultural heritage object discovery • To train the crew for awareness on cultural heritage items

Table 6.759: Project Activities, Impacts and Design Controls- Onshore Section

Stage	Activity	Impact	Impact Reducing Measures / Design Controls
Pre-construction, Site Preparation	Construction of temporary access roads, clearing of land and preparation of the ground (e.g. removal of upper soil, leveling and earth works)	Damage on CHO	• To develop Cultural Heritage Object Management Plan including a Coincidental Findings Procedure • To train field workers for awareness on cultural heritage items • To notify the nearest Administrative Office or the Museum Directorate in the event of encountering any remains or artifacts
Construction	Construction of the structures and the pipeline in the Onshore Section	Damage on CHO	• To train construction workers for awareness on cultural heritage items • To implement the Coincidental Findings Procedure in case of potential cultural heritage object discovery during construction

6.10.1.2 Impacts of the Construction Stage and Reducing Measures

Although no impact is expected on the operational stage, the Coincidental Findings Procedures and relevant legislation will be implemented during observations planned for the pipeline.

6.10.1.3 Impacts of the Decommissioning Stage and Impact Reducing Measures

The strategy of decommissioning stage of the Project is not known yet, but it will be determined after evaluating future technology in 50 years and no impact on CHO is expected.

6.11 Landscape Characteristics

The Project Area is located in the Kıyıköy area of the Vize District, Kırklareli Province in the Marmara Region of Thrace. Kıyıköy has an important rural landscape where local natural characteristics are preserved and original natural values coexist. With the composition of these properties, it can also contribute to ecotourism considerably (Ref: Namık Kemal Üniversitesi, Bilimsel Araştırma Projeleri, Kıyıköy Örneğinde Ekoturizm Planlamasına Yönelik Görsel Peyzaj Analizinin Uygulanması). The district lands, which are composed of lowlands separated by river valleys, are located in the eastern part of the province. The Strandzha Mountains (Yıldız Mountains), which extend in the northwest-southeast direction, divide the district into two. The waters originating from the eastern slopes of this mountainous area approaching 400 meters in height within the district limits reach the Black Sea and the waters from western slopes reach the Aegean Sea. Papuçdere and Kazandere are the main rivers flowing into the Black Sea. The source of the Ergene River, which is one of the main branches of the Meriç River flowing into the Aegean Sea, originates from the lands of Soğucak and Anadere Districts. Certain areas of Strandzha Mountains, especially those facing the Black Sea, are covered with oak and beech forests.

When the coastal forms are analyzed, in the mouths of valleys between Kıyıköy-İğneada there are small bays, high fields and capes. The coast has a cliff-like structure but flat areas can be seen partly. The strong waves arisen from northern winds have caused erosions and cliffs to form on the coast. The main beaches along the coast are the beaches of Kıyıköy, Panayır İskelesi, Kastro and Selvez. Pabuçdere from the north and Kazandere from the south of Kıyıköy area located on a rocky ground which is common in the Black Sea Region, flow into the sea. There are Selvez Beach and Municipality Beach on both ends of Kiyikoy.

Vegetation of Kırklareli includes 5 different groups: moist forests, dry forests, steppes (with plenty of grass), maquis, (with plenty of shrubs) and coastal plants. In the Ergene Basin and on the southern slopes of the Yıldız Mountains of Kırklareli there are abundant quantities of plants belonging to the Dry Forest Group. Kırklareli is rich in vegetation and variety. Among these natural plants there are oak, hornbeam, red pine, black pine, ash, rarely elms, cornelian cherry, christ's thorn, wild pear, maple and prickly juniper from macqui group. Woody plants such as black pine and red pine were included during Kirklareli afforestation. The Project Area includes areas that are mostly classified as productive forests. In a forest-rich region, Vize is the leading district with 71.701 hectares of forest. 31% of them is high forest and %69 is coppice forest. In addition, there are also pasture areas with very small territories, limited agricultural areas, and areas to be ecologically integrated into the forest.

Impacts on the landscape are the impacts that will arise in the construction and operational stages of the Onshore Section and result from changes in the field, including the addition of new units or the replacement of existing items. These impacts can be considered as the impacts of the construction and operation activities to be carried out on the general landscape characteristics and the impacts of possible changes and visual changes on people in the vicinity.

The impacts of receiving terminal and vent stacks on the landscapes are regarded to be permanent. In order to minimize these impacts, appropriate landscaping for the environment will be carried out around the perimeter of the terminal by planting suitably for the vegetation structure of the region. The evaluation of visual impacts is presented in Section 10.11 (Visual Impacts) in detail.

Within the scope of the "European Landscape Convention", which we became a party to by publishing it in the Official Gazette dated 27.07.2003 and numbered 25181, the protection, evaluation and management of the landscape is included. The convention notes that the landscape has an important public interest role in the cultural, ecological, environmental and social fields, and in the constitution of the local cultures and argues that those qualities are the most important aspects of cultural and natural heritage as well as it contributes to the consolidation of the country's identity so the convention focuses on the protection and management of cultural heritage. In this context, the provisions of the relevant convention will be adapted regarding the usability of the land and the measures to be taken.

Impacts of construction and operational stage of the Onshore Section of the Project on landscape and impact reducing measures are given in Table 6.7610.

Table 6.7610: Impacts on the landscape in the Onshore Section and impact reducing measure

Stage	Activity	Impact	Impact Reducing Measures
Construction	Earthworks, leveling of the area Pipe laying RT Installation	Permanent changes in the landscape and scenery caused by the removal of habitat, leveling of the area and buildings	To choose the route and construction technique in order to minimize earthworks as much as possible within the Project design
Operational Stage	Pipeline and receiving terminal	Permanent changes on current landscape	• To place the pipeline underground and to landscape the area with appropriate shallow-rooted plants • Planting the perimeter of the terminal suitably with the vegetation pattern

6.12 Socio-economic Aspects

In order to determine the socio-economic and demographic profile and socio-economic impacts of the project, an evaluation of the socio-economic situation in the present state is presented in detail under **Chapter 9** (Socio-Economic Environment Assessment) based on literature studies conducted within the scope of the Project and the findings of socio-economic field studies conducted by expert sociologists via face-to-face meeting or phone calls with local, regional and official stakeholders with the participation of socio-economic experts assigned by the Project Owner on October 2015 and January and April 2017. Besides, potential socio-economic impacts of the Project are analyzed and impact reducing measures to be implemented are given in terms of reducing, preventing and avoiding these potential impacts in the same chapter.

6.13 Protected Areas (within the list of environmentally sensitive areas in ANNEX-V)

The protected areas in Turkey include national parks, nature reserves, natural parks, natural monuments, wildlife improvement areas, protection forests, natural sites, special environmental protected areas, RAMSAR sites (sites under protection with the RAMSAR convention), biosphere reserves and world heritage sites. Within the scope of the project, "Protected Areas Of Turkey" System conducted by the General Directorate of Nature Conservation and National Parks within the Ministry of Forestry and Water Affairs, the size of the terrestrial protected area was determined as 5,647,568 hectares. These areas are managed by the General Directorate of Nature Conservation and National Parks within the framework of the legislations to ensure the preservation and continuity of biodiversity, natural and nature related cultural resources (Ref 6.86).

6.13.1 The Project Area and the Protected Areas in the Impact Range of the Project

6.13.1.1 Offshore and Shore Crossing Sections

Information was requested from Kırklareli Provincial Directorate of Food, Agriculture and Animal Husbandry in order to identify the aquaculture production and breeding area in the Offshore Section of the Project and the letter dated 30.05.2017 and numbered E.1330956 (**Annex-5.A**) was issued. In the letter, it is stated that there are a total of 6 trout farming facilities in Kırklareli province, 5 in Vize District and 1 in Central Dereköy Village. The names of the aquaculture facilities are given below:

- Filiz Salmon and Trout Farm;
- Kartalkaya Trout Farm;
- Strandzha Trout Farm and Marketing;
- Balkaya Trout Farm;
- Hasan Bayraktar Vize Trout Farm; and
- Aras Trout Farm.

According to the coordinates provided in the letter, the locations of the existing facilities are detected regarding the Project Area. As a result, trout production facilities were found to be out of the Project Area. Aquaculture facilities in the region of the Project Area are shown in Figure 6.896 below.

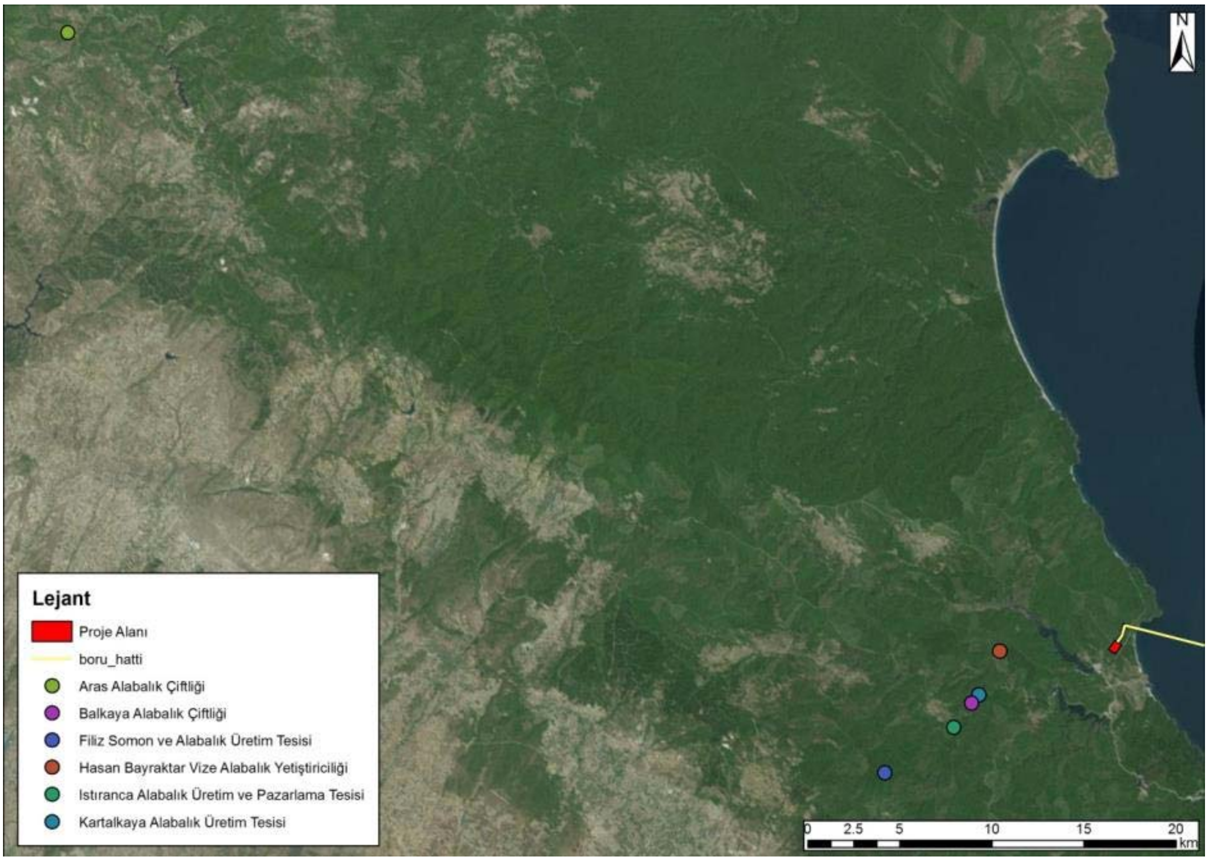


Figure 6.896: Aquaculture facilities in the region of the Project Area

There is no vulnerable or protected area listed under the Annex V of relevant EIA Regulation in the Offshore and Shore Crossing Sections of the Project.

6.13.1.2 Onshore Section

In this chapter, the presence and distribution of the protected areas in the immediate proximity of the Project Area were assessed by a detailed desk-based literature survey.

Kırklareli has its own distinctive ecosystems, rich biodiversity and a location in a temperate zone. One nature reserve is located within the boundaries of Vize District, Kırklareli province and it was declared as "Kırklareli Kasatura Körfezi Nature Reserve" on 18.04.1987 with 329 hectares of land. It is 233 km away from Istanbul and 48 km from Vize district. It is the only ecosystem with a black pine forest stand in Thrace. The main tree species in the area are black pine, Hungarian oak, sessile oak, Turkish oak, oriental hornbeam, European hornbeam, ash, beech, maple, tilia and alder There are also roe deers, wild boars, wolves, jackals, martens, foxes, badgers and rabbits in the area. Other than the Kırklareli Kasatura Körfezi Nature Reserve, Igneada Floodplain Forests National Park located in Demirköy District and Kavaklımeşe Korusu Nature Park, located in the Central District, are also among the protected areas. Igneada Floodplain Forests and Kırklareli Kasatura Körfezi are known countrywide, while Kavaklımeşe Natural Park is known at regional level (Ref 6.10; Ref 6.87).

There are wildlife protection and improvement areas, wild animal breeding areas and hunting grounds in various districts of Kırklareli province (Demirköy, Kofçaz, Vize, Central, Babaeski, Lüleburgaz etc). Besides, there are two wetlands in Demirköy District; these are İğneada Floodplain and Dupnisa Cave. In addition to these, natural sites and similar areas in the province of Kırklareli are as follows (Ref 6.10);

- Dinginoğlu Park (2nd Degree Natural Site-Central District);

- Dereköy roadside (2nd Degree Natural Site- Dereköy area);
- Sivriler Village, Pedina Hill Area, Pedina Lake and its proximity (1. Degree Natural Site + 1. Degree Archaeological Site- Demirköy);
- Igneada Mert Lake and its proximity (1. and 3. Degree Natural Site-Demirköy);
- Igneada Erikli Lake and its proximity (1. and 2. Degree Natural Site-Demirköy);
- Sivriler Village Hamam Lake and its proximity (1. Degree Natural Site-Demirköy);
- Dupnisa Cave (2. Degree Natural Site-Demirköy);
- Ali Özer Park (Pınarhisar);
- Pekmezdere Cae (Natural Site- Pınarhisar);
- Interior of Alpullu Sugar Factory (Natural, Historical, urban site, industrial structure-Babaeski);
- The stream beds of Kıyıköy Kazandere and Pabuçdere (1. Degree Natural Site-Vize);
- Evrenli Village (1. Degree Natural and Archaeological Site - Vize) and
- Saka Lake-Floodplain Forests (1., 2. and 3. Degree Natural Site-Demirköy);

A considerable part of Vize district, starting from the point where the Pabuçdere and the Kazandere, which are located on each side of the Kıyıköy town, meet the Black Sea, has been taken under protection as a First Degree Natural Site. In the letter of the Board of Edirne dated 13.03.2017(**ANNEX-5.A**), It is stated that the Kıyıköy area is declared as an urban and archaeological site by the decision of the Board of Edirne dated 13.05.1988 and numbered 36.

In the province of Kırklareli there are caves, karstic formations, valleys and beaches with touristic value. Especially the Yıldız Mountains are home to many caves. There are several caves and entrances like the Dupnisa cave, which is formed by the dissolving of limestone by water in the karstic region of Demirköy District. In accordance with the Kırklareli Province Nature Tourism Master Plan, some of the areas registered in the inventory of Vize District includes Bağlar Cave, Bostanlıktarla Cave, Kıyıköy Cave, Kızılağaç Cave, Kovantaşı Cave, Kurudere (Ağıl) Cave, Kurudere (Domuzdere) Cave, Ocak Cave, Pestilin Cave, Uzuntarla Cave and Yenesu Cave. Among those caves, Yenesu Cave located east of Balkaya Village with 18 m depth and 1620 m length is the second longest cave in Yıldız Mountains and third largest in Thrace. The inside of the Yenesu cave is covered with dripstone of all kinds (stalactites, stalagmites, columns, pools and soda straws) (Ref. 6.10; Ref. 6.88).

According to "Key Biodiversity Areas Programme" of Doga regarding Marmara Region, the Strandzha Mountains are considered as an important natural area for the Province of Kırklareli. The Strandzha Mountains, also known as the Yıldız Mountains, within the boundaries of Kirklareli, are the mountain line that runs parallel to the sea in North Thrace. The northern and southern slopes of the Strandzha Mountains differ in terms of forest type. The southern slopes of the mountain are covered with dry forest vegetation, while the northern forests have a moist structure. This natural area is an important breeding ground for forest birds and the northern part of the area is relatively remote from settlements. Pabuçdere dam is located on the southern side of the mountains. Another important natural area in the region is the Iğneada Floodplain Forests. There is a lake system within the floodplain forests and it includes Mert Lake, Erikli Lake, Hamam Lake, Saka Lake and Pedina Lake (Ref. 6.35).

In the Drinking Water Basin Protection and Control Regulation of ISKI regarding the protection area measurements of dam basins, 0-300 m is regarded as "Absolute Protection Area", 300-1000 m is regarded as "Short Distance Protection Area", 1000-2000 m is regarded as "Middle Distance Protection Area" and 2000 m - basin boundary is regarded as "Long Distance Protection Area"

In addition to the above general information, opinions of the Directorate General for Preservation of Natural Heritage under the Ministry of Environment and Urbanization and the General Directorate of Nature Conservation and National Parks under the Ministry of Forestry and Water Affairs are requested. In the opinion letter (**ANNEX-5.A**) dated 17.04.2017 and issued by the Directorate General for Preservation of Natural Heritage under the Ministry of Environment and Urbanization, it is stated that the new Project Area is not involved in any Special Environmental Protected Areas declared by the Decree of the Council of Ministers as per Decree-Law No. 383. In the opinion letter (**ANNEX-5.A**) dated 27.05.2017 and issued by the General Directorate of Nature Conservation and National Parks under the Ministry of Forestry and Water Affairs, it is stated that the Project Area is not involved in any protected area or site and the given coordinates are seen convenient.

According to the letter of Kırklareli Provincial Directorate of Environment and Urbanization dated 24.05.2017, the archive records indicate that said project area is not included in any natural assets or natural sites within our provincial borders.

The list of environmentally sensitive areas within the scope of Annex-V of EIA Regulation is given below. In addition, legislations to be complied with for the Project activities is also given within the scope of this regulation. The changes in the legislations are an integral part of this chapter.

1. Areas that should be under protection as per Turkish legislation:

a) "National Parks", "Natural Parks", "Natural Monuments" and "Nature Reserves" defined in the Article 2 of the National Parks Law and determined in accordance with the Article 3 of this Law,

b) "Wildlife Protection and Improvement Areas and Wild Animal Breeding Areas" defined by the Land Hunting Law,

c) "Cultural Assets", "Natural Assets", "Sites" and "Protected Areas" identified in the sub-clauses 1, 2, 3 and 5 within clause (a) under the title of "Definitions" within the 1. paragraph of the Article 3 of the Law on the Protection of Cultural and Natural Assets and areas registered and defined as per the relevant articles of Law No.3386 dated 17/6/1987 (amending the Law No. 2863 on the Protection of Cultural and Natural assets) and the Law No. 2863,

d) Aquaculture Production and Breeding Areas within the scope of the Law on Aquaculture,

e) Areas identified in Article 17, 18, 19 and 20 of the Water Pollution Control Regulation,

f) Areas identified in the Regulation on Air Quality Assessment and Management,

g) Areas identified and declared as "Special Environmental Protected Areas" by the Council of Ministers as per the Article 9 of the Environmental Law,

h) Areas under protection as per the Bosporus Law,

i) Areas regarded as forest land as per the Forestry Law,

j) Areas subject to ban on construction as per the Coastal Law,

k) Areas identified in the Law on Olive Improvement and Grafting of Wild Species,

l) Areas identified in the Law on Pastures,

m) Areas identified in the Regulation on Conservation of Wetlands.

2. Areas that should be under protection as per international conventions to which Turkey is a party:

a) Category I and II Protected Areas among "Important Sea Turtle Nesting Habitats" and "Monk Seal Conservation Areas" under protection by the Convention on the Conservation of European Wildlife and Natural Habitats (BERN Convention),

b) Areas under protection as per the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention),

1) Areas identified as "Specially Protected Area" in Turkey as per the Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean,

2) Areas included in the list of 100 Coastal Historical Site with a common value in the Mediterranean Region published by UN Environment Programme and prepared as per the Declaration of Geneva,

3) Feeding and living grounds in the coastal areas for "Threatened Marine Species in Mediterranean" stated in the Article 17 of the Declaration of Geneva,

c) Cultural, historical and natural areas with the statue of "Cultural Heritage" and "Natural Heritage " under protection of the Ministry of Culture and Tourism as per the Articles 1 and 2 of the Convention Concerning the Protection of the World Cultural and Natural Heritage,

d) Areas under protection as per "the Convention on Wetlands of International Importance especially as Waterfowl Habitat" (RAMSAR Convention),

e) European Landscape Convention.

3. Areas that should be under protection:

a) Areas identified as areas where existing features will be preserved, with construction ban by the Approved Environmental Plans (areas where natural characteristics will be preserved, biogenetic reserves, geothermal areas etc.),

b) Areas of Agriculture: Areas of agricultural development, irrigated areas, irrigable areas, class I, II, III and IV areas under the land capability classification, class I and class II rain fed areas and all of the special product plantation areas

c) Wetlands: all waters, swamps, reeds and turbaries that are natural or artificial, permanent or temporary, still or flowing, fresh, brackish or salty, covering shallower depths than 6 m during low-tide and of importance as a habitat for biota especially waterfowl and ecological wet grounds between the shore edge line of these areas and land,

d) Lakes, rivers, groundwater management areas,

e) Areas which are hosting species with scientific importance, threatened or near threatened species or endemic species in Turkey and areas with biosphere reserves, biotopes, unique geological and geomorphological formations

6.13.2 Impacts on protected areas and Measures to be Taken During the Project (Land Preparation, Construction, Operation and Post-operation)

The Project route within Onshore Section runs on Sazlıdere north of the Receiving Terminal. The detailed crossing technique which will be prepared to determine the most appropriate creek crossing technique with the help of detailed field studies, will be submitted to DSİ (General Directorate of State Hydraulic Works) and other related institutions, if necessary. Other impact reducing measures are given in Chapter 6.4.1.

The project is located in the forest area. Chapter 6.1.3 and Chapter 8.5 provide conservation measures for the forest area in detail (Impacts of the Works and Operations within the Scope of the Project and Reducing Measures).

6.14 Impacts on the Lands Under the Sovereignty and Disposal of the Competent Bodies of the State and Other Projects in the Region (Military Forbidden Zones, Areas Allocated to Public Institutions and Organizations for Specific Purposes and "Particular protected areas" as per Decree No. 7/16349 of the Council of Ministers etc.)

6.14.1 The Project Area and the Impact Range of the Project

The Project Area is identified in **Chapter 1** (General Characteristics of the Project) The potential impacts of the activities in the Offshore and Shore Crossing Sections of the Project on the lands under the sovereignty and disposal of the competent bodies of the state are assessed in this chapter.

6.14.1.1 Offshore and Shore Crossing Sections

Shore areas are under the sovereignty and disposal of the state and they are not subject ownership. These areas can be used with a certificate of occupancy. Territorial waters cover the area starting from the baseline to territorial water borders. The territorial waters of Turkey in the Black Sea are 12 nautical miles. This maritime area is included in Turkish Borders and under the sovereignty of Turkey with the exceptions such as harmless passage of ships. Similarly, these areas are under the sovereignty and disposal of the state and they are not subject ownership but they can be used with a certificate of occupancy as well. Beyond the territorial waters, there is the exclusive economic zone which is defined by the agreements made between Turkey and other countries having a coast on the Black Sea. On these waters, Turkey's rights are limited like the other countries. The usage of the sea bed by other countries for gas pipelines is only possible provided that the marine environment is preserved. The usage of these areas under the sovereignty and disposal of the state is only possible if the necessary permissions regarding relevant national legislations are granted. Information on their usage is given below.

Areas under the sovereignty and disposal of the state: ownership of these areas is not negotiable. The land and maritime areas on the sea side of the shore edge line, creeks and the lakes are included in this category. Natural and legal persons can rent these areas for short-term leases from the Governorates or they can use the area for up to 49 years with a certificate of occupancy. Certificate of occupancy is granted by the Ministry of Culture and Tourism in touristic areas and by the Ministry of Environment and Urbanization for the Special Environmental Protected Areas and natural sites. Related legislations include the Law on the Utilization of Real Properties Held by the Treasury and Value Added Tax no 4706, the Regulation on the Administration of Treasury Immovables and The Communique (Serial No: 374) on the Amendment to the National Estate General Communique.

The Onshore Section of the Project on the sea side of the shore edge line and the Offshore Section within the borders of territorial waters has this status.

6.14.1.1.1 Restrictions on Fishery

The Article 10 of the Notification No. 2016/35 on Commercial Fishing is as follows.

"Article 10 - (1) Bottom trawling is prohibited in the areas defined by the Article 9 during the validity period and in Mediterranean between April 15 - September 15 and in all other waters between April 15 - August 31 within all trawling free territorial waters.

(4) Bottom trawling is prohibited within 3 miles (Map-38-1) between Bulgarian border and Alacaağzı Burnu, Zonguldak Province (41° 21.920' N - 31° 32.000' E) and within 2 miles (Map-38-2) between Tekke Burnu, Amasra District, Bartın Province (41° 43.485' N - 32° 19.258' E) and Kerempe Burnu, Cide District, Kastamonu Province (42° 01.072' N - 33° 20.459' E) in the Black Sea".

Article 12- Prohibitions regarding surrounding nets in Turkish Territorial Waters; usage of purse seine is prohibited at shallower depths from 24 m beginning from the shore.

Article 34- Among the inland waters with complete fishing ban, Armağan and Kırklareli Dams are included.

Prohibited zones are identified in the Article 7 of the Notification and as it can be seen in Figure 6.907 there is a prohibited zone north of the 12-mile line starting from Nusret Bulca watch tower south of the point where Mutludere flows into the sea on the Bulgarian border and running east:

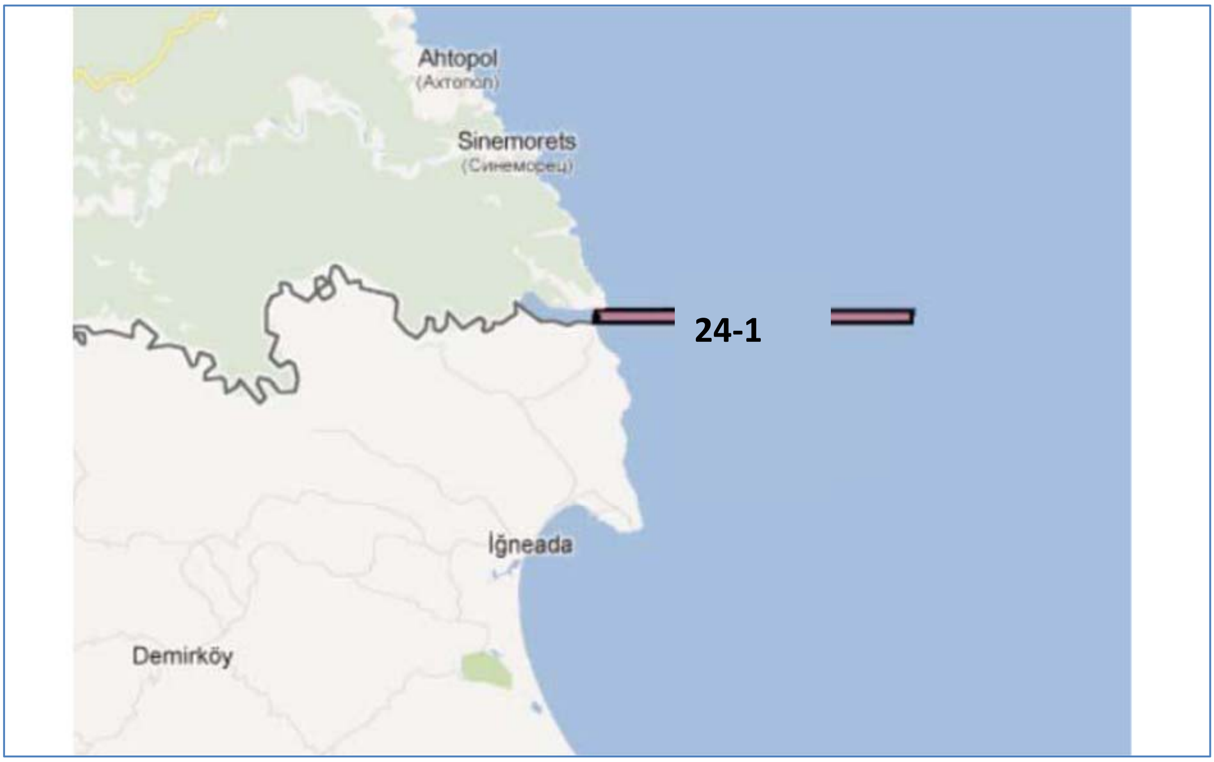


Figure 6.907: Prohibited zones in the Black Sea (Ref. 6.78)

The map of the zone no. 38 where bottom trawling is prohibited within 3 miles from the shore and where the Project Area is located, is given in Figure 6.918.

Figure 6.918: Zones where the bottom trawling is prohibited in the Black Sea (Ref. 6.78)

6.14.1.1.2 Restrictions on Diving

According to the map covering the diving prohibited areas as per "the Decision on Abolition of 89/14235 and 98/11087 Numbered Decrees on Diving Ban at Areas Given at Coordinate List and Maps Determined by Ministry of Culture Related with Cultural and Natural Entities Needed to be Protected Under Water and Decision No: 2001/2952", there is no diving prohibited area in the Project Area or its proximity (Figure 6.929) (Ref. 6.89).

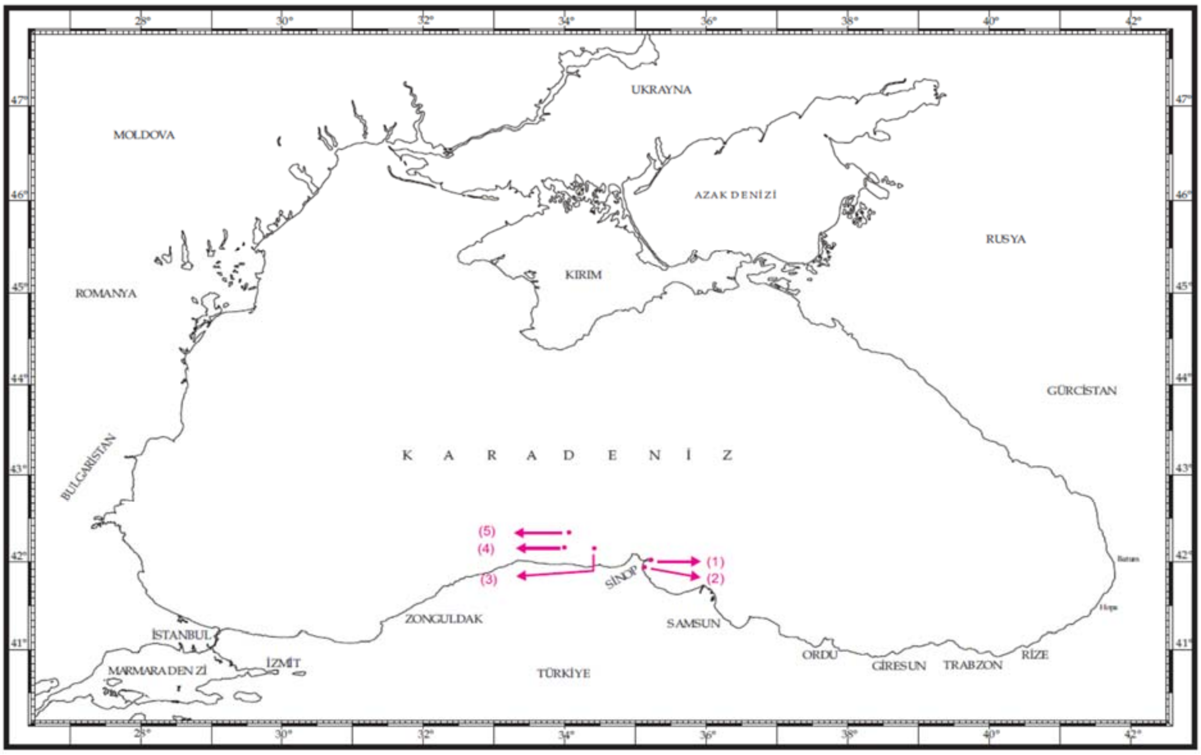


Figure 6.929: The map OF ONHO covering the diving prohibited areas (Ref. 6.89)

In addition, according to the principles in case of a cultural heritage discovery, recreational diving is prohibited in the areas with cultural and natural assets and free-diving sites apart from the diving prohibited areas. The permission of the Ministry of Culture and Tourism are required for scientific researches and excavations (Ref. 6.90).

6.14.1.1.3 Restrictions on Swimming Areas

Kırklareli has an important tourism potential with a 60-km coastline in the Black Sea. The most important beaches in the Black Sea coasts of the province of Kırklareli are Kıyıköy (Mussel), İğneada and Kastro (Ref. 6.91). According to web-based "Swimming Water Tracking System" prepared by the Ministry of Health in Demirköy and Vize District, Kırklareli Province, there is no beach with a swimming ban in terms of water quality within the Project Area and its proximity. Swimming beaches in the

Project Areas and its proximity are listed in Figure 6.9350 in terms of water quality (Ref. 6.92). The beach belonging to Igneada Resort Hotel, located in Demirköy District, Kırklarereli province is the only beach with a blue flag in the province (Ref. 6.93).

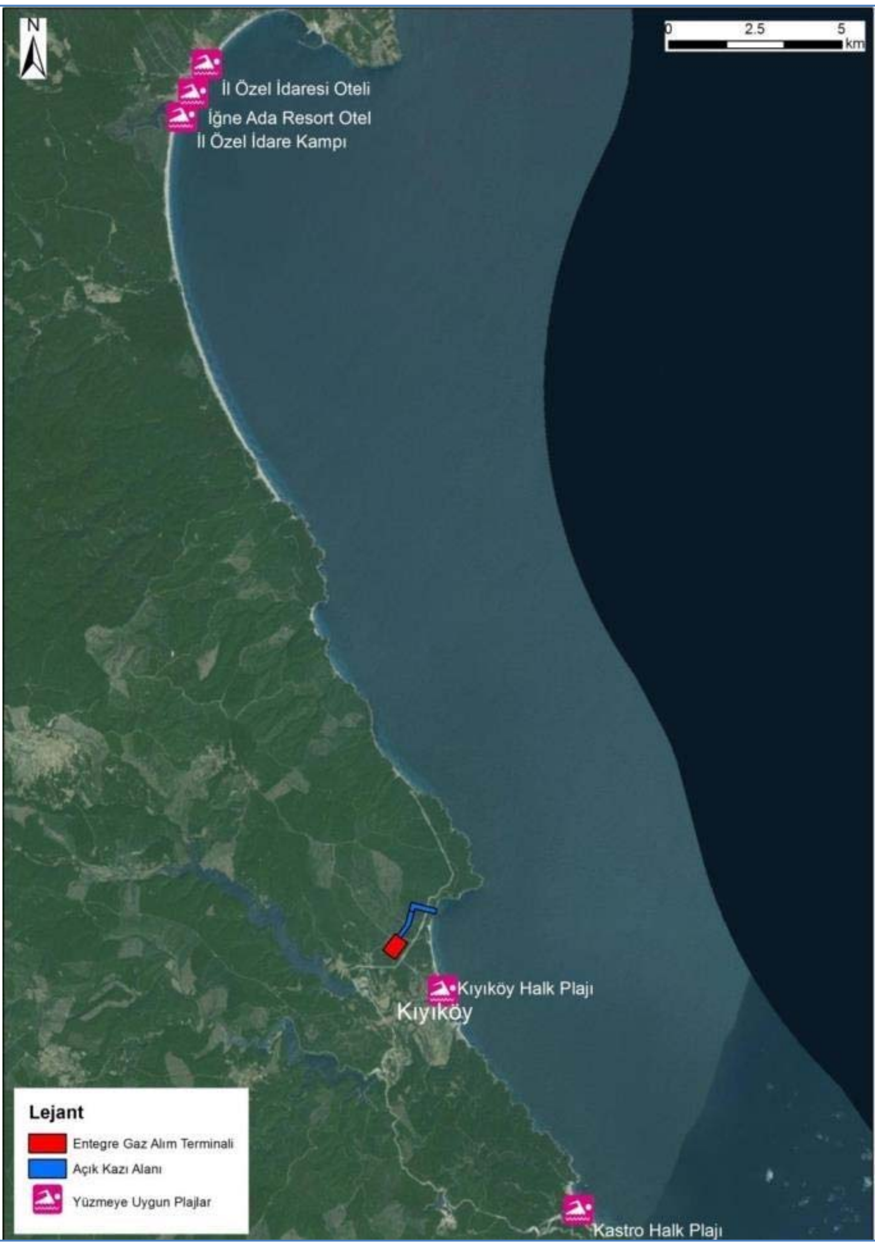


Figure 6.9350: The map of swimming beaches by the Ministry of Health

6.14.1.1.4 Military Zones and Unexploded Ordnance

These areas are used by Turkish Exclusive Economic Zone (EEZ) and Turkish Naval Forces Command for various purposes. The Turkish Naval Forces Command also carries out military exercises in the Black Sea.

According to the data in the map (Figure 6.9451) of exercise and firing areas within the "Annual Notice to Mariners 2017" published by Turkish Naval Forces, Office of Navigation, Hydrography and Oceanography, planned route for the Offshore Section of the Project passes through the exercise area no. 020.

In the opinion letter (**ANNEX-5.A**) dated 11.05.2017 of the Ministry of National Defense, there is no military zone, military forbidden zones and security zones and areas belonging to NATO pipeline system under the responsibility of the Ministry of National Defense (except the General Command of Gendarmerie) within the study area.

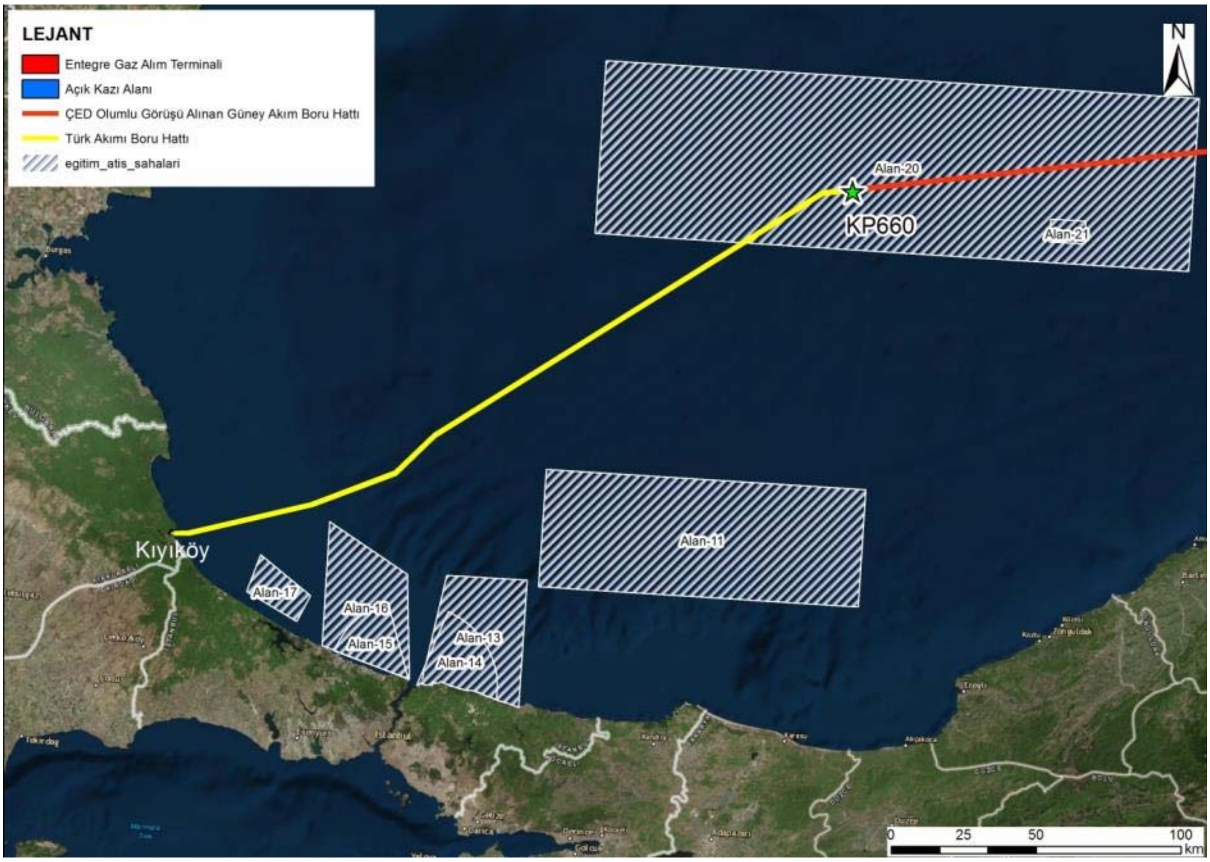


Figure 6.9451: The Map (6) of Exercise and Firing Areas (Ref. 6.89)

In order to ensure that any military exercises that may take place in the Turkish Exclusive Economic Zone (EEZ) doesn't affect the construction, communications with the related Turkish authorities will be maintained during pre-construction and construction.

According to Notification no.139 within the Annual Notice to Mariners 139 by ONHO, the coordinates of unexploded ordnance in the Black Sea are given below (Ref. 6.94) and there is none in the Project route

- 41°10'.230 K, 29°40'.125 D (Central location); and
- 41°10'.70 K, 29°40'.20 D (Central location).

No information is included in Annual Notice to Mariners 2016 and 2017 regarding unexploded ordnance in the Black Sea (Ref. 6.89). A dedicated UXO survey will be carried out in specific locations along the Pipeline route, where detailed desk-based assessments suggest higher likelihood of UXO presence. The UXO survey will be carried out in advance of the pre-lay surveys. According to risk assessment of coincidental findings and information to be obtained from relevant official institutions, identified UXOs will be avoided by changing the route or by repositioning them far away from the pipeline corridor. A UXO Risk Mitigation Plan will be developed by the Project Owner in close conjunction with relevant national authorities, if necessary. However, a final check for the presence of UXOs will also be undertaken during pre-lay surveys ahead of the pipe-lay spread.

In case of any findings in the survey, all study results shall be shared in writing and electronically with the MoEU with a preliminary report within one month after the completion of the survey and the final report within six months after the completion of the studies. The transfer of data received during examinations to third parties is subject to prior written consent from the Republic of Turkey.

6.14.1.1.5 TPAO Exploration and Drilling Areas

Turkish Petroleum (TPAO) is responsible for oil and gas exploration in Turkey. TPAO has defined potential utilization areas and exploration blocks for oil exploration in a vast area in Turkish EEZ in the Black Sea (Figure 6.9552). The construction corridor and some of these oil exploration blocks may cross each other (Figure 6.9653) (Ref. 6.95).

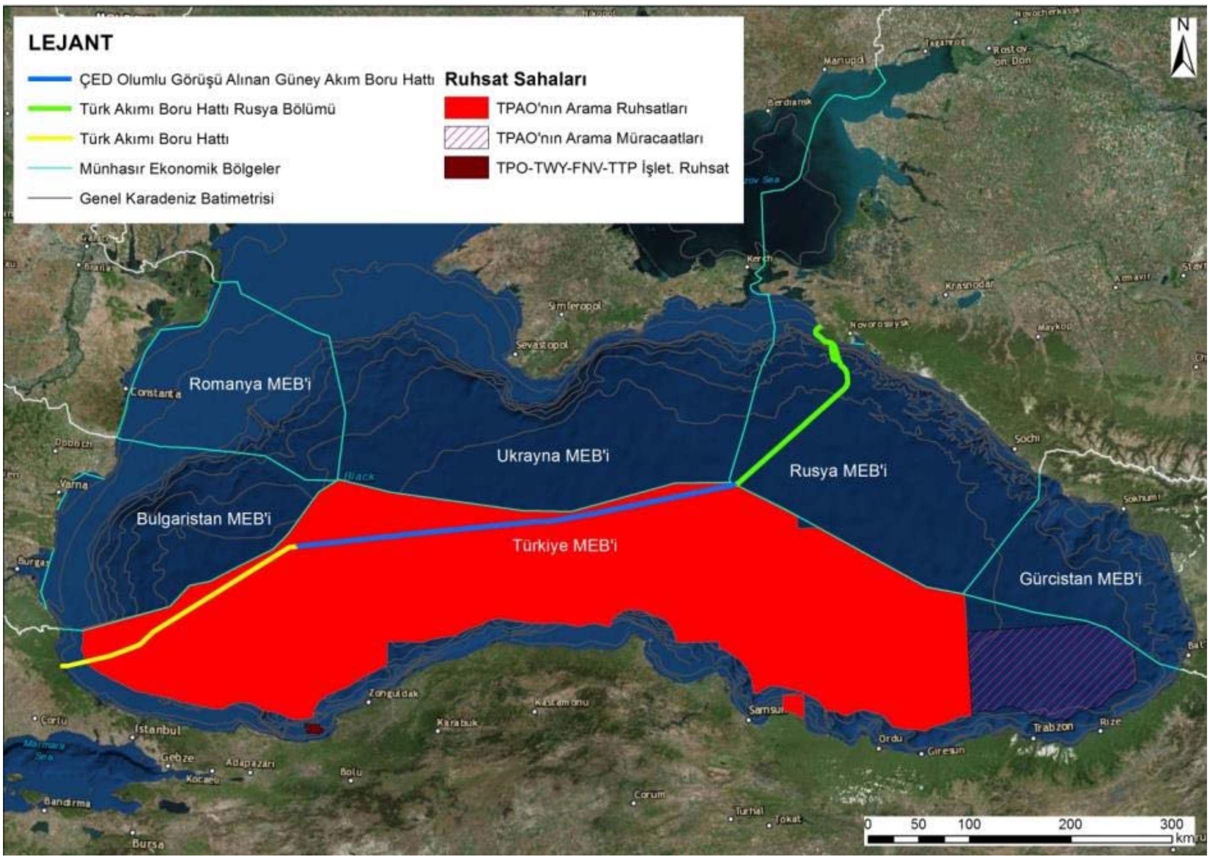


Figure 6.9552: TPAO Exploration Licences in Turkish EEZ in the Black Sea

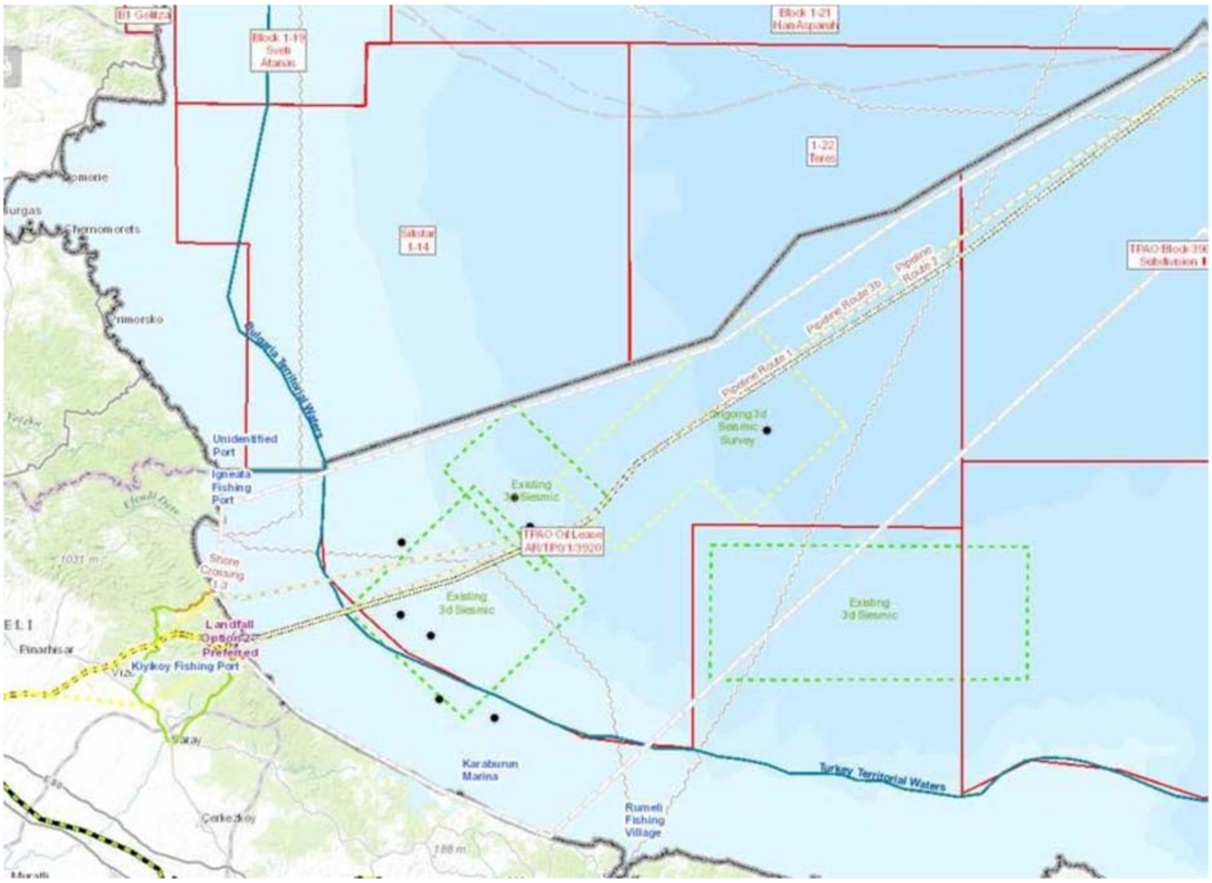


Figure 6.9653: The Locations of TPAO Exploration Blocks and The Pipeline Route of the Project

As stated in TPAO's opinion letter (**ANNEX-5.A**) dated 28.07.2015, TPAO is informed periodically about the possible changes in the pipeline route and the progression of the Project in order to maintain the coordination between TPAO's activities and the works planned within the Project and thus the activities of the Project is arranged accordingly. The Project Owner will continue to be in contact with TPAO and during pre-construction and the construction regarding the work schedules and progress reports for the coordination of planned activities in Turkish EEZ.

Due to the crossing with the oil and gas exploration activities or research and development studies of TPAO, Operational Safety Corridor around 420 m of the pipeline where exploration activities of TPAO are not restricted but seabed activities are prohibited, will be set as per the agreement with the TPAO regarding waters deeper than 150m. In case of future crossing with the facilities of TPAO (such as pipelines), the Project Owner will cooperate with TPAO, the Ministry of Foreign Affairs and the Ministry of Energy and Natural Resources in terms of proximity and/or crossing agreements.

The 3D seismic data gathering activity (Tuna 3D), which will start in November 2017 and will be conducted in an area of 7.500 km^2, which is located in the Western Black Sea, and which belongs to TPAO with 3921 numbered offshore license, is planned to continue for 6 months, as stated in the opinion letter (**Annex-5.A**) dated 04.07.2017 of Turkish Petroleum Corporation (TPAO), Directorate of Environment Protection. The final shape of the Tuna 3D area has not yet been determined. It is also estimated that an exploratory shaft (Riva-1) which is planned to be opened in 2019 with the 3920-numbered offshore license, in the western Black Sea, should not deviate from the determined location even though its exact spot has not yet been determined (Figure 6.154). The works will be conducted in constant coordination between the Project Owner and the TPAO, in order to prevent the construction stage of the Project and these works, which are planned to be conducted in the future, from overlapping.

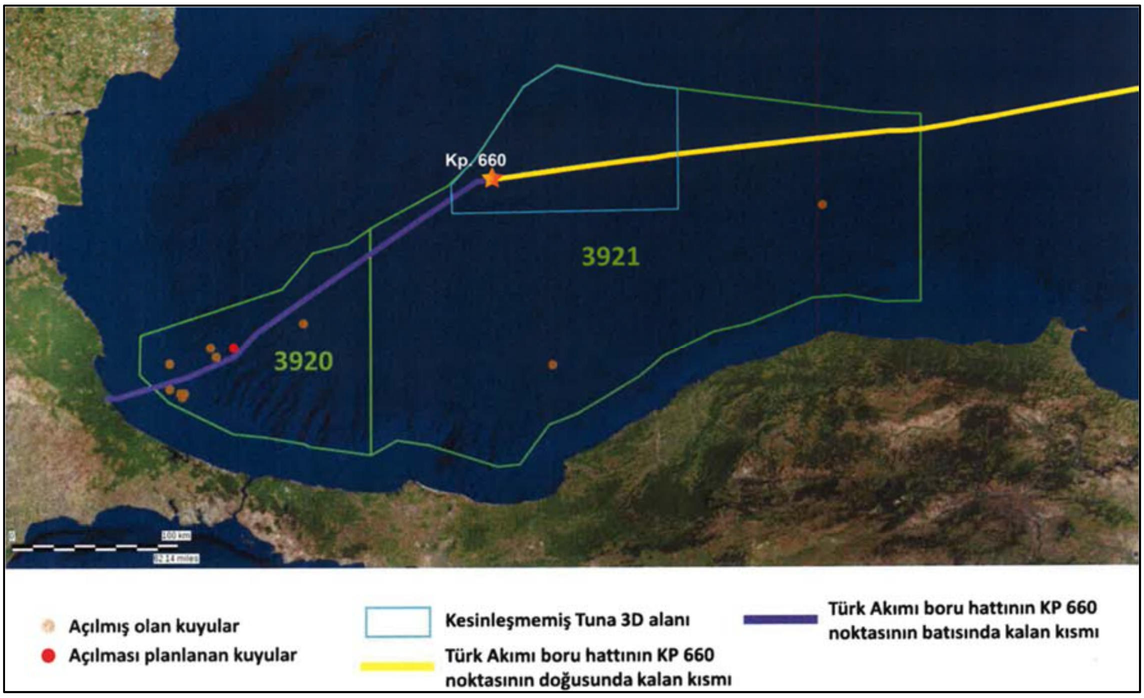


Figure 6.154: TPAO Drilling Locations and the Location of the Pipeline of the Project

6.14.1.1.6 Cable Crossing Agreements

In the region of Turkish EEZ where the project route is included, several international and regional fiber optic cables have been installed The Project route in the Offshore Section and 4 existing shall cables cross (Figure 6.155);two being active and others inactive. Information on these cable lines and their operators is given in Table 6.7711 below. Approximate distance of cable lines to Turkish coast is given in the table (figures are rounded to the nearest 10). Kilia-Odessa telegraph cable and Italy - Turkey - Ukraine - Russia (ITUR) telecommunication cable are no longer operational. Even though information on the location of the inactive Kilia-Odessa telegraph cable were obtained from the cable database of the Global Marine Systems, this cable couldn't be located by the ROV surveys during Front End Engineering and Design stage. ITUR telecommunication cable is reported to be inactive by the operator, Rostelecom. In addition, High-Voltage Direct Current Line (HVDC) is planned to be installed between Constanza, Romania and Istanbul, Turkey but the installation of the line or its route is not specified yet.

Table 6.77: Information on Submarine Cable Systems

Name	Cable Type	Operator	Approximate distance (km) from Turkish Coast is measured throughout the pipeline.
Italy-Turkey-Ukraine-Russia (ITUR)	Telecommunication / Out of Service	Rostelecom	190
Black Sea Fibre Optic System (BSFOCS)	Telecommunication	Vivacom	60
Caucasus Cable System	Telecommunication	Caucasus Online	230
Kilia-Odessa Telegraph Cable	Telegraph / Out of Service	Unknown	140

Name	Cable Type	Operator	Approximate distance (km) from Turkish Coast is measured throughout the pipeline.
Romania-Turkey HVDC Interconnection link	HVDC	Transelectrica S.A.	Unknown

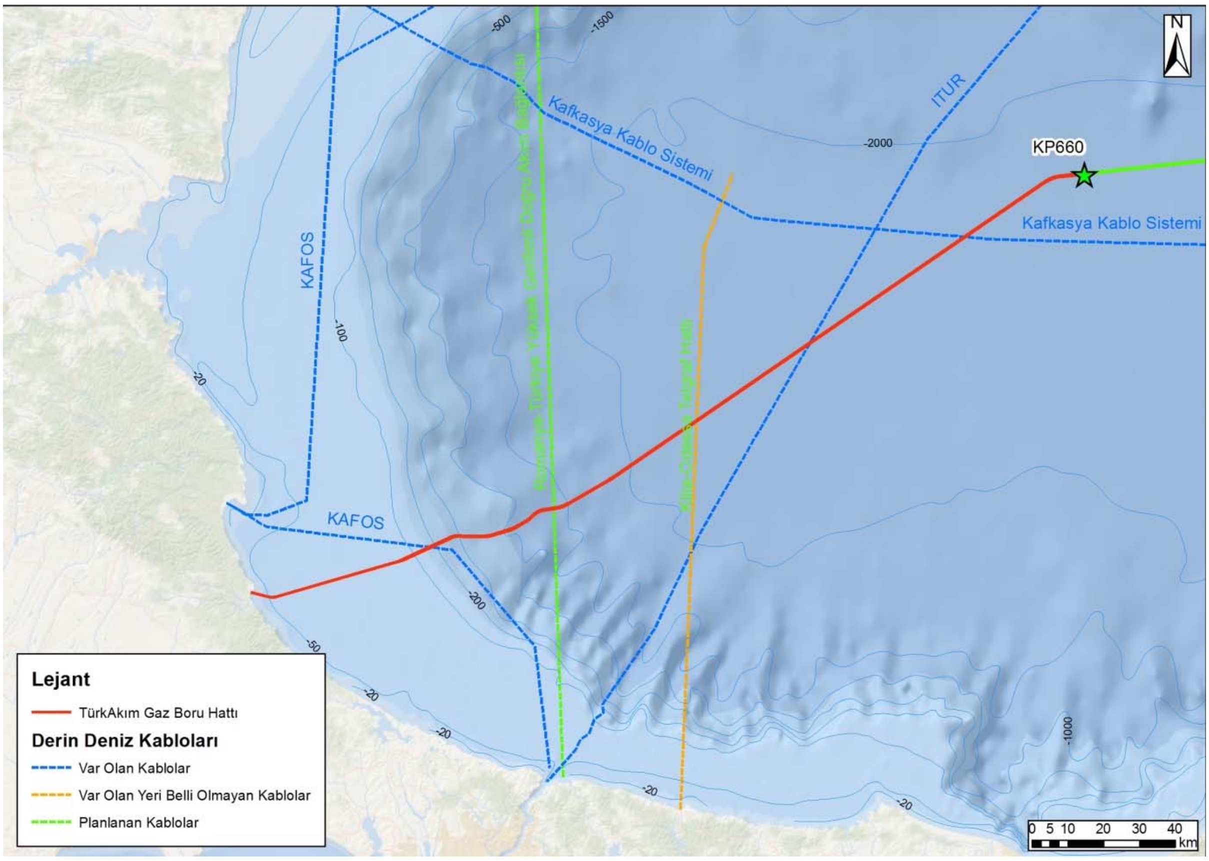


Figure 6.155: The Intersection of Offshore Pipeline and the Communication Cables

The owners/operators of active cables and water pipelines, if present, will be contacted in order to come to a mutual understanding on crossing agreements in line with the liabilities and procedures of crossing methods. According to agreements, crossing designs and installation procedures will be determined prior to pipe laying with the opinions of the said owners. In the crossing agreements to be made with the cable operators, the International Cable Protection Committee (ICPC) guides, which are used worldwide for the telecommunication cables, will be based on. Detailed information about the cable conduits is presented in Section 1.13 (The Scope of the Project Period).

The Ministry of Transport, Maritime Affairs and Communications will be contacted and the crossing agreements with the cable/pipeline owners will be made in order to confirm the locations of existing and future pipelines and cable lines and to make necessary agreements for the activities to be conducted within the scope of the Project.

6.14.1.2 Onshore Section

In the Onshore Section non-proprietary land such as rivers, lakes, dams, stream beds are under the sovereignty and disposal of the state. Information on easement of registered land subject to ownership is given in this chapter.

- **Treasury Owned Land:** Treasury Owned Land subject to ownership can be leased or granted easement until 49 years for the investor users by the Ministry of Finance. If the conditions regarding relevant legislation are met, they can be sold. Related legislations include the Law on the Utilization of Real Properties Held by the Treasury and Value Added Tax no 4706, the Regulation on the Administration of Treasury Immovables and The Communique (Serial No: 374) on the Amendment to the National Estate General Communique.
- **Forest Land:** Forest land is not subject to ownership. Forest land can be leased or granted easement until 49 years for the investor users by the Ministry of Forestry and Water Affairs. It can be extended up to 99 years. The Implementation Regulation of the Articles 17/3 and 18 of the Forest Law No. 6831 is the relevant legislation.

  Inventors can get permission for the easement of the forest land for the projects approved by the Forest Law No. 6831. The project is included among the projects approved by the said legislation. The procedures and principles of this matter are stated in the Implementation Regulation of the Articles 17/3 and 18 of the Forest Law No. 6831.
- **Private Ownership:** A private property can be acquired by means of purchase, usufruct, easement and long-term leasing. Purchasing method is the most common way to acquire a private property. The practice of expropriation may take place for a purpose deemed to be in the public interest or a public investment addressed in related legislation. Gas pipeline projects fall under the category which allows expropriation. Besides, expropriation of easement is possible for the projects which are going to be installed underground or above the ground, not having any impact on the land. The Expropriation Law no. 2942 and its subordinate legislations are the relevant legislations for this matter.

Private properties, although non-existent in the Project Area, can be expropriated by the Ministry of Energy and Natural Resources. If it doesn't prevent the utilization of the project property, it may be entitled to easement by expropriation on a certain section, height, depth or resource of the immovable, provided that it is sufficient for the purpose, instead of expropriation of the immovable property.

6.14.1.2.1 Restriction on Hunting Grounds

According to "Kırklareli Hunting Grounds Map" prepared by the General Directorate of Nature Conservation and National Parks under the Ministry of Forestry and Water Affairs as per the decision of Central Hunting Commission 2016-2017 Hunting Season, there is no area with a hunting ban in the Onshore Section of the Project and its proximity (Figure 6.9756) (Ref. 6.96; Ref. 6.97).

There are wildlife protection and improvement areas, wild animal breeding areas and hunting grounds in various districts of Kırklareli province (Demirköy, Kofçaz, Vize, Central, Babaeski, Lüleburgaz etc). There are 9 public hunting grounds (Sislioba, Kocayazı, Kıyıköy, Balkaya, Karadere, Üsküp, Sivriler, Sergen and Mahyatepe) and 9 general hunting grounds (Ergene, Ahmetbey, Kayalı, Düğüncübaşı, Erikleryurdu, Kocatarla, Celaliye, Topçuköy and Kuzuçardağı). Kıyıköy public hunting ground located in Vize District covers an area of 31.0 hectares (Ref 6.98). As a special case, hunting of all partridge species is prohibited throughout the province of Kırklareli (Ref 6.97). Hunting grounds are shown in Figure 6.9756 in the Project Area and its proximity.

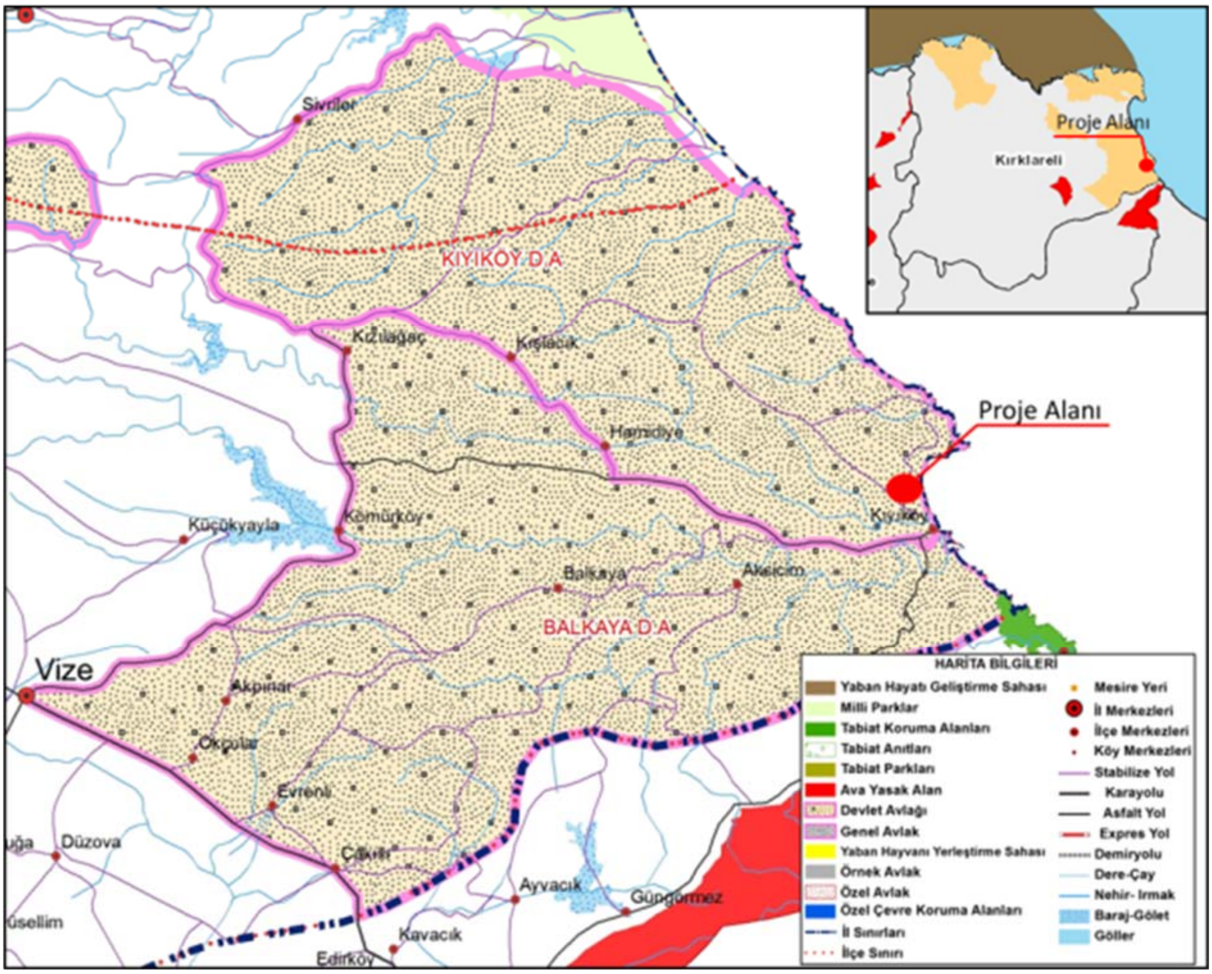


Figure 6.9756: Hunting Grounds Map in the Project Area and its proximity.

6.14.1.2.2 Electrical Transmission Line

According to the General Directorate of Turkish Electricity Transmission Co. (TEİAŞ), there is no energy transmission line within the planned Project Area. Figure 6.9857 shows the images of TEİAŞ electrical transmission line running nearby the Onshore Section of the Project. The distance of electrical transmission line near the Project area to the facilities to be installed in the shore and its location are shown in Figure 6.9958. A substation is located 2 km away from the western part of the Project Area. The distance of electrical transmission line route and the substation to the Project Area is shown in Figure 6.998. Within the scope of the project, the provisions of the Electrical High Current Facilities Regulation will be complied with in terms of determining horizontal and vertical distances between the gas pipeline and electric lines. According to the Table-8 of the Electrical High Current Facilities Regulation, minimum vertical distances of overhead line conductors to the places (oil and gas pipeline) over which they pass with maximum sag can't be less than 9 m regardless of its ampacity (1-420 kV) as per the Article 8, Clause 10 of the Technical Security and Environment Regulation on Construction and Operation of Crude Oil and Natural Gas Facilities of BOTAŞ. Moreover, minimum distance of towers of wind turbines to the pipeline should be "tower length x 1.20".

Minimum vertical distances of overhead line conductors to the places over which they pass with maximum sag are defined in the Table-8 within the Electrical High Current Facilities Regulation.

Necessary measures will be taken in line with the provisions of above-mentioned legislations for the design and placement of the Onshore Section.

Figure 6.9857: Electrical Transmission Lines of TEİAŞ near the Project Area

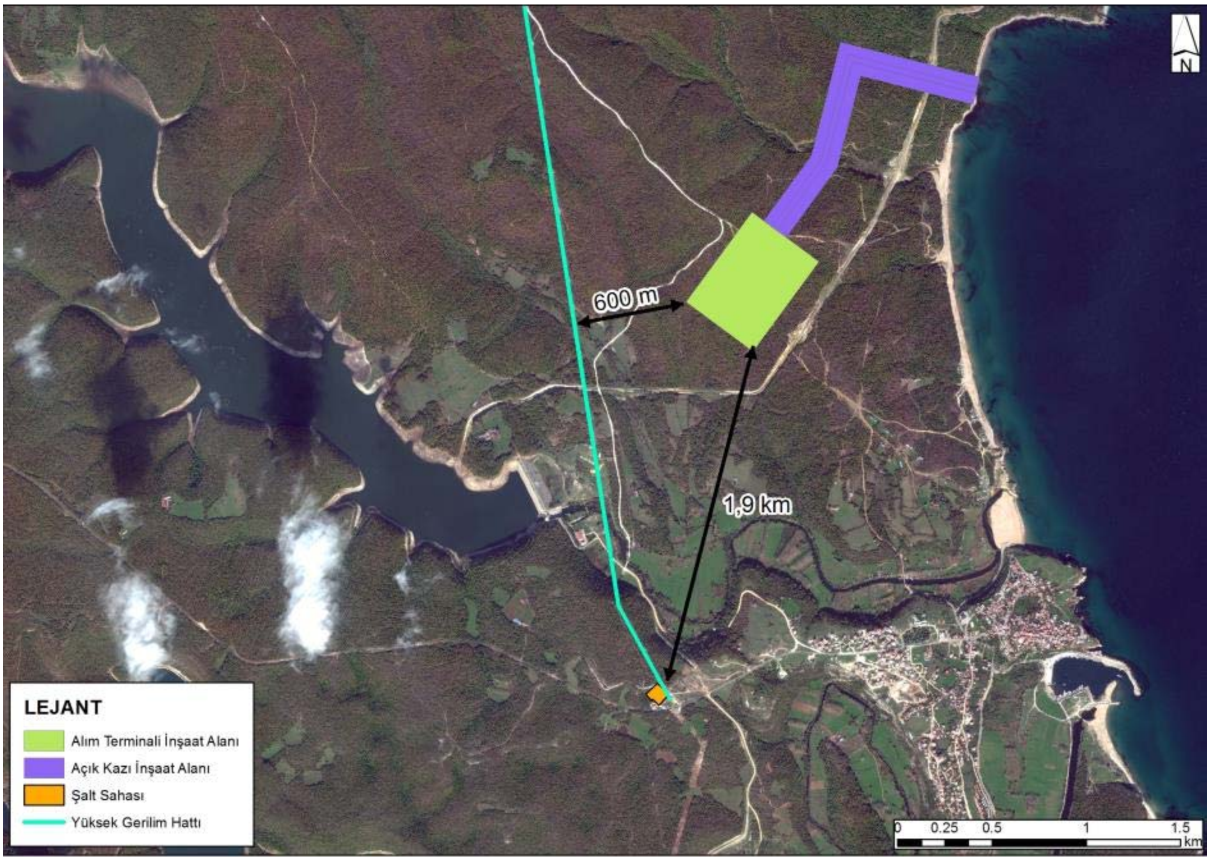


Figure 6.9958: High-voltage Transmission Lines near the Project Area

The satellite images of the telephone lines located around the Project Area according to the Onshore Section are shown in Figure 6.1009.

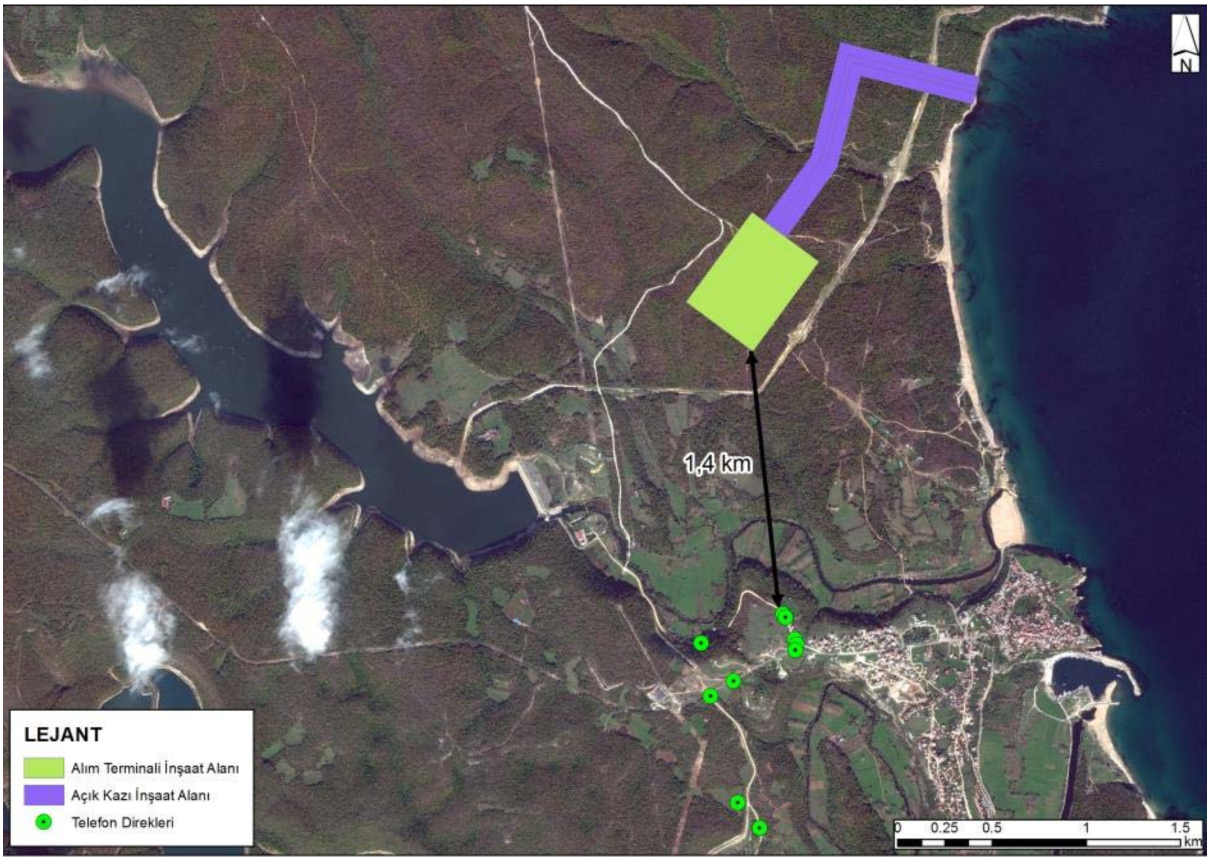


Figure 6.1009: Telephone Lines near the Project Area

6.14.1.2.3 ISKI Canal, Water-distribution Pipeline and Water Catchment Basin

Kıyıköy town center is enclosed by Pabuçdere Dam from the west and Kazandere Dam from the southwest. Kazandere and Papuçdere Dams are built by ISKI to compensate the need for drinking water in İstanbul on the Kazandere stream and Papuçdere stream, which is located west of the estimated Project area. While Pabuçdere and Kazandere Dams are operational in the region, Kömürköy - Kızılağaç Dams are in planning stage. ISKI water-distribution pipeline in the region is shown in Figure 6.10160, the location of the dams and their distance to the Project Area is presented in Figure 6.10261. Information on mentioned dams is given in Table 6.7812.

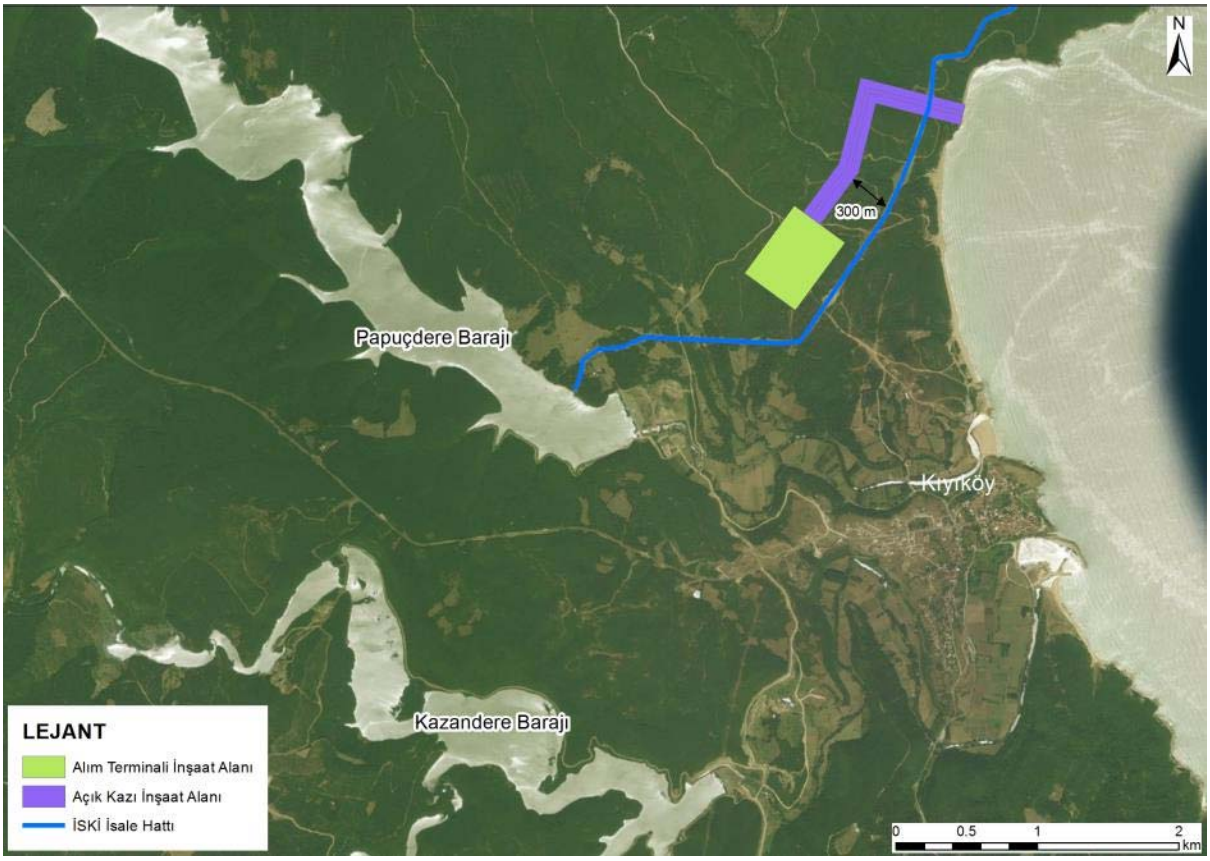


Figure 6.10160: Pabuçdere and Kazandere Dams, ISKI Water-distribution Pipeline

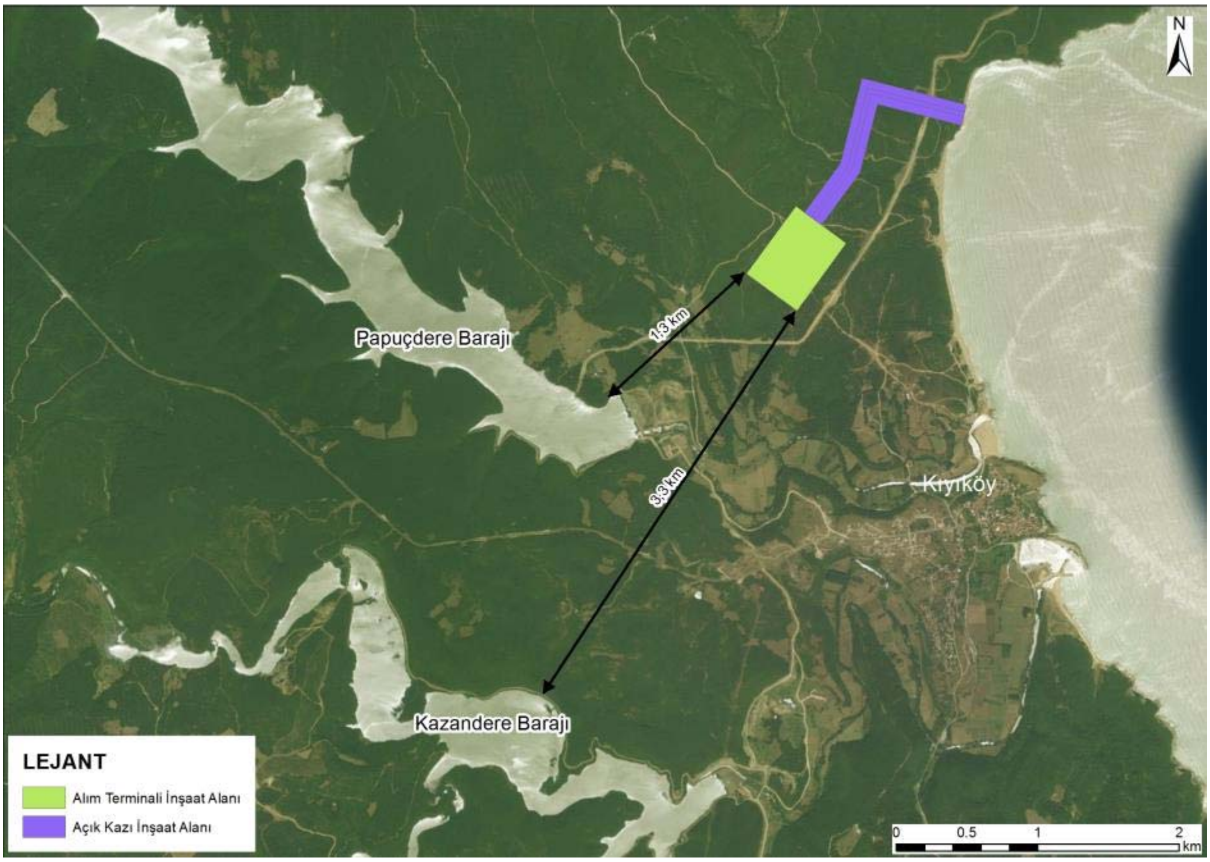


Figure 6.10261: Dams surrounding Kıyıköy and Their Distance to the Project Area

Table 6.7812: Information on the Dams around Kıyıköy (Ref. 6.4; Ref. 6.36)

Dam	Type	Commission Year	Lake Volume (Million m^3)	Basin Area (km^2)	Capacity (Million m^3/year)
Kazandere	Zonned Earth fill	1997	17.424	313	100
Papuçdere	Zonned Rocky Filling	2000	58.500	178.5	60

According to The Regulation Regarding the Control of Water Pollution and the Regulation of Drinking Water Basins, protection area measurements of dam basins are given below:

- 0-300 m: Absolute Protection Area;
- 300-1.000 m: Short Distance Protection Area;
- 1.000-2.000 m: Middle Distance Protection Area; and
- 2.000 m – basin boundary: Long Distance Protection Area.

The bird fly distance of planned Project Area to nearby dams are given and according to the Environmental Plan of Ergene Basin sub-region Thrace (1/100 000 Scaled), it is stated that it is not in the range of basin protection areas. Planned project area is 1.2 km away from the borders of 300-1.000 m Short Distance Protection Area of ISKI (Figure 6.10362).

According to the opinion letter of Department of Research, Development and Planning of ISKI dated 05.09.2017 (Annex-5.A), the main distribution lines Ø4500 Ç, Ø 2200 Ç, Ø1800 Ç located in the Project Area shall be preserved and suffer no damage during the drilling activities. In order to execute the activities in the determined areas, permission shall be taken from the Regional Directorate of Forestry indicating that there is no inconvenience in resuming the activities in the areas allocated to ISKI by the Regional Directorate of Forestry. The static calculation report, which involves the examination of the road projects, distribution line pipe thickness regarding the additional traffic and pack mass and the forest allocation document, shall be approved by ISKI. Necessary applications shall be made in order to provide an employee of ISKI Europe Department of Water Distribution shall be present as an observant during the construction stage.

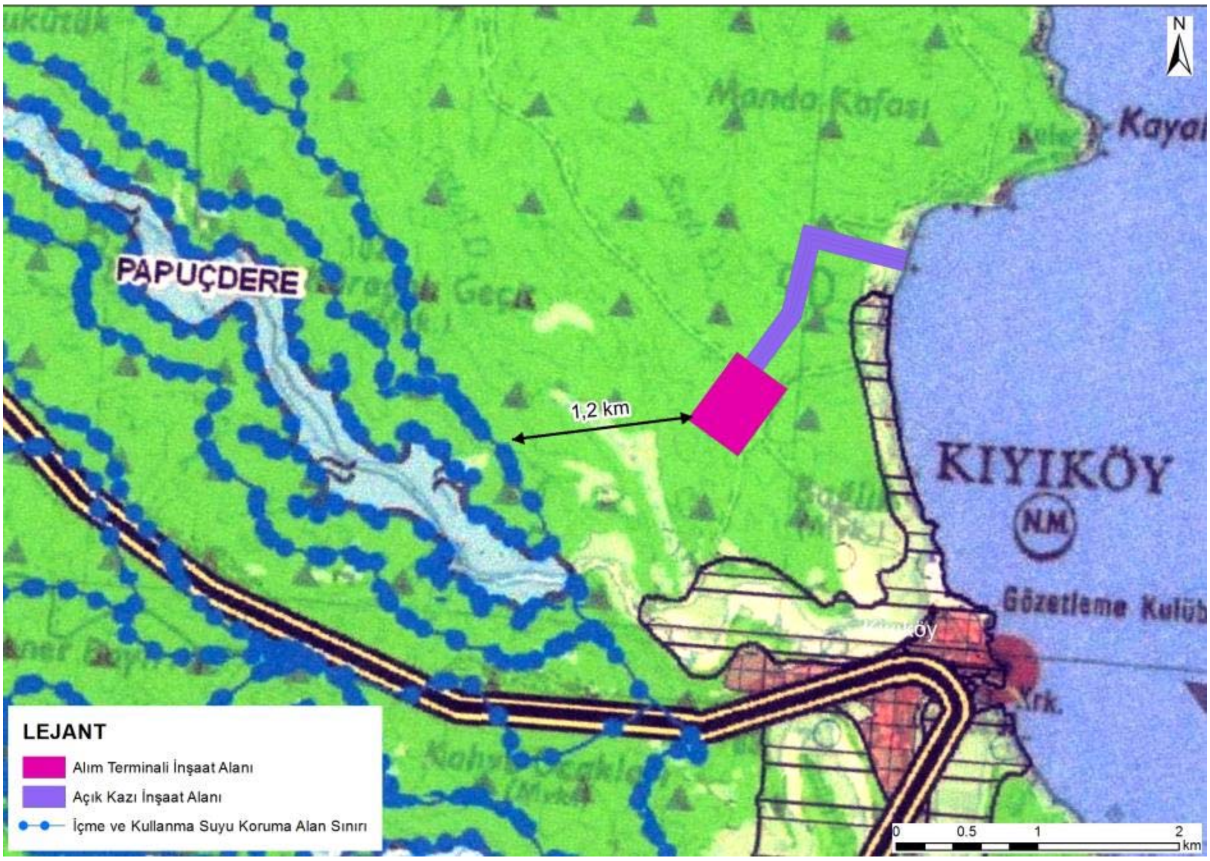


Figure 6.10362: The distance between the Project Area and ISKI 300-1000 m protection area boundary

6.14.1.2.4 Licensed Mining Areas

The sheet, which is prepared in line with the data obtained from the General Directorate of Mining Affairs in April 2017 regarding licensed areas in the region, is shown in Figure 6.10463 providing the locations of licensed areas with the Project Area. The project area is included in the licensed areas thus applications will be made to relevant authorities for the necessary permits.

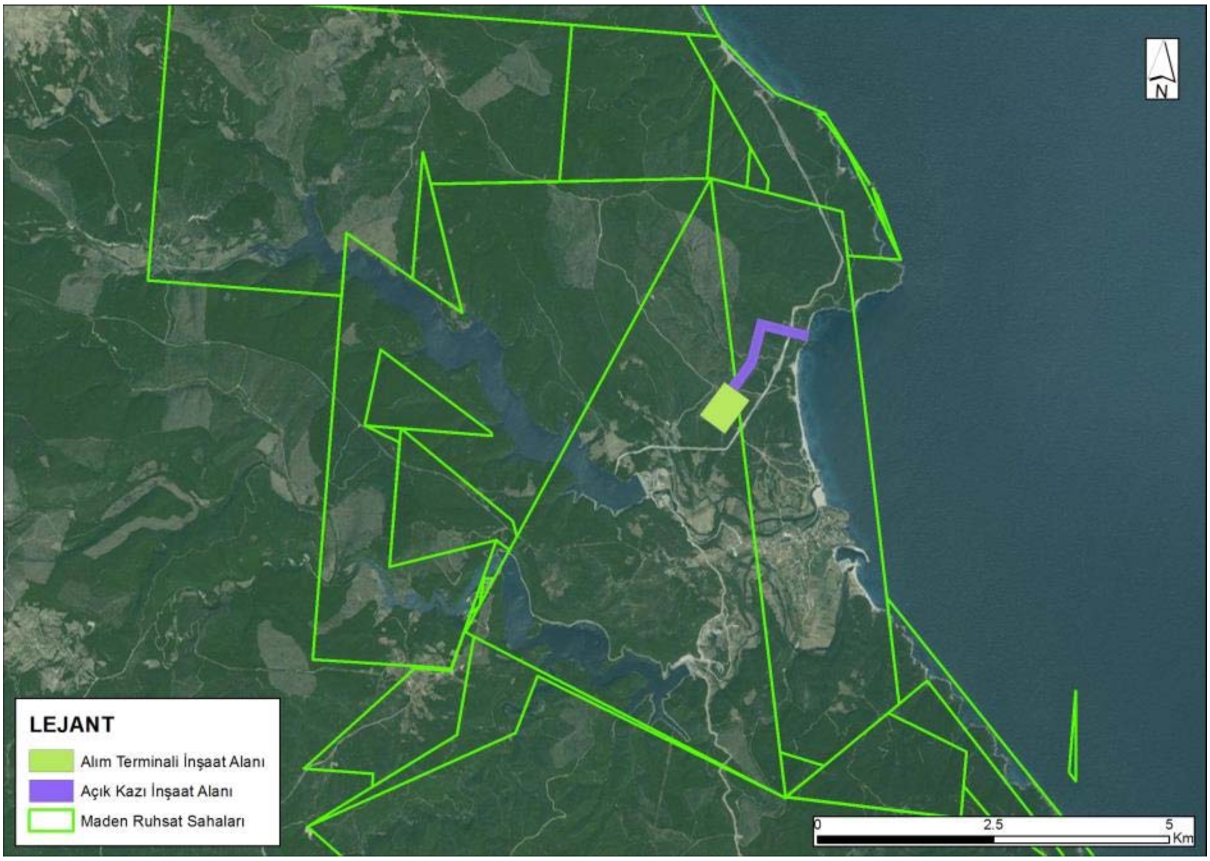


Figure 6.10463: Licensed Mining Areas

6.14.2 Impacts of the Works and Operations and Measures to be Taken within the Scope of the Project (Land preparation, Construction, Operation and post-operation)

6.14.2.1 Impacts of the Construction and Reducing Measures

As it is stated in the relevant chapters above;

In the event that the lands under the sovereignty and disposal of the competent bodies of the state, military forbidden zones, areas allocated to public institutions and organizations for specific purposes and "Particular protected areas" as per Decree No. 7/16349 of the Council of Ministers are included in the Project Area, all formal applications will be made to relevant authorities for the necessary permits before the construction.

In the utilization of these areas, the provisions of the Environmental Law and relevant legislations will be complied with.

6.14.2.2 Impacts of the Operational Stage and Reducing Measures

It is not expected that the Project will have any impact on the areas in question during the operational stage. However, relevant legislation provisions will be followed and necessary permits will be obtained during the Operational Stage if necessity arises.

6.14.2.3 Impacts of the Decommissioning Stage and Impact Reducing Measures

The strategy of decommissioning stage of the Project is yet unknown, but it will be determined after evaluating future technology in 50 years and no impact on these areas is expected. Necessary permits will be obtained during the decommissioning stage as future legislation suggests.

6.15 Marine and Land Traffic

6.15.1 Marine Traffic

The Offshore and Shore Crossing Sections of the Project is included in the Black Sea, Turkey's EEZ in the Black Sea and Turkish territorial waters. The Black Sea is a very important transport area for the countries around it. The vast majority of the vessel traffic concentrates between the following connection points:

- Istanbul Bosporus connection point (Istanbul);
- Northwest ports (Odessa);
- Kerch Strait connection point; and
- Northeast ports.

The Black Sea is an important transport route for the coastal countries. The navigation routes in the Black Sea and the crossing of these routes with the Project's route are shown in Figure 6.10564 (Ref. 6.100).

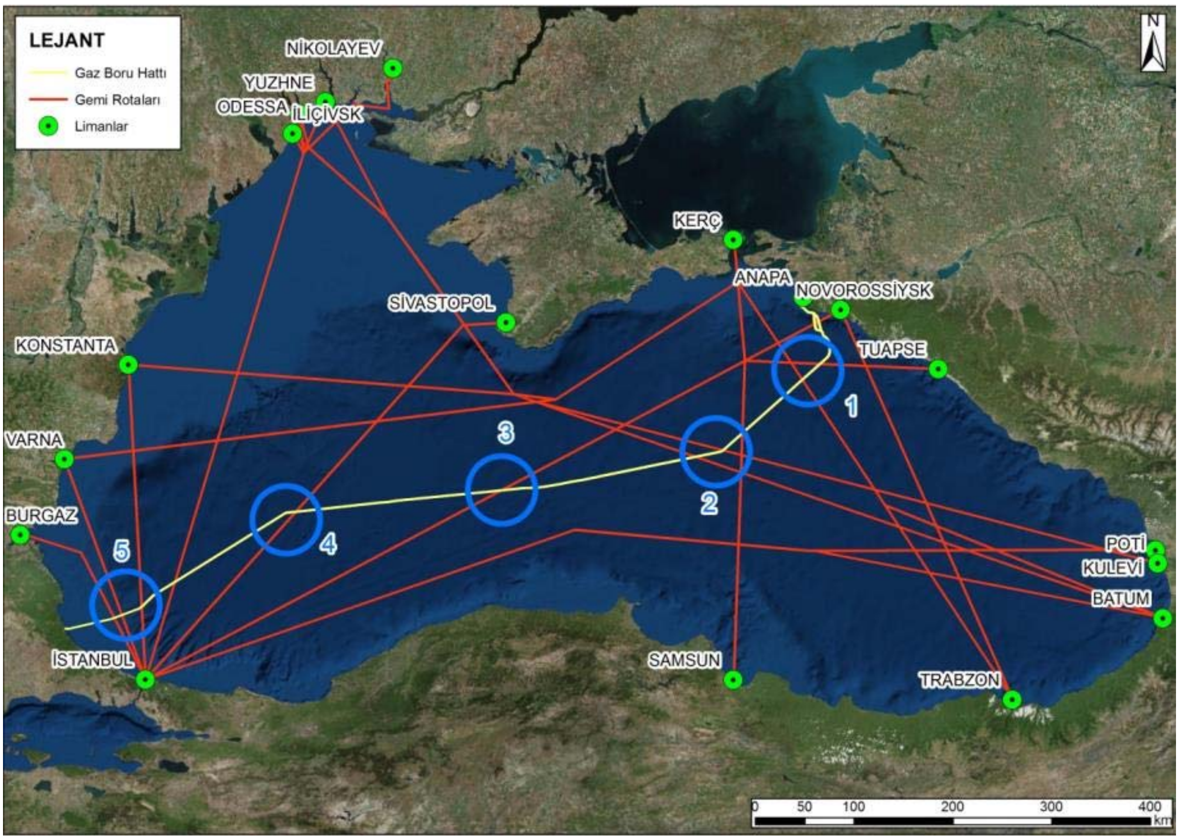


Figure 6.10564: The Navigation Routes in the Black Sea

The number of vessels using Istanbul and Dardanelles straits in 2016 is presented in Table 6.7913 for Istanbul and Table 6.8014 for Canakkale on monthly basis. As it can be seen in the tables, the total number of vessels passing through the Bosporus is 42,553, while this value is 42.553 for the Dardanelles (Ref. 6.101).

The nearest port authority to the Onshore Section of the Project is İğneada Port Authority and the air distance is approximately 27 km. According to the vessel statistics of İğneada Port Authority in 2011-

2016, it is seen that the number of vessels arriving in one year is maximum 405 (Table 6.8115, Ref. 6.101). Fishing vessels in the region also affect the marine traffic negatively. Statistics of vessels arriving at ports based on port authorities for 2016 are given in Table 6.8115. Features of fishing ports in Kıyıköy and Igneada are given in **Chapter 9** (Socio-Economic Environment Assessment) and information on the port authorities around the Project Area is given in Section 10.4 (Marine and Land Traffic) in detail.

In order to minimize the impact on the maritime traffic and the potential collision risk of the ships which shall operate in the scope of the Project, the relevant institutions (e.g Port Authority, Office of Navigation, Hydrography and Oceanography) shall distribute information in intervals specified by the Turkish legislation and the official authorities and shall provide that the necessary precautions were taken in order to ensure secure navigation. All necessary permits will be obtained at least six months in advance for the vessels to be employed in the Turkish EEZ in the Black Sea unless otherwise is decided with the Ministry of Foreign Affairs of the Republic of Turkey. Unless otherwise agreed with the Ministry of Foreign Affairs of the Republic of Turkey, ship operators shall have received all relevant operating permits at least six months prior to construction.

Table 6.7913: Statistical Summary of Vessels Passing Through the Bosporus in 2016 (Ref. 6.101)

Months	Total Vessel	Total Gross Ton	Piloted Vessel	With submitted Sp-1	Vessel in Transit	Larger than 200 M	Lesser than 500 Gt	Numbers of Tankers			Towage Passages
								TTA	LPG-LNG	TCH	
January	3.103	41.342.718	1.681	3.077	1.807	284	41	492	89	143	4
February	3.146	41.688.172	1.703	3.111	1.880	283	43	460	104	115	4
March	3.786	51.423.593	2.031	3.744	2.289	352	44	551	102	149	6
April	3.612	45.378.529	1.808	3.580	2.182	300	46	468	90	142	7
May	3.754	45.786.750	1.960	3.718	2.192	283	57	498	92	143	6
June	3.463	44.379.390	1.783	3.425	2.024	300	52	506	99	141	5
July	3.504	47.929.178	1.816	3.458	2.242	338	48	497	74	125	5
August	3.714	50.140.136	1.995	3.684	2.330	339	36	454	80	124	10
September	3.619	48.219.584	1.838	3.595	2.283	330	37	500	68	129	12
October	3.738	51.755.564	1.913	3.702	2.388	377	39	527	75	156	3
November	3.610	48.218.615	1.872	3.567	2.251	339	50	524	56	150	6
December	3.504	49.020.058	1.956	3.471	2.182	348	29	556	60	164	5
Total	42.553	565.282.287	22.356	42.132	26.050	3.873	522	6.033	989	1.681	73

Table 6.8014: Statistical Summary of Vessels Passing Through the Dardanelles in 2016 (Ref. 6.101)

Months	Total Vessel	Total Gross Ton	Piloted Vessel	With submitted Sp-1	Vessel in Transit	Larger than 200 M	Lesser than 500 Gt	Numbers of Tankers			Towage Passages
								TTA	LPG-LNG	TCH	
January	3.162	57.030.096	1.418	3.133	1.763	414	33	456	89	205	6
February	3.356	58.927.424	1.474	3.323	1.979	432	38	503	101	164	10
March	3.701	67.075.167	1.651	3.667	2.202	485	23	523	89	210	7
April	3.749	63.427.204	1.589	3.715	2.198	440	51	507	76	195	17

May	3.779	63.497.429	1.596	3.743	2.182	436	48	495	75	217	12
June	3.679	61.801.905	1.618	3.616	2.047	446	97	502	69	230	12
July	3.720	66.838.550	1.619	3.670	2.248	500	65	504	73	215	10
August	3.831	67.353.403	1.641	3.782	2.326	495	63	465	74	193	14
September	3.720	64.558.861	1.548	3.684	2.295	487	69	484	59	199	13
October	3.920	69.597.756	1.666	3.870	2.364	528	69	523	62	251	11
November	3.734	65.062.504	1.554	3.689	2.263	485	54	518	57	236	14
December	3.684	67.752.383	1.633	3.651	2.204	517	51	561	57	244	13
Total	44.035	772.922.682	19.007	43.543	26.071	5.665	661	6.041	881	2.559	139

Table 6.8115: Statistics of Vessels Arriving at Ports Based on Port Authorities

Port Authorities	Number of Vessels with Different Flags						Total Number of Vessels with Stopover Passage					
	Turkish Flag Vessel		Foreign-Flag Vessel		Total		Turkish Flag Vessel		Foreign-Flag Vessel		Total	
	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton
Igneada	12	852	0	0	12	852	45	4.206	0	0	45	4.206
Karasu	16	799	0	0	16	799	70	5.484	1	2.597	71	8.081
Kefken	41	2.392	0	0	41	2.392	124	6.964	0	0	124	6.964
Şile	35	2.648	0	0	35	2.648	114	9.419	1	2.506	115	11.925
Istanbul	318	238,900	125	1.174.503	443	1.413.403	2.182	9.179.448	803	11.257.823	2.985	20.437.271

6.15.2 Land Traffic

Kırklareli Province including the Project Area is located within the borders of 1. Division Directorate of General Directorate of Highways, under the Ministry of Transport, Maritime and Communications Kırklareli Province Vize District has 3 different highway connection and these are explained below (Ref. 6.102; Ref. 6.103):

- *Visa - Pinarhisar Highway (D020-03):* Vize is 23 km away from Pinarhisar and 56 km away from Kırklareli. It is provided with asphalt road.
- *Vize-Saray-Çerkezköy-İstanbul (D020-03-TEM):* it is a busy and important route. Vize is 20 km from Saray, 40 km from Çerezköy and 140 km from Istanbul; and
- *Vize - Ahmetbey - Evrensekiz - Lüleburgaz or Ahmetbey - Sakızköy - Lüleburgaz Highway:* this road connects Vize to Lüleburgaz, Çorlu and Tekirdağ. Vize is 46 km away from Lüleburgaz through Sakızköy.

Kırklareli's total road length is 622 km, including highway, state and provincial roads. Highways constitute 70 km of total, State Roads constitute 342 km and provincial roads constitute 196 km. The length of the village roads is 1.922 km in the province. 2015 data of General Directorate of Highways is shown in Table 6.826 regarding the traffic in Kırklareli.

Table 6.826: Traffic in Kırklareli, 2015 (Ref. 6.103)

Province	Vehicle-Km		Passanger-Km		Ton-Km	
	Highway	State Road	Highway	State Road	Highway	State Road
Kırklareli	196,466	574,060	605,307	1.399.171	586,487	1.038.137

Permanent and temporary roads (in grey) in the region are given in Figure 6.10665.

Figure 6.10665: Permanent and Temporary Roads in the Region

The 2016 traffic volume map of state roads shows the traffic intensity of the land and connection roads where the Project Area is located. According to Traffic Volume Map of 1. Division Directorate of General Directorate of Highways, vehicle volume of the roads connecting to the Project area is 4.719 (Figure 6.166) (Ref. 6.105).

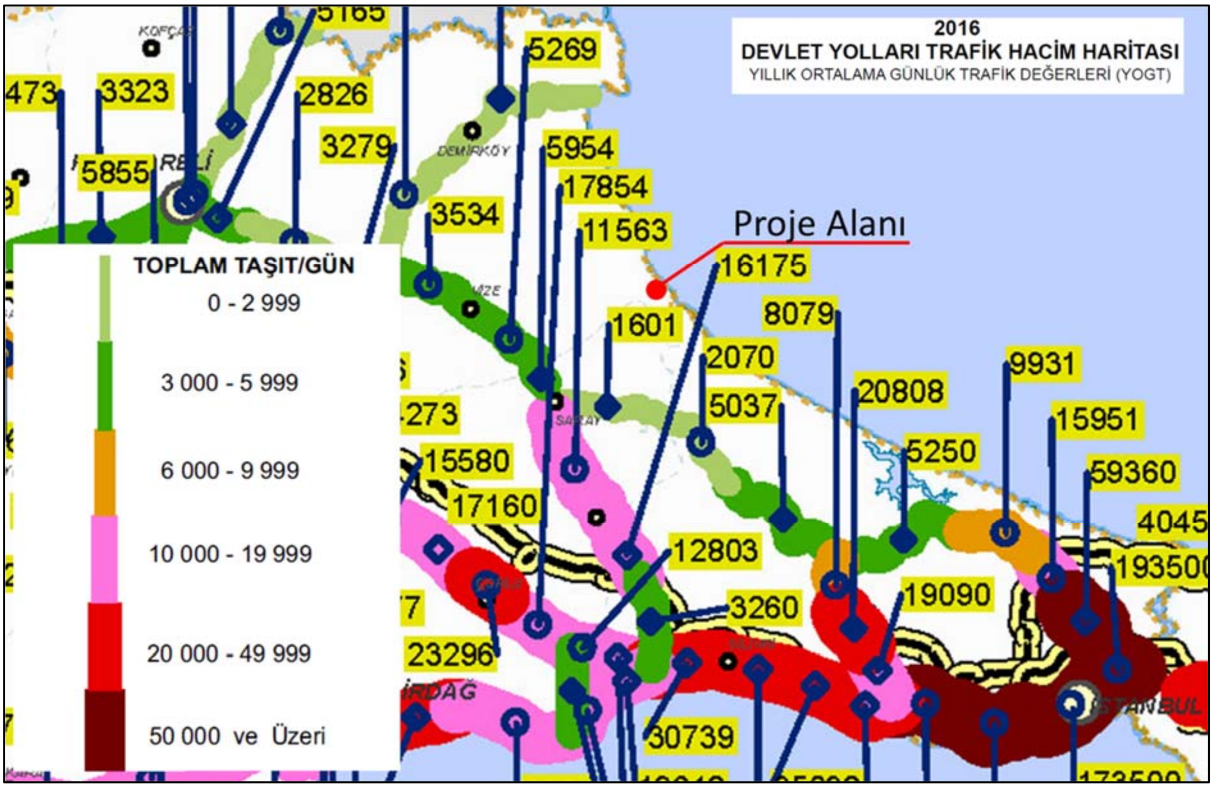


Figure 6.10766: The 2016 Traffic Volume Map (Ref. 6.105)

Wherever possible, the existing road infrastructure will be used for transportation in the construction and operational stages of the Project and additional roads may be built for the Project site, if necessary. In this case, all necessary permits will be obtained from relevant authorities.

An "Assessment of Current Traffic Management" regarding the evaluation of transportation routes for the Onshore Section was carried out by the Project Owner in 2017. Information on this assessment is given in Section 10.4 (Marine and Land Traffic) in detail

6.16 Other Issues

There are no other issues that can be addressed in this chapter.

Contents

7 Assessing Biological Environment

This chapter offers an assessment of impact on the biological environment (biological receptors) of the Project area and its immediate vicinity. The assessment considers impacts produced throughout all of the Project phases, taking into account unexpected incidents and emergencies' potential impact on biological receptors within marine environment. Assessments included in this chapter cover all 3 main sections of the Project, namely Offshore Section, Shore Crossing Section and Onshore Section. Project Sections are described in detail in **Chapter 1** (General Characteristics of the Project).

Majority of the impact is expected to occur during the construction phase. In particular, the impact from vessels, machinery and equipment to be used during the construction process has potential to disturb biological receptors (flora and fauna).

Design controls and mitigation methods to be implemented through all project phases in order to minimise the potential impact in Offshore, Shore Crossing and Onshore Sections are also covered in this chapter.

As described in **Chapter 1** (General Characteristics of the Project); since the micro-tunnel technique considered for adoption as shore crossing technique during preliminary assessments of 2015 was revealed not to be feasible given the findings of studies conducted; in February 2017, the final decision of the project owner was to use open-cut trench excavation.

In the scope of the EIA study, all previous studies conducted to identify the biological components within the 2015 Project Site layout as well as in the vicinity of the pipeline were updated in May 2017 by specialists in flora, fauna and marine biology for Onshore and Shore Crossing Sections, also assessing the current layout and environmental impact of open-cut trench excavation.

7.1 Defining the Natural Environment of the Project Site and Assessing the Baseline

7.1.1 Offshore Section

The Black Sea is a semi-closed inland sea, with the strait of Istanbul as its only connection to international seas. 2.212 m deep at its maximum, the sea has an area of 423,000 km^{2}and a wide continental shelf. Around 87% of the Black Sea is anoxic, making it the biggest anoxic water body in the world (Ref. 7.1; Ref. 7.2).

Two different water zones with different salinity and density rates in the Black Sea are separated via a permanent pycnocline layer with regional depth variations (~100–200 m). Beneath the upper layer waters that are shaped by river water recharge with low salinity (~17.5–18.5‰) and ample oxygen, are lower layer waters originating from the Mediterranean with high salinity (~22–22.5‰) and hydrogen sulphide (Ref. 7.2; Ref. 7.3; Ref. 7.4). The anoxic layer with hydrogen sulphide is located at 100 - 2,000 m depth and above it, or between 50-80 or 100-120 m level is the suboxic layer which serves as a stable lid (Ref. 7.5). Annual average temperature is 8.9 °C. Surface water temperature in winter months is around 6 - 8 °C; however, it drops down to 0.5 °C in the shallow waters of the north-western continental shelf. In summer months, surface water temperature can go up to 25 °C in most areas. The cold intermediate layer located within the depths of 70 - 100 m is 7 - 8 °C and remains stable round the year. The 2,000 metre-thick, homogenous deep water layer underneath the former layer has a vertically uniform character and the temperature under 200 m is between approximately 8.9 – 9.1 °C (Ref. 7.6; Ref. 7.7).

The Black Sea upper water layer basically has a cyclonic (counter clockwise) current system across the basin. Two main cyclonic gyres almost divide the entire basin area in half. In addition, there is a rim current that follows the continental slope throughout the basin as well as coastal anticyclonic (clockwise) current gyres between the rim current and the shore (Ref. 7.8; Ref. 7.9).

7.1.1.1 Marine Flora and Fauna

7.1.1.1.1 Introduction and Methodology

Since the Offshore Section of the project bears similarities with the general characteristics of the Black Sea, a comprehensive literature research on the general hydrographic characteristics of the Black Sea, phytoplankton and zooplankton communities in the Black Sea, pelagic fish, marine mammals and seabirds was carried out by the Specialist Aquaculture Engineer and the Specialist Biologist in October 2015 to define the flora and the fauna and to assess the baseline. The research has been updated with the studies carried out by the Institute of Marine Science and Technology at Dokuz Eylül University, taking the up-to-date Project itinerary into account.

In the scope of the research, species composition, distribution and seasonal variations of phytoplankton and zooplankton communities in the Black Sea were studied in detail. General biological characteristics of marine mammals distributed throughout the Black Sea were defined and assessments were carried out for: their global distribution, level of abundance in various parts of the Black Sea, whether they are priority protected species under Bucharest Convention, whether they are on the Black Sea Red List and CITES Lists, their IUCN conservation status, and hazards to which they are exposed in the Black Sea. Additionally, bird migration routes going around or over the Black Sea and bird species that may be present in the area covering the Offshore Section of the Black Sea Project site, whether these species are included in the Black Sea Red List as well as their IUCN conservation status were provided in detail.

Pelagic fish species are of great importance in the Offshore Section of the Project due to their economic value and vulnerability. From a taxonomic point of view, Thracian coasts are part of the Black Sea coast of Turkey about which extremely limited scientific research have been conducted and for which there is the least amount of information available. The Black Sea was studied as a whole in taxonomic studies to date (Ref. 7.50); thus, faunal similarities or differences between western, central and eastern coasts have yet to be revealed effectively. It is possible to access the most important information on pelagic fish species in the Black Sea coast through the inventories which were created by ichthyology curators based on the study of scientific samples from museums of natural history and zoology in Europe and the Black Sea basin, published with the support of organisations such as FAO and UNESCO (Ref. 7.51; Ref. 7.52). The said publications include not only biological traits of species but also their distribution maps. Aside from these, few articles and project reports specifically focusing on the western Black Sea that are based on real samples are available (Ref. 7.53; Ref. 7.54; Ref. 7.55; Ref. 7.56). In light of all of this literature, a list was drafted for the pelagic fish species peculiar to the region. Conservation status of the pelagic fish species in the western Black Sea were also added to the species list following a study of national legislation and international conventions to which Turkey is party. Potential national or international conservation status for each species were assessed within the frameworks of IUCN red lists, Bucharest Convention, CITES and Aquaculture Notice no. 4/1 issued by the Directorate General for Fisheries and Aquaculture of the Ministry of Food, Agriculture and Livestock.

7.1.1.1.2 Findings

Phytoplankton

A major part of the Black Sea coastal waters and continental shelf is of eutrophic (rich in nutrients) character while the Offshore Section is mesotrophic (medium level nutrient content). Furthermore, hypertrophy (excessive amount of nutrient) is observed in a significantly large area (Ref. 7.10). Largest hypertrophicareas are found in Sea of Azov and in the north-western continental shelf into which Danube, Dniester and Dnieper rivers, whose waters contain extremely high levels of chlorophyle flow (Ref. 7.10). Primary production is measured at 570 – 1.200 µg C/m^{2}in the north-western continental shelf, at 320 – 500 on the continental slope and at 100 – 370 µg C/m^{2}in the offshore, i.e. mid-section (Ref. 7.11). Average biomass of phytoplankton in the north-western continental shelf between 1983 and 1990 reached 4.105 µg/m^{3}level (Ref. 7.12).

The number of known phytoplankton species in the Black Sea is approximately 1,600 (Ref. 7.13; Ref. 7.14; Ref. 7.15; Ref. 7.16). There are significant variations in species composition of phytoplankton in these areas due to variations in hydrological and hydro-chemical characteristics of different areas of the Black Sea. For example; the number of brackish water and freshwater species within phytoplankton communities in the shallow, less saline and extremely eutrophic north-western area is much higher compared to those in other areas (Ref. 7.17).

Phytoplankton communities react to human impact with changes in species compositions, abundance as well as in the timing and duration of phytoplankton blooms. While the number of bloom-producing phytoplankton species in the coastal part of the Black Sea is approximately 44,the same number say, in the Aegean Sea with lower nutrient concentration is nearly 30; and these two seas differ greatly also in terms of species composition (Ref. 7.18). While the annual average phytoplankton abundance value in the Black Sea is measured at 7,000,000 individuals per litre, abundance was observed to reach extreme values such as 800,000,000 individuals per litre in the event of phytoplankton blooms (Ref. 7.19).

Significant changes were observed within phytoplankton communities in the Black Sea between 1985 and 1994. It was noted that the existing seasonal cycle in which diatom blooms occurring in spring is followed by dinoflagellate and phytoflagellate blooms, respectively was disrupted. A decrease was reported in the diatom component during the spring bloom. It has been a radical change that has continued to date (Ref. 7.20). Although the causes have not yet been fully understood, various natural and human causes were suggested. Among those are the cold spell that lasted from 1985 till 1994, hot summers and early warming of the surface zone, drop in silicate inputs following dam constructions on the Danube river and increase in the share of coccolithophorids within the phytoplankton communities along with the decrease in the nitrogen:phosphor ratio (Ref. 7.21).

Increased primary production due to man-made nutrients observed in the Black Sea in 1970s and 1980s as well as changes in the composition of phytoplankton communities remained limited to coastal and continental shelf waters only. Up until mid-1980s, i.e. until the arrival of regional cold climate conditions, no changes had been observed within phytoplankton communities in the central basin of the Black Sea (Ref. 7.22; Ref. 7.23). The change observed in the phytoplankton regime of the mid-sections of the Black Sea did not stem from man-made nutrient increase effect and resulted from an increased advance of nutrients from the bottom toward the euphotic zone following harsh winter conditions during the Black Sea’s cold climate period (Ref. 7.21; Ref. 7.24). However, in general, production level in mid-sections of the Black Sea is far lower than the production level in coastal and continental shelf waters (Ref. 7.25).

Due to the aforementioned man-made and natural factors, phytoplankton blooms became events that are observed at least once a year and take place in wider areas rather than being rare and isolated (Ref. 7.41). Furthermore, the increase in the level of eutrophication increased in its turn the number of cells and biomass of phytoplankton (Ref. 7.26). For instance, *Skeletonema costatum*, a type of diatom, has population blooms typically in springtime and the cell number of this species reaches 1 x 10^8cells per litre while it is a known fact that this number did not exceed 1.8 x 10^6cells per litre in 1960s (Ref. 7.27; Ref. 7.41).

Between 1989 and 2005, there were 401 known phytoplankton species along the Turkish coasts of the Black Sea (Ref. 7.70). See the percentage distribution of the classes to which these species belong in Figure7.1. The most dominant classes in terms of the number of species are Dinophyceae and Bacillariophyceae, with 173 and 89 species each, respectively. The third most dominant class is Mediophyceae with 7 species, which is followed by Coscinodiscophyceae with 40 species. Trebouxiophyceae and Cryptophyceae classes are represented with only one species each (Ref. 7.70). While diatom species are rather more dominant in winter and spring months, coccolithophorid species appear more dominant in autumn. Dinoflagellate and coccolithophoride species are more dominant in coastal waters and since recently were found to bloom in months other than what has been usual (Ref. 7.20; Ref. 7.30; Ref. Ref. 7.31).

More recently, with dinoflagellates and other micro and nano-plankton species becoming more dominant than diatoms, important changes in the composition of the phytoplankton community in the Black Sea were reported (Ref. 7.20). The rise in the ratio of dinoflagellates and the change in the balance between nutrients are believed to be linked to the changes in eutrophication and sea water temperature regime (Ref. 7.20; Ref. 7.26).

Growth of phytoplankton was welcomed at first by some researchers because it had increased biological productivity, which led to a rise in the number of plankton-eating fish species such as anchovy and sprat. However, it is known that there are also other factors which are equally contributing to the increase in the amount of anchovy and sprat caught. Among those factors are absence of large pelagic hunters (e.g. mackerel, bonito, bluefish) or an increased number of fishing boats and intensified commercial fishing due to use of trawlers. All of the above-mentioned factors may have possibly contributed to the temporary increase in the catch of small plankton-eating fish (Ref. 7.28; Ref. 7.41).

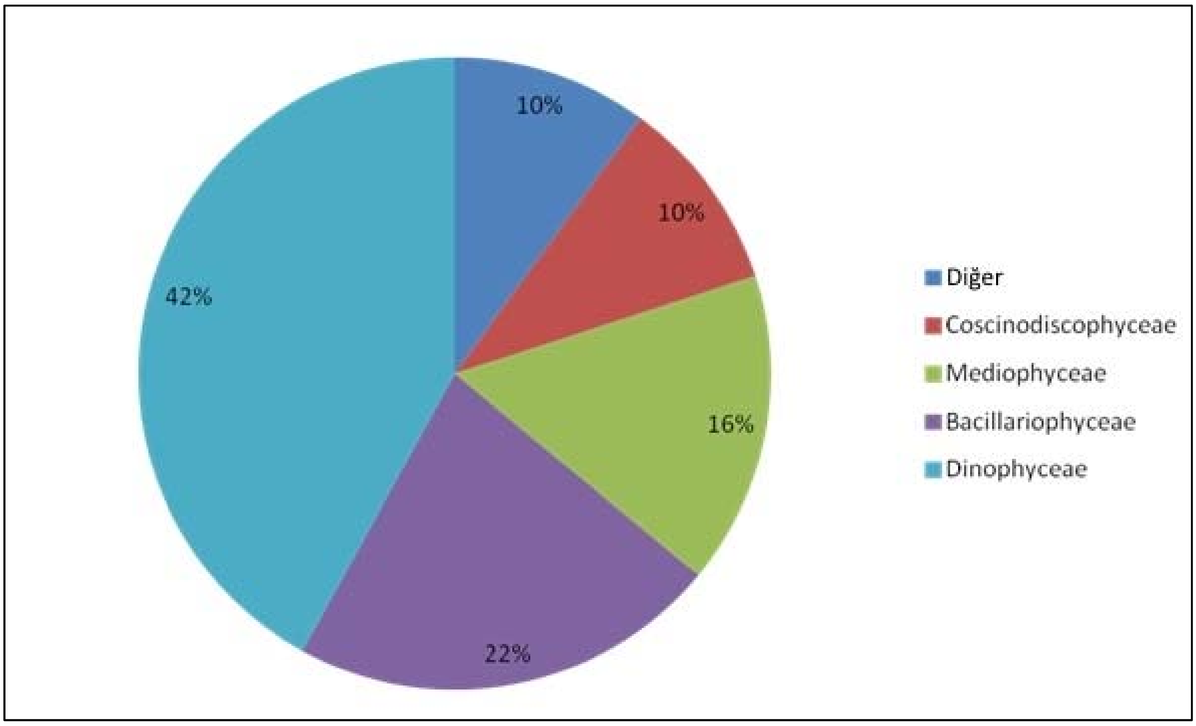


Figure7.1:Percentage Distribution of Phytoplankton Classes in terms of the Number of Species They Contain, as Identified in Studies of the Turkish Black Sea Coasts [Ref. 7.29].

Zooplanktons

Structure of zooplankton communities play a critical role in the food chain, between the autotrophic level and higher trophic levels. Yet, as the zooplankton is a consumer of phytoplankton and microzooplankton, population size of these groups is associated with the population size of the zooplankton to a large extend. Fish stocks are also closely linked to the zooplankton because zooplankton are the nutrient of small pelagic fish and all fish larvae (Ref. 7.32). Although zooplankton communities in the Black Sea have quite high abundance, they are poor in species diversity when compared to the Mediterranean. Copapoda and Caldocera are groups with the highest edible zooplankton diversity in the Black Sea. Many taxonomic groups with broad distribution across the Mediterranean, e.g. Doliolida, Salpida, Pteropoda, Siphonophorae and Euphausiidae, are either non-existent or represented with few species in the Black Sea (Ref. 7.16; Ref. 7.32; Ref. 7.33). Approximately 60 out of the nearly 250 known plankton species in the Black Sea are freshwater species, and around 70 are generally brackish water species originating from the Black-Caspian Sea. Around 50 of the remaining species are meroplankton, i.e. organisms spending some of their life stages in the plankton (Ref. 7.16; Ref. 7.34).

In the aftermath of the eutrophication period, the most important characteristic of the zooplankton species in the Black Sea has been the changes observed in species compositions of various zooplankton groups. Some species such as *Oithona nana* and *Acartia margalefi* had completely disappeared while abundance of some species such as *Anomalocera patersoni*, *Pontella mediterranea* and *Centropages ponticus* Karavaev, 1895 was reduced to a very large extent. What is more, an excessive rise in abundance was identified in jelly-like zooplanktonic species like *Aurelia aurita* and *Rhizostoma pulmo* as well as *Noctiluca scintillans,* a dinoflagellate causing red tide. These species formed a large portion of the total zooplankton biomass throughout 1980s. After 1988, an alien and invasive comb jelly species, *Mnemiopsis leidyi*, multiplied excessively and intensively consumed the edible zooplankton, which seriously affected zooplankton communities in the Black Sea. That state of affairs continued until 1997–1998, when another comb jelly, *Beroe ovata,* which is the main predator of *M. leidyi* was carried into the Black Sea, probably with ballast waters. Later on, zooplankton communities began to transform into their previous status in terms of both species composition and abundance levels. Kopepod and kladoser biomass and abundance began to increase in some areas; *Pontella mediterranea*, *Centropages ponticus* and *Anomalocera patersoni*copepod species were recorded in high abundance during2000s while only a minute amount would be found present from 1980 to 1990s. Populations of *Penilia avirostris* (Cladocera) and *Parasagitta setosa* (Chaetognatha), holoplanktonic species that were at first severely affected by eutrophication, started to recover and their abundance exceeded that of *Acartia clausi* (Copepoda) and *Podon polyphemoides* (Cladocera), opportunist species that are available in high levels during eutrophication period. Re-emergence of *Pontella mediterranea*, which was almost completely extinct in the previous period and whose presence is an indicator of good water quality, after 2000 as well as the improvement in the *Pleurobrachia pileus* population, a comb jelly whose ecological niche was invaded by *M. leidyi* after 1989, are indicators of the positive change in zooplankton communities and ecosystem (Ref. 7.16; Ref. 7.26; Ref. 7.32;).

Numerical distribution of zooplankton species in the Turkish Black Sea coasts are summarised in Table7.1. Scientific studies covering the first half of 2000s when the Black Sea ecosystem started to evolve into its current conditions (1999–2005) and carried out in the Cape Sinop area measured the total biomass of the edible zooplankton and *Noctiluca* in 1999, 2004 and 2005 as 100 mg/m^3, this value was found to be twice as low during the cold years of 2002 and 2003 (Ref. 7.32). It was found that in all years, over 70% of the total zooplankton biomass was composed of inedible zooplankton group, majority of which is *N. scintillans,* a species that is a eutrophication indicator. *Noctiluca* biomass was found to be more dominant in winter and early spring during the cold year of 2003 and in spring and summer during the relatively warmer year of 2004. Edible zooplankton and *Noctiluca*were found to have an abundance range of 0-4,000 individuals per cubic metre between 1999–2005. This value is 2-3 times lower compared to what is available in Bulgarian continental shelf, and not assessed as a bloom-level value. The highest edible zooplankton abundance and biomass was recorded in February and March of 1999, 2000 and 2003 while the highest abundance and biomass values in 2004 and 2005 were then recorded in end of summer and early autumn. *N. Scintillans* dominated zooplankton communities by the end of spring and in summer months and renewable zooplankton abundance gradually decreased during the months when *N. Scintillans* and also *M. leidyi* abundance is high. It was also stated that the copepoda group and *Noctiluca* were present in zooplankton population in almost equal numbers throughout 2004 and 2005, however Copepoda group was found to be more dominant in other years (Ref. 7.32).

Table7.1: Numerical Distribution of Species from Various Zooplankton Groups Throughout the Turkish Black Sea Coast (Ref. 7.29).

Reference	**Ref. 7.35**	**Ref. 7.36**	**Ref. 7.37**	**Ref. 7.38**	**Ref. 7.39**	**Ref. 7.40**	**Ref. 7.41**	**Ref. 7.42**	**Ref. 7.43**	**Ref. 7.44 & Ref. 7.45**	**Ref. 7.46**
Period	**1952-1953**	**1955-1956**	**1991-1992**	**1995-1996**	**1994-1996**	**1996-1997**	**1995**	**1999**	**2000**	**2002-2004**	**1999-2002; 2005-2006**
Location	**Trabzon**	**Turkish Coast**	**Turkish Coast**	**Sinop**	**GD-KD**	**GD-KD**	**GD-KD**	**Sinop**	**Sinop**	**Sinop**	**Trabzon; Düzce-Trabzon**
Appendicularia	1					+	1	1	1	1	1
Cladocera	5	3				+	5	4	2	4	2
Chaetognatha	1	1			1	+	1	1	1	1	1
Copepoda	9	6	5	5	5	4	5	8	7	7	6
Dinophyceae	1					1		1	1	1	1
Foraminifera								+	+		
Ostrocoda						+			+		
Nematoda								+	+	+	
Rotatoria								+			
Tintinnidae	+					+		+			
Amphipoda								+	+		
Bivalvia larvae						+	+	+	+	+	+
Byrozoa larvae								+		+	
Cirripedia larvae							+	+	+	+	+
Decapoda larvae								+	+	+	+
Echinodermata larvae		+									

Reference	Ref. 7.35	Ref. 7.36	Ref. 7.37	Ref. 7.38	Ref. 7.39	Ref. 7.40	Ref. 7.41	Ref. 7.42	Ref. 7.43	Ref. 7.44 & Ref. 7.45	Ref. 7.46
Period	**1952-1953**	**1955-1956**	**1991-1992**	**1995-1996**	**1994-1996**	**1996-1997**	**1995**	**1999**	**2000**	**2002-2004**	**1999-2002; 2005-2006**
Location	**Trabzon**	**Turkish Coast**	**Turkish Coast**	**Sinop**	**GD-KD**	**GD-KD**	**GD-KD**	**Sinop**	**Sinop**	**Sinop**	**Trabzon; Düzce-Trabzon**
Gastropoda larvae		+				+		+	+	+	+
Isopoda								+		+	
Oligochaeta								+			
Phoronidae larvae								+			
Polychaeta larvae						+	+	+	+	+	+

+ sign indicate species that are present but not identified.
GB-KD: Southwest Black Sea, GD-KD: Southeast Black Sea

Pelagic Fish

Based on findings from the existing literature research, there are a total of 33 known pelagic fish species from 15 families in the Western Black Sea covering the Offshore Section of the Project site. 11 of these species are placed under protection by various legislation. Pelagic fish species in the western Black Sea as well as their conservation statuses and susceptibilities under the Bucharest Convention and the Black Sea Red List have been given in Table7.2.

Table7.2:Pelagic Fish Species Distributed Throughout Western Black Sea Coasts and Their Current Conservation statuses.

Family	Species	Common Name	Bucharest Convention	The Black SeaRed List	Vulnerability (Ref. 7.57)
ACIPENSERIDAE	*Huso huso* (Linnaeus, 1758) *	Huso huso	***		Very High
ATHERINIDAE	*Atherina boyeri* Risso, 1810	Black Sea Silverside			Medium
	Atherina hepsetus Linnaeus, 1758	Black Sea Silverside			Low-Medium
BELONIDAE	*Belone belone* (Linnaeus, 1761)	Black Sea Garfish	***	EN	Medium-High
CARANGIDAE	*Lichia amia* (Linnaeus, 1758)	Leerfish			High-Very High

Family	Species	Common Name	Bucharest Convention	The Black SeaRed List	Vulnerability (Ref. 7.57)
	Trachurus mediterraneus (Steindachner, 1863)	Mediterranean Horse Mackerel			Medium-High
	Trachurus trachurus (Linnaeus, 1758)	Atlantic Horse Mackerel			Medium-High
CLUPEIDAE	*Alosa caspia* (Eichwald, 1838)	Caspian Shad			Medium
	Alosa fallax (Lacepede, 1803)	Twaite Shad			Medium-High
	Alosa immaculata (Eichwald, 1838)	Pontic Shad			Low-Medium
	Sardina pilchardus (Walbaum, 1792)	European Pilchard			Low
	Sardinella aurita(Valenciennes, 1847)	Round Sardinella			Medium
	Sprattus sprattus (Linnaeus, 1758)	Sprat			Low
ENGRAULIDAE	*Engraulis encrasicolus* (Linnaeus, 1758)	Anchovy			Low
GOBIIDAE	*Aphia minuta* (Risso, 1810)	Transparent Goby	***		Low
MUGILIDAE	*Chelon labrosus* (Risso, 1827)	Thicklip Grey Mullet			High
	Liza aurata (Risso, 1810)	Golden Grey Mullet			High
	Liza haematocheila (Temminck & Schlegel, 1845)	So-iuy Mullet			High
	Liza ramada (Risso, 1827)	Thinlip Grey Mullet	**	VU	Medium-High
	Liza saliens (Risso, 1810)	Leaping Mullet			Medium-High
	Mugil cephalus Linnaeus, 1758	Flathead Grey Mullet			Medium-High
POMACENTRIDAE	*Chromis chromis* (Linnaeus, 1758)	Damsel Fish			High
POMATOMIDAE	*Pomatomus saltatrix* (Linnaeus, 1766)	Bluefish	***		High
SCOMBRIDAE	*Euthynnus alleteratus* (Rafinesque, 1810)	Little Tunny			High
	Sarda sarda (Bloch, 1793)	Atlantic Bonito	***	CR	Low-Medium
	Scomber colias Gmelin, 1789	Atlantic Chub Mackerel			Medium

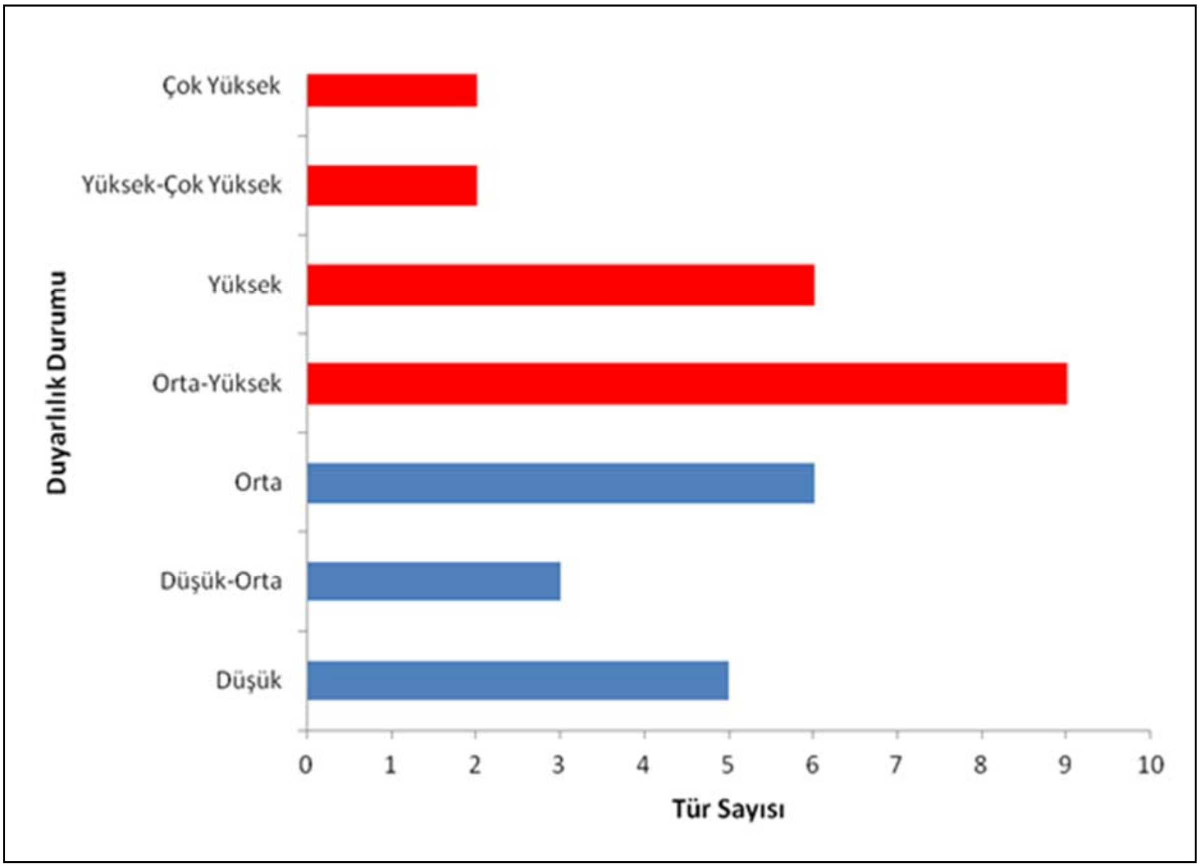
Family	Species	Common Name	Bucharest Convention	The Black SeaRed List	Vulnerability (Ref. 7.57)
	Scomber scombrus Linnaeus, 1758	Atlantic Mackerel	***	EN	Medium
	Thunnus thynnus (Linnaeus, 1758)	Atlantic Bluefin Tuna	***	EN	Very High
SPARIDAE	*Spicara maena* (Linnaeus, 1758)	Blotched Picarel			Medium-High
	Spicara smaris (Linnaeus, 1758)	Picarel	**		Medium
SPHYRAENIDAE	*Sphyraena sphyraena* (Linnaeus, 1758)	European Barracuda	**		Medium-High
SYNGNATHIDAE	*Syngnathus schmidti* Popov, 1927	Schmidt's Pipefish			Low
XIPHIIDAE	*Xiphias gladius* Linnaeus, 1758	Swordfish	**	EN	High-Very High

* Hunting of the huso huso (mersin morinası) is banned in the Turkish Black Seacoasts (Aquaculture notices no. 4/1 and 4/2; the said species are also on the CITES Annex-II.
**Rare species with protection priority under the Bucharest Convention;
***Endangered species with protection priority under the Bucharest Convention. Taken from Red List categories, The Black Sea Red List (Ref. 7.94) book. (VU: Vulnerable; CR: Critically Endangered; EN: Endangered).

There are no literature data on the catch of some of the species on the Table7.2 (e.g. swordfish, European barracuda, Atlantic Bluefin tuna, huso huso etc.) in the relevant region for the past 30 years (3 generations). These species are considered to be quite possibly non-existent in the Western Black Seacoasts.

It is possible to identify the "vulnerability" (or, characteristics that are contributing to extinction) status of each species using some biological and ecological parameters including age, size, form of reproduction, trophic (feeding) status of the fish (Ref. 7.57; Ref. 7.58).Particularly when studied in terms of their vulnerabilities in the face of fishing-related pressures, out of the species included in the pelagic fish list on Table7.2 a total of 19 species show severe vulnerability, and the remaining 14 species include short-lived, fast-growing, "low-medium vulnerability" species that reach reproductive maturity early and have high potential to double their populations (Figure7.2).

The species with the highest vulnerability are huso huso (*H.huso*) and Atlantic Bluefin tuna (*T.thynnus*) whilecommon species of the Black Sea basin including sprat (*S.sprattus*) and anchovy (*E.encrasicholus*) show low vulnerability to fishing-related pressures because of their bio-ecological characteristics.



*Vulnerability Data Taken from Fish base (Ref. 7.57)

Figure7.2: Statuses of Pelagic Fish Species of the Western Black Sea in terms of their Vulnerability to Fishing-Related Pressures

The Black Sea, the most efficient and productive one among all of the Turkish seas, had the highest amount of production again, according to the 2014 aquaculture statistics of the Turkish Statistical Institute (TURKSTAT) despite experiencing quite a severe drop compared to past years. 69% of all of the 230,000 tons of sea fish caught in Turkey came from the Black Sea; and the Eastern Black Sea coasts produced the highest amount (78% of the total) in the entire Black Sea. Thus, the Western Black Sea has an evidently low profile in terms of fish production compared to the Eastern Black Sea.

As is the case across the Black Sea, anchovy is the prevailing pelagic catch in western sections (Figure 7.3), and is followed by bonito, bluefish, trachurus and clupeidae. Sprat and Black Sea garfish are also among other pelagic fish with very low production.

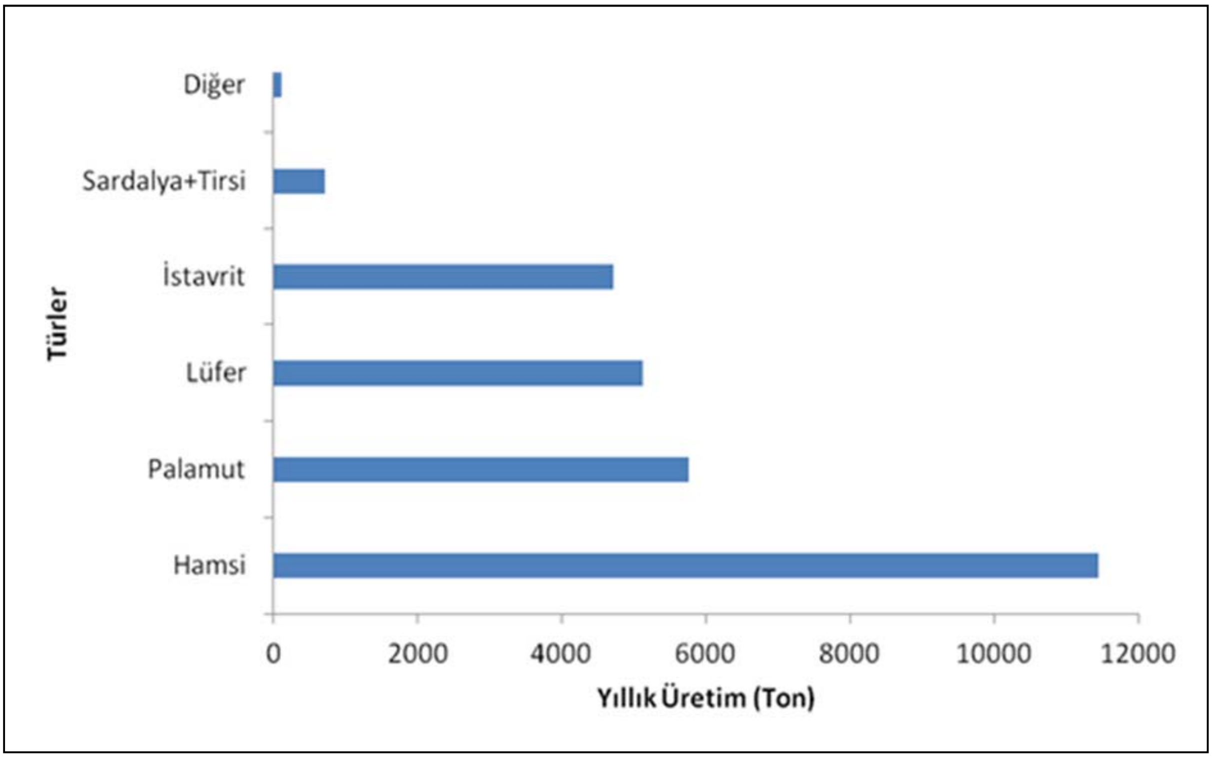


Figure 7.3: The Most Caught Commercial Pelagic Fish Species in the Western Black Sea (Ref. 7.136)

Anchovy, forming large schools in coastal waters, are a euryhaline (able to survive in a wide band of salinity) form and may be present in a broad range of environments from brackish waters with 5‰ salinity to waters 41‰ salinity. The anchovy reproduces at depths of 0-25 m which form the warmest layers of the sea, from mid-May till end of August when water temperature varies between 16-28°C in the Western and North-western Black Sea basin; however, optimum temperature range in peak months of reproduction, namely June and July is 19-24°C. Results obtained from Turkish coasts are consistent with other parts of the Black Sea (Ref. 7.61). According to the results from the scientific study dated 1985, which is acknowledged by many researchers, on the reproduction of the Black Sea anchovy (Ref. 7.64), the anchovy migrates to the northern basin of the Black Sea to spawn and feed from February to April, and they, having fed and spawned in the north, then descend to the Turkish coasts as the weather starts to grow cold in October-December. An in-depth study (Ref. 7.65) conducted in 1994 revealed that besides the northern Black Sea, the anchovy has intensive reproductive activities also in the southern Black Sea (i.e. Turkish coasts) (Ref. 7.65) (Figure 7.4). Ichtioplankton research conducted for the central and eastern Black Sea produced results that are corroborative of the said findings (Ref. 7.63; Ref. 7.66).

In the past 15 years, there were a lot of ups and downs in the anchovy catch statistics belonging to the western Black Sea. Following the 2002 production nearing 100,000 tons, only 11,000 tons of anchovy were caught in 2014, the lowest catch rate in the history of the region (Figure 7.5). Fluctuations related to anchovy fishing in the Black Sea in general are due both to ecological reasons (eutrophication, global climate change, introduction of alien/invasive species etc.) and to erosion of this closed ecosystem with overfishing when it is already extremely vulnerable to anthropogenic factors (Ref. 7.67).

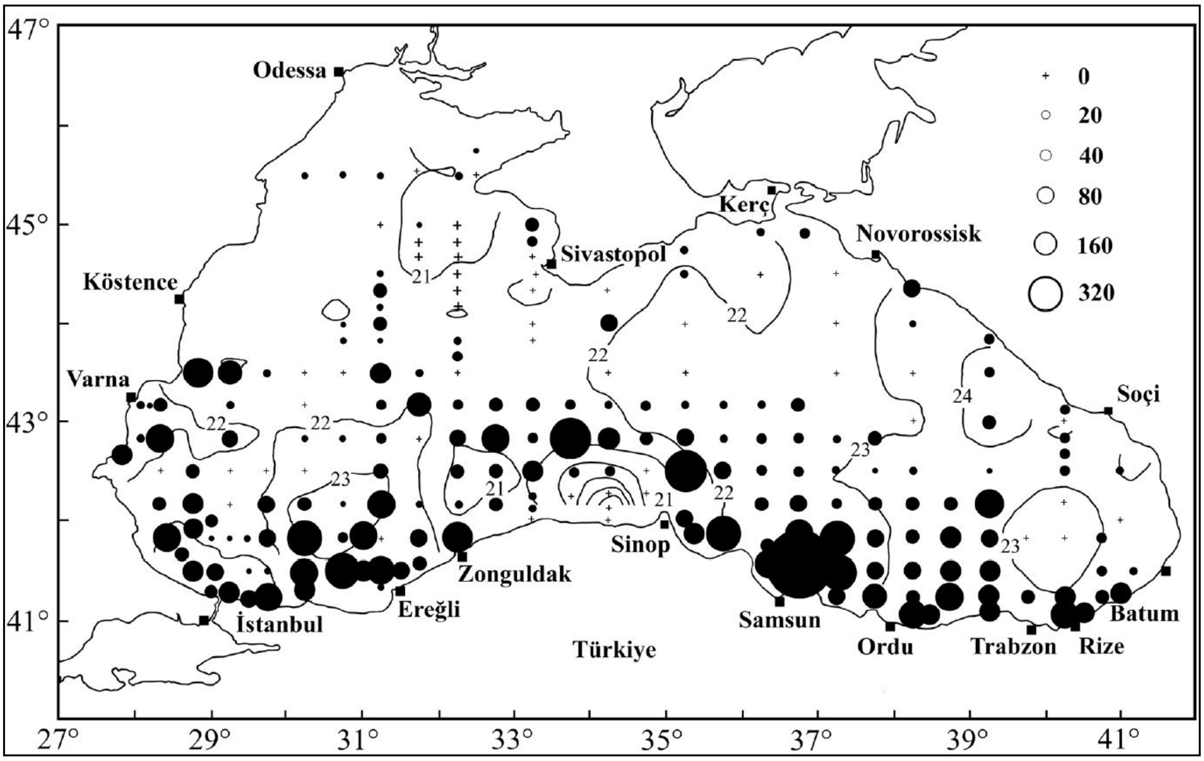


Figure 7.4: Distribution of Anchovy Eggs (item.m^{-2}) in the Black Sea (The Biggest Ring being 1167 Egg.m^{-2})

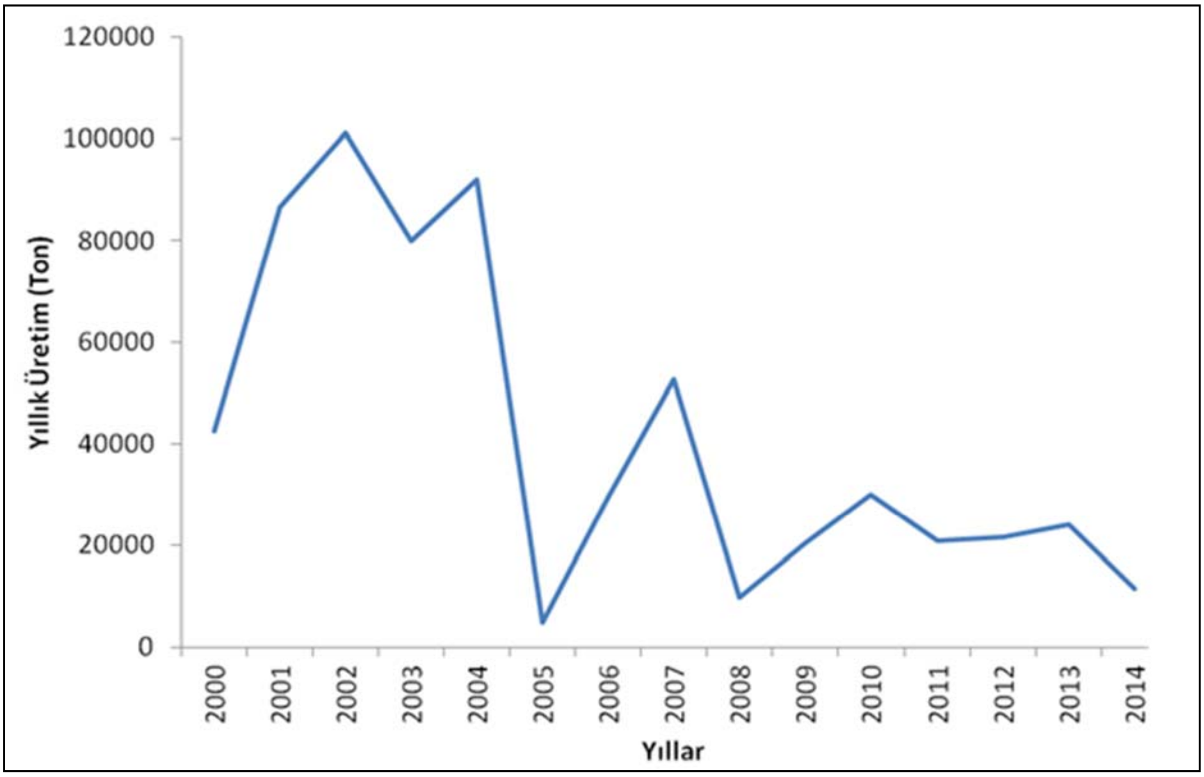


Figure 7.5: Amount of Anchovy (*Engraulis encrasicholus*) Production in the Western Black Sea Region in the Last 15 Years (Ref. 7.136)

Bonito, one of the most important pelagic fish in the Black Sea in terms of economic value, ranks second right after the anchovy in terms of the amount of annual production in the western Black Sea. While in 1969, 20,000 tons of this species was caught across the entire Black Sea basin, it has been caught by Bulgaria and Turkey only for the last 45 years since then, due in particular to the pollution in the northern Black Seawaters, changes in oceanographic conditions which severely affected the migration route of the species and also overfishing (Ref. 7.69). Bonito, with a typical reproduction and feeding migration pattern, migrate from the Aegean Sea towards the Black Sea starting from April until mid-August, then return to the Aegean Sea in winter (Ref. 7.70). Bonito have an extremely rapid growth performance. Bonito size reaches 35-40 cm by the end of the 1st year and 50-60 cm by the end of the 2nd year; and the fish can grow up to 70 cm (and rarely 90 cm) on our coasts (Ref. 7.71; Ref.7.72; Ref. 7.73). Bonito, reaching reproductive maturity in age 1 and when around 35 cm length (Ref. 7.70), can be caught as of minimum 25 cm of length in accordance with the aquaculture notice, which was in place in 2015 and from which this information was derived. Amount of bonito production in the western Black Sea Region for the last 15 years was provided in Figure 7.6. A piscivore (organisms that exclusively feed on fish) fish, bonito consumes small pelagic fish that form schools such as anchovy, sardine, sprat and trachurus (Ref. 7.57), so any reduction in the amount of nutrients can also negatively affect the population.

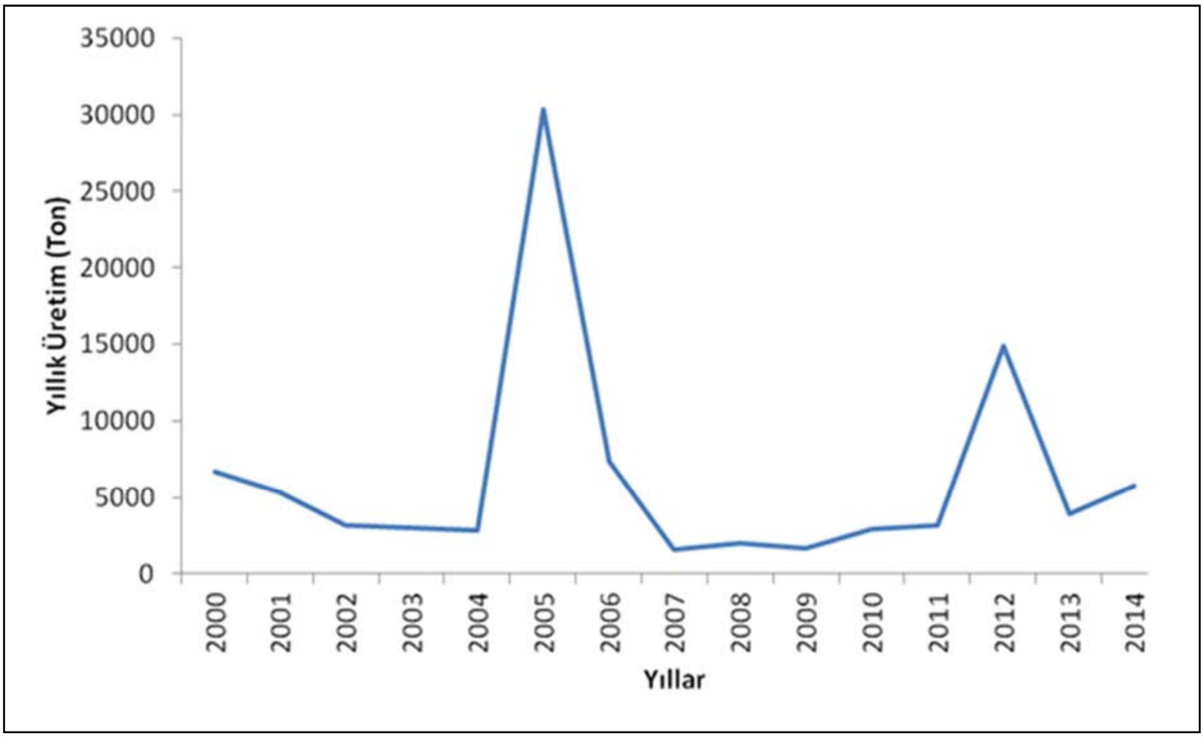


Figure 7.6: Amount of Bonito Production (*Sarda sarda*) in the Western Black Sea Region for the Last 15 Years (Ref. 7.136)

Following anchovy and bonito, another species in the western Black Sea producing the biggest amount of catch is the bluefish, with an extremely high economic value. There have been quite a limited number of research available on the biology of this species to date. Spawning in the Marmara, the bluefish move to the western Black Sea and then migrate back towards the Aegean Sea direction; however, the eastern Black Sea population probably do not join this migration (Ref. 7.74; Ref. 7.75; Ref. 7.76). In 2007, a research carried out on age, size and reproductive characteristics of the bluefish (Ref. 7.67) revealed that 1 year old individuals were on average 19.5 cm long and weighed 94 g;2-year-old individuals were 27.5 cm long and weighed 239 g; and 3-year-old individuals were 33 cm long and weighed 431 g. The research also identified the first reproductive size (average size in which 50% of the population obtained reproductive ability) as 25.4 cm. Results of this research were compared with another research that was carried out in 1959 (Ref. 7.75) to reveal that average size of the bluefish back in 1959 was 28.5 cm (individual of maximum size = 68 cm) and that this value dropped to 16.9 cm in 2007. This shows that large-sized individuals reaching reproductive maturity in the population have almost vanished as a result of the huge fishing pressure on the bluefish (Ref. 7.68). The current aquaculture notice no. 4/1 defines the minimum catch size for the bluefish as 18 cm. Figure 7.7 presents the production amounts for the bluefish in the western Black Sea for the last 15 years.

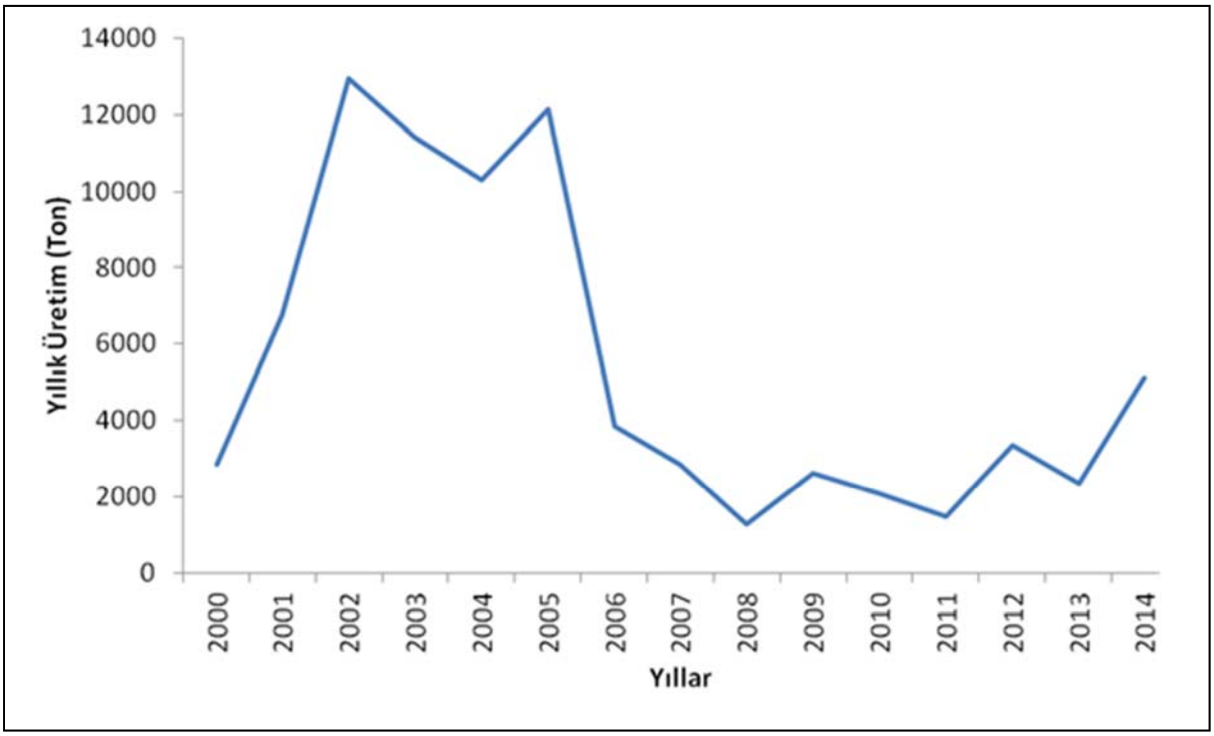
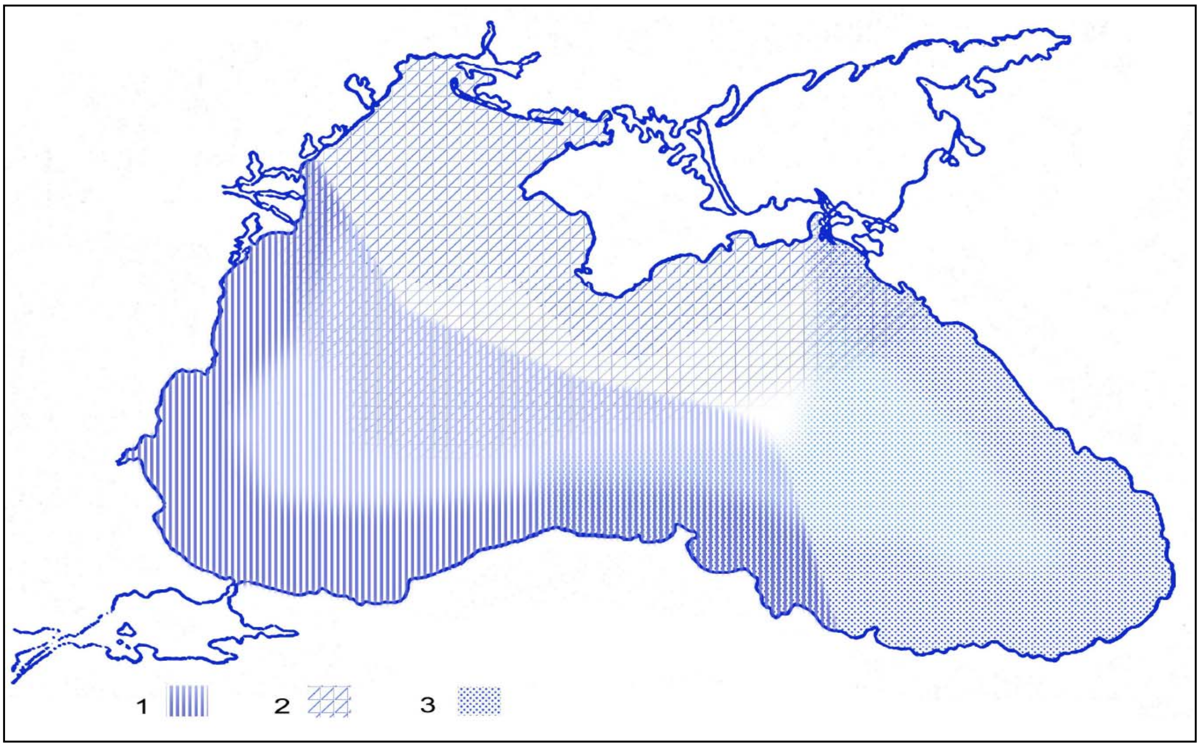


Figure 7.7: Amount of Bluefish (Pomatomus saltatrix) Produced in the Western Black Sea Region for the Last 15 Years (Ref. 7.136)

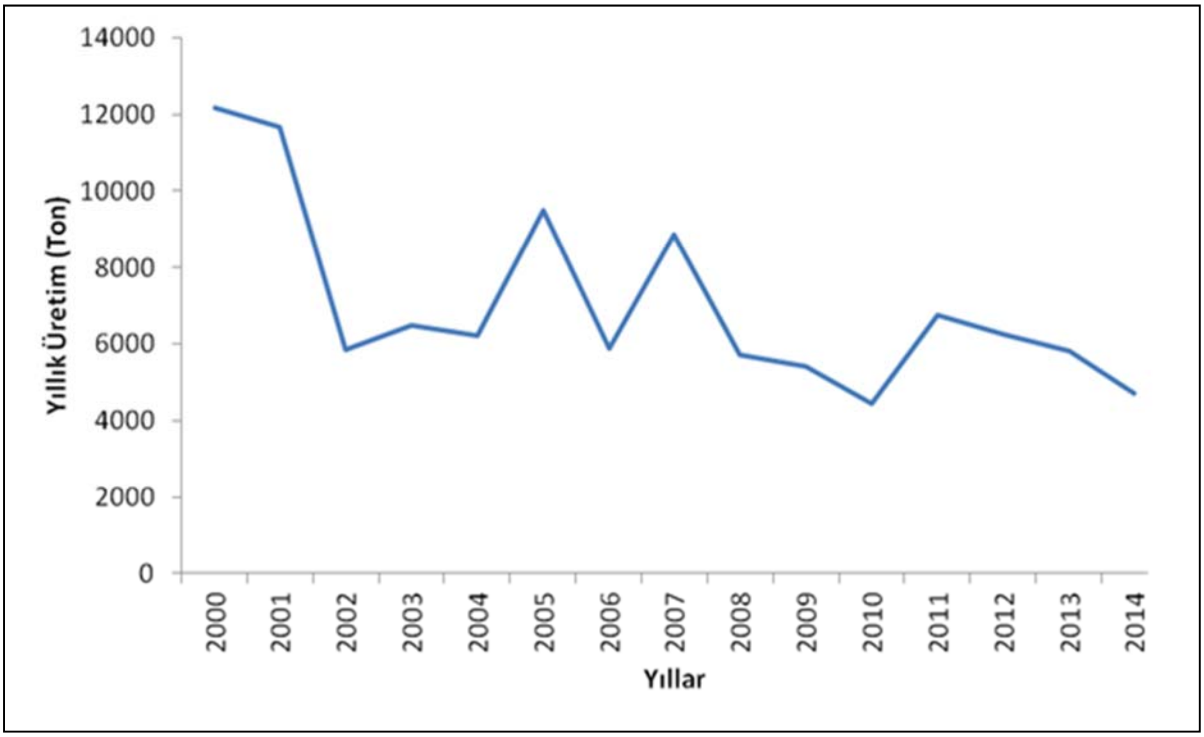
There are two known trachurus species in the Black Sea; however, the most commonly distributed species is the *Trachurus mediterraneus* (Ref. 7.79). This migrant species that has spread to the entire basin has three subpopulations (Marmara-Bosporus population in the northwest, Crimean population in the north and Caucasian population in the east) (*1) Marmara-Bosporus population, 2) Crimean population, 3) Caucasian population.

Figure 7.8) (Ref. 7.80). The trachurus migrate to north in spring months to reproduce and feed, and are distributed throughout the entire continental shelf in summer (particularly so on the seasonal thermocline layer), and move to the southern and south-eastern Black Sea in autumn to overwinter (Ref. 7.64). The first reproductive maturity size has been identified to be 12.2 and 12.5 for female and male individuals, respectively. The reproductive season starts in May and lasts until September, following the peak in July August (Ref. 7.81). Amount of trachurus produced in the last 15 years within the western Black Sea Region is given in Figure 7.9.



*1) Marmara-Bosporus population, 2) Crimean population, 3) Caucasian population.

Figure 7.8: Subpopulations of the *Trachurus mediterraneus* (Mediterranean Horse Mackerel) in the Black Sea (Ref. 7.80)



*Total amount of catch has been assessed covering both trachurus species.

Figure 7.9: Amount of Trachurus Produced in the Western Black Sea Region for the last 15 years (Ref. 7.136)

Marine Mammals

Current research indicates that a total of 6 species of marine mammals have been reported to be present in the Turkish Black Sea coasts to date (Ref. 7.83). Among those, the Mediterranean Monk Seal (*Monachus monachus*) became completely extinct in the Black Sea, and its last valid observation was in 1987 in Zonguldak - Ereğli (Ref. 7.84). 2 male beluga (*Delphinapterus leucas*) that were caught in 1991 in the Okhotsk Sea (North Pacific Ocean, Russia) and brought to Crimea fled their shelter and one of them reached Sinop/Gerze (Ref. 7.85). Similarly, a fur seal (*Arctocephalus* cf. *pusillus*) that was kept in pools to be used in scientific trials conducted in Anapa during USSR period escaped from its keep and reached Zonguldak/Ereğli and lived on there in 1988-1989 (Ref. 7.84).

Excluding the extinct mammal species or the ones mentioned above (which joined the ecosystem through human impact), currently there are 3 subspecies of dolphin species are distributed across the Black Sea. The Black Sea Harbour Porpoise (*Phocoena phocoena relicta*), the Black Sea Bottlenose Dolphin (*Tursiops truncatus ponticus*) and the Black Sea Common Dolphin (*Delphinus delphis ponticus*). General biological characteristics are given in Table 7.3.

Table 7.3: General Biological Characteristics of Marine Mammals Distributed Across the Black Sea

	Phocoena phocoena relicta **(Black Sea harbour porpoise)**	***Tursiops truncatus ponticus*** **(Black Sea bottlenose dolphin)**	***Delphinus delphis ponticus*** **(Black Sea common dolphin)**
Distribution (Ref. 7.83.; Ref.7.86)	Distributed across the Black Sea, Marmara and north Aegean Sea; for worldwide distribution see Figure 7.10.	Distributed across all of the Turkish coasts; for worldwide distribution see Figure 7.11	Distributed across all of the Turkish coasts; for worldwide distribution see Figure 7.12
Habitat (Ref. 7.87)	Any coastal lagoon, estuary or delta along the continental shelf	Any coastal waters including lagoons, semi-closed bays and estuaries	Generally high seas; however, they also visit coastal waters in search of nutrients
Size and Weight (Ref. 7.88; Ref. 7.89.)	Females (160 cm and 60 kg), Males (145 cm and 50 kg)	Adult individuals are 2.0-3.8 m long and weigh 220-500 kg	They reach 200 cm in length and 200 kg in weight at most
Migration Behaviour (Ref. 7.50; Ref. 7.90)	In March-April, they migrate from south coasts of the Black Sea to the Sea of Azov in the north, in October-November they migrate in the opposite direction	Probably following the migratory route of the anchovy; the existing subpopulations are believed to be semi-settled	They migrate from south/southeast to north/northwest in spring and early summer, and in the opposite direction come end-of-summer and autumn
Feeding Behaviour (Ref. 7.50)	Whiting, red mullet, grey mullets, gobies, flounder, sole fish, Black Sea silverside, anchovy, shad	Turbot, whiting, red scorpion fish, red mullet, grey mullets, bonito, anchovy, common stingray, and Crustacea	Anchovy, sprat, greater pipefish, whiting, trachurus, red mullet, bluefish, scrombridae, grey mullet, and Crustacea

Figure 7.10: Worldwide Distribution of the Black Sea Harbour Porpoise Species (Ref. 7.137)

Figure 7.11: Worldwide Distribution of the Black Sea Bottlenose Dolphin Species (Ref. 7.137)

Figure 7.12: Worldwide distribution of the Black Sea Common Dolphin Species (Ref. 7.137)

There are few studies available on the stock size of the Black Sea dolphins. One of the pioneering studies used vessel and aerial observations to estimate that the total dolphin population consisted of 60,000-100,000 individuals in 1983-1984 (Ref. 7.2). In 1987, Turkish researchers identified a total of 51,226 dolphins across a 60-km radius (59.1%Black Sea common dolphin, 32.5% Black Sea bottlenose and 8.4% Black Sea harbour porpoise) (Ref. 7.91). Details of dolphin counts within the basin are given in

Table7.4 for the Black Sea bottlenose dolphin, Table7.5 for the Black Sea common dolphin and Table7.6 for the Black Sea harbour porpoise.

Table7.4:Abundance Level Research for the Black Sea Bottlenose Dolphin Conducted in Different Parts of the Black Sea (Ref. 7.90)

Area Surveyed, area /length	Observation type	Date	Abundance Level
The Kerch Strait, 890 km^2/353 km	Aerial observation	August 2002	88 (31–243)*
The Kerch Strait, 862 km^2/310 km	Vessel registration	August 2003	127 (67–238)
The Kerch Strait, 890 km2/353 km	Aerial observation	August 2002	88 (31–243)
Northeast Black Sea shelf, 7,960 km^2/791 km	Aerial observation	August 2002	823 (329– 2057)
Northwest, north and northeast of the Black Sea, territorial waters of Russia and Ukraine, 31780 km^2/2,230 km	Vessel registration	Sept-Oct 2003	4,193 (2,527–6,956)
Southeast of the Black Sea, Territorial waters of Georgia, 2.320 km^2/211 km	Vessel registration	January 2005	0
Southeast of the Black Sea, Territorial waters of Georgia, 2.320 km^2/211 km	Vessel registration	May 2005	0
Southeast of the Black Sea, Territorial waters of Georgia, 2.320 km^2/211 km	Vessel registration	August 2005	0
Central Black Sea, Outside of territorial waters of Russia and Turkey, 31,200 km^2/660 km	Vessel registration	Sept-Oct 2005	0

* 95%confidence interval

Table7.5:Abundance Level Research for the Black Sea Common Dolphin Conducted in Different Parts of the Black Sea (Ref. 7.92)

Area surveyed, area / length	Observation type	Date	Abundance level
Northwest, north and northeast regions of the Black Sea, territorial waters of Russia and Ukraine, 31,780 km^2/2230 km	Vessel registration	Sept-Oct 2003	5,376 (2,898–9,972)*
Southeast of the Black Sea, Territorial waters of Georgia, 2,320 km^2/211 km	Vessel registration	January 2005	9,708 (5,009–18,814)
Central Black Sea, outside of the Russian and Turkish territorial waters, 31,200 km^2/660 km	Vessel registration	Sept-Oct 2005	4,779 (1,433–15,945)

* %95 Confidence interval

Table7.6:Abundance Level Research for the Black Sea Harbour Porpoise Conducted in Different Parts of the Black Sea (Ref. 7.93)

Area surveyed area / length	Observation type	Date	Abundance level assessment
Sea of Azov, 40,280 km^2/2735 km	Aerial observation	July 2001	2,922 (1,333-6,403)*

Area surveyed area / length	Observation type	Date	Abundance level assessment
SouthSea of Azov, 7.560 km^2/716 km	Aerial observation	August 2002	936 (436-2,009)
The Kerch Strait, 862 km^2/310 km	Boat registration	August 2003	54 (12-245)
Northwest, north and northeast of the Black Sea, territorial waters of Ukraine and Russia, 31,780 km^2/2230 km	Vessel registration	Sept-Oct 2003	1,215 (492-3,002)
Southeast of the Black Sea, Territorial waters of Georgia, 2.320 km^2/211 km	Boat registration	January 2005	3,565 (2,071-6,137)
Central Black Sea, outside of the Ukrainian and Turkish territorial waters, 31,200 km^2/660 km	Vessel registration	Sept-Oct 2005	8,240 (1,714-39,605)

* %95 confidence interval

Dolphin subspecies distributed across the Black Sea and their conservation statuses based on the IUCN Red List were identified as follows: Black Sea harbour porpoise (**EN:** Endangered), Black Sea bottlenose dolphin (**EN:** Endangered) and the Black Sea common dolphin (**VU:** Vulnerable). In the framework of "The Black Sea Biodiversity and Landscape Conservation Protocol" to the Bucharest Convention, all three of the dolphin subspecies peculiar to the Black Sea were identified as **endangered species**. The Book Black Sea Red List (Ref. 7.94) pointed to the lack of sufficient data during the assessments as justification to categorise all the said dolphins DD (Data Deficient) across the basin; however, red list categories for these species have been identified in countries such as Ukraine, Romania and Bulgaria where there is sufficient data and have been presented in Table7.7. All the dolphins have been listed in Annex. II under the CITES Convention which regulates the trade of endangered flora and fauna species (species whose trade are regulated under certain principles to prevent uses that are non-compliant with the continuation of their generation although they are not absolutely endangered). Additionally, the notices no. 4/1 and 4/2 regulating aquaculture fishing within the territorial waters of Turkey strictly ban fishing of all Cetaceans (dolphins and whales) species seen in our seas for the whole year.

Table7.7:Conservation Statuses of the Dolphin Species in the Black Sea

Species	IUCN Red List	CITES	Bucharest Convention	The Black SeaRed List
Black Sea harbour porpoise *(Phocaena phocaena relicta)*	EN (Endangered)	Annex. II	**	**DD** (**EN** in Ukraine and Romania, **VU** in Bulgaria)
Black Sea common dolphin *(Delphinus delphis ponticus)*	VU (Vulnerable)	Annex. II	**	
Black Sea bottlenose dolphin *(Tursiops truncatus ponticus)*	EN (Endangered)	Annex. II	**	**DD** (**EN** in Romania, **VU** in Bulgaria and Ukraine)

** Endangered species

Dolphin hunting caused hunting of large amounts of dolphins until 1983, when it was completely banned in Turkey. It is estimated that in 22 years (1962-1983) around 160,000 Black Sea common dolphin individuals, in 38 years (1946-1983) 28,000 Black Sea bottlenose dolphin individuals and in 8 years (1976-1983) 211,000 Black Sea harbour porpoise individuals were hunted during the regulated hunting that took place before the ban was put in place (Ref. 7.90; Ref. 7.92; Ref. 7.93). Hazards faced by the Black Sea dolphins according to the Black Sea Commission (Ref. 7.138) report have been summarised in Table7.8.

Table7.8:Hazards Faced by Dolphin Species in the Black Sea (Ref. 7.138)

Hazard Definition	Black Sea harbour porpoise	Black Sea common dolphin	Black Sea bottlenose dolphin
Dolphin hunting (oil extraction, household remedy or food)	past	past	past
Live catch (for military or scientific reasons)	past	past	current
Accidental deaths from fishing	current	current	current
Conscious killing (with firearms)	unknown	unknown	current
Uncontrolled release/flight of captured dolphins	unknown	unknown	past, future
Food scarcity (due to overfishing/invasive alien species)	current	current	current
Water pollution (agricultural, domestic, industrial)	current	current	current
Pathogens causing mass deaths	current	current	current

Seabirds

A number of migration routes stretching from the Arctic to South Africa occur around and over the Black Sea for birds that overwinter, roost and nest in coastal locations (Ref. 7.95). However, in the Turkish EEZ, the birds observed in this region are restricted to a small number of species that may be feeding or migrating through the area. The central Black Sea is outside the main Mediterranean/Black Sea Flyway migration route, which connects Europe with Africa (Figure 7.13). This route is typical of many flyways, following mountain ranges and coastlines, sometimes rivers, often taking advantage of updrafts and other wind patterns to avoid geographical barriers such as large stretches of open water. Thus, the area is not of much importance for migrating birds although data on the occurrence of birds in the central Black Sea (Ref. 7.97).

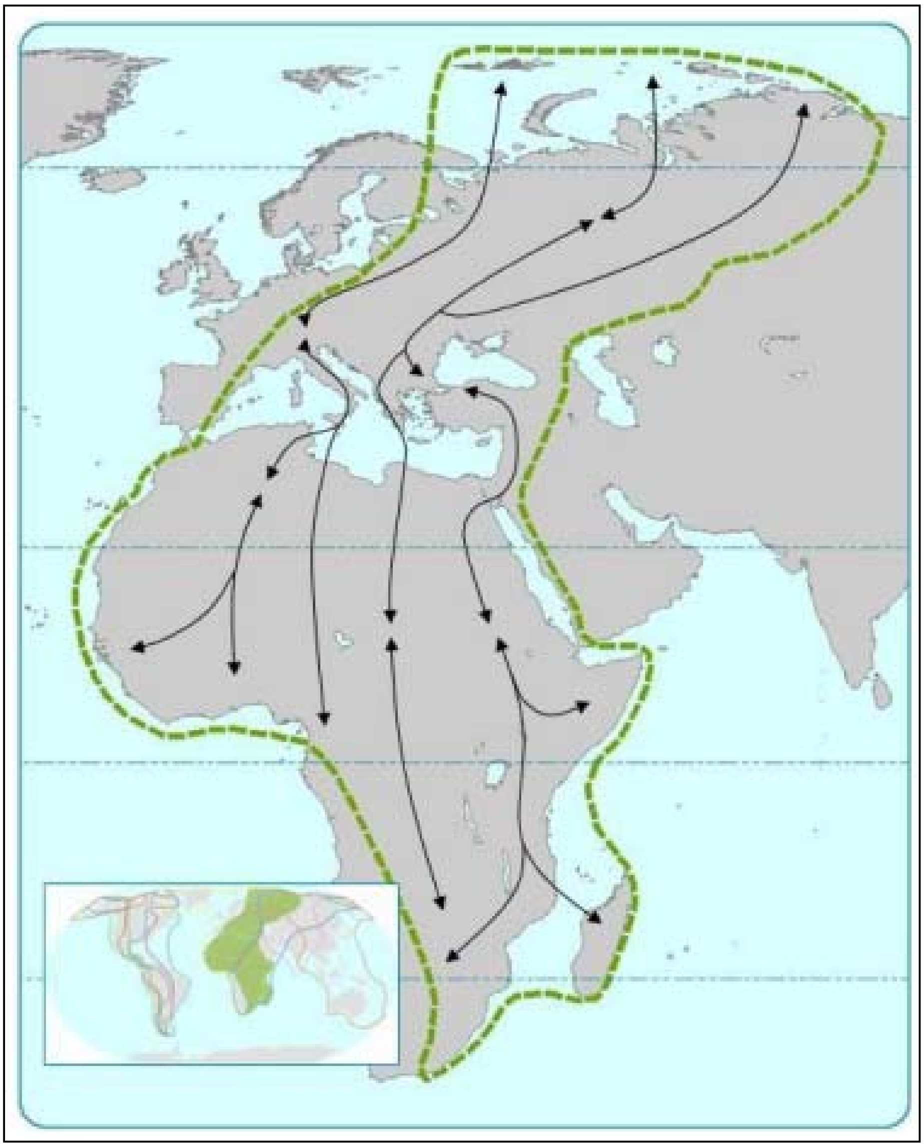


Figure 7.13: Mediterranean/Black Sea Flyway (Ref. 7.58)

Several species of seabird are quite common along the Turkish coast including the Mediterranean shearwater (*Puffinus yelkouan*) and gull. Whilst the said species mostly feed in coastal areas, there is foraging offshore when pelagic species like grey mullet are spawning. The little gull *(Larus minutus*) and the Mediterranean Gull *(Larus melanocephalus)* may also be seen offshore as they make regular migrations between feeding and breeding grounds around the Black Sea.

The Mediterranean or Yelkouan shearwater was formerly considered a subspecies of the Manx Shearwater *(Puffinus puffinus)*. It is a gregarious species, nesting in burrows which are only visited at night to avoid predation by large gulls. It breeds on islands and coastal cliffs in the eastern and central Mediterranean in spring and early summer, after which the birds disperse throughout their range.

The Mediterranean shearwater may range widely, with birds ringed in Malta having been observed in the Black Sea. Increasing numbers have in fact been observed entering the Black Sea since the 1970's though there are no recent records of breeding birds there. Non-breeding birds are mostly present in the Black Sea from February to October, though some are present all year. This species has been reported to make large scale clockwise movements around the Black Sea, with flocks of up to 20,000 gathering in the north during summer months (Ref. 7.98).

The Mediterranean shearwater is under threat from coastal development in its breeding range as well as predation of eggs and young by rats and cats. Adult birds are frequently caught in long line fisheries, and may also suffer from depleted food stocks due to the overfishing of anchovy in some areas (Ref. 7.99).

Genetic studies suggest that the Mediterranean Shearwater may have suffered a marked population decline historically and thus could be vulnerable to adverse effects of inbreeding (Ref. 7.100). It was formerly classified as a species of least concern by the IUCN but in 2012 this was changed to Vulnerable.

The little gull can be found breeding in northern Scandinavia, the Baltic, western Russia and Siberia. Its distribution expands in winter to include most of the Mediterranean, Black Sea and Caspian Sea coastlines, as well as the Atlantic coast of Europe. This species is fully migratory and usually arrives in its breeding areas from late-April to late-May and leaves in late-July (although its movements are poorly documented). The species is gregarious and breeds from late-June in mixed-species colonies and sub-colonies occasionally as large as 2,000 individuals, sometimes also in more solitary scattered pairs (Ref. 7.101).

The little gull has an extremely large range, the population trend appears to be increasing and population’s sizes are very large. As such this species is evaluated as “least concern” on the IUCN Red List (Ref 7.99).

The Mediterranean gull breeds almost across Europe, with its main breeding area in Ukrainian coast of the Black Sea. Breeding areas have recently spread to the plains of northern Caucasia (Ref. 7.20). Most populations are fully migratory and travel along coastlines between their breeding and wintering areas, although some travel inland across Anatolia or follow major river valleys through Eastern and Central Europe (Ref. 7.98).

Outside the breeding season the species becomes entirely coastal, favouring estuaries, harbours, saline lagoons and other sheltered waters. Mediterranean gulls migrate to breeding colonies at lagoons, estuaries and coastal salt marshes from late-February to early-April, with most beginning to breed from early-May. A significant portion of the population also breeds on lakes and lowland marshes away from the coast (Ref. 7.98). It often breeds near but not among Sandwich terns *(Sterna sandvicensis)*, or intermingling with black headed gulls *(Larus ridibundus)* (Ref. 7.99).

The migration to the wintering grounds occurs from late June onwards through to autumn. The gulls breed in colonies, usually of less than 1,000 pairs and occasionally in single pairs amidst colonies of other species. Mediterranean gulls are susceptible to heavy losses as a result of tourist disturbance at breeding colonies. They may also be threatened by habitat loss resulting from coastal development and by marine pollution (oil spills and chemical wastes).

Surveys were carried out covering all the Turkish waters of the Black Sea (EEZ and territorial waters) in 2009 in the scope of the TurkStream Gas Pipeline – Turkey EEZ Section (formerly known as South Stream Offshore Pipeline–Turkey Section Project). In the summer 2009 surveys, 20 taxa were observed with 18 identified to species level. In total, 1,195 birds were seen: 299 at stations and 934 during transects. The greater number of birds observed in summer 2009 is due to two species recorded in great numbers: the Mediterranean shearwater *(Puffinus yelkouan*) and the Caspian gull (*Larus cachinnans*), which are resident species in the Black Sea. These two accounted for 44% of all individuals observed during transects. Table7.9 lists the birds observed during the 2009 survey and their conservation status.

Table7.9: List of Bird Species Observed During the 2009 Survey and Total Number of Birds

Species Name	Common Name	Red Data Book Black Sea	IUCN Red List Category	Number of species observed(2009)		
				Stations	Transects	Total
Alauda arvensis	Eurasian skylark	-	LC	3	2	5
Anas platyrhynchos	Mallard	-	LC	-	30	30
Anthus pratensis	Meadow Pipit	-	LC	7	-	7
Circus cyaneus	Northern Harrier	-	LC	1	-	1
Columba livia	Rock Pigeon	-	LC	-	2	2
Cygnus cygnus	Whooper Swan	-	LC	-	1	1
Egretta alba	Great Egret	-	-	-	2	2
Fulica atra	Eurasian Coot	-	LC	-	7	7
Gavia arctica	Black-throated loon	-	LC	11	50	61
Gavia sp.	Loon species	-	-	-	17	17
Larus cacchinans	Caspian gull	-	-	178	273	451
Larus canus	Mew gull	-	LC	2	3	5
Larus minutus	Little gull	-	LC	-	1	1
Larus ridibundus	Black-headed gull	-	LC	4	2	6
Phalacrocorax carbo	Common cormorant	-	LC	1	70	71
Podiceps cristatus	Great-crested grebe	-	LC	-	9	9
Podiceps nigricollis	Black-necked Grebe	-	LC	-	2	2
Podiceps sp.	Grebe Species	-	-	-	5	5
Puffinus yelkouan	Mediterranean shearwater	N/A	VU	45	452	459
Sturnus vulgaris	Common Starling	N/A	N/A	47	6	53
Total				299	934	1195

IUCN Category: NA – No category yet, LC: Least Concern, VU: Vulnerable.

Songbirds are particularly of importance since they represent 219 out of a total of 500 bird species registered in Turkey during the 2009 surveys. The information provided on the seabirds of the Black Sea is considered valid for the Project's Offshore Section, as it is for the overall literature study of which findings are given in this section.

7.1.1.1.3 Conclusion and Evaluation

Pipeline laying operations during the construction phase of the Project are expected to have the biggest impact on the ecological receivers within the Project's Offshore Section. Underwater noise and vibration, water and waste discharge, light sources to be used for lighting that may be produced by the vessel fleet may have some potential, even though low, to have an impact on the aquatic biota located in Offshore sections of the Project during construction operations related to the Project.

Fish in the Offshore Section of the Project are of great importance, particularly in terms of fishing activities taking place in the Black Sea. Considered to be the most important fish resource of Turkey in the Black Sea due to its commercial value, the anchovy migrates to the northern basin of the Black Sea in February – April to spawn and feed. As the weather starts to get colder, the anchovy descends to the Turkish coasts in October – December, having spawned and fed up in the north. The anchovy is also known to have intensive reproductive activities in the southern Black Sea.

Since migrating fish schools like the anchovy move rapidly, they only stay in each location for a short period of time. The pipeline laying vessel fleet is considered a stationary object since it will be advancing nearly 3.5 km per day, thus enabling migratory fish species like the anchovy to avoid that area. Given that the migration corridor in the Turkish EEZ is around 125 km wide, the vessel fleet advancing within a relatively narrow corridor is not thought to restrict fish migration. Furthermore, the acoustic impact modelling for the construction (vessel) spread under the TurkStream Gas Pipeline – Turkey EEZ Section (formerly known as the South Stream Offshore Pipeline –Turkey Section Project) showed that the noise will not lead to death or injury among the marine organisms and will only affect some individuals locally for short durations without having an impact on the community in general. As the impact will be limited to the construction phase, it is believed that Project activities will not have a long-term impact on the migratory behaviour of the fish or the marine ecology.

During the operational phase of the Project, pipelines will be placed on the Offshore Section at a depth of around 2,000 m. Because there are no fish below the depth of around 150 m, operation of pipelines will have no impact on the marine organisms and fish species. Consequently, no significant impact is expected during the operational phase of the Project. Although it is not possible to fully evaluate the impact of the de-commissioning phase of the Project, two different strategies can be compared: leaving in situ and removal of the pipes. The first strategy would create the same impact as the operational phase, while the other one will have similar impact to that of the construction and pre-construction phases. In this light, both are subject to similar mitigation strategies.

The aforementioned potential impact is thought to be negligible as the design controls are adopted and mitigation measures are put in place.

7.1.2 Shore Crossing Section

A marine biology study of the site covering the coastal waters through which the Project route passes (within 1 nautical mile) was undertaken by the Institute of Marine Sciences and Technology (DEU-IMST) of Dokuz Eylül University to describe the biological environment within the Shore Crossing Section of the Project and to evaluate the baseline as is stated in the opinion letter (**ANNEX-5.A**) dated July 2015 of the Directorate General of Environmental Management of the MoEU. A broad summary of the findings from the marine biology study covering the Shore Crossing Section of the Project has been provided below and the final report is provided in **ANNEX-7.A**.

The marine biology study mainly aims to identify biodiversity and marine habitats within the site as well as to obtain baseline information about the site prior to planned dredging activities within the Project. In this context, the Environmental Management Plan for Dredging, also drafted by the DEU-IMST in light of the information obtained from the completed studies and in compliance with the format requested in the opinion letter dated July 2017 (**ANNEX-5.A**) of the Marine and Coastal Area Management Department, Directorate General of Environmental Management of MoEU, is provided in **ANNEX-7.B**. A summary of the full report is also given under Section 7.1.2.4.

7.1.2.1 Marine Biology Study - Introduction

The Black Sea is the world's most isolated inland sea. Its only connection to other seas is through the narrow Turkish Straits System to the Mediterranean. Despite its low salinity (‰18) and anoxic waters under 200 m (with high level H2S), the Black Sea has relatively diverse marine flora and fauna. Out of nearly 3,800 plant and animal species identified within the Black Sea, 42.9% are fungi, algae and plants, 52.5% are invertebrates, 4.5% are fish and 0.1% are marine mammals (Ref. 7.2). Although saltwater fish only has a small share in the biodiversity of the Black Sea, large stocks of species such as anchovy, bluefish and bonito are important due to their high commercial value. Majority of the research on fisheries were carried out in the central and eastern Black Sea basins. There are only few studies available on Thracian coasts (Ref. 7.55). The marine biology studies in this section aim to produce baseline information about the Shore Crossing Section of the project site.

The marine biology study intended to cover the following issues:

- Identifying the ecological characteristics of the survey site,
- Classifying and evaluating the habitats of the survey site taking into account benthic habitats, sea grasses, fish spawning sites etc. (habitat imaging to be included)
- Presence and evaluation of indicator species found in the survey site,
- Evaluation of the endemic/endangered species found in the survey site as per the IUCN Black Sea Red List and Bern Convention Annexes 1 and 2,
- Composition, diversity and abundance of species,
- Ecological status of marine species found in the survey site.

In addition to the above-mentioned issues, in light of water and sediment quality data measured on the survey site and the analyses of the sediment samples collected from the study site, a site-specific sediment distribution map was elaborated and provided under relevant sections.

7.1.2.2 Methodology Adopted for the Marine Biology Study

The marine biology study was conducted by the specialists from the DEU-IMST. The survey vessel R/V K. Piri Reis of the DEU-IMST was deployed for the study. Sampling stations to be established on the survey site for the marine biology study were determined based on the opinion letter dated July 2015

(**ANNEX-5.A**) of the Directorate General of Environmental Management, MOEU. The relevant opinion was that to establish a baseline, samples were to be taken on the route of the pipeline starting from the coast towards the offshore within 1,800 metre-radius and at 500, 1,000 and 1,800 metres from the coast, both within regions through which the line passes and at 500 m distances on both sides of the line. In addition to the distances stated in the opinion letter, it was agreed to take samples also at 250 m from the coast on the pipeline route as well as at 500 m from the sides of this area upon the deliberations with the Directorate General of Environmental Management, MOEU. As is stated in the same opinion letter, these observations are also to be planned so that they are made on the same locations; twice per year before the construction starts, twice per year during the construction and once the construction has been completed. In conclusion, a number of studies on marine physical oceanography, geology, biology and fisheries were carried out on the Shore Crossing Section of the Project site(Figure 7.14) from 4 to 6 April 2017,using the K. Piri Reis survey vessel, on the survey site covering the stations indicated in Figure 7.15and Table7.10.Relevant methodologies for each study are presented under the following subheadings.

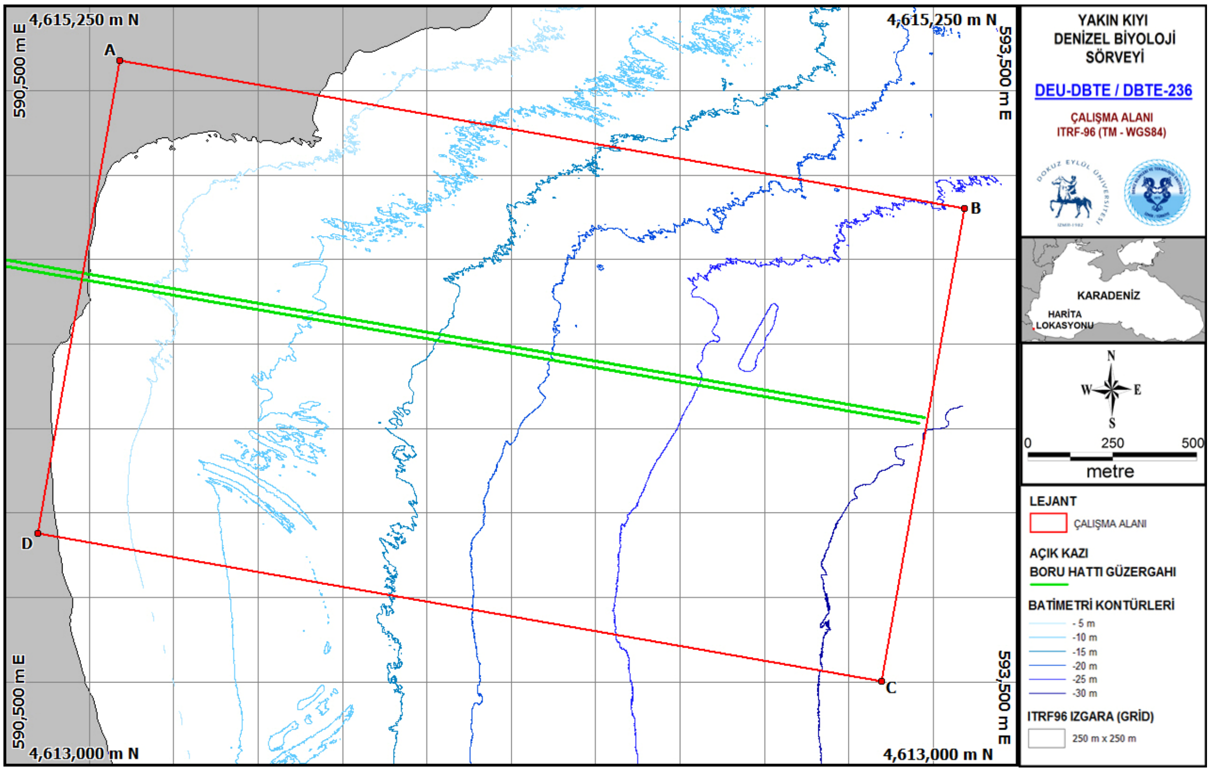


Figure 7.14: Shore Crossing Section Marine Biology Survey Site

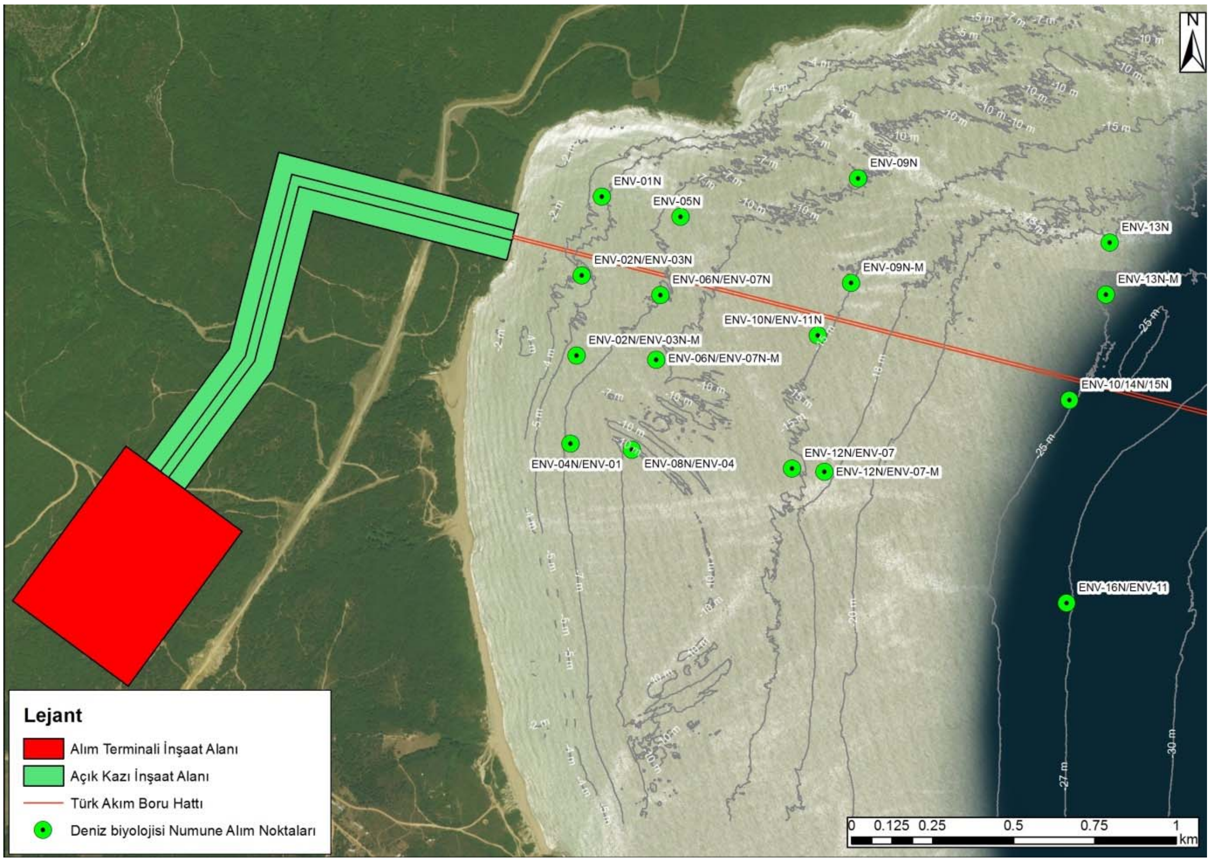


Figure 7.15: Marine Biology Sampling Points

Table7.10: Parameters measured at marine biology sampling points

STATIONCODE	X	Y	DEPTH(m)	CTD	SECCHI DISC	SEDIMENT	PHYTOPLANKTON	ZOOPLANKTON	BENTHIC
ENV-01N	28,092785	41,661300	5	√	√		√		√
ENV-02N/ENV-03N	28,092228	41,659053	5	√	√		√		
ENV-05N	28,095781	41,660881	8	√	√		√		√
ENV-06N/ENV-07N	28,095223	41,658636	8	√	√		√		
ENV-09N	28,102329	41,662292	11	√	√		√		
ENV-10N/ENV-11N	28,101214	41,657800	15	√	√		√		√
ENV-13N	28,111914	41,660953	21	√	√		√	√	
ENV-04N/ENV-01	28,092216	41,654303	8	√	√		√		√
ENV-08N/ENV-04	28,094545	41,654247	10	√	√		√		√
ENV-12N/ENV-07	28,100586	41,654014	13	√	√		√		
ENV-10/14N/15N	28,110797	41,656460	25	√	√		√	√	√
ENV-16N/ENV-11	28,111203	41,650753	27	√	√		√	√	√
ENV-12N/ENV-07-M	28,101797	41,653983	18			√			
ENV-13N-M	28,111907	41,659494	26			√			

STATIONCODE	X	Y	DEPTH(m)	CTD	SECCHI DISC	SEDIMENT	PHYTOPLANKTON	ZOOPLANKTON	BENTHIC
ENV-09N-M	28,102328	41,659341	15			√			
ENV-06N/ENV-07N-M	28,095229	41,656814	10			√			
ENV-02N/ENV-03N-M	28,092234	41,656788	6			√			

7.1.2.2.1 Physical Oceanography

Temperature and salinity data was measured with CTD (Conductivity, Temperature, Depth) probe. Concentration was calculated using the data on temperature, salinity and depth.

Temperature and salinity data was measured on 12 stations of the survey site, using the SBE 911plus CTD system, on 4 and 5 April 2017 (Figure 7.15). CTD probe also measures light permeability and dissolved oxygen value every metre throughout the entire water column. Vertical profiles were drawn to observe how variables change throughout the water column. In addition to vertical profiles, vertical and horizontal transects were also provided to reveal changes to the physical variables within the survey area. All CTD sensors are calibrated every year by Sea-Bird Electronics. Table7.11 gives the characteristics of temperature, conductivity and pressure sensors. Secchi depth was measured using the Secchi disc on all stations shown in Figure 7.15. The Secchi disc is a white, flat disc that is 25 cm in diameter and is used to measure water clarity.

Seasonal thermocline was identified based on temperature profiles and using temperature criterion. According to that criterion, in the event that temperature at a given depth differs by 0.5 °C from the surface temperature, this first depth is considered mixed-layer depth.

Table7.11: Characteristics of the SBE 911plus CTD probe

Measuring Range

Conductivity	0 to 7 S/m
Temperature	-5 to +35 °C
Pressure	6.800 m, 10.000 psia

Measuring Accuracy

Conductivity	± 0,0003 S/m
Temperature	± 0,001 °C
Pressure	± 0,015% full scale range

Typical Stability

Conductivity	0,0003 S/m monthly
Temperature	0,0002 °C monthly
Pressure	0,02% annual

Resolution (24 Hz)

Conductivity	0,00004 S/m
Temperature	0,0002 °C
Pressure	0,001% full scale

Other

Measurement Rate	24 Hz (24 sample/sec)
Time Response	conductivity and temperature 0,065 sec; Pressure 0,015 sec
Master Clock Error Contribution	conductivity 0,00005 S/m; Temperature 0,00016 °C; Pressure 0,3 dbar (for 6.800 m [10.000 psia] sensor)
Auxiliary Sensors	Power consumption from 1 A to +14.3 V; 0-5 VDC input space; Initial accuracy ± 0.005 V; Stability 0.001 volt/month; Resolution 12 bits; Time response 5.5 Hz 2-pole Butterworth Low Pass Filter.
Sea Cable	Inner conductor resistance 0 to 350 ohms
Modem Baud Rate	300 baud (30 characters/sec, full duplex)
9plus Housing, Depth Range, Weight (with pump and cage)	Aluminium; 0-6.800 m; 25 kg in air, 16 kg. in water
11plus	Sizing 13.0 x 37.5 x 44.4 cm; 48.3 cm from one side to another for assembly brackets. AC power requirement 130 watts at 115 or 230 VAC 50-400 Hz.

7.1.2.2.2 Survey Site Sediment Distribution

In the scope of Shore Crossing Section Water and Sediment Quality Survey, which was carried out between 23 January 2017 and 4 February 2017and details of which are given under the **Chapter 6** (Assessing Baseline Environmental Properties, Part 6.4.3.1), seawater and sediment samples were collected from the pre-defined points (Figure 7.15) by the Düzen Norwest Çevre Gıda ve Veteriner Sağ. Hiz. Eğt. Dan. Tic. A.Ş. (Düzen Norwest) laboratory, taking into account the issues raised in the opinion letter (**ANNEX-5.A**) dated July 2015 of the Directorate General of Environmental Management of the MoEU and explained earlier in this section. During the site survey conducted in the scope of the Shore Crossing Section Water and Sediment Quality Survey, sediment samples could not be collected at 5 points indicated in Table7.10 (ENV NEW 03N, ENV NEW 07N, ENV 09N, ENV 12N/ENV 07 and ENV 13N) due to rocky seabed. Thus, sediment samples were collected using grab sampler from sedimentary floors that are closest to these 5 points during the marine biology site study carried out in 4-6 April 2017 (Table7.12). These samples were subjected to sieve analysis at the DEU-IMST Geology Laboratory to identify sediment distribution of the study site in line with ASTM (American Society for Testing and Materials) D421/422 standards (Ref. 7.47, Ref. 4.48). Sediment categories were defined for all stations in line with Shepard (Ref. 7.59) classification system as modified by Schlee (Ref. 7.49), using SEDPLOT (Ref. 7.60, Ref. 7.62) software.

Table7.12: Sediment sampling stations (those marked as modified were sampled during the marine biology study)

Stations	X	Y	Depth (m)
ENV-05N	28,095781	41,660881	11
ENV-NEW 11N	28,101236	41,657761	15
ENV-NEW 04N	28,093222	41,649636	8
ENV-16N/ ENV-11N	28,111203	41,650753	27
ENV-08N/ENV-04	28,094545	41,654247	10
ENV-NEW- 15N/ENV-10	28,110797	41,656460	25
ENV-01N	28,092785	41,661300	5
ENV-02N/ENV-03N (modified)	28,092234	41,656788	6
ENV-06N/ENV-07N (modified)	28,095229	41,656814	10
ENV-09N (modified)	28,102328	41,659341	15
ENV-13N (modified)	28,111907	41,659494	26
ENV-12N/ENV-07 (modified)	28,101797	41,653983	18

7.1.2.2.3 Phytoplankton

A total of 22 phytoplankton samples were collected during the exercise carried out on 4 and 5 April 2017 at the marine biology study site. A total of 12 stations were sampled within the study zone; and on 10 sampling points, samples were collected at two different depths including surface (0 m) and deep (7.5-27.8 m) water. Only surface sampling was conducted on the other 2 stations. Phytoplankton samples were collected into 1-litre bottles, fixed suing Lugol solution and then settled in the laboratory. Fully settled (7-10 days) samples were syphoned out and concentrated down to 5 ml. Samples were counted with the inverted light microscope using single drop method (Ref. 7.72). Phytoplankton species identification was done using different sources (Ref. 7.72; Ref. 7.77;Ref. 7.78; Ref. 7.82; Ref. 7.86; Ref. 7.96; Ref. 7.102; Ref. 7.103; Ref. 7.104).

7.1.2.2.4 Zooplanktons

Zooplankton samples were collected from four stations (Table7.10). Three of the four sampling stations on the horizontal line of the coastal zone under the river influence and one station in the deepest part of the area in the offshore zone were identified as reference stations. Sampling was carried out by vertically pulling the plankton bucket from the bottom to the surface.

WP2 plankton bucket (WP2 net, mesh opening 200 µm) was pulled out vertically at a speed no greater than 1 m/s. The digital 5-step Flowmeter was fitted onto the mouth of the plankton bucket to calculate the volume of filtered water. Once the plankton bucket was pulled on board the vessel, the sample that accumulated in the collector was poured into the large jar or bucket. After each sampling, plankton was washed lightly with the heavy hose using the seawater flow and added to the jar. A label, where descriptive information including station name and number, sampling time, flowmeter readings etc. was marked using a water-resistant pen, was placed on the sample bottle.

Plankton samples were conserved with formaldehyde solution to ensure that the last concentration is 4% (1 part 40% formaldehyde + 9 parts seawater). Samples were stippled with sodium borax ($Na_2B_4O_3.10H_2O$) prior to formaldehyde usage to ensure a pH of 8.0-8.2.

Samples were stored in the dark awaiting microscopic studies. Samples that are brought to the laboratory were condensed by removing the seawater on top, through filtration method in jars depending on their concentration.

Abundance of species belonging to zooplankton groups was determined through census of the species within the sample. Censuses were carried out under stereomicroscope using zooplankton census camera. The number of common zooplankton groups and the species belonging to these groups were calculated with sub-sampling censuses. For rare groups with low abundance, abundance values were determined through the analysis of the entire sample.

Detailed taxonomic analysis for species was based on different research findings. Data belonging to zooplankton groups were classified down to branch, class, team, type and species level. Adult copepods (female and male), copepodite, copepod nauplii and cladoseras Mauchline and others (Ref. 7.142) were identified down to their species and type level using Johnson and Allen (Ref. 7.143). Species identification for the copepod and cladoseras was done based on their general anatomies and P4, P5 swimmeret legs, a1 antenna and urosome structures. Results were calculated in terms of species composition and abundance (individual/m3).

7.1.2.2.5 Macrobenthos

Black Seacoasts are represented with fewer number of species in Turkey, compared to other Turkish coasts. Salinity, despite being the most important component of the benthic ecosystem, affects the diversity of species in the Black Sea as well as physio-chemical parameters like eutrophication in the water column and hypoxic conditions in most deep waters.

Soft substratum samples were collected on 5-6 April 2017 from 7 stations with van Veen grab, which can sample an area of 0.1 m^2. Hard substratum samples were taken on 11-12 May 2017, from 5 stations, using a quadrat that can sample an area of 400 cm^2 by scuba-diving. Material within each quadrate was carefully scraped off using a spatula. Benthic samples were filtered on board the vessel using a sieve with 0.5 mm mesh opening and the remaining material was washed with freshwater and stored in containers with 4% seawater-formaldehyde solution. Samples were washed with freshwater once again at the laboratory and were divided into their taxonomic groups under the stereo microscope. Individuals belonging to systematic groups were stored in bottles containing 70% alcohol. Species were subsequently assigned using stereo and light microscope. Biomass values (wet weight) of benthic non-vertebrates were identified via precision scale after removing the excess water from their bodies with a drying paper. Number of species, number of individuals, abundance, dominance, frequency index of Soyer, Shannon-Wiener diversity and Pielou Evenness index values were calculated in the study.

Epifauna samples were collected with the K. Piri Reis vessel on 5-6 April 2017 using trawl and beam trawl. All of the collected samples were divided into their main groups and weighed. Invertebrate species were placed in drums containing4% formaldehyde solution. Having been washed under running freshwater, invertebrates were rearranged at the laboratory using a stereomicroscope based on their taxonomical groups. Then species were identified and number of individuals per species were found out. An Olympus Touch TG-4 camera was used to visually record the species.

7.1.2.2.6 Fish and Fisheries

Several samples were collected within the survey site on 5-6 April 2017 using beam trawl[1]and deep trawl to establish a baseline for fisheries resources distributed on the seabed and/or near the seabed (demersal) (Figure 7.16). Prior to sampling, suitability of the deep structure for bottom trawling or beam trawling was checked with the scientific echo sounder (Simrad EK60) and a total of 8 samplings were done: 4 with beam trawling and 4 with bottom trawling. Bottom trawling was not used for sampling at depths shallower than 20 m within the study area, where beam trawling was preferred over bottom trawling. Two of the sampling rounds using beam trawl were conducted at depths shallower than 20 m, while the other two were conducted within lines starting at 16-17 m levels to 31-33 m. Information regarding the location, depth and sampling times of the said beam-trawl and deep-trawl sampling rounds are given in Table7.13. The distance travelled during the trawling between the start and finish points is also given in Figure 7.17. Samplings were done in daylight (daytime), and the deep trawl or the beam trawl were towed at 3 nautical miles/s once they settled onto the seabed. For both sampling instruments, mesh opening at the end of the net pocket measures 20 mm from node to node (full mesh measures 40 mm).

After each sampling (once sampling instrument is taken to the deck), caught organisms were first divided into two groups, namely invertebrates and fish. Invertebrates were divided into subgroups such as tunicata, bivalvia, gastropoda, echinodermata, decapoda etc. and weighed collectively, and then placed into 4% formaldehyde solution for species identification later on at the laboratory (information regarding these species is available under macrobenthos section of this report). However, out of these benthic invertebrates, sea snail (Rapana venosa) and black mussel (*Mytillus galloprovincialis*), which are commercially significant and very widely distributed across the Black Sea, were assigned at species level and their numbers were also recorded in addition to their weight. Identification of all fish species caught during the survey was done at species level and total number and total weight of individuals for each species was measured and recorded. All weighing on board the vessel was done using a scale (Marel brand) specifically designed to weigh at sea, with 2-g accuracy.

[1] A fishing instrument, whose opening is made of an iron frame, to which a net pocket is attached and dragged across the seabed (Hoşsucu, 1991).

Figure 7.16: Trawling operation

Table7.13: Information regarding sampling with beam trawler and bottom trawler in the survey area

Sampling Date	Station No	Coordinates		Sampling Depth (m)		Sampling Time		State of the Air and the Sea	
		Start	Finish	Start	Fin	Start	Fin	Air	Sea
05.04.2017	1	41° 38´ 202´´ N 028° 06´ 278´´ E	41° 38´ 744´´ N 028° 06´ 054´´ E	14	17	15:14	15:31	Calm	Calm
05.04.2017	2	41° 39´ 011´´ N 028° 06´ 079´´ E	41° 38´ 815´´ N 028° 07´ 183´´ E	17	33	16:02	16:39	Calm	Calm
05.04.2017	3	41° 39´ 030´´ N 028° 06´ 127´´ E	41° 38´ 268´´ N 028° 06´ 364´´ E	17	18	16:58	17:22	Calm	Calm
05.04.2017	4	41° 38´ 624´´ N 028° 06´ 109´´ E	41° 38´ 392´´ N 028° 07´ 237´´ E	16	31	17:47	18:14	Calm	Calm
06.04.2017	Tr1	41° 36´ 972´´ N 028° 07´ 663´´ E	41° 38´ 736´´ N 028° 07´ 848´´ E	19,5	43	09:30	10:10	Calm	Calm
06.04.2017	Tr2	41° 39´ 397´´ N 028° 06´ 808´´ E	41° 38´ 228´´ N 028° 06´ 975´´ E	27	29	11:00	11:30	Calm	Calm

Sampling Date	Station No	Coordinates		Sampling Depth (m)		Sampling Time		State of the Air and the Sea	
		Start	Finish	Start	Fin	Start	Fin	Air	Sea
06.04.2017	Tr3	41° 39´ 237´´ N 028° 06´ 479´´ E	41° 38´ 100´´ N 028° 06´ 838´´ E	25	26	11:55	12:19	Calm	Calm
06.04.2017	Tr4	41° 39´ 009´´ N 028° 06´ 106´´ E	41° 38´ 539´´ N 028° 08´ 201´´ E	18	52	12:50	13:25	Calm	Calm

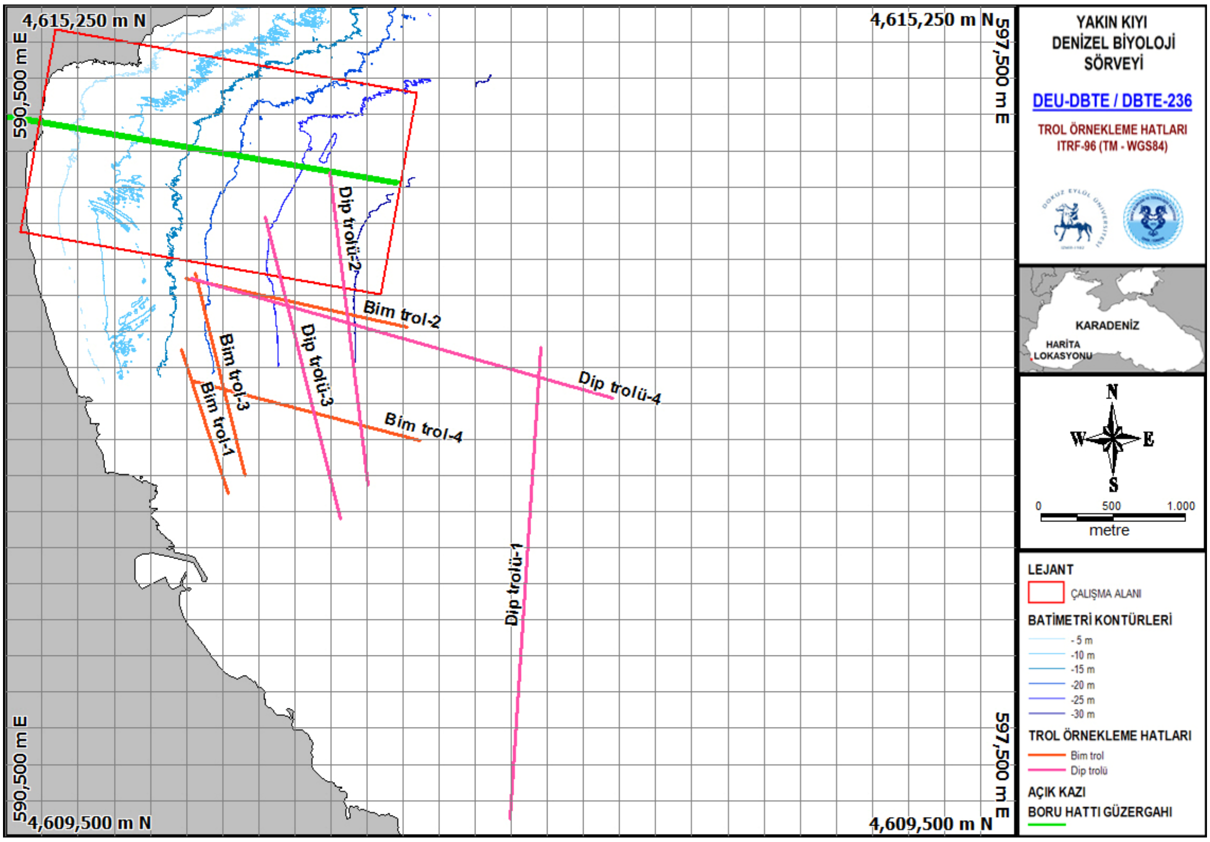


Figure 7.17: Start and finish points of trawl lines off the coast of Kıyıköy

As towing times of samplings done at the survey site may vary depending on the suitability of the seabed, amount of catch for the species caught per sampling was proportioned to 1 hour and calculated in kg/hour (proportioning took into account the amount of time that took the sampling instrument to settle onto the seabed and then get off of it. These times are around 14 minutes for the beam trawl no. 1 and 32, 20 and 22 minutes for the beam trawl no. 2,3 and 4 respectively. Values for trawl samplings were around 30, 25, 20 and 30 minutes respectively). Weight ratios (%) and biomass amounts (kg/km^2) of the species within the catch composition were calculated.

Biomass estimations were produced using the following equation per 1 km^{2}unit area:

$$\sum_{i=1}^{n} \hat{B}_i = \frac{A \cdot \overline{C}_i}{a_i \cdot q}$$

In the equation;

$\hat{B}$:average biomass estimation

$\overline{C}_i$: i. average amount of catch of the sampling

A : total area for which biomass estimation was made (1 km^2).

a_i : i. screened area for the sampling

q :catch coefficient of the trawl net (here, q value will be assumed to be "1").

Variance of the average biomass value was found with the following equation:

$$\mathrm{var}(\hat{B}) = \sum_{i=1}^{n} \left(\frac{A_i}{a_i}\right)^2 \cdot \frac{\mathrm{var}(C_i)}{n}$$

In the equation n represents the total number of trawls towed at each sampling time. Square roots of the calculated variance values were taken to find the standard deviations.

Waste materials caught during bottom trawl sampling sessions at the Project site were divided into categories such as plastic, glass, metal etc., weighed, and the amounts were calculated per unit area (1 km^2) using the above-mentioned screened area method.

Besides biomass estimations, length-frequency distribution graphs were also elaborated for the whiting (*Merlangius merlangus*), which have commercial value, caught during trawl samplings. To that end, total lengths of the fish were measured with 1 mm accuracy; however, they were arranged into groups of categories within 1 cm length range while drafting the graphic. The number of individuals per length category is proportioned to the total number of individuals in the relevant species so as to identify observation frequency per length category in percentages and then frequency distributions were made into a graph.

7.1.2.2.7 Marine Mammals

Marine mammals that were observed during the studies at the survey site were recorded and listed.

7.1.2.2.8 Survey Site Sea Water and Sediment Quality Analyses

In the scope of the Shore Crossing Section Water and Sediment Quality Survey which was carried out between 23 January 2017 and 4 February 2017 and whose details are given under Chapter 6: Assessing Baseline Environmental Properties, sea water and sediment samples were collected from the points, which were explained above in detail and identified taking into account the points made in the opinion letter (**ANNEX-5.A**) dated July 2015 of the Directorate General of Environmental Management, MoEU (Figure 7.15), by Düzen Norwest laboratory.

Sediment samples collected under the supervision of Düzen Norwest laboratory representatives from the 12 points whose coordinates are given in Table7.10 were stored under proper conditions by the lab representatives to be forwarded to Düzen Norwest Laboratory for chemical analyses and to Marmara Research Centre of the Scientific and Technological Research Council of Turkey (TUBİTAK) for hazard analyses as per the Waste Management Regulation ANNEX-3B. The samples were found to be non-hazardous as a result of the analyses of the 12 sediment samples collected from the site. Analysis results provided by the Marmara Research Centre of the Scientific and Technological Research Council of Turkey (TUBİTAK) are given in **ANNEX-6.F**. Impact of the sea water and sediment quality on biological environment is discussed in the following sections.

7.1.2.2.9 Types of Habitats within the Survey Site

Diving lines were identified based on the seabed information provided by the Project Owner, covering in particular the characteristics of the seabed as well as those of the sediment. Diving operations were planned taking into account the entire seabed information and so as to define benthic habitats.

Underwater visual observations at the previously defined 12 diving lines were carried out with scuba diving equipment from R/V K. Piri Reis Research Vessel (Table7.14andFigure 7.18). Location records of the dived lines were established by pulling of the GPS buoy on the surface by one of the divers who followed the lines underwater. Divers took visual records of sea bottom habitats on these lines by filming and taking photographs, and recorded all habitat types and boundaries by also taking depth and time into account. Depth and time data were used to help identify boundaries of habitat types by matching bathymetry and GPS coordinates.

Habitat types were identified based on the European Nature Information System's (EUNIS) habitat classification system (http://eunis.eea.europa.eu/habitats-code-browser.jsp). Observed habitats were recorded at level 3 Marine Habitats section under the EUNIS hierarchy.

GPS lines and matching coordinates were introduced into bathymetry and seabed characteristics zones using the Geographic Information Systems software, and habitat types were digitalised.

Table7.14: Habitat mapping diving lines

ID	Start X	Start Y	Start Depth (m)	Finish X	Finish Y	Finish Depth (m)	Line Length (m)
D-TR-1	28.088686	41.653508	2	28.090372	41.659183	2	762
D-TR-2	28.092176	41.662857	2	28.097700	41.662577	7	512
D-TR-3	28.103616	41.662191	12	28.097788	41.662429	7	516
D-TR-4	28.098730	41.659887	11	28.092013	41.660371	4	591
D-TR-5	28.098501	41.658026	12	28.092844	41.659375	6	615
D-TR-6	28.089261	41.653457	2	28.096764	41.657395	10	992
D-TR-7	28.094417	41.652965	10	28.094641	41.654598	11	409
D-TR-8	28.101714	41.651941	19	28.096898	41.654588	12	704
D-TR-9	28.116251	41.650052	30	28.111412	41.650473	27	424
D-TR-10	28.109957	41.656564	24	28.102785	41.657894	16	701
D-TR-11	28.113838	41.657677	26	28.110293	41.660272	23	478
D-TR-12	28.116178	41.660744	25	28.111723	41.662831	16	582

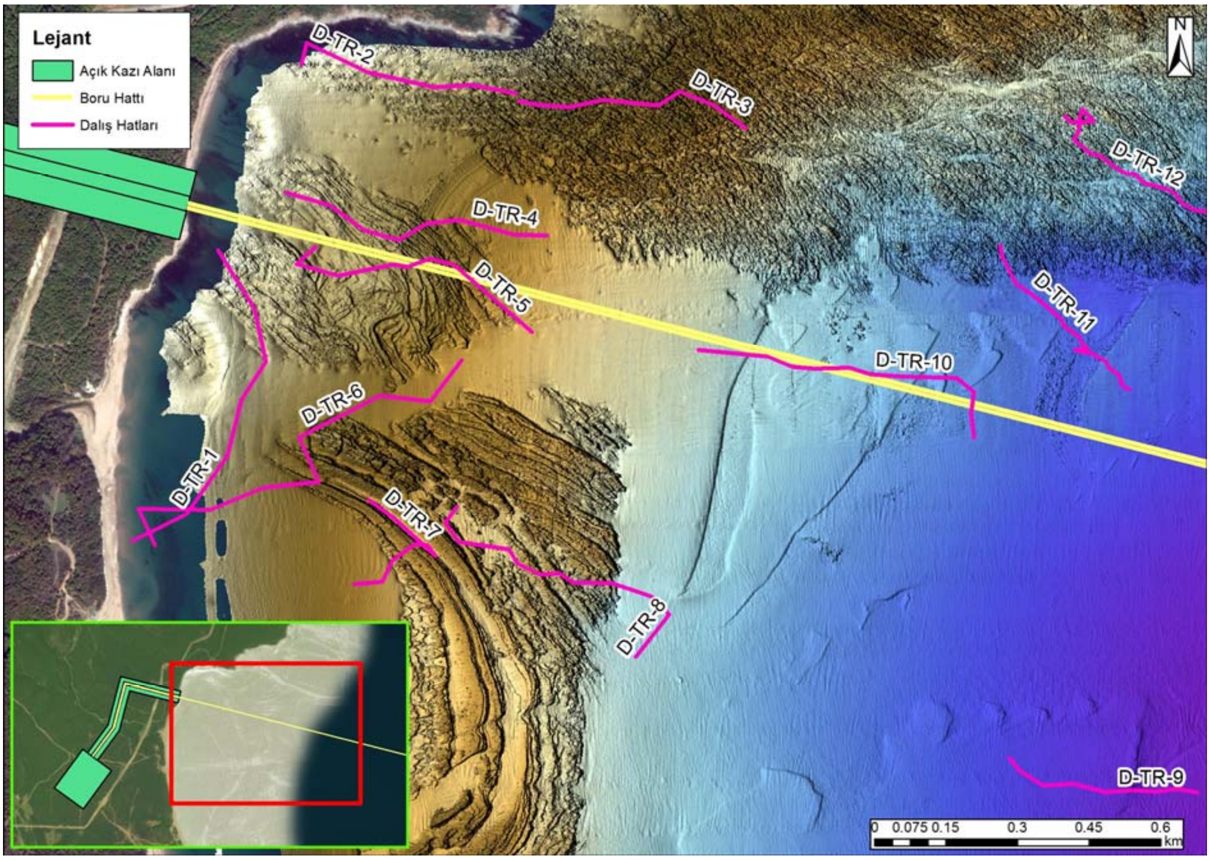


Figure 7.18: Locations of diving lines

7.1.2.3 Marine Biology Survey – Findings and Evaluations

7.1.2.3.1 Physical Oceanography

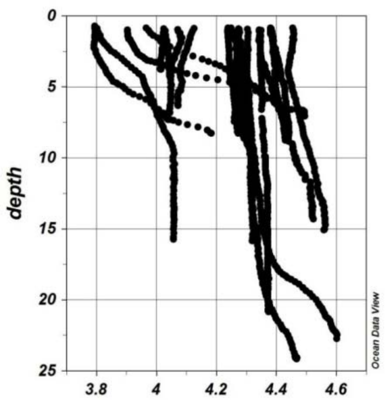
Distribution of the physical oceanographic parameters (temperature, salinity and concentration values) vary depending on seasons and regions. Thus, several high-resolution space-time oriented studies were conducted to find out the characteristics of the water within the study area. This study used data from January[2]and April 2017.

According to the results obtained, there is a water column that is nearly homogenous in the vertical based on the temperature values recorded in January 2017 period as varying between 3,8 and 4,6 °C (Figure 7.19). The main reason why the physical variables show homogenous distribution throughout the entire water column during the winter months is the winter convection and wind's water mixing effect throughout the water column. When it comes to the vertical distribution graphs, salinity and concentration values seem to fall into two groups. The first group had the following salinity values: 16,95-17,11 psu at the surface and 17,2-17,35 psu at the bottom. The other group's salinity values were higher with 17,3-17,41 psu at the surface and 17,45-17,56 psu at the bottom. These upper layer waters of the Black Sea have low salinity values which are shaped by river water inputs. From the concentration point of view, the vertical distribution graphs show that the first group's values were 1013,45-1013,57 kg/m^{3}at the surface and approximately 1013,8 kg/m^{3}at the bottom, while the other group had higher concentration values with 1013,75-1013,85 kg/m^{3}at the surface and around 1013,95 kg/m^{3}at the bottom. A closer look at the horizontal distribution graphs of January 2017 (Figure 7.20, Figure 7.21, Figure 7.22) reveal a difference between the south and the north of the area. North of the region and the coasts are relatively colder than the southern part.

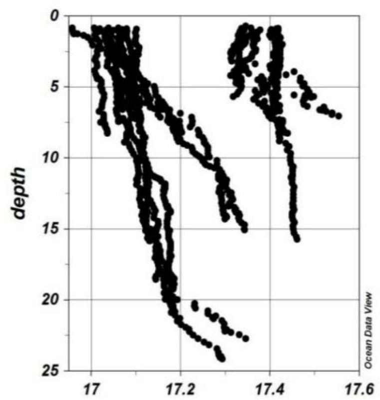
[2] January data were provided to DEU-IMST by the Project Owner.

In April 2017, temperatures rose along with warming weather, and temperature values varying between 8,6-9,8 °C at the surface, and 7-7,5 °C at the bottom were measured (Figure 7.23). The vertical distribution graphs indicate high salinity and concentration values in deep parts. Salinity values were measured to be 17,01-17,19 psu at the surface and around 17,4 psu at the bottom. Concentration values were 13-13,25 kg/m^{3}at the surface and around 13,6 kg/m^{3}at the bottom. When it comes to the horizontal distribution graphs, on the other hand (Figure 7.24, Figure 7.25, Figure 7.26), it is possible to say that, particularly in terms of temperature distribution, eastern part of the region temperature values are high, while deep areas in the western part of the region are low. For the Black Sea, 18 psu salinity is considered to be the border between the coast and offshore waters. Since the salinity of all the waters within the study area is lower than 18 psu, the whole area contains coastal waters only. Coastal waters within this area consist of waters originating from big rivers like the Danube which flow into the Black Sea and have a value within 17-17,4 psu range in a thin ribbon up to the strait of Istanbul. Measured at around 4°C in January, waters warmed up in April reaching up to 9°C. The water column seems to have mixed up completely in January, while layering up starts in April. Mixture layer on the surface reached 10 m and seasonal thermocline formed at 10 m level. As it warms up further the layering up will become clearer.

January 2017 Temperature (°C) values



January 2017 Salinity (psu) values



January 2017 Concentration (kg/m^3) values

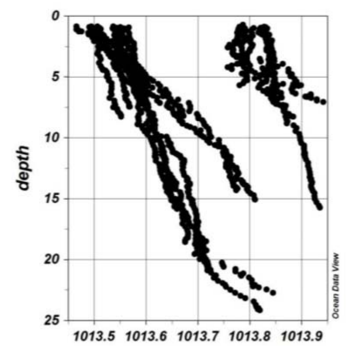


Figure 7.19: Temperature, salinity and concentration profiles of the study area in January 2017

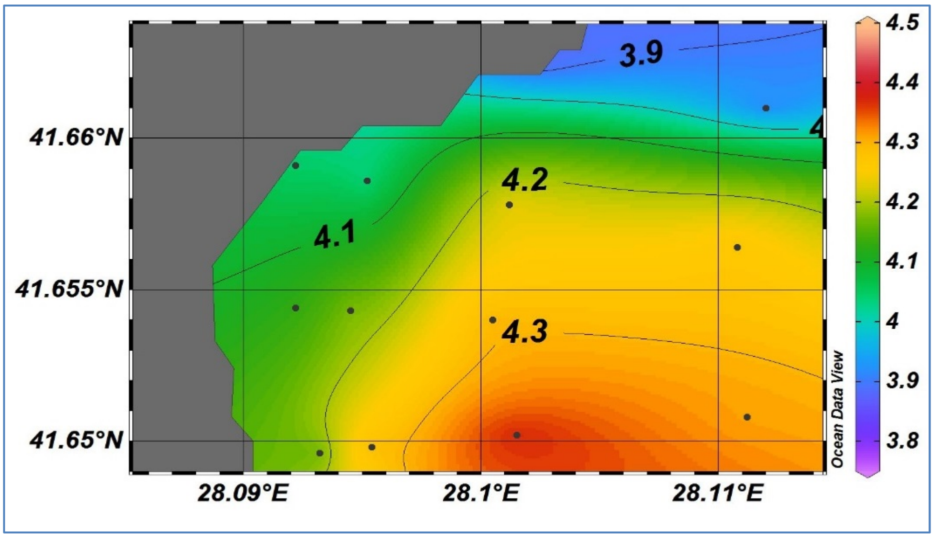


Figure 7.20: Surface Temperature Distribution of the Survey Site in January 2017

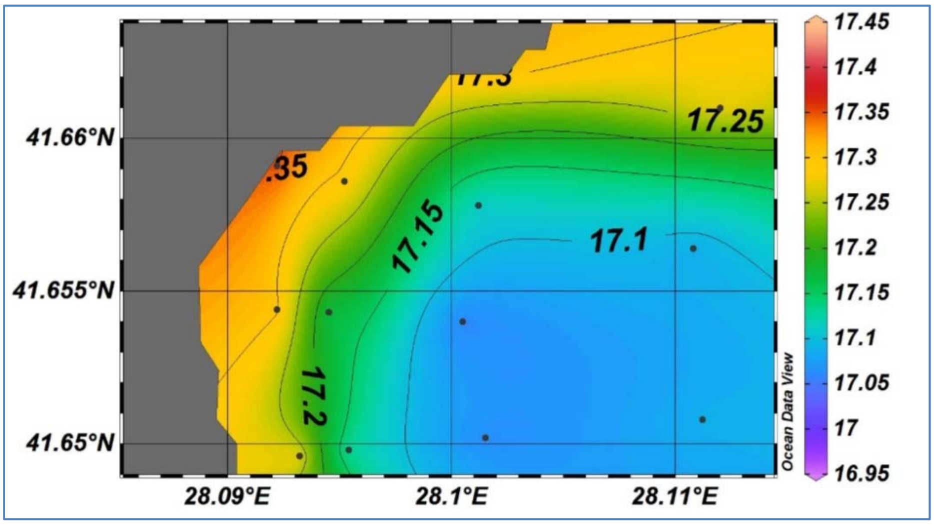


Figure 7.21: Salinity Distribution of the Survey Site in January 2017

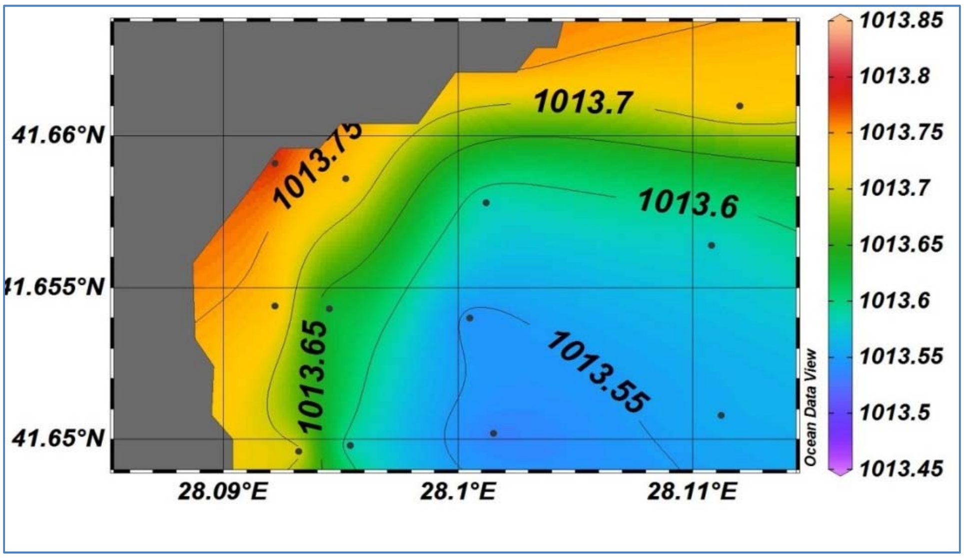
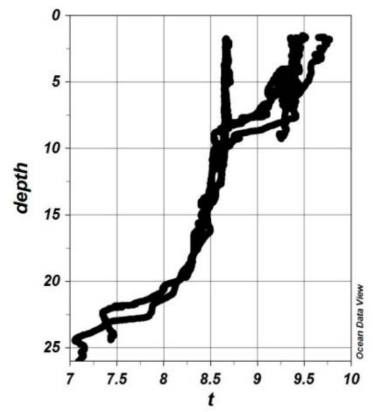
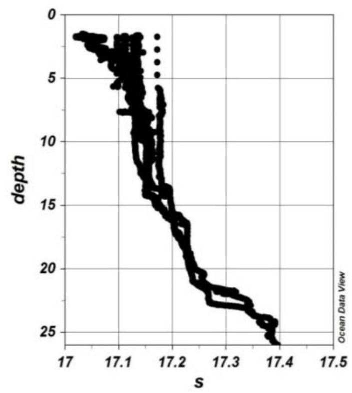


Figure 7.22: Concentration Distribution of the Survey Site in January2017

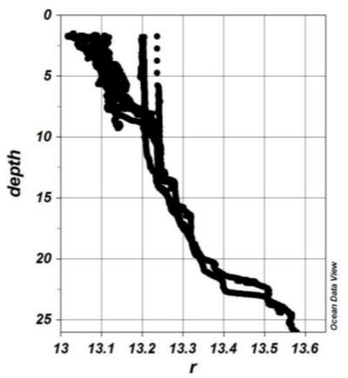
April 2017 Temperature (°C) values



April 2017 Salinity (psu) values



April 2017 Concentration (kg/m^3-1000) values



April 2017 Secchi (m) values

	Station	Secchi
1	ENV 16N ENV 11	7.4
2	ENV NEW 15 N ENV 10	7.4
3	ENV 13N	8.4
4	ENV 09 N	8.4
5	ENV NEW 11N	9
6	ENV 12N ENV 07	8.2
7	ENV 08 N ENV 04	7.5
8	ENV NEW 07 N	5.9
9	ENV 05N	6.6
10	ENV NEW 04N	6.6

Figure 7.23: Temperature, Salinity and Concentration Profiles of the Study Area in April 2017

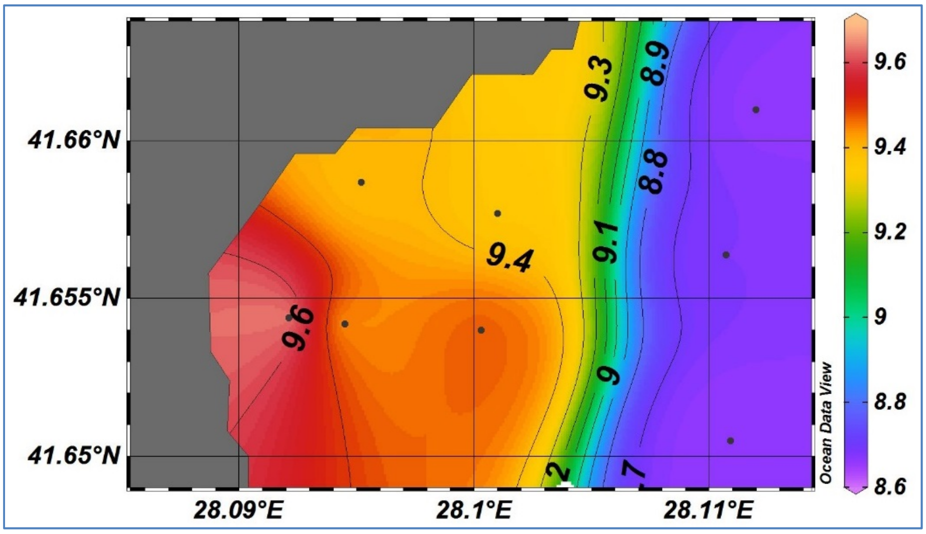


Figure 7.24: Surface Temperature Distribution of the Study Area in April 2017

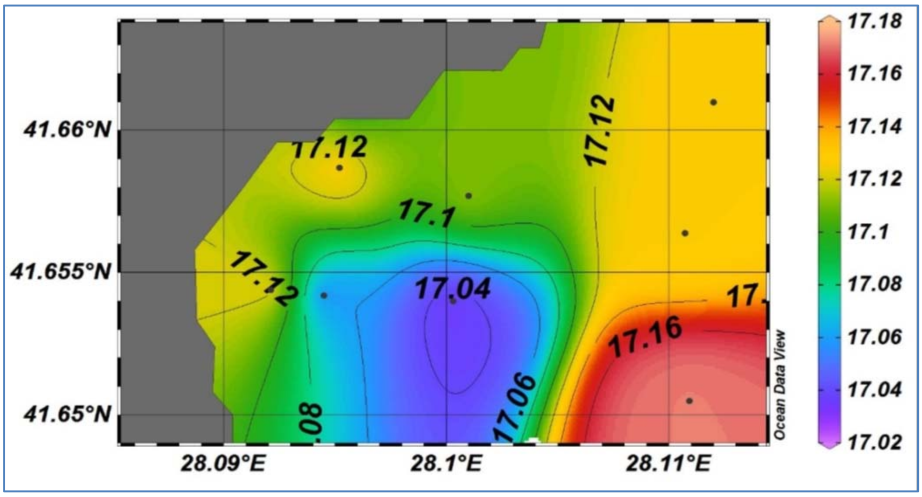


Figure 7.25: Salinity Distribution of the Study Area in April 2017

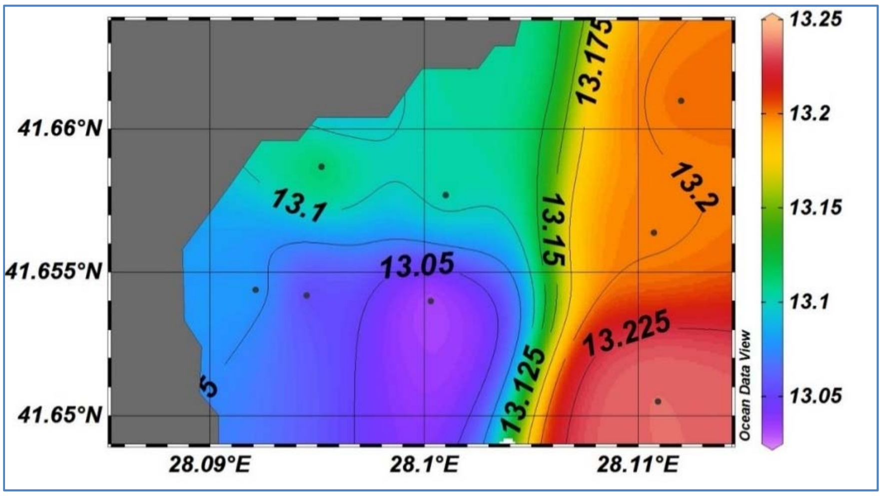


Figure 7.26: Surface Concentration Distribution of the Study Area in April 2017

7.1.2.3.2 Sediment Distribution at the Survey Site

The seabed is dominated by two categories within the study area: pebbled-rocky and sandy sediment zones. Large grains including pebbles were observed in only one location (ENV-16N/ ENV-11N), while at another station (ENV-13N-modified) relatively high clay + silt content was seen. All of the results are presented in Table7.15.

Table7.15: Findings of the sieve analysis and sediment category of each station

Study	Station	Pebble (> 4,75mm) (%)	Sand (4,75-0,075 mm) (%)	Silt (0,074 - 0,005 mm) (%)	Clay (0,005 - 0,001 mm) (%)	Colloids (< 0,001 mm) (%)	Sediment category (Shepard)
RESULTS PROVIDED BY DÜZEN NORWEST	ENV-05N	0,0	98,2	1,7	0,0	0,1	Sand
	ENV-NEW 11N	0,8	97,1	1,9	0,0	0,2	Sand
	ENV-NEW 04N	1,3	97,6	1,0	0,0	0,1	Sand
	ENV-16N/ ENV-11N	15,2	79,9	4,6	0,0	0,3	Sand with pebbles

	ENV-08N/ENV-04	0,0	98,6	1,3	0,0	0,1	Sand
	ENV-NEW-15N/ENV-10	NA (shell)	NA (shell)	NA (shell)	NA (shell)	NA (shell)	NA
	ENV-01N	0,0	94,9	4,8	0,0	0,3	Sand
RESULTS REPORTED BY DEU-IMST	ENV-02N/ENV-03N (modified)	1,4	95,6	3,0	0,0	0,0	Sand
	ENV-06N/ENV-07N (modified)	1,9	92,8	5,4	0,0	0,0	Sand
	ENV-09N (modified)	2,8	93,4	3,8	0,0	0,0	Sand
	ENV-13N (modified)	1,5	65,7	14,7	1,9	16,2	Sand with clay
	ENV-12N/ENV-07 (modified)	0,1	95,5	4,4	0,0	0,0	Sand

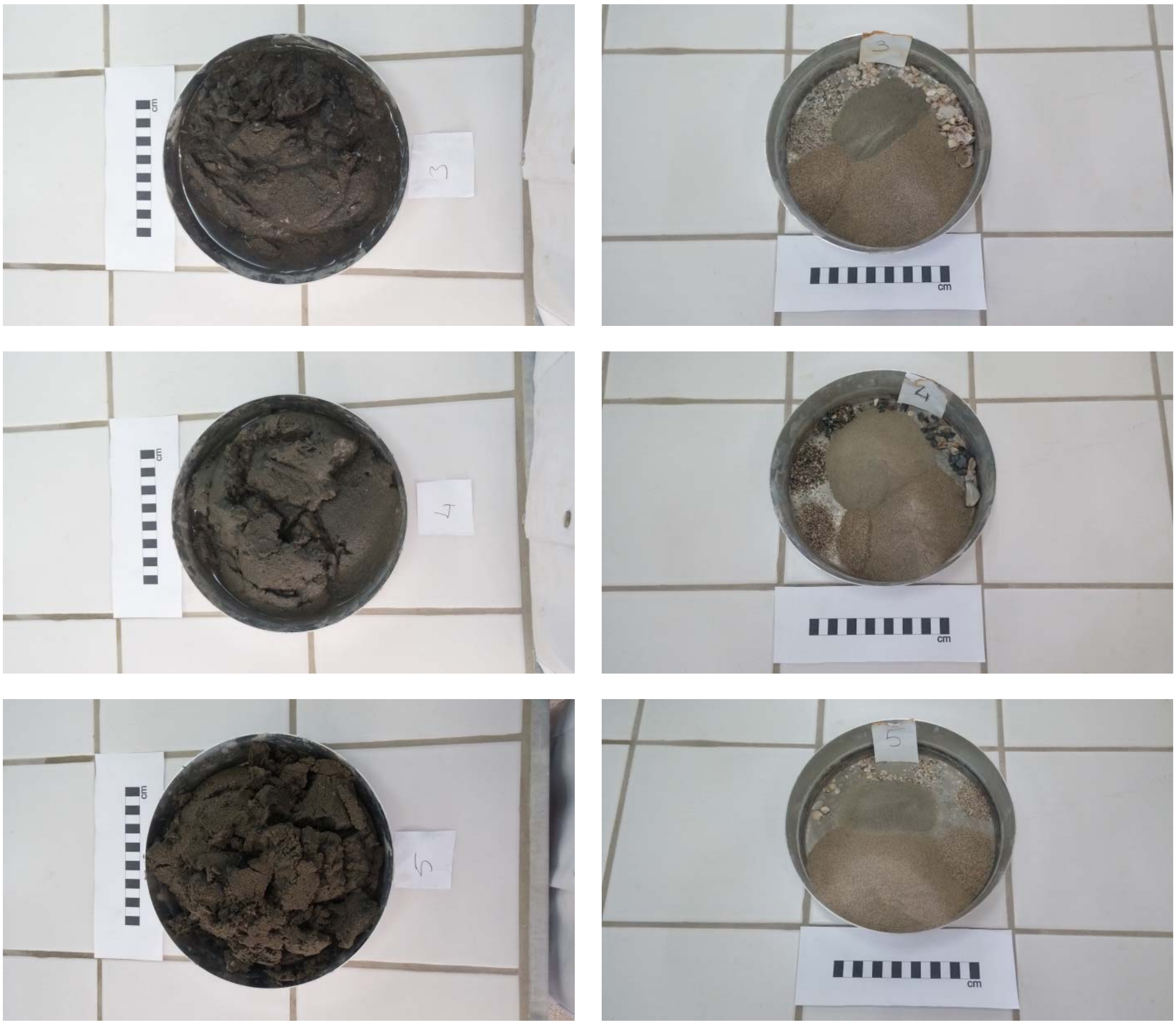


Figure 7.27: Sediment Samples: Before (Left) and After (Right) the Sieve Analysis

As seen in Table7.15, sand content is within 65,7%-98,6%range in all stations. This high sand content with an average value of 91,8%naturally results in sand dunes on the seabed. Generally low pebble content is an indication that parts of the study area which are shallower than 5 m were not sampled; however, it remains below 15,5% in all stations and has an average value of 2,3%. Fine grains formed by silt and clay reached their maximum value within the same station and distinguished this location (ENV-13N modified) from others. At this station, silt reached 14,7% value while clay went up to 18,1%. It would also be pertinent to highlight the fact that in this area, where there are also areas of sandy sediments, some locations had high shell content (Figure 7.27).

Side-looking sonar and underwater images provided by the Project owner show that the entire area can be studied in two general categories, namely pebbled-rocky and sandy sedimentary areas. The findings of the sieve analysis pointed to three categories within sediment category, outside of the pebbled-rocky areas: sand, sand with pebbles and sand with clay. This punctual data was assigned signature to seabed forms which were provided by the Project owner and used as the bottom map. Findings of the study are presented in Figure 7.28.

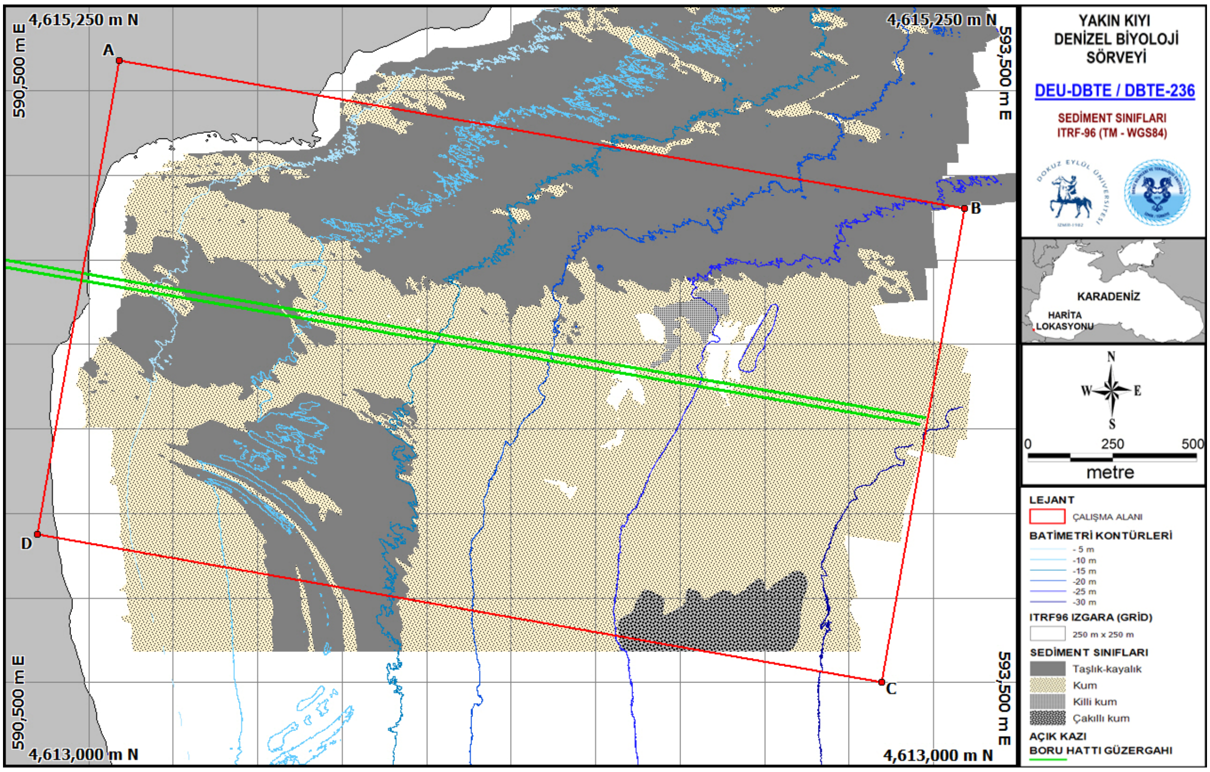


Figure 7.28: Map of Sediment Categories

7.1.2.3.3 Phytoplankton

Phytoplankton results are given in Figure 7.29 and Figure 7.30, with total abundance and percentage distribution of the represented taxa shown on a pie chart. At the time of the sampling, or in April 2017, plankton abundance values were distributed between 183.000 – 1.600.000 cells l^{-1} (Table7.16). The study of the structure of the surface water phytoplankton community belonging to the six stations for which analyses had been completed, revealed that in general, phytoplankton abundance values were equally distributed among the groups and that species diversity was low. A total of 42 taxa were identified: Diatom (14), Dinoflagellate (24), Prymnesiophyceae (Coccolithophorids) (1), Cryptophyceae (1), Chrysophyceae (1) and Dictyochophyceae (1). Average percentage ratios of dominant groups were as follows: Diatom: 11%, Dinoflagellatee: 10%, Cryptophyceae: %23 and Nanoplankton: 46%. Nanoplankton group had the highest share among all (average 35) and within that group, 4 different dimension categories were identified: < 5 µm, 5-6 µm, 7-8 µm and 9-10 µm, with average abundance values reaching 205.000, 90.000, 65.000, 28.000 cells l^{-1} respectively, within those categories.

The highest phytoplankton abundance was observed in deep waters of the station ENV 13N (1.600.000 cells l^{-1}), with nanoplankton reaching 1.078.000 cells l^{-1} level on this station and being represented predominantly with < 5 µm size. Nanoplankton was followed by Cryptophyceae (245.000 cells l^{-1}), Nanoflagellate (100.000 cells l^{-1}) and Dinoflagellate (80.000 cells l^{-1}) respectively, and the most frequently observed Dinoflagellate species were *Heterocapsa circularisquama*, *Protoperidinium pellucidum*, *Protoperidinium sp*.

While in general, Skeletonema sp., Licmophora abbreviata, Licmophora sp., Nitzschia longissima species were observed within the survey site from the Diatom group; Protoperidinium sp., Protoperidinium bipes, Gyrodinium spirale, Gyrodinium sp. and species belonging to Gymnodinaceae group were observed from Dinoflagellate group. Thecal dinoflagellate, naked dinoflagellate and dinoflagellate individuals smaller than 15 µm were assigned in many stations, while pennat diatoms were seen in all stations (

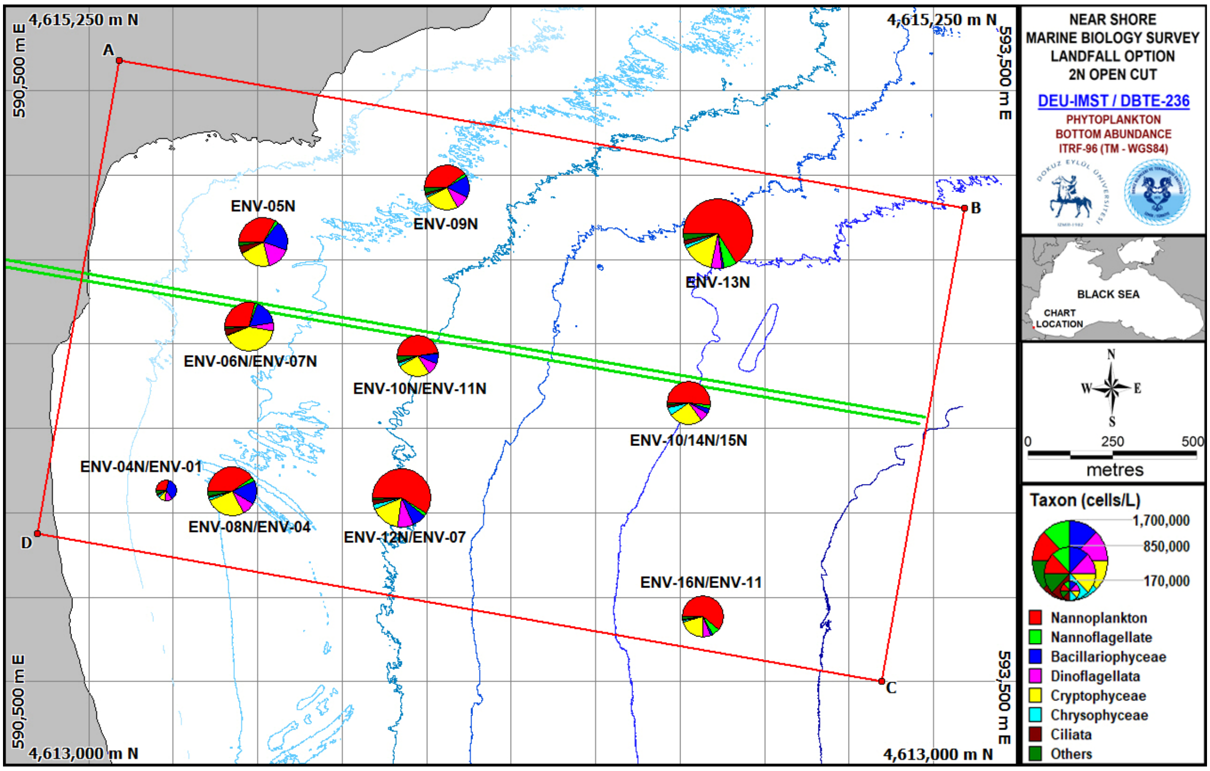


Figure 7.30: Percentage Pie Chart of Values per Taxon within Total Phytoplankton in Deep Waters

Table7.17). On the other hand, Cryptophyceae individuals and the solitary *Dinobryon* cf *faculiferum*, which are planktonic chrysophytes that favour brackish water medium, were identified in almost all the stations.

When coastal stations and relatively offshore stations are compared, Diatom and Dinoflagellat abundance is found to be high on the coast, while nanoplankton abundance is high in open waters. While no difference was observed between the distribution of the total phytoplankton abundance in coastal and open waters, higher results were found in deep waters of many stations compared to surface waters. There was no difference in surface and deep waters on the North-South line in terms of group composition within the phytoplankton; however, individuals of the Cryptophyceae group were observed to go up in numbers in deep waters within the central line where the excavation fort he pipeline will be carried out. Increased number of Cryptophycea in deep waters may be explained by the formation of an environment preferable for the species of this group, for example with nutrients -released into the environment due to a possible sediment movement (deep currents)- increasing the number of autotrophic species or beyond all, by the mixotrophy and heterotrophy advantage of the said group.

Table7.16: Distribution of abundance values of each taxon (cell/l) per station.

Stations	Nano plankton	Nano flagellate	Diatom	Dinoflagel lata	Cryptophy ceae	Chrysophy ceae	Ciliata	Total Fitoplankt on
ENV-01N_Y	58672	7653	155608	122445	30611	25509	7653	**420906**
ENV-02N/ ENV03-N_Y	265932	11819	413673	195017	65006	0	23638	**992814**
ENV-04N/ ENV-01_Y	183768	4967	72017	79467	94368	4967	9933	**454454**
ENV-04N/ ENV-01_D	56100	0	66713	22743	18194	7581	6065	**183461**
ENV-05N_Y	239889	15183	85024	85024	127536	22774	28847	**592132**
ENV-05N_D	303456	19899	174114	139291	186551	4975	44772	**853160**
ENV-06N/ ENV-07N_Y	272973	35061	57600	60104	155269	15026	5009	**633599**
ENV-06N/ ENV-07N_D	258364	15021	150212	48068	356002	6008	37553	**850198**
ENV-08N/ ENV-04N_Y	142967	15049	105344	36118	72236	0	13544	**394287**
ENV-08N/ ENV-04N_D	353326	22553	127799	76679	227031	12028	15035	**846478**
ENV-09N_Y	234548	15035	79686	85700	123288	15035	16539	**566825**
ENV-09N_D	298870	13382	115979	71372	187351	8921	14869	**730076**
ENV-10N/ ENV-11N_Y	258871	20505	53825	76859	107649	17942	33320	**571533**

Stations	Nano plankton	Nano flagellate	Diatom	Dinoflagel lata	Cryptophy ceae	Chrysophy ceae	Ciliata	Total Fitoplankt on
ENV-10N/ ENV-11N_D	312339	4549	50035	54583	166783	16678	12130	**635291**
ENV-10/14N/ 15N_Y	341905	19241	8881	130249	139130	2960	19241	**660128**
ENV-10/14N/ 15N_D	380388	22202	23682	50324	182053	42923	14801	**717852**
ENV-12N/ ENV-07N_Y	764176	19978	99892	137352	197287	39957	32465	**1293605**
ENV-12N/ ENV-07N_D	693627	22701	88280	103414	196738	27745	32790	**1147638**
ENV-13N_Y	907095	54975	34984	129942	254886	44980	17492	**1451851**
ENV-13N_D	1078019	100048	12506	80039	245118	25012	35017	**1598269**
ENV-16N/ ENV-11N_Y	739394	109992	22915	67218	253594	106937	10694	**1333658**
ENV-16N /ENV-11N_D	392502	41484	9573	33506	134025	9573	6382	**638214**

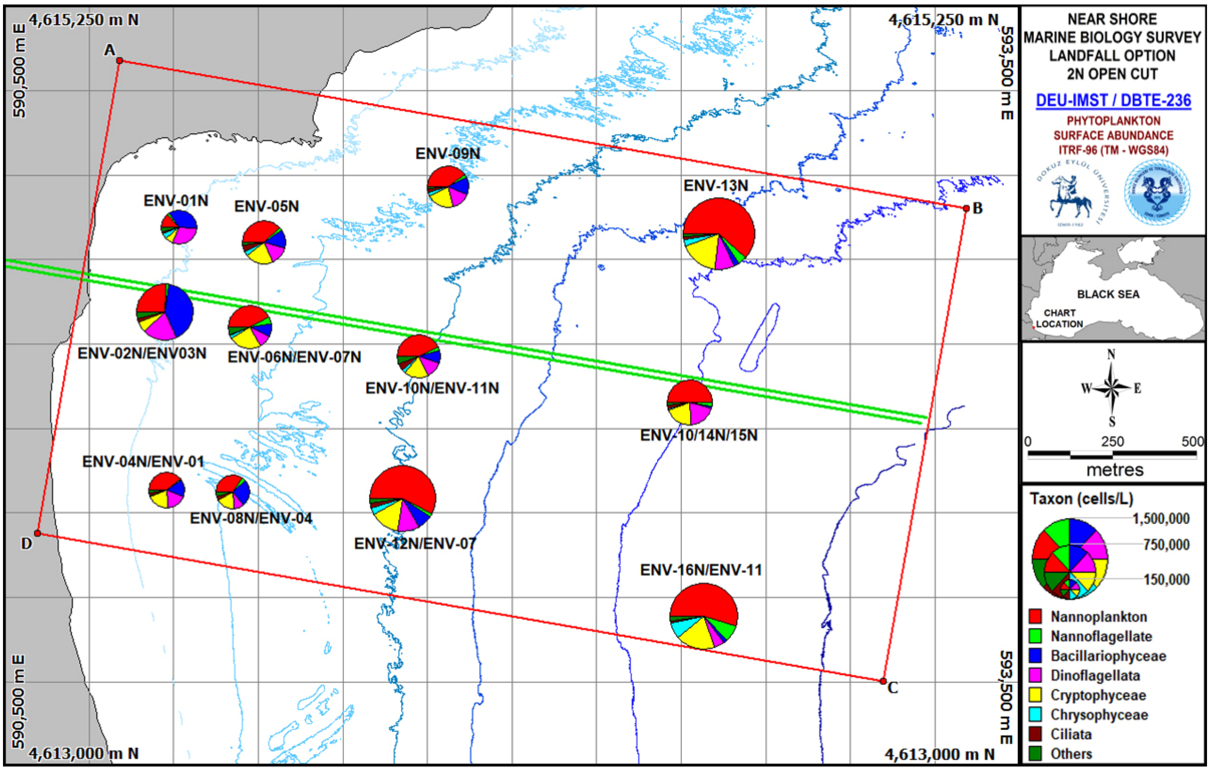


Figure 7.29: Percentage pie chart distribution of values per taxon within total phytoplankton in surface waters

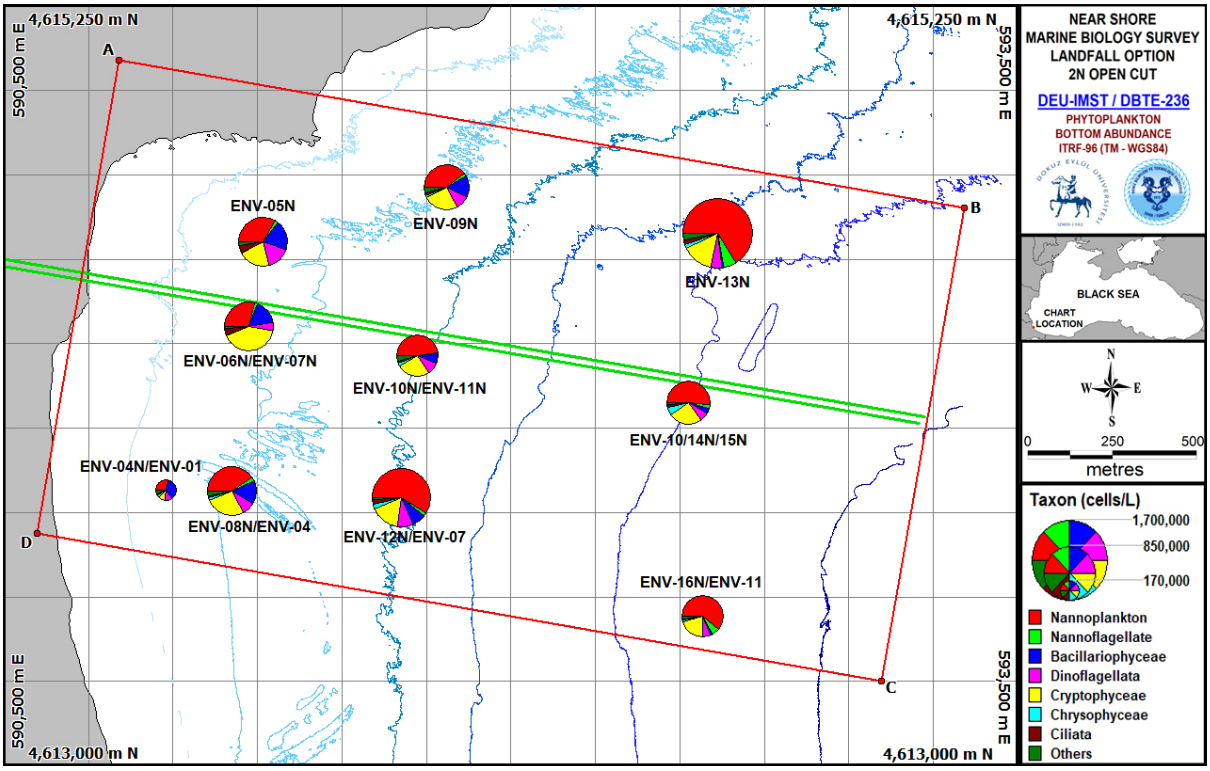


Figure 7.30: Percentage Pie Chart of Values per Taxon within Total Phytoplankton in Deep Waters

Table7.17: Distribution of the observed species and groups per station

	ENV-01N_Y	ENV-02N/ENV-03N_Y	ENV-04N/ENV-01_Y	ENV-04N/ENV-01_D	ENV-05N_Y	ENV-05N_D	ENV-06N/ENV-07N_Y	ENV-06N/ENV-07N_D	ENV-08N/ENV-04N_Y	ENV-08N/ENV-04N_D	ENV-09N_Y	ENV-09N_D	ENV-10N/ENV-11N_Y	ENV-10N/ENV-11N_D	ENV-10/14N/15N_Y	ENV-10/14N/15N_D	ENV-12N/ENV-07N_Y	ENV-12N/ENV-07N_D	ENV-13N_Y	ENV-13N_D	ENV-16N/ENV-11N_Y	ENV-16N/ENV-11N_D
Nannoplankton	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Nannoplankton	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Nannoplankton	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Nannoplankton	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Nannoflagellate	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Heterotrophic					+	+		+	+	+	+	+		+		+	+	+	+	+	+	+
Amphora sp.	+				+	+		+		+			+				+	+	+			
Chaetoceros sp.			+															+				
Cylindrotheca	+					+					+											
Fragilaria sp.		+																				
Licmophora	+	+	+	+	+	+	+	+	+	+	+	+	+	+			+	+	+			
Licmophora flabellata													+									
Licmophora sp.	+	+		+	+	+	+	+	+	+	+	+	+	+	+		+		+			
Navicula sp.	+	+					+	+			+	+		+								
Nitzschia		+	+	+	+	+			+	+	+	+	+	+	+		+	+			+	+
Pinnularia sp.						+																
Pleuro/Gyrosigm						+																
Pseudonitzschia						+																
Skeletonema sp.		+	+	+	+	+		+	+	+	+	+	+	+		+	+	+	+	+	+	+
Striatella				+		+		+	+													
Thalassionema						+																
Centric Diatom					+			+	+	+		+	+			+	+		+			
Pennate Diatom	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Alexandrium sp.	+			+	+				+					+	+		+		+	+		
Amphidinium																						+
Ceratium fusus										+												
Ceratium furca		+																				
Diplopsalis	+	+																				
Gonyaulax	+																					
Gymnodiniacea	+					+	+				+	+	+	+	+		+	+		+	+	
Gyrodinium		+			+	+	+	+	+	+	+				+		+			+		
Gyrodinium sp.	+	+					+	+	+	+		+		+	+	+						
Heterocapsa																			+	+	+	
Heterocapsa						+	+	+					+		+							
Heterocapsa sp.											+		+		+			+		+		+
Katodinium											+								+	+		
Mesoporos												+										
Noctiluca						+																
Oblea sp.		+																				
Oxytoxum sp.																			+			
Phalacroma													+									
Prorocentrum	+	+									+						+					
Prorocentrum sp.	+				+						+											
Protoperidinium			+	+	+	+	+	+		+	+	+		+	+	+			+			
Protoperidinium									+	+												

	ENV-01N_Y	ENV-02N/ENV-03N_Y	ENV-04N/ENV-01_Y	ENV-04N/ENV-01_D	ENV-05N_Y	ENV-05N_D	ENV-06N/ENV-07N_Y	ENV-06N/ENV-07N_D	ENV-08N/ENV-04N_Y	ENV-08N/ENV-04N_D	ENV-09N_Y	ENV-09N_D	ENV-10N/ENV-11N_Y	ENV-10N/ENV-11N_D	ENV-10/14N/15N_Y	ENV-10/14N/15N_D	ENV-12N/ENV-07N_Y	ENV-12N/ENV-07N_D	ENV-13N_Y	ENV-13N_D	ENV-16N/ENV-11N_Y	ENV-16N/ENV-11N_D
Protoperidinium	+		+										+		+					+		
Protoperidinium	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Scrippsiella					+	+							+					+	+			
Dinoflagellate	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Dinoflagellate sp.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Dinoflagellate sp.	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Cryptophyceae	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Dinobryon cf	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Coccolithophorid										+		+	+									
Dictyocha										+												
Protozoa	+	+	+	+	+	+	+	+	+		+		+		+			+	+			
Ciliata	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Tintinit										+											+	
Copepod																					+	+
Und(unidentified)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

7.1.2.3.4 Zooplankton

Mesozooplankton, including groups of organisms sized 200 µm - 2 mm, is the most important component of the pelagic ecosystem. This group has holo- and meroplantic organisms such as Copepoda, Cladocera Appendicularia, Chaetognatha, Polychaeta. Groups forming the mesozooplankton were collected from the four stations so as to reflect the sampling period on the sampling site. Collected zooplankton samples were studied under the Zeiss 508 steriomicroscope. Sample results studied in standard volumes were calculated as individual/m^3. Numerical distribution of the mesozooplankton species in the Kıyıköy area of the Turkish Black Sea Coasts is summarised in Table 7.18. The group represented with the highest number of species in all stations is copepods. The number of copepod species identified in deep stations was higher (Table 7.18 and Table 7.19).

Table 7.18: Number of species forming the mesozooplankton

Location/Depth	ENV-13 N (22 m)	ENV-10/14N/15 N (25 m)	ENV-16N/ENV-11 (30 m)	Reference (50 m)
Copepoda	5	6	7	7
Appendicularia	1	1	1	1
Cladocera		1		1
Chaetognatha	1			1
Dinophyceae	1	1	1	1
Rotatoria	1	1	1	1
Bivalvia larva	+	+	+	+

Cirripedia larva	+	+	+	+
Gastropoda larva	+	+		
Polychaeta larva		+	+	

Table 7.19: Number of zooplankton species per station

Filum	Set	Species/Stations (individual/m^3)	ENV-13N	ENV-10/14N/15N	ENV-16N/ENV-11	Reference
Arthropoda	Copepod	**Calanoid copepod**				
		Calanus euxinus	0	27	42	4
		Acartia clausi	2765	3490	2749	1014
		Acartia tonsa	1311	1698	1283	1021
		Paracalanus parvus	60	28	49	59
		Pseudocalanus elongatus	108	54	104	78
		Cyclopoid copepod				
		Oithona similis	24	7	36	70
		Oithona davisae	0	0	12	78
		Cirriped larva	143	239	110	35
		Cladocera	0	14	0	12
		Copepod nauplii	179	93	116	82
		Copepod Egg	24	27	98	23
Mollusca		Bivalvia Larva	48	119	104	23
		Gastropod larva	12	14	0	0
Chordata	Appendicularia	*Oikopleura dioica*	131	80	37	58
Chaetognatha	Aphragmorphora	*Parasagitta setosa*	12	0	0	4
Annelida	Polychaeta	Poliket Larva	0	7	12	0
Cnidaria	Coelenterata	*Medusae planula*	0	20	6	70
		Aurelia aurita	60	10	11	80
Dinoflagellata	Noctilucales		14836	4292	3074	2736
Rotifera			417	153	372	86
Fish Egg			0	0	0	4

7.1.2.3.5 Macrobenthos

Beam Trawl and Trawl Samples

Study of the collected 8 samples helped identify 33 macrobenthic species belonging to 5 taxonomic groups within the region (Table 7.). Total number of individuals within each sample varied between 22-203 individuals for the beam trawl, and 91-497 individuals for the trawl. Within the beam trawl samples, the highest invertebrate abundance (329 individuals) was recorded in Beamtrawl-2 which had the highest concentration of *Diogenes pugilator* (Figure 7.34) species. Within the trawl samples, the highest concentration of invertebrate (591 individuals) was recorded in Trawl-4 where the Tunicate species *Ascidiella aspersa* (Figure 7.) were dominant.

Table 7.20: Species found in beam trawl and trawl samples at the survey site (species and no. of individuals per station)

Sampling Area	Kıyıköy	Kıyıköy	Kıyıköy	Kıyıköy	Kıyıköy	Kıyıköy	Kıyıköy	Kıyıköy
Sampling Date	**5April 2017**	**5 April 2017**	**5 April 2017**	**5 April 2017**	**6 April 2017**	**6 April 2017**	**6 April 2017**	**6 April 2017**
Sampling Station	**Beamtrawl-1**	**Beamtrawl-2**	**Beamtrawl-3**	**Beamtrawl-4**	**Trawl-1**	**Trawl-2**	**Trawl-3**	**Trawl-4**
Depth (m)	**14-17**	**17-33**	**17-18**	**16-31**	**19,5-43**	**27-29**	**25-26**	**18-52**
CRUSTACEA								
Crangon crangon (Linnaeus, 1758)	-	-	-	-	5	1	-	-
Palaemon adspersus Rathke, 1837	-	-	-	-	11	-	4	6
Upogebia pusilla (Petagna, 1792)	-	-	3	1	-	-	9	-
Diogenes pugilator (Roux, 1829)	-	72	1	2	-	1	-	3
Liocarcinus depurator (Linnaeus, 1758)	4	7	3	13	39	49	33	40
Liocarcinus navigator (Herbst, 1794)	1	6	4	3	73	11	11	17
Medorippe lanata (Linnaeus, 1767)	-	-	-	-	1	-	-	-
Pilumnus hirtellus (Linnaeus, 1761)	1	1	-	-	-	-	-	-
Xantho poressa (Olivi, 1792)	-	-	1	-	2	-	-	2
MOLLUSCA								
Gibbula divaricata (Linnaeus, 1758)	-	3	-	-	-	-	-	-
Aporrhais pespelecani (Linnaeus, 1758)	-	-	-	-	1	-	-	-
Calyptraea chinensis (Linnaeus, 1758)	-	-	-	1	-	-	-	2
Cyclope neritea (Linnaeus, 1758)	-	45	-	-	-	-	-	-
Tritia reticulata (Linnaeus, 1758)		48	7	1	1	13	3	3
**Rapana venosa* (Valenciennes, 1846)	14	3	7	10	8	3	8	2
**Anadara kagoshimensis* (Tokunaga, 1906)	-	-	3	10	-	9	9	2
Gibbomodiola adriatica (Lamarck, 1819)	-	-	-	-	1	-	-	-
Mytilaster lineatus (Gmelin, 1791)	2	-	3	1	-	-	5	-

Sampling Area	Kıyıköy	Kıyıköy	Kıyıköy	Kıyıköy	Kıyıköy	Kıyıköy	Kıyıköy	Kıyıköy
Sampling Date	**5April 2017**	**5 April 2017**	**5 April 2017**	**5 April 2017**	**6 April 2017**	**6 April 2017**	**6 April 2017**	**6 April 2017**
Sampling Station	**Beamtrawl-1**	**Beamtrawl-2**	**Beamtrawl-3**	**Beamtrawl-4**	**Trawl-1**	**Trawl-2**	**Trawl-3**	**Trawl-4**
Depth (m)	**14-17**	**17-33**	**17-18**	**16-31**	**19,5-43**	**27-29**	**25-26**	**18-52**
Mytilus galloprovincialis Lamarck, 1819	-	-	-	-	14	-	-	50
Pteria hirundo (Linnaeus, 1758)	-	-	-	-	1	-	-	-
Ostrea edulis Linnaeus, 1758	-	-	-	-	2	-	-	-
Chamela gallina (Linnaeus, 1758)	-	16	1	3	8	6	-	4
Pitar rudis (Poli, 1795)	-	1	-	-	4	3	1	4
Pitar sp.	-	-	-	-	16	-	-	14
Polititapes aureus (Gmelin, 1791)	-	-	-	2	-	1	-	-
Teredo sp.	-	-	-	-	1	1	1	-
BRYOZOA								
Conopeum seurati (Canu, 1928)	-	1	1	-	-	1	1	-
Cryptosula pallasiana (Moll, 1803)	-	-	-	-	-	-	-	1
Schizomavella (*Schizomavella*) *auriculata* (Hassall, 1842)	-	-	-	-	-	-	-	1
ECHINODERMATA								
Astropecten sp.	-	-	-	-	47	-	-	-
TUNICATA								
Ascidiella aspersa (Müller, 1776)	-	-	1	4	1	33	6	346
Botryllus schlosseri (Pallas, 1766)	-	-	1	-	-	-	-	-
Pyura dura (Heller, 1877)	-	-	-	-	1	-	-	-

Mollusca group is represented with 17 species in the area. Among all the species, *Mytillus galloprovincialis* (Figure 7.) had the highest number of individuals in Trawl-4. *Cyclope neritea* (Figure 7.) and *Tritia reticulata* (Figure 7.) are represented with the highest number of individuals in Beamtrawl-2 (Table 7.). *Rapana venosa* (Figure 7.), which are an alien gastropod species for the Black Sea were identified in all samples. This species, carried to the Mediterranean with vessels, has a wide distribution area in different parts of the world. This species was first reported in the Turkish Black Seacoasts by Fischer (Ref. 7.105). They live in the soft and hard substrata of the infralittoral zone and are highly important in terms trade across the world (Ref. 7.106). *Anadara kagoshimensis* (Figure 7.), another alien species, is ofindo-pacific origin and thought to have been introduced to the Turkish coasts via vessels (Ref. 7.107;Ref. 7.108; Ref. 7.109). Distribution of the species spans down to 50-m depth from the coast within the soft substratum (Ref. 7.106).

This study identified 9 Crustacea species. 2 species among all, namely *Liocarcinus depurator* (Figure 7.35), *L. navigator* (Figure 7.36) were observed in all the samples. *L. Depurator* is a crab species, which was identified first in the Black Sea, and then in the Marmara Sea, Aegean Sea and the Mediterranean. *L. Navigator* has only been reported at the Black Sea out of all the Turkish coasts (Ref. 7.110). *Medorippe lanata* (Figure 7.37) was reported as a new registry for the Black Sea in this study. It is a crab species that is distributed in the Mediterranean continental shelf at depths of 20-100 m and on soft grounds (Ref. 7.111; Ref. 7.112). This species was first recorded by Monod (Ref. 7.113) at Levantine coasts of Turkey, and then by Kocataş (Ref. 7.114)at the Aegean Sea and finally by Demir (Ref. 115) at the Marmara Sea.

Within the study area, 3 bryozoa species were identified on hard substrate and mollusc shells. A competitive species, *Conopeum seurati* are present in brackish waters and in this study whitish colonies formed by the species had covered the entire surface of the piece of wood, which was perforated by *Terredo* sp. (Figure 7.) (Ref. 7.116). Both *C. Seurati* and *Cryptosula pallasiana* are organisms that are not wanted to form colonies on artificial substrates. They are widely distributed across the world, particularly at docks, ports and estuaries. In addition to bryozoa colonies mentioned in the study, small colonies of *Schizomavella auriculata*were found, mostly on *R. Venosa* shells.

Tunicate group is represented with two solitary and one colonial species. *A. aspersa* is a species found in the Mediterranean ports and artificial substrates (Ref. 7.117;Ref. 7.118). In seas of Turkey, *A. aspersa* was reported by Uysal (Ref. 7.119) from the Black Sea and the Levantine Sea. This species was recorded by Colombo at the Çanakkale strait (Dardanelles) entry of the Aegean Sea (Ref. 7.120). Another solitary Tunicate species, *Pyura dura* (Figure 7.) was identified for the first time in the Black Sea during this study. Being a local species, it was previously reported from the Mediterranean (Ref. 7.121), North-east Atlantic (Ref. 7.122) and European waters (Ref. 7.123). This species was discovered by Çınar et al. (Ref. 7.124) at the Alsancak Port, within the soft ground zoobenthic community of Izmir. A colonial tunicate, *Botryllus schlosseri* (Figure 7.) is considered an alien cryptogenic species. Natural distribution zone of the species is debatable. It was recorded by Băcescu (Ref. 7.125) from the Black Sea, by Demir from the Marmara Sea (Ref. 7.115), and by Pınar from the Aegean and Levantine Seas (Ref. 7.126).

The study also discovered *Astropecten* sp. (Figure 7.), an Echinoderm species. Abundance of this species in the region is high (47 individuals); and with this study, it was reported for the first time from the Black Sea. Following an evaluation regarding the Bern Convention (Ref. 7.127 and Ref. 7.128), none of these species were under any conservation.

Photographs of Crustacea species identified at the Survey Site are given below.

Figure 7.31: Outlook of the *Crangon crangon* (Scale: 1 Cm).

Figure 7.32: Outlook of *Palaemon adspersus* (Scale: 1 Cm)

Figure 7.33: Outlook of *Upogebia pusilla* (Scale: 1 Cm).

Figure 7.34: Outlook of *Diogenes pugilator* (Scale: 1 Cm).

Figure 7.35: Outlook of *Liocarcinus depurator* (Scale: 1 Cm).

Figure 7.36: Outlook of *Liocarcinus navigator* (Scale: 1 Cm).

Figure 7.37: Outlook of *Medorippe lanata* (Scale: 1 Cm).

Figure 7.38: Outlook of *Pilumnus hirtellus* (Scale: 1 Cm).

Figure 7.39: Outlook of *Xantho poressa* (Scale: 1 Cm).

Photographs of Mollusca species identified at the Survey Site are given below.

Figure 7.40: Outlook of *Gibbula divaricata* (Scale: 1 Cm).

Figure 7.41: Outlook of *Aporrhais pespelecani* (Scale: 1 Cm).

Figure 7.42: Outlook of *Calyptraea chinensis* (Scale: 1 Cm).

Figure 7.43: Outlook of *Cyclope neritea*(Scale: 1 cm).

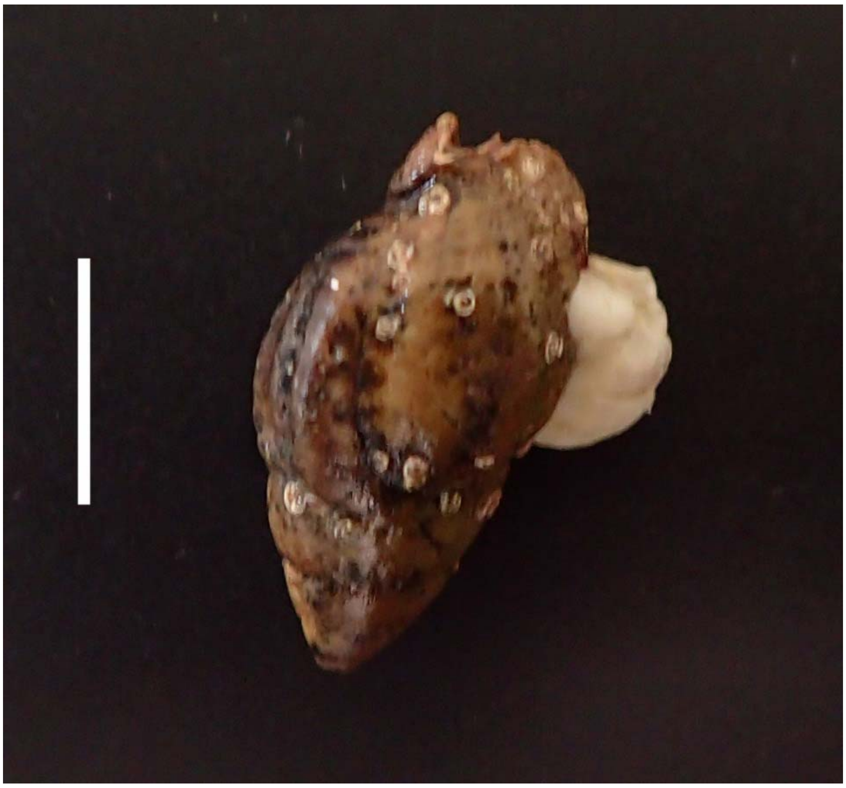


Figure 7.44:Outlook of *Tritia reticulata* (Scale: 1 cm).

Figure 7.45:Outlook of *Rapana venosa* (Scale: 1 cm).

Figure 7.46:Outlook of *Anadara kagoshimensis*(Scale: 1 cm).

Figure 7.47:Outlook of *Gibbomodiola adriatica*(Scale: 1 cm).

Figure 7.48:Outlook of *Mytilaster lineatus*(Scale: 1 cm).

Figure 7.49:Outlook of *Mytilus galloprovincialis*(Scale: 1 cm).

Figure 7.50:Outlook of *Pteria hirundo*(Scale: 1 cm).

Figure 7.51:Outlook of *Ostrea edulis*(Scale: 1 cm).

Figure 7.52:Outlook of *Chamela gallina*(Scale: 1 cm).

Figure 7.53:Outlook of *Pitar rudis*(Scale: 1 cm).

Figure 7.54:Outlook of *Polititapes aureus*(Scale: 1 cm).

Figure 7.55:Outlook of *Teredo sp.*(Scale: 1 cm).

Photographs of Tunicata species identified at the Survey Site are given below.

Figure 7.56:Outlook of *Ascidiella aspersa* (Scale: 1 cm).

Figure 7.57:Outlook of *Botryllus schlosseri*(Scale: 1 cm).

Figure 7.58:Outlook of *Pyura dura* (Scale: 1 cm).

The photograph of the Echinodermata species identified at the Survey Site is given below.

Figure 7.59: Outlook of *Astropecten sp.*(Scale: 1 cm).

Macrobenthos: Soft Substratum Samples

Following the analysis of the samples collected from 7 soft substratum stations (*see* Table 7.21 *for benthic station codes*) at Kıyıköy, 18.506 individuals belonging to 96 species from 9 systematic groups (Cnidaria, Nemertea, Nematoda, Polychaeta, Crustacea, Mollusca, Bryozoa, Echinodermata and Cephalochordata) were identified (Table 7.22).

Table 7.21: Matching up the codes of the macrobenthos sampling stations at Kıyıköy with the general station codes

STATION CODE	BENTHIC STATION CODE	X	Y	DEPTH (m)	SOFT SUBSTRATUM	HARD SUBSTRATUM
ENV-01N	12	28,092785	41,661300	5	√	
ENV-02N/ENV-03N	11	28,092228	41,659053	5		√
ENV-05N	9	28,095781	41,660881	8	√	
ENV-06N/ENV-07N	8	28,095223	41,658636	8		√
ENV-09N	4	28,102329	41,662292	11		√

STATION CODE	BENTHIC STATION CODE	X	Y	DEPTH (m)	SOFT SUBSTRATUM	HARD SUBSTRATUM
ENV-10N/ENV-11N	5	28,101214	41,657800	15	√	
ENV-13N	3	28,111914	41,660953	21		√
ENV-04N/ENV-01	10	28,092216	41,654303	8	√	
ENV-08N/ENV-04	7	28,094545	41,654247	10	√	
ENV-12N/ENV-07	6	28,100586	41,654014	13		√
ENV-10/14N/15N	2	28,110797	41,656460	25	√	
ENV-16N/ENV-11	1	28,111203	41,650753	27	√	

Table 7.22: Species identified at Kıyıköy soft substratum stations (*: alien species; **: indicator species).

	ST 1	ST 2	ST 5	ST 7	ST 9	ST 10	ST 12
CNIDARIA							
Anthozoa (spp.)	1	-	-	-	-	-	-
NEMERTEA							
Nemertini (spp.)	3	1	1	2	1	-	-
NEMATODA							
Nematoda (spp.)	-	10	-	1	-	-	1
POLYCHAETA							
Harmothoe imbricata (Linnaeus, 1767)	-	2	-	-	-	-	-
Pholoe inornata Johnston, 1839	-	56	-	-	-	-	-
Eumida sanguinea (Örsted, 1843)	-	1	-	-	-	-	-
Erinaceusyllis sp.	-	1	-	-	-	-	-
Sphaerosyllis sp.	-	1	-	-	-	-	-
Exogone naidina Örsted, 1845	-	1	-	1	-	-	-
Syllides fulvus (Marion & Bobretzky, 1875)	-	4	-	-	-	-	-
Nereis zonata Malmgren, 1867	-	1	-	-	-	-	-
Micronephthys stammeri (Augener, 1932)	18	1	8	11	3	11	1
Nephtys cirrosa Ehlers, 1868	2	-	4	11	-	13	3
Glycera tridactyla Schmarda, 1861	-	-	1	3	2	-	1

	ST 1	ST 2	ST 5	ST 7	ST 9	ST 10	ST 12
Protodorvillea kefersteini (McIntosh, 1869)	-	46	-	1	-	-	-
Orbinia latreillii (Audouin & H Milne Edwards, 1833)	-	-	3	8	5	3	-
Aricidea (*Strelzovia*) *suecica meridionalis* Laubier & Ramos, 1974	42	1	-	-	-	-	-
Aricidea (*Strelzovia*) *claudiae* Laubier, 1967	2	-	-	-	-	-	-
Paradoneis armata Glémarec, 1966	-	-	-	1	-	2	-
Aonides paucibranchiata Southern, 1914	-	16	-	-	-	-	-
***Polydora cornuta* Bosc, 1802	-	1	-	-	-	-	-
Prionospio (*Minuspio*) *maciolekae* Dagli & Çinar, 2011	-	6	3	-	-	-	-
Scolelepis (*Parascolelepis*) *tridentata* (Southern, 1914)	-	-	1	-	1	-	-
***Spio decoratus* Bobretzky, 1870	-	6	3	29	10	18	10
Magelona mirabilis (Johnston, 1865)	-	-	2	2	-	6	-
Magelona minuta Eliason, 1962	-	-	-	1	5	-	-
***Capitella teleta* Blake, Grassle & Eckelbarger, 2009	-	-	-	-	2	-	-
***Heteromastus filiformis* (Claparède, 1864)	1	2	-	-	2	-	-
Euclymene sp.	-	-	-	1	-	-	-
Amphitritides gracilis (Grube, 1860)	-	3	-	-	-	-	-
Polycirrus sp.	-	1	-	-	-	-	-
CRUSTACEA							
**Amphibalanus improvisus* (Darwin, 1854)	-	-	-	-	3	-	-
Nebalia sp.	1	-	-	-	-	-	1
Gastrosaccus sp.	-	-	-	-	-	-	1
Ampelisca pseudosarsi Bellan-Santini & Kaim-Malka, 1977	2	-	-	-	-	1	-
Ampithoe ramondi Audouin, 1826	-	-	-	-	-	-	2
Microdeutopus versiculatus (Spence Bate, 1857)	-	2	-	-	-	-	-
Bathyporeia guilliamsoniana (Spence Bate, 1857)	-	-	1	10	8	-	-
Leptocheirus pilosus Zaddach, 1844	-	3	-	-	-	-	-
Dexamine spinosa (Montagu, 1813)	-	-	-	-	-	-	2
Ericthonius sp.	-	-	-	-	-	-	1
Megaluropus massiliensis Ledoyer, 1976	-	-	1	4	1	4	2
Perioculodes longimanus (Spence Bate & Westwood, 1868)	4	-	1	2	-	1	2
Eurydice pulchra Leach, 1815	-	-	1	2	-	5	5
Cumella (*Cumella*) *limicola* Sars, 1879	-	-	-	-	-	-	5
Pseudocuma (*Pseudocuma*) *longicorne* (Bate, 1858)	8	-	5	6	3	4	-

	ST 1	ST 2	ST 5	ST 7	ST 9	ST 10	ST 12
Diogenes pugilator (Roux, 1829)	3	-	9	5	4	2	3
MOLLUSCA							
Gibbula rarilineata (Michaud, 1829)	-	2	-	11	-	-	-
Tricolia pullus (Linnaeus, 1758)	-	-	-	6	-	-	-
Theodoxus fluviatilis (Linnaeus, 1758)	-	26	-	-	-	-	-
Bittium reticulatum (da Costa, 1778)	646	1.545	42	3.312	60	108	2
Bittium submammillatum (de Rayneval & Ponzi, 1854)	-	58	-	-	-	-	-
***Turritella communis* Risso, 1826	1	-	-	-	-	-	-
Marshallora adversa (Montagu, 1803)	-	26	1	14	-	-	-
Cerithiopsis tubercularis (Montagu, 1803)	2	68	-	-	-	-	-
Pusillina lineolata (Michaud, 1830)	155	16	-	-	-	2	-
Pusillina marginata (Michaud, 1830)	-	23	-	-	-	-	-
Pusillina sp.	-	124	-	35	-	-	-
Rissoa splendida Eichwald, 1830	-	1	3	260	-	15	-
Setia valvatoides (Milaschewitsch, 1909)	-	-	-	48	1	-	-
Caecum armoricum de Folin, 1869	-	4	-	-	-	-	-
Caecum clarkii Carpenter, 1859	-	27	-	23	-	-	-
Caecum trachea (Montagu, 1803)	-	733	-	185	-	-	-
Ecrobia ventrosa (Montagu, 1803)	10	8.568	-	-	-	1	-
Tornus subcarinatus (Montagu, 1803)	-	-	-	8	-	-	-
Calyptraea chinensis (Linnaeus, 1758)	-	1	-	-	-	-	-
Stramonita haemastoma (Linnaeus, 1767)	-	1	2	9	-	-	-
Tritia neritea (Linnaeus, 1758)	2	1	3	1	2	4	2
Tritia incrassata (Strøm, 1768)	3	18	-	-	-	-	-
Chrysallida emaciata (Brusina, 1866)	-	-	-	26	1	-	-
Chrysallida fenestrata (Jeffreys, 1848)	1	-	-	-	-	-	-
Spiralinella incerta (Milaschewich, 1916)	-	27	-	129	-	-	-
Eulimella acicula (Philippi, 1836)	1	2	-	-	-	-	-
Auristomia erjaveciana (Brusina, 1869)	6	16	13	66	1	1	4
Odostomia sp.	-	5	-	62	-	-	-
Parthenina suturalis (Philippi, 1844)	6	48	-	14	1	-	-
Turbonilla sp.	7	78	-	-	-	-	-
Ebala pointeli (de Folin, 1868)	-	-	-	2	-	-	-
Cylichnina umbilicata (Montagu, 1803)	12	65	-	52	-	-	-

	ST 1	ST 2	ST 5	ST 7	ST 9	ST 10	ST 12
Retusa truncatula (Bruguière, 1792)	1	10	-	15	-	1	-
Mytilaster lineatus (Gmelin, 1791)	-	-	-	5	-	-	-
Mytilidae (sp.)	-	-	-	-	6	2	-
Lucinella divaricata (Linnaeus, 1758)	8	2	4	1	-	1	1
Papillicardium papillosum (Poli, 1791)	-	2	-	-	-	-	-
Spisula subtruncata (da Costa, 1778)	-	-	2	2	-	-	-
Fabulina fabula (Gmelin, 1791)	3	-	-	1	1	-	1
Macomangulus tenuis (da Costa, 1778)	-	-	-	16	-	2	4
Donax trunculus Linnaeus, 1758	-	-	116	41	3	29	4
Donax venustus Poli, 1795	-	-	3	21	3	5	8
Chamelea gallina (Linnaeus, 1758)	20	-	116	188	198	59	102
Gouldia minima (Montagu, 1803)	1	14	-	-	-	-	-
Pitar rudis (Poli, 1795)	-	8	-	-	-	-	-
Lentidium mediterraneum (O.G. Costa, 1830)	1	10	-	5	4	1	24
BRYOZOA							
Cryptosula pallasiana (Moll, 1803)	-	-	-	-	-	X	-
ECHINODERMATA							
Oestergrenia digitata (Montagu, 1815)	-	1	-	-	-	-	-
CEPHALOCHORDATA							
Branchiostoma sp.	1	3	-	1	-	-	-

Among systematic groups, Mollusca forms the most dominant group in terms of the number of species (51 species) and individuals (97% of total individuals), followed by Polychaeta (49 species; 2.2% of total individuals) and Crustacea (34 species; 0.7% of total individuals). Other systematic groups comprising Cnidaria, Nemertea, Nematoda, Echinodermata and Cephalochordata are represented by 5 species and 0.1% of total individuals. Biomass values of the non-vertebrate identified within samples vary between 2.2 g and 101.9 g. The highest biomass value in all stations was identified in station number 10, where species *Donax trunculus*, *Chamelea gallina* and *Bittium reticulatum* had high biomass values. Detailed analyses conducted are given in the marine biology report of the **ANNEX-7.A**.

Macrobenthos: Hard Substratum Samples

Within the hard substrate samples collected from 5 stations at Kıyıköy, 86 species belonging to a total of 8 systematic groups (Cnidaria, Platyhelminthes, Nemertea, Nematoda, Polychaeta, Crustacea, Mollusca and Bryozoa) were identified. The number of all countable individuals belonging to systematic groups except for the three bryozoa (Cryptosula pallasiana, Collarina balzaci, Conopeum seurati) and one Anthozoa species (Clytia sp.) was 16.745 (Table 7.23).

Table 7.23: Species identified in hard substratum stations at Kıyıköy (*: alien species; **: indicator species)

	ST 3	ST 4	ST 6	ST 8	ST 11
CNIDARIA					
Anthozoa (spp.)	-	-	-	-	3
Clytia sp.	-	X	-	-	-
PLATYHELMINTHES					
Plathelminthes (spp.)	1	-	1	1	2
NEMERTEA					
Nemertini (spp.)	-	5	-	-	1
NEMATODA					
Nematoda (spp.)	1	12	1	2	126
POLYCHAETA					
Harmothoe imbricata (Linnaeus, 1767)	-	-	1	1	3
Harmothoe impar (Johnston, 1839)	3	-	11	1	11
Pholoe inornata Johnston, 1839	3	5	7	3	15
Eulalia clavigera (Audouin & Milne Edwards, 1833)	-	5	-	-	-
Eumida sanguinea (Örsted, 1843)	-	2	-	-	4
Nereiphylla rubiginosa (Saint-Joseph, 1888)	-	-	-	1	12
Pterocirrus macroceros (Grube, 1860)	-	-	1	-	-
Erinaceusyllis belizensis (Russel, 1989)	-	-	-	-	2
Exogone naidina Örsted, 1845	1	6	-	3	1
Salvatoria clavata (Claparède, 1863)	-	2	2	1	2
Salvatoria dolichopoda (Marenzeller, 1874)	1	5	3	14	7
Salvatoria limbata (Claparède, 1868)	-	-	3	7	33
Syllides fulvus (Marion & Bobretzky, 1875)	-	-	-	1	-
Syllis gerlachi (Hartmann-Schröder, 1960)	-	2	-	-	-
Syllis gracilis Grube, 1840	-	-	-	-	2
Nereis zonata Malmgren, 1867	6	4	-	-	7
Platynereis dumerilii (Audouin & Milne Edwards, 1834)	13	27	30	2	70
Micronephthys stammeri (Augener, 1932)	-	-	-	-	7
Lysidice ninetta Audouin & H Milne Edwards, 1833	1	-	-	-	1
Dorvillea rubrovittata (Grube, 1855)	1	-	1	-	-
Prionospio (Minuspio) maciolekae Dagli & Çinar, 2011	-	-	-	-	7
***Spio decoratus* Bobretzky, 1870	-	-	-	-	2
Polyophthalmus pictus (Dujardin, 1839)	-	16	2	6	102

	ST 3	ST 4	ST 6	ST 8	ST 11
***Capitella teleta* Blake, Grassle & Eckelbarger, 2009	-	1	-	-	3
Branchiomaldane vincenti Langerhans, 1881	-	-	-	-	2
Amphitritides gracilis (Grube, 1860)	-	-	-	-	2
Polycirrus sp.	1	2	1	-	-
Fabricia stellaris (Müller, 1774)	-	-	-	-	3
Manayunkia sp.	-	-	-	-	1
Janua (*Dexiospira*) *pagenstecheri* (Quatrefages, 1866)	-	-	25	-	5
Neodexiospira pseudocorrugata (Bush, 1905)	-	-	1	-	-
Pileolaria militaris Claparède, 1870	-	-	7	-	-
Spirobranchus triqueter (Linnaeus, 1758)	1	-	-	-	-
CRUSTACEA					
**Amphibalanus improvisus* (Darwin, 1854)	-	-	-	2	-
Nebalia sp.	3	-	-	-	2
Gastrosaccus sp.	1	-	-	-	-
Ampelisca pseudosarsi Bellan-Santini & Kaim-Malka, 1977	1	-	-	-	-
Ampithoe ramondi Audouin, 1826	255	8	46	19	86
Microdeutopus gryllotalpa Costa, 1853	8	-	-	-	1
Apherusa sp.	28	-	10	1	-
Monocorophium acherusicum (Costa, 1853)	3	4	-	3	13
Monocorophium insidiosum (Crawford, 1937)	7	-	-	-	-
Monocorophium sp.	36	2	1	-	-
Corophium sp.	1	-	-	-	-
Dexamine spiniventris (Costa, 1853)	-	-	-	-	27
Dexamine spinosa (Montagu, 1813)	67	-	1	4	20
Tritaeta gibbosa (Spence Bate, 1862)	34	4	-	-	3
Parhyale aquilina (Costa, 1857)	31	-	5	-	-
Ericthonius difformis H. Milne Edwards, 1830	9	-	-	-	4
Ericthonius punctatus (Spence Bate, 1857)	15	3	-	-	6
Ericthonius sp.	25	-	-	-	2
Perioculodes longimanus (Spence Bate & Westwood, 1868)	2	-	-	-	-
Idotea balthica (Pallas, 1772)	7	-	-	-	-
Chondrochelia savignyi (Kroyer, 1842)	6	1	2	1	3
Cumella (*Cumella*) *limicola* Sars, 1879	43	-	2	3	4

	ST 3	ST 4	ST 6	ST 8	ST 11
Pseudocuma (*Pseudocuma*) *longicorne* (Bate, 1858)	-	-	-	-	2
Hippolyte leptocerus (Heller, 1863)	3	-	-	-	-
Pisidia bluteli (Risso, 1816)	1	-	5	1	1
Macropodia rostrata (Linnaeus, 1761)	1	-	-	-	-
Pilumnus hirtellus (Linnaeus, 1761)	8	-	-	-	-
Xantho poressa (Olivi, 1792)	3	-	-	-	-
MOLLUSCA					
Lepidochitona cinerea (Linnaeus, 1767)	1	-	-	-	-
Acanthochitona fascicularis (Linnaeus, 1767)	2	6	-	-	-
Gibbula divaricata (Linnaeus, 1758)	1	-	-	-	-
Tricolia pullus (Linnaeus, 1758)	13	37	133	35	543
Bittium reticulatum (da Costa, 1778)	106	304	45	108	1928
Pusillina lineolata (Michaud, 1830)	8	-	1	2	6
Rissoa splendida Eichwald, 1830	-	-	-	-	4
**Rapana venosa* (Valenciennes, 1846)	2	-	-	-	-
Stramonita haemastoma (Linnaeus, 1767)	-	-	-	-	2
Tritia neritea (Linnaeus, 1758)	-	-	-	1	8
Chrysallida emaciata (Brusina, 1866)	3	2	1	1	20
Auristomia erjaveciana (Brusina, 1869)	-	7	2	-	4
Parthenina suturalis (Philippi, 1844)	1	-	-	-	13
Retusa truncatula (Bruguière, 1792)	-	-	-	-	1
Mytilaster lineatus (Gmelin, 1791)	25	663	74	-	-
Mytilaster sp.	-	-	-	25	-
Mytilidae (sp.)	641	3230	1932	829	4372
BRYOZOA					
Conopeum seurati (Canu, 1928)	-	X	X	-	-
Collarina balzaci (Audouin, 1826)	-	X	X	-	-
Cryptosula pallasiana (Moll, 1803)	-	-	X	-	-

The survey revealed, considering the number of species within hard substratum samples, that Polychaeta is the first group in the zone (33 species), followed by Crustacea (28 species) and Mollusca (18 species) groups. “Other systematic groups” comprising Cnidaria, Platyhelmithes, Nemertea and Nematoda are represented by 4 species.

The most dominant species identified among the hard substratum samples within the survey site are species belonging to the Mytilidae family (Mollusca, 65.7% of the number of total individuals), *Bittium* *reticulatum* (Mollusca, 14.9%), *Mytilaster lineatus* (Mollusca, 4.6%), *Tricolia pullus* (Mollusca, 4.5%) and *Ampithoe ramondi* (Crustacea, 2.5%) (**Figure 7.60**).

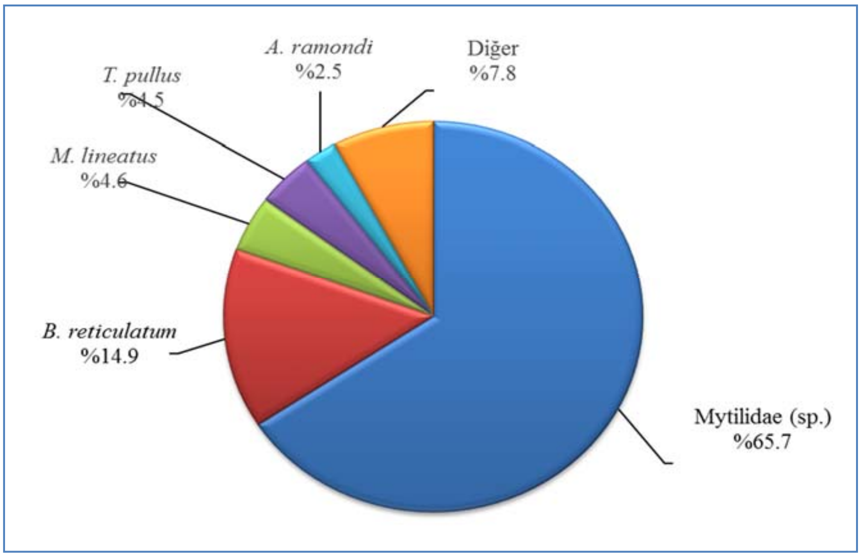


Figure 7.60: Dominance values of the species within hard substratum samples

When studied for their frequency index values, of all the species identified, 45.3% (39 species) was classified "Rare", 19.8% (17 species) was classified "Common" and 34.9% (30 species) was classified "Continuous". Majority of the species of this survey are classified "Rare" and were identified in a single sampling station. Some species which were identified in all stations such as *Pholoe inornata*, *Salvatoria dolichopoda*, *Platynereis dumerilii*, *Ampithoe ramondi*, *Chondrochelia savignyi*, *Tricolia pullus*, *Bittium reticulatum*, *Chrysallida emaciate* and the members of the Mytilidae family were classified (100%) "Continuous". Detailed analyses conducted are provided in the marine biology report within **ANNEX-7.A**.

Macrobenthos: General Assessment

Faunistical analyses of the benthic samples collected from different biotopes during the marine biology study conducted in the scope of the project revealed a total of 165 species, 96 of which were identified in soft substratum while 86 were identified in hard substratum. While Mollusca has the highest number of species in the substratum (51 species), Polychaeta (33 species) has the highest number of species within the hard substratum. 9 polychaeta species from the Turkish Black Sea coasts (*Pterocirrus macroceros*, *Erinaceusyllis belizensis*, *Salvatoria dolichopoda*, *Glycera tridactyla*, *Aricidea* (*Strelzovia*) *suecica meridionalis*, *Paradoneis armata*, *Polydora cornuta*, *Magelona mirabilis* and *Branchiomaldane vincenti*), 1 crustacea species (*Medorippe lanata*), 1 tunicata species (*Pyura dura*), 1 echinodermata species (*Astropecten* sp.) and 1 bryozoa species (*Collarina balzaci*) were identified for the first time in this survey. Furthermore, 1 polychaeta species (*Orbinia latreillii*) is a new registry for the Turkish coasts.

Ecrobia ventrosa, *Bittium reticulatum*, *Caecum trachea*, *Chamelea gallina*, *Rissoa splendida* and *Donax trunculus* are mollusc species making up the 88.5% of the total number of individuals within the soft substratum samples. Of these species, *Ecrobia ventrosa* is the most dominant species (46.4%) in the zone. However, the most dominant species identified among the hard substratum samples are species belonging to the Mytilidae family (Mollusca, 65.7%), *Bittium reticulatum* (Mollusca, 14.9%), *Mytilaster* *lineatus* (Mollusca, 4.6%), *Tricolia pullus* (Mollusca, 4.5%) and *Ampithoe ramondi* (Crustacea, 2.5%). *Bittium reticulatum,* a Mollusc species, was observed in both soft and hard substrata.

Biomass values of the non-vertebrate vary between 2.2 g and 101.9 g in the soft substratum, and 0.6 g and 31 g in the hard substrata. Mollusca group having the highest biomass in both soft and hard substrata is due to the high number of individuals within *Chamalea gallina* and *Donax trunculus* species.

Species identified are assessed as per the Bern Convention and IUCN Red List no endangered species was identified.

7.1.2.3.6 Fish and Fisheries

Very little amount of and few (only 6 species in total) fish samples were caught during beam-trawl sampling conducted at the Project site (Table7.). Almost all the materials obtained with beam-trawl sampling consisted of benthic invertebrates and their dead shells.

Table7.24: Organisms Caught by Beam Trawling and Their Distribution at the Survey Site

Scientific Name	Common Name	% Weight	Average (kg/s)	Biomass (kg/km^2)
Benthic Invertebrates				
Tunicata	Sea Squirts	1,59	0,02	1,10
Mollusca	Molluscs	86,47	0,99	59,54
Crustacea	Copepods	10,08	0,12	6,94
Bony Fish				
Sprattus sprattus	Sprat	0,26	0,00	0,18
Engraulis encrasicolus	Anchovy	0,24	0,00	0,16
Hippocampus guttulatus	Seahorse	0,12	0,00	0,08
Syngnathus tenuirostris	Greater pipefish	0,57	0,01	0,39
Neogobius melanostomus	Round goby	0,48	0,01	0,33
Parablennius tentacularis	Tentacled blenny	0,19	0,00	0,13

The fish caught during beam trawl sampling operations are all juvenile (young or baby) individuals except for Syngnathus tenuirostris species. According to the biomass estimation made through beam trawl samplings, the amount of bony fish distributed throughout depths relatively shallower than 20 m within the Survey Site is 1,27 kg/km^2, which is quite a low value. For example, in the western Black Sea the estimated bony fish biomass amounts to about 1.611 kg/km^{2}for the bottom trawling samplings carried out from November 2006 to October 2007 (Ref. 7.56). The average amount of fish caught within 1 hour during the sampling operations, also at the western Black Sea from October 2010 - April 2011 period and at 30-100 m depth amounts to 136 kg/s (Ref. 7.129). Additionally, another study carried out in the central Black Sea(Sinop-Yakakent Region) these values were estimated to vary between 327-16.940 kg/km^2 (Ref. 7.130). A study conducted at Trabzon coasts of the eastern Black Sea estimated that the total biomass of the demersal fish was somewhere between 1.703 kg/km^{2}and 8.255 kg/km^2 (Ref. 7.131).

The results did not differ much in bottom-trawl sampling operations undertaken at the Survey Site. An abundance of invertebrate benthic organisms and shells (pieces of dead shell) were caught (Figure 7.). The number and amount of species caught in trawl samplings was also much lower than what was expected (Table7.25).

Table7.25: Organisms Caught by Bottom Trawl at the Survey Site and Their Distribution

Scientific name	Common name	% Weight	Average (kg/s)	Biomass (kg/km²)
Marine Plants				
Codium tomentosum	Green Seaweed	19,13	1,47	22,93
Benthic Invertebrates				
Tunicata	Sea Squirts	5,59	0,43	6,70
Bivalvia	Bivalve molluscs	2,18	0,17	2,61
Mytillus galloprovincialis	Black mussel	2,02	0,16	2,43
Gastropoda	Gastropoda, Snails	2,08	0,16	2,49
Rapana venosa	Sea Snail	6,39	0,49	7,66
Echinodermata	Echinoderms	1,07	0,08	1,28
Decapoda	Decapod	0,42	0,03	0,51
Malacostraca	Malacostraca	0,00	0,00	0,00
Brachyura	Crabs	7,15	0,55	8,57
Bony Fish				
Sprattus sprattus	Sprat	0,73	0,06	0,88
Engraulis encrasicolus	Anchovy	0,12	0,01	0,14
Hippocampus guttulatus	Seahorse	0,27	0,02	0,33
Syngnathus tenuirostris	Greater pipefish	0,14	0,01	0,17
Syngnathus typhle	Broad-nosed pipefish	0,03	0,00	0,04
Merlangius merlangus	Whiting	8,61	0,66	10,32
Mullus barbatus	Red Mullet	0,12	0,01	0,14
Trachinus draco	The greater weever	15,28	1,17	18,31
Uranoscopus scaber	Stargazer	13,98	1,07	16,76
Gobius niger	Black goby	3,92	0,30	4,70
Mesogobius batrachocephalus	Knout goby	0,98	0,08	1,17
Neogobius melanostomus	Round goby	2,25	0,17	2,70
Scorpaena porcus	Black scorpionfish	3,71	0,28	4,44
Scophthalmus maximus	Turbot	3,79	0,29	4,54
Arnoglossus kessleri	Scaldback	0,03	0,00	0,03
Lepadogaster candollei	Connemarra clingfish	0,02	0,00	0,02

Figure 7.61: Outlook of the Materials Obtained Via Trawl (1, 2, 3 and 4) Sampling Operations

16 bony fish species were caught during the sampling operations undertaken with the bottom trawl. Amount of biomass of the bony fish, which made up 54% of the total catch, was estimated to be around 65 kg/km^2. This value, although much more reasonable than samplings with the beam trawl, is still far

below the expectations. The fact that length distributions of the fish species caught during both the beam-trawl and bottom-trawl samplings were quite short is an important indication that coastal area of Kıyıköy is a "feeding and growing" zone as far as the fish presence is concerned. Bottom water temperature was quite low (5-8°C) at the time of sampling. It leads to the adult fish abandoning this site to overwinter in the offshore where waters are probably warmer. Abundance of young fish individuals at the Project site; and the fact that a sizeable share of whiting individuals which hold great commercial value especially for the Black Sea indicate that the region is an important growing area where the fish spend their youth (Figure 7.). The sampling catch consisting of different whiting sizes is an indication that the species in question fulfil its reproductive function throughout the phase (Figure 7.).

Figure 7.62: Size of Whiting İndividuals Caught at the Project Site

Graphs of length-frequency distribution per station of the whiting individuals caught during trawling operations are given in Figure 7.. about 90% of the whiting were consisted of small individuals within 6-8 cm length category. A similar case applies to the other fish species caught in the region.

The fish with the highest commercial value among the demersal species caught during trawl sampling operations, is the turbot. The 2 turbot that were caught in sampling operations were also small-sized, young individuals.

Another interesting finding is that no species of cartilaginous fish were caught in sampling operations. It is likely that some sharks and stingray species that are known to have a distribution throughout the area were then distributed throughout warmer depths offshore because of the low sea water temperatures.

An evaluation of the fish caught during sampling operations at the Project site in terms of the "Red List of Endangered Species" (Ref. 7.132), no endangered species were found within the area.

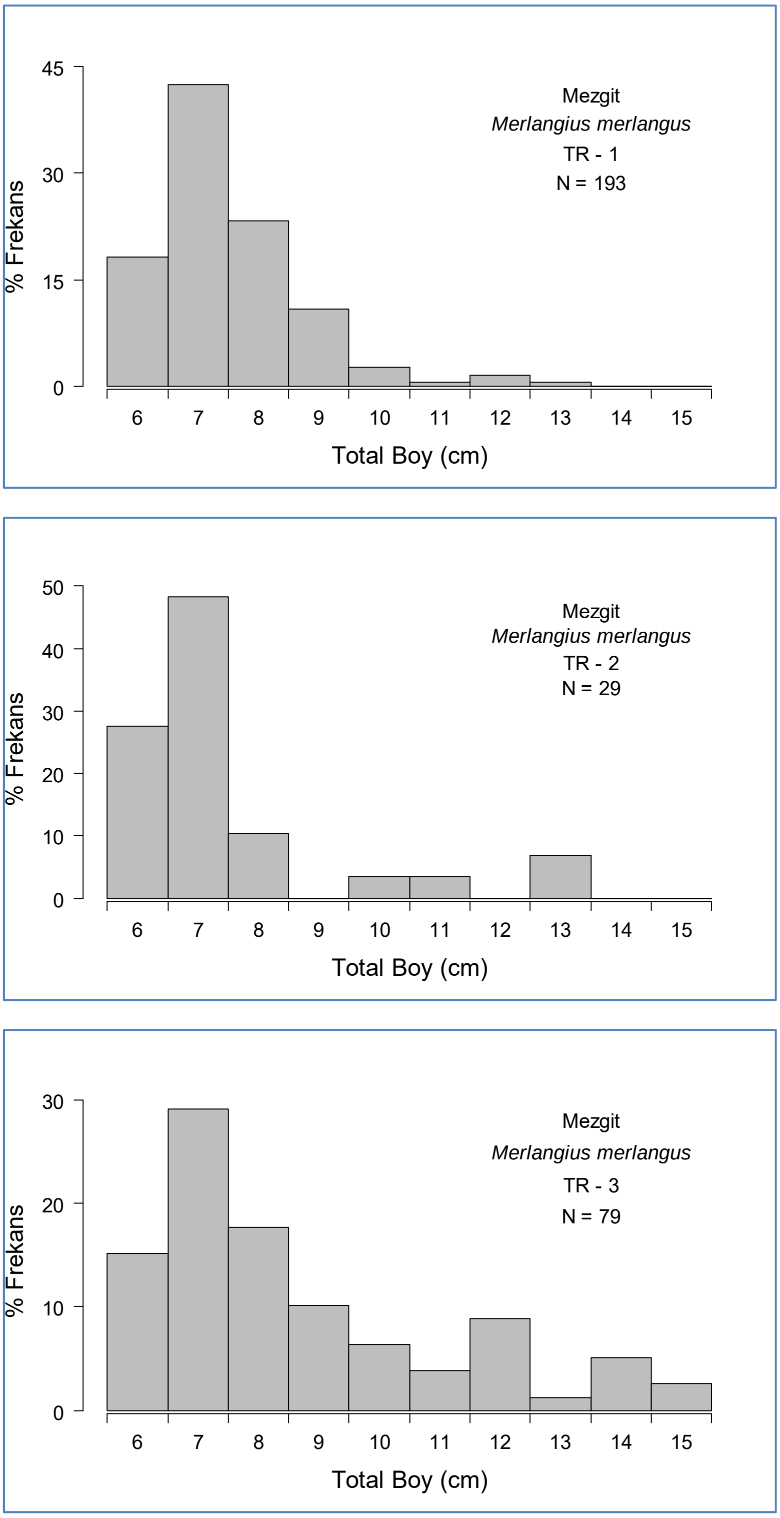


Figure 7.63: Length-Frequency Distribution of Whiting Per Trawl Sampling

7.1.2.3.7 Marine Mammals

The coincidental observations carried out in the region throughout field studies several dolphin individuals belonging to three different dolphin species were spotted (Table7. and Figure 7.). The dolphins were observed to come too close to the trawl net particularly during trawl sampling operations. Observed species are identified as *Phocoena phocoena* (Black Sea harbour porpoise), *Delphinus delphis* (Black Sea common dolphin) and *Tursiops truncatus* (Black Sea bottlenose dolphin) and their photos were taken to identify species.

Table7.26: Numerical Values Related to the Observed Species (Pp: *P. phocoena*; Dd, *D. delphis*; Tt: *T.truncatus*)

Observation	Species	Number	Date	Time
1	Black Sea harbour porpoise	25	05.04.2017	7:30
2	Black Sea common dolphin	2	05.04.2017	9:50
3	Black Sea bottlenose dolphin	2	05.04.2017	15:52
4	Black Sea harbour porpoise	2	06.04.2017	9:00
5	Black Sea harbour porpoise	1	06.04.2017	9:30
6	Black Sea harbour porpoise	4	06.04.2017	11:15
7	Black Sea common dolphin	3	06.04.2017	11:55
8	Black Sea bottlenose dolphin	4	06.04.2017	12:15
9	Black Sea harbour porpoise	4	06.04.2017	13:15

Red List evaluations regarding the observed general and Black Sea subpopulations are as follows:

- Phocoena phocoena: (LC) Phocoena phocoena ssp. retlica (EN)
- Delphinus delphis: (LC) Delphinus delphis ssp. ponticus (VU)
- Tursiops truncatus: (LC) Tursiops truncatus ssp. ponticus (EN)

Red List status of all species is stated to be of "Least Concern"; however, there is no information available about their population. However, their Red List status is not the same for the Black Sea subpopulation; Black Sea common dolphin is classified as vulnerable (VU) and the other two species are classified as endangered (EN). Despite short duration of observations, it was understood that the study area was used by dolphins. Furthermore, the dolphins were observed to approach the trawl pocket net during the sampling. It is an indication that there is interaction between dolphins and fisheries in the area.

Figure 7.64: Dolphin individuals encountered at the study area

7.1.2.3.8 Evaluation of Water and Sediment Quality Results

Analyses of the water and sediment samples collected from the Survey Site were carried out by Düzen Norwest laboratory. The results are presented in **ANNEX-6.E**. Sediment samples were also analysed for hazards at the Marmara Research Centre of TUBİTAK. The results are given in **ANNEX-6.F**, and sediment samples were classified as non-hazardous upon the analysis results.

E.coli and intestinal enterococci results have been evaluated on the basis of "Regulation on the Management of Surface Water Quality" (Official Journal 28483, 2012) "Table 6.2: Standard Values Required for Coastal and Transitional Waters Used for Recreational Purposes"(Table7.).

Table7.27: Standard Values Required for Coastal and Transitional Waters Used for Recreational Purposes(Table 6)

Parameter	Standard
Colour Turbidity Clarity Light permeability	No unusual changes in the colour
	Secchi depth: 1 m – 90% (reference)
	2 m – 95% (mandatory)
pH	6–9
Carbon residue and floating substances	None
Floating substance (including oil and grease)	No floating objects such as wood, plastic etc. No visible film of oil or foam.
Dissolved oxygen	80-120%saturation (90%)
	100 (95%) (reference)

Parameter	Standard
Intestinal enterococci* (colony/100 mL)	200 (95%) (mandatory)
	185 (90%) (sufficient)
*Escherichia coli** (colony/100 mL)	250 (95%) (reference)
	500 (95%) (mandatory)
	500 (90%) (sufficient)

As per the Bathing Water Quality Regulation, bathing and recreational waters are required to meet the quality criteria stipulated in ANNEX-1 of the regulation, in the table for quality criteria to be met by bathing and recreational waters (Table7.). Results of water analyses were below relevant limit values for all microbiological parameters.

Table7.28: Table of Quality Criteria to be Met by Bathing and Recreational Waters(ANNEX-1)

	Parameters	Reference		Mandatory	Minimum Sampling Frequency	Method of Analysis and Study
A	Microbiological					
1	Total coliform/100ml	1000	500 (year 2015)	10000	Once every two weeks	Membrane filter
2	Faecal coliform/100ml	200	100 (year 2015)	2000	Once every two weeks	Membrane filter
3	Faecal streptococci/100ml	100		1000	Once every two weeks	Membrane filter
4	Salmonella/1litre	-		0		Membrane filter
5	Enterovirus PFU/10 litre	-		0		Membrane filter (for virus)

Effect of the lowest values (The effects range-low value- ERL) and effect of median values (effects range-median value – ERM) are used to evaluate risks in line with the Sediment Quality Guideline (Ref. 7.133). Concentrations of cadmium, arsenic, lead, chromium, copper, nickel, zinc and mercury measured at all sampling stations are below the relevant values (Table7.), which shows that metal concentration values pose no ecological risk to benthic organisms in the vicinity.

Table7.29: Metal Concentrations in the Sediment (mg/kg dry weight)

Metals	ENV-05N	ENV-NEW-11N	ENV-NEW 04N	ENV-16N/ENV-11N	ENV-08N/ENV-04	ENV-NEW-15N/ENV-10	ENV-01N	ERL	ERM
Cadmium	< 0,3	< 0,3	< 0,3	< 0,3	< 0,3	< 0,3	< 0,3	1,2	9,6
Arsenic	< 0,3	< 0,3	< 0,3	< 0,3	< 0,3	1,9	< 0,3	8,2	70
Lead	1,6	2,5	2,4	5,9	1,5	3,1	1,1	46,7	218
Chromium	10,1	12,2	11,0	17,2	9,0	2,4	11,6	81,0	370
Copper	12	10,5	10,4	12,8	10,8	3,3	16,3	34,0	270
Nickel	6.4	6,8	6,4	7,1	6,5	2,3	7,4	20,9	51,6

Zinc	23,2	20,3	18,7	22,5	18,5	7,4	25,1	150	410
Mercury	< 0,02	< 0,02	< 0,02	< 0,02	< 0,02	< 0,02	< 0,02	0,15	0,71

In addition to the evaluations above, TRIX was calculated using total phosphorous, total inorganic nitrogen, chlorophyle-a concentrations and % deviation values from saturated oxygen to identify eutrophication level and water quality (Ref. 7.134):

$$TRIX= [\log(Chl\text{-}a \times aD\%O \times DIN \times TP) + 1,5]/ 1,2$$

It is possible to use this index to make evaluation in separate scales for pollution levels in the Mediterranean and the Black Sea. Areas of the Mediterranean whose TRIX unit exceeds 6 are considered waters with high production. Eutrophication effect in such areas is revealed by a decrease in dissolved oxygen concentrations which are frequently observed. A TRIX unit between 4-6 is considered to identify areas with risk of eutrophication. Areas lower than 4 are considered areas with little primary production and regions with2 or fewer TRIX units are associated with open seas. This scale is the most pertinent one for the Mediterranean and the Aegean Sea. When it comes to trophic level evaluations for the Black Sea, however, values given in Table7. are considered (Ref. 7.135).

Table7.30: Reference Values for the Average TRIX Defining the Trophic Level in the Black SeaCoasts (Ref. 7.135)

TRIX	Trophic Scale	Eutrophication Status	Water Quality Status
<4	Very good	No risk of Eutrophication	Poor in nutrient elements, high light permeability, high percentage of oxygen saturation in bottom waters
4-5	Good	Little risk of Eutrophication	Medium productivity in terms of nutrient elements and sporadically turbid waters
5-7	Medium	Risk of Eutrophication	Productive in terms of nutrient elements, lowlight permeability, lack of oxygen in bottom waters
>7	Poor	High Risk of Eutrophication	Rich in nutrient elements, productive waters, low light permeability low, lack of oxygen in bottom waters

Water quality measurements, which were conducted on the water samples taken from the stations at the Survey Site and from the same locations as the sediment sampling points given in Section 7.1.2.2(Figure 7.15), are evaluated as good level as per the scope of the Table 7.26 (Table7.).

Table7.31 TRIX values based on stations

Station	Dissolved Oxygen	Temperature	Salinity	Production (chlorophyle-a)	Ammonia	Nitrate	Nitrite	Total Phosphorous	DIN	TRIX
	%	°C	psu	µg/L	µg N /L	µg N/L	µg N/L	µg P/L	µg N/L	
ENV-05	93,073	4,395	17,063	2,265275	1,484	108,122	3,906	18,383	113,5	5,01
ENV-08	92,225	4,483	17,225	2,0189	1,05	98,616	4,186	15,996	103,9	4,93
ENV-NEW-11N	93,587	4,429	17,183	2,0739	1,148	90,762	3,934	17,856	95,8	4,88
ENV-12N/ ENV-07	93,455	4,414	17,0944	2,383975	1,526	88,41	4,256	18,631	94,2	4,95
ENV NEW 15N/ ENV-10	93,724	4,364	17,129	2,29895	0,868	91,77	5,404	17,143	98,0	4,90

Station	Dissolved Oxygen	Temperature	Salinity	Production (chlorophyle-a)	Ammonia	Nitrate	Nitrite	Total Phosphorous	DIN	TRIX
ENV-16N ENV-11	92,924	4,333	17,126	2,24780	1,554	87,766	4,466	19,158	93,8	4,96
ENV-06	95,128	4,266	17,052	2,18855	2,044	89,11	3,892	12,245	95,0	4,66
ENV-08 N ENV-04	94,927	4,245	17,01	1,90465	1,792	88,746	4,032	19,747	94,6	4,80
ENV-09	94,021	4,302	17,11	2,328775	2,688	98,924	4,018	13,144	105,6	4,82
ENV-12	93,602	4,314	17,109	2,158925	3,402	86,702	4,55	21,607	94,7	4,96
ENV-05N	94,487	4,212	17,399	2,218175	0,756	89,558	7,364	17,577	97,7	4,85
ENV-NEW-07N	94,805	3,953	17,359	2,41360	1,33	90,258	7,392	18,383	99,0	4,88
ENV-09N	93,889	3,841	17,329	2,099675	0,812	87,094	7,028	16,461	94,9	4,83
ENV-013N	93,39	4,022	17,419	1,815575	0,448	93,702	7,49	14,818	101,6	4,80
ENV-NEW-03N	95,711	4,024	17,413	1,764425	0,798	93,38	6,524	20,274	100,7	4,74
ENV-01N	94,943	4,035	17,412	1,760575	0,112	93,898	7,574	16,523	101,6	4,73
ENV-NEW-02	94,964	4,05	17,421	1,768475	0,924	92,708	8,358	13,547	102,0	4,66
ENV-NEW -04N	95,849	4,084	17,414	1,934075	0,434	58,352	3,542	8,184	62,3	4,26

7.1.2.3.9 Types of Habitats within the Survey Site

6 types of habitats were identified within the study site on the 3rd degree as per the EUNIS marine habitat classification (Figure 7.). 4 of them represent rocky habitats of the Black Sea while the remaining two are sandy habitats.

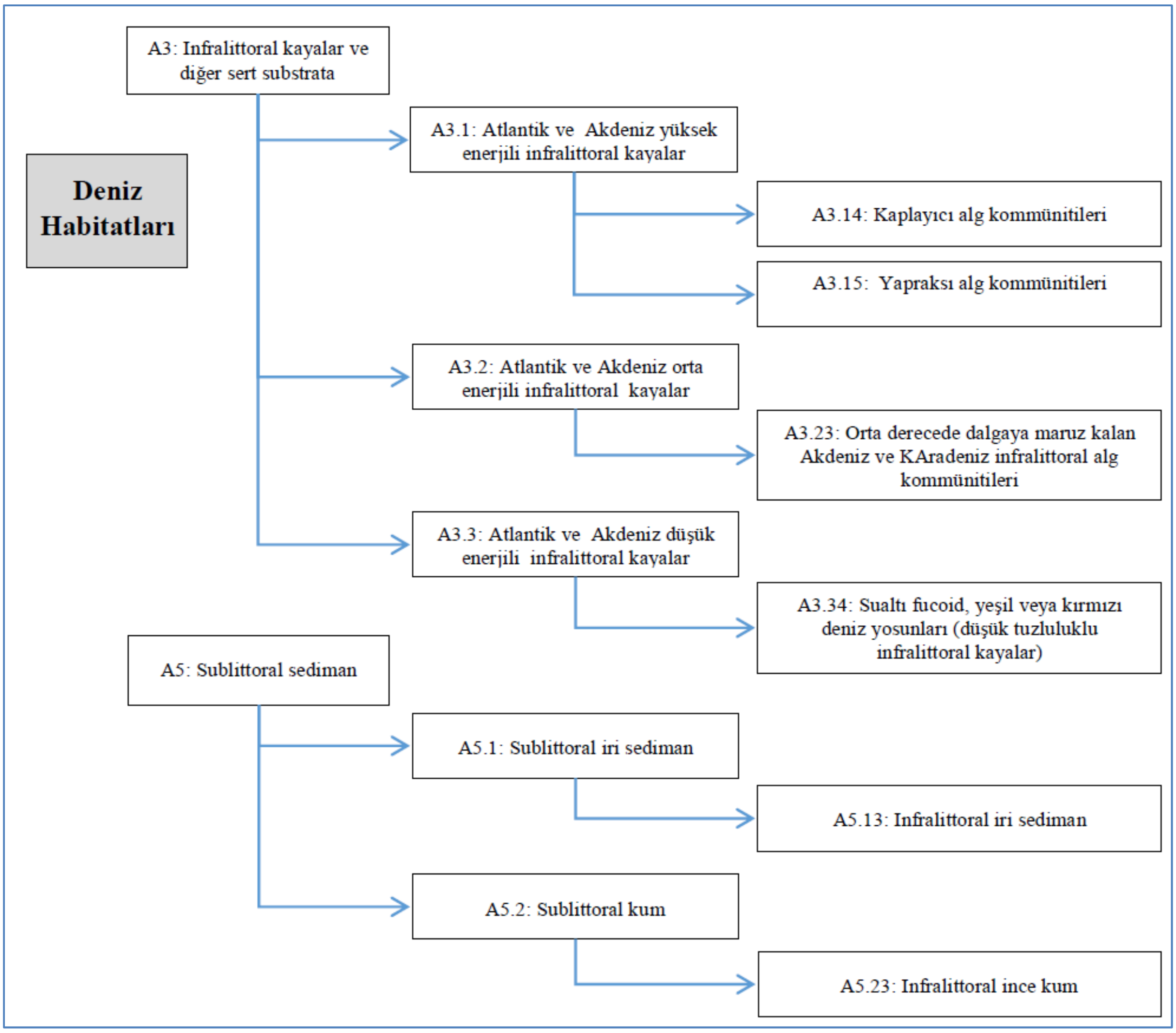


Figure 7.65: Hierarchical Display of the Identified Habitat Types as per the EUNIS Classification

With 61% share in the distribution, “sublittoral sediment” (A5.13 and A5.23) was identified as containing the most commonly identified types of marine habitats within the study site (Figure 7.66).

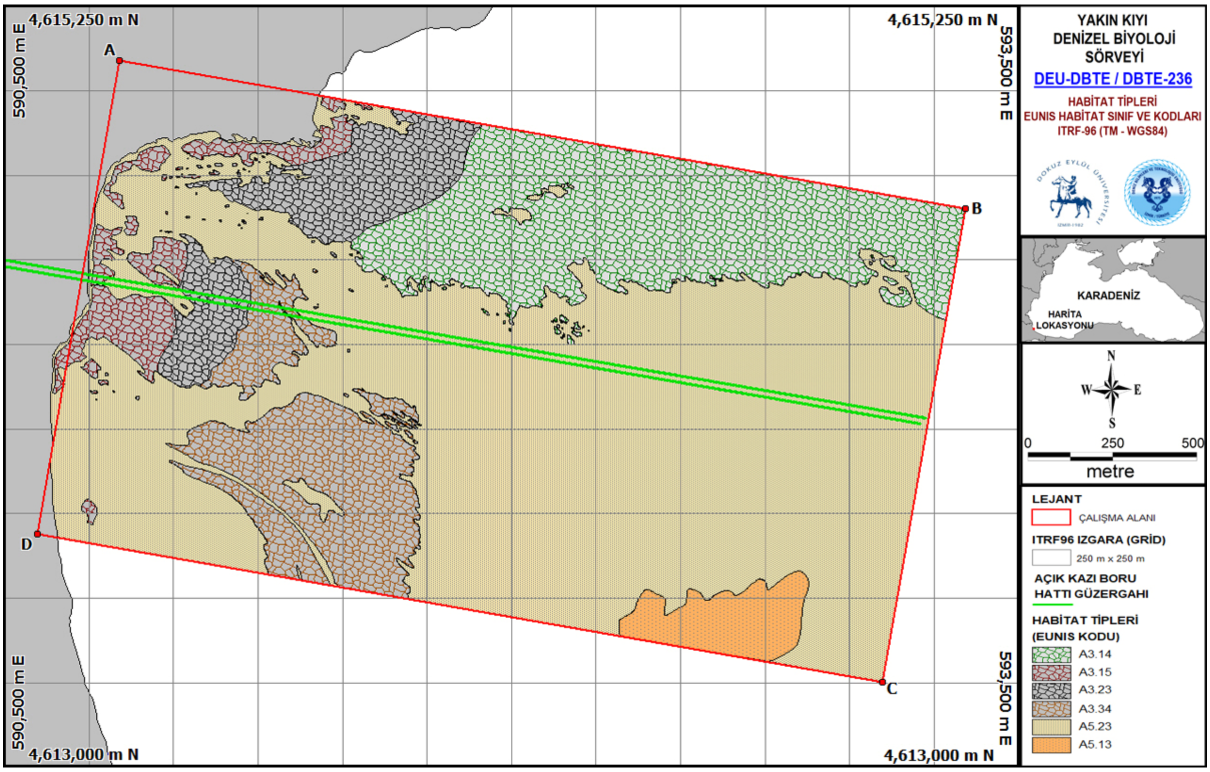


Figure 7.66: Habitat Types Distributed Throughout the Study Site

As explained earlier, a total of 6 habitat types were identified at the study site as per the EUNIS marine habitat classification on the 3rd level (Figure 7., Figure 7.66). As a result of visual observations on the 12 diving lines shown in Figure 7.18, images compiled from underwater images obtained for each of the identified habitat types are given below between Figure 7. and Figure 7..

Figure 7.67:Coater Algae Communities

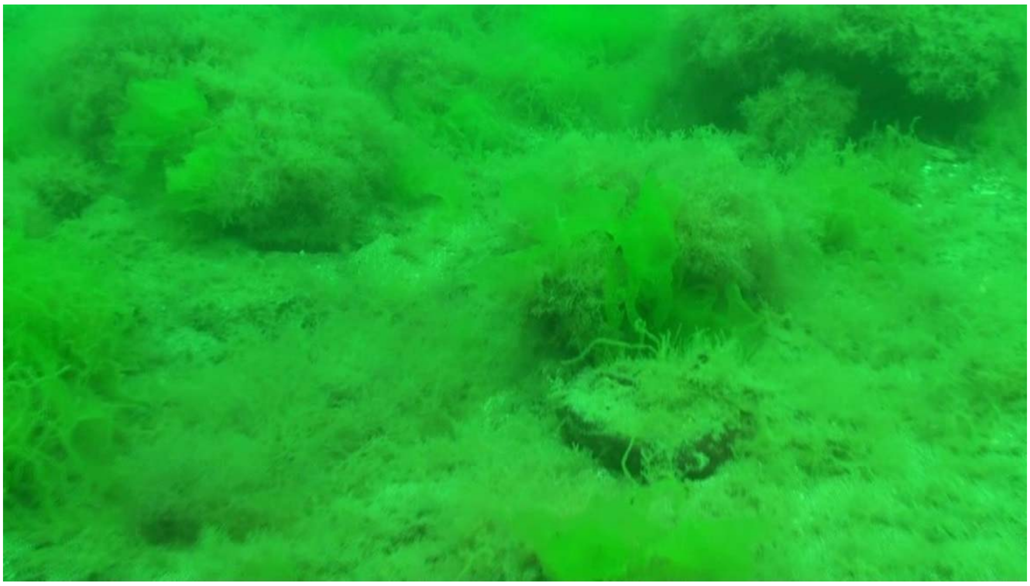


Figure 7.68: Foliaceous Algae Communities

Figure 7.69: Mediterranean and Black Sea Infralittoral Algae Communities Exposed to Mid-Level Waves

Figure 7.70: Underwater Fucoid, Green or Red Seaweed (Low Salinity Infralittoral Rocks)

Figure 7.71: Infralittoral Coarse Sediment

Figure 7.72: Infralittoral Coarse Sand

7.1.2.4 Environmental Management of Bottom Dredging

Bottom Dredging Environmental Management Plan is elaborated by DEU-DBTE and provided in **ANNEX-7.B** as part of the Project and to identify the environmental aspects of the construction of the pipeline on the Shore Crossing Section through dredging of the seabed as well as other activities in conjunction with the construction. The plan also includes current values at the Survey Site as well as the studies regarding the current and sediment transport.

Bottom dredging operation will consist mainly of the excavation of the material on the area to be dredged, laying the pipes into the resulting ditches at the identified depth, and covering operations. Identifying the characteristics of the bottom dredging materials to be excavated out during these operations is crucial to be able to evaluate the environmental impact of these operations. Identification of the characteristics and physical composition of the dredging material was based on the Draft Regulation of the MoEU on the Environmental Management of Sea Bottom Dredging and Dredging Materials.

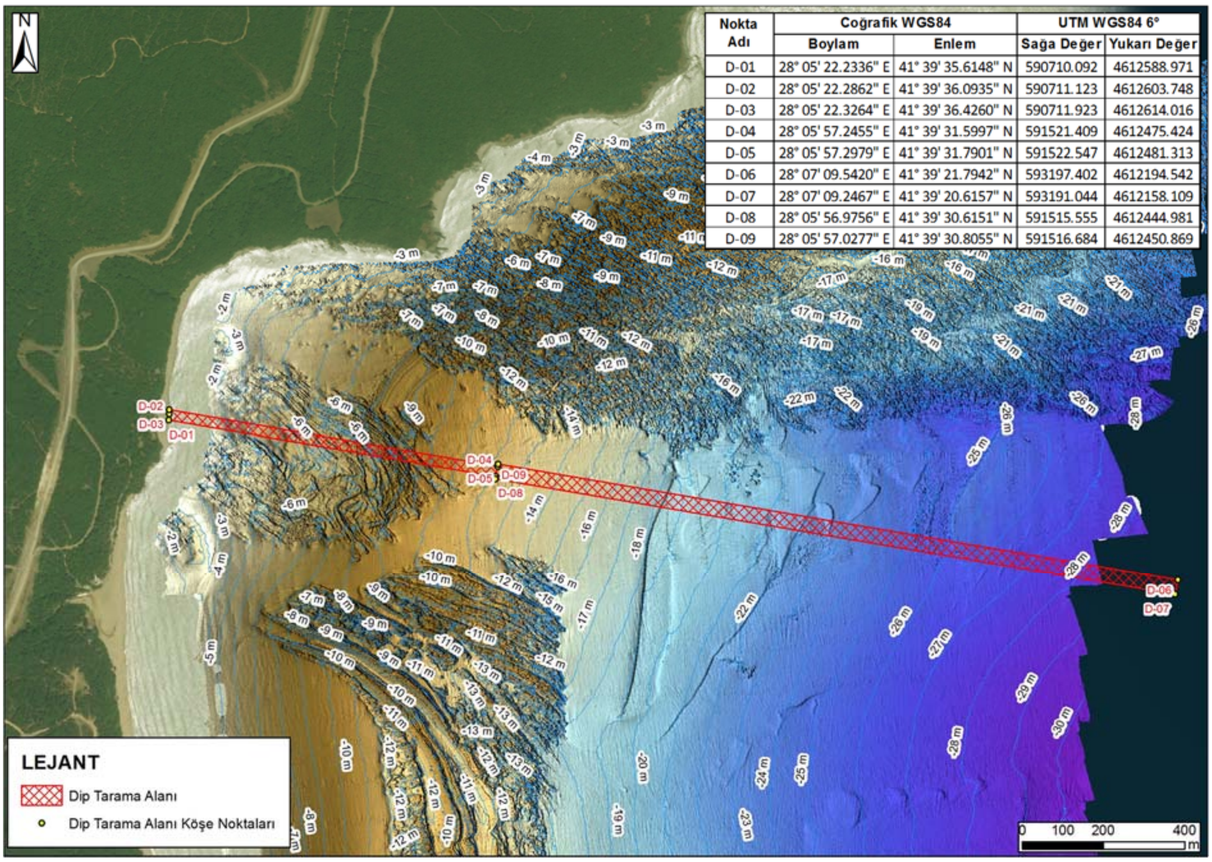
“Waste Management Regulation” (WMR) ANNEX-3B tests in the scope of the EIA report were conducted at the Marmara Research Centre of the Scientific and Technological Research Council of Turkey (TUBİTAK-MAM). As part of this study, the 12 sediment samples, which were collected by the staff of Düzen Norwest laboratory the study station locations in the Black Sea Region Kıyıköy shore with minutes of proceedings, were studied and evaluated for “hazardous content” as per the WMR published in the Official Journal dated 23.03.2017 and numbered 30016. For the evaluation of the sediment samples in the scope of the WMRANNEX-3B, an initial content identification was done. Identification of the sediment samples resulted in assigning the materials to the code M (Potentially Hazardous Waste) as “bottom dredging sludge containing hazardous materials” under the WMRANNEX-IV main heading (17) “Construction and Demolition Wastes (Including the Excavations at Contaminated Sites)”, (17 05) and the subheading “Soil (Including the Excavations at Contaminated Sites), Rocks and Bottom Dredging Sludge)” (17 05 05).

TUBİTAK-MAM analyses concluded that:

- the sediment samples had basic, moist and inorganic contents;
- the inorganic contents were non-hazardous as per the WMR;
- the eco-toxicity analysis established that samples were non-toxic (cat=0);
- the fish bio-tests were ZSF=1, meaning there were no acute hazard to aquatic creatures living in aquatic environment; and
- acute toxicity results in mice were category 5 (GHS 5) as per Global Harmonised System. LD50 value> 2000 – 5000 mg/kg body weight.

TUBITAK-MAM reported that the sediment samples were “non-hazardous” (**ANNEX-6.F**). Technical details regarding the bottom dredging operation are provided in**ANNEX-7.B,** with the Bottom Dredging Environmental Management Plan. Reporting format used for the elaboration of the Plan complies with the requirements in the opinion letter (**ANNEX-5.A**) dated July 2017 of the Marine and Coastal Area Management Department under the Directorate General of Environmental Management of the MoEU.

Bottom dredging operation, planned to be carried out in the area indicated in Figure 7.73, is intended to be put in motion using the backhoe dredger (BHD) and the trailing suction hopper dredger (TSHD). A Cutter Suction Dredger (CSD) fitted with a special cap may be needed for the rock bottom, which is located near the coast and whose toughness will be revealed with detailed geotechnical studies. The Bottom Dredging Environmental Management Plan will be reviewed based on the planned geotechnical studies, and having covered the other issues pointed out in the opinion letter dated July 2017 (**ANNEX-5.A**) of the Directorate General of Environmental Management of the MoEU, the Plan will then be shared with the Directorate General of Environmental Management of MoEU. Required permits in the scope of this plan will be obtained prior to the construction phase.



Nokta Adı	Coğrafik WGS84		UTM WGS84 6°	
	Boylam	Enlem	Sağa Değer	Yukarı Değer
D-01	28° 05' 22.2336" E	41° 39' 35.6148" N	590710.092	4612588.971
D-02	28° 05' 22.2862" E	41° 39' 36.0935" N	590711.123	4612603.748
D-03	28° 05' 22.3264" E	41° 39' 36.4260" N	590711.923	4612614.016
D-04	28° 05' 57.2455" E	41° 39' 31.5997" N	591521.409	4612475.424
D-05	28° 05' 57.2979" E	41° 39' 31.7901" N	591522.547	4612481.313
D-06	28° 07' 09.5420" E	41° 39' 21.7942" N	593197.402	4612194.542
D-07	28° 07' 09.2467" E	41° 39' 20.6157" N	593191.044	4612158.109
D-08	28° 05' 56.9756" E	41° 39' 30.6151" N	591515.555	4612444.981
D-09	28° 05' 57.0277" E	41° 39' 30.8055" N	591516.684	4612450.869

Figure 7.73: Area of dredging and its coordinates

Modelling studies were conducted for sediment cloud distribution in the scope of the Bottom Dredging Environmental Management Plan. Source power was calculated separately for the potential use of mechanical (BHD and TSHD) and hydraulic (CSD and TSHD) dredging equipment; and the sediment cloud distribution was computed using this source power. The calculations indicate that the distance at which the sediment concentration falls under 1 mg/L is 100 m for mechanical dredging equipment and 150 m for hydraulic dredging equipment.

Aside from the mechanical and hydraulic dredging scenarios mentioned earlier, a modelling was done to determine how far from the pipeline the sediment cloud would be transported when extreme values are used. To develop an extreme values scenario; the sediment on the Project Site Shore Crossing Section was modelled so that it behaves like fine sand (grain radius was modelled as 20 microns to be on the safe side, though it was measured to be 100 microns on average) though actually mostly composed of coarse sand, and current values on the Survey Site were deemed to be much higher (30 cm/s) than the actual measured values (15 cm/s). According to the extreme values scenario, sediment concentration falls below 1 mg/L at 165 m from the study zone. Given that water quality measurements carried out to establish the baseline of the site revealed the average concentration of suspended solids at the Survey Site to be 2.2 mg/L, the scenario that the sediment would be transported 165 m away from the study zone could be considered a cautious scenario.

According to the current plans, approximately 180.000 m^3 of materials will be dredged in the Shore Crossing Section of the Project. No negative environmental impact is expected because the dredging material is non-hazardous. Considering that the dredging material is “non-hazardous” and that the potential impact on the marine ecology is considered to be at negligible level with the adoption of design controls developed in the scope of the Project and the implementation of mitigation measures, the plan is to put the dredging material in good use by temporarily storing it near the excavated ditches only to cover the pipeline in the aftermath.

Bununla birlikte, geliştirilen Dip Tarama Çevresel Yönetim Planı kapsamında, bir izleme programı gerçekleştirilecek olup, gerekmesi halinde, deniz ekolojisi üzerindeki etkilerin en aza indirilmesi amacıyla ilave önlemler alınacaktır.

7.1.2.5 Impact Assessment and Conclusion

7.1.2.5.1 Impact Assessment

Potential impact on the marine fauna and flora due to the operations to be carried out during the construction phase of the Project's Shore Crossing Section was assessed and provided below. Impact during the construction phases are defined considering the planned pipeline construction operations (Figure 7.74). Size of marine fields to be used in the scope of the operations of transition road construction, bottom dredging and temporary storage of the dredging material are given in Table 7.32.

Impact assessment was based on the situation that is considered a combination of the worst conditions of all operations, and maximum impact was taken into account. The scenario takes into consideration habitat and biomass loss which has direct and/or indirect impact on the marine ecosystem, covering on the seabed and suspended sediment in the water column and increased turbidity. Scenario combination was created as per the criteria given in Table 7.33.

Table 7.32: Areas of the Project site covered by operations per area

Operation	Zone (depth, m)	Area (km^2)*
Transition Road Construction	North (0-6 m)	0,0116
	South (0-6 m)	0,0099
Bottom dredging	Dredging 0-12 m	0,0192
	Dredging 12-30 m	0,0641
	Dredging outer zone 0-12 m	0,0105
	Dredging outer zone 12-30 m	0,0170
Evacuation/Storage	BHD	0,0574
	TSHD	0,1848

*Areas were calculated as extrapolation, seabed slope was neglected.

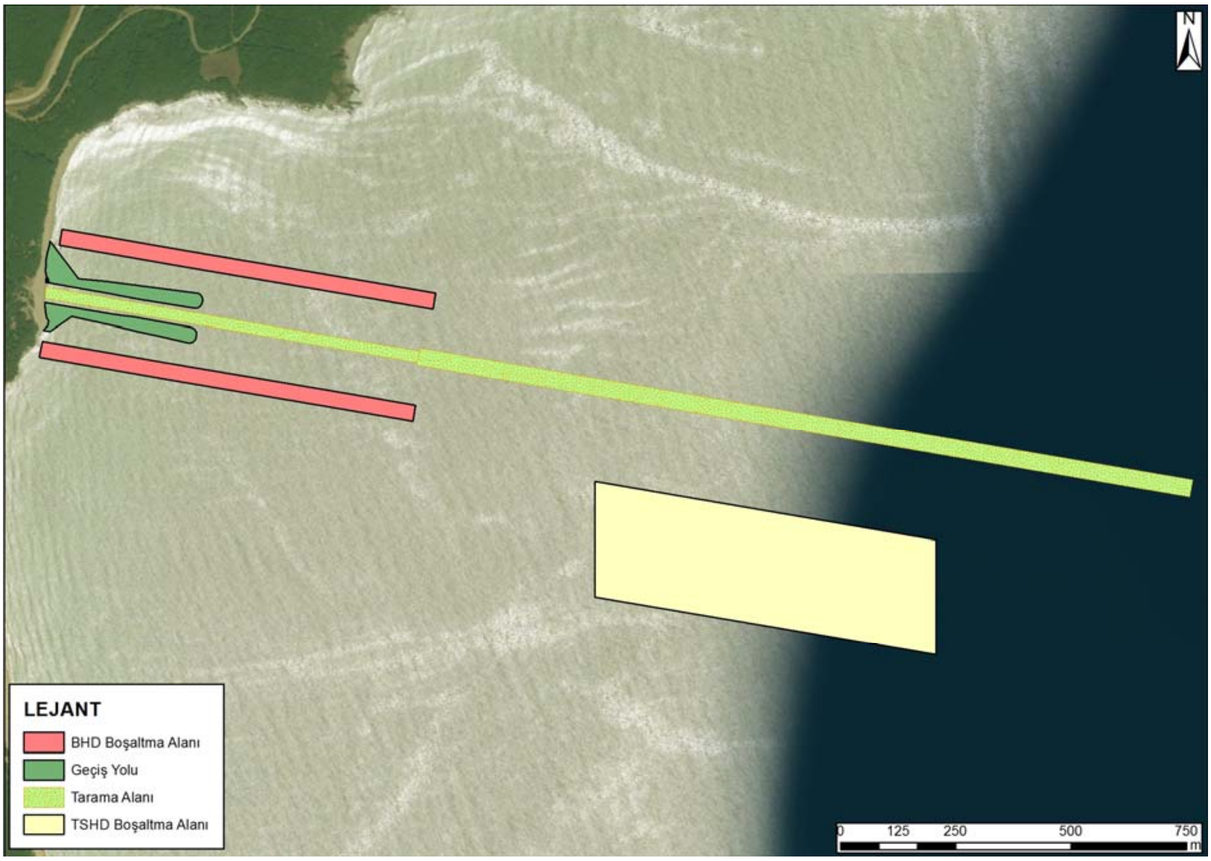


Figure 7.74: Borders of the construction operations at the Project site

Table 7.33: Impact assessment criteria for the Project site

Operation	Type of Impact	Border of Impact
Transition road construction	Direct habitat loss	Transition road borders
	Direct biomass loss	Transition road borders
	Cover (seabed)	Transition road 165 m surrounding borders
	Suspended sediment/ turbidity increase	Transition road 165 m surrounding borders
Bottom dredging	Direct habitat loss	Dredging border + 5 m surrounding area
	Direct biomass loss	Dredging border + 5 m surrounding area
	Cover (seabed)	Borders surrounding the dredging area 165 m
	Suspended sediment/ turbidity increase	Borders surrounding the dredging area 165 m
Evacuation	Direct habitat loss	BHD + TSHD borders
	Direct biomass loss	BHD + TSHD borders
	Cover (seabed)	BHD + 165 m TSHD + 120 m (as per the defined operation[3])
	Suspended sediment/ turbidity increase	BHD + 165 m TSHD + 120 m (as per the defined operation)

[3] TSHD evacuation area and the cover impact area are defined so that they remain within the A5.23 habitat type so as to minimise the impact on different habitats.

All of the above-mentioned criteria are developed considering the information provided by the Project owner, information from the Bottom Dredging Environmental Management Plan as well as the findings of the biological study conducted in the scope of the Project. The said impact is expressed spatially in Figure 7.75, when the impact borders provided in Table 7.33 are applied. All areas were calculated by neglecting the seabed slope, so the values provided reflect the extrapolated areas of the defined areas.

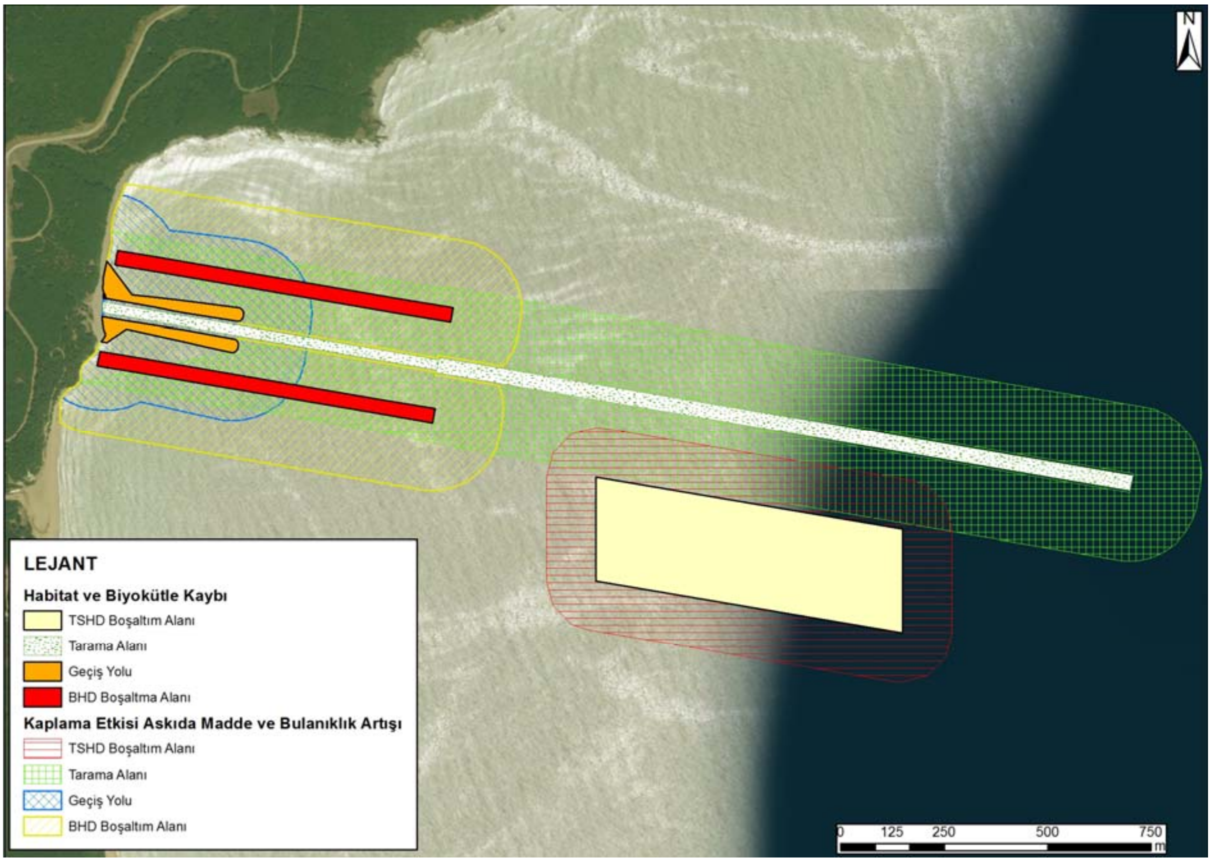


Figure 7.75: Construction operation borders within the Project site

Impact of the operations including the transition road construction, bottom dredging and evacuating the bottom dredging material into temporary storage areas on marine biology are provided in detail in the marine biology report given in **ANNEX-7.A**, and a summary of the assessments is given below.

A total of 0.0215 km^2 habitat loss is expected due to transition road construction. This loss will occur in three of the six habitat types identified in the study area: A3.15, A3.23 and A5.23 (Figure 7.76 and Table 7.34).

Figure 7.76: Types of habitat to be lost with the transition road construction and areas covered

Table 7.34: Types of habitat to be lost with the transition road construction and areas covered

EUNIS Code	Habitat Name	Area (km^2)
A3.15	Leafy algae communities	0,0103
A3.23	Mediterranean and Black Sea infralittoral algae communities exposed to intermediate waves	0,0027
A5.23	Infralittoral fine sand	0,0085
Total		**0,0215**

Within these habitat borders, there will be biomass loss besides the habitat loss. Calculations for the biomass loss was carried out considering the critical values obtained from the biological study conducted for groups of demersal fish, marine flora and benthic fauna in sand habitats (soft and hard grounds). Maximum biomass loss expected to occur for demersal organisms is given in Table 7.35 on the basis of groups.

Table 7.35: Biomass to be lost with the causeway construction

Group	Biomass (kg/km^2)	Area (km^2)	Biomass loss (kg)
Demersal fish	65[4]-1.688,8[5]	0,0085	0,55-14,35
Marine flora	22,93	0,0085	0,19
Benthic fauna (soft ground)	1.019.070	0,0085	8.662,09
Benthic fauna (hard ground)	775.000	0,0130	10.075,00

Due to moving materials in the environment, the transition road construction will inevitably cause suspended sediment and turbidity in the water column, covering impact on the seabed. As per the scenario developed in the scope of the Bottom Dredging Environmental Management Plan, using extreme values, sediment particles could be carried off 165 m away from the source. This indicates that a maximum total area of 0.1952 km^2 could be affected. Nevertheless, impact from sediment movement is concluded to be lesser than this value and to possibly concentrate in the southern direction given the current regime. During the removal of transition roads, suspended sediment and turbidity in the water column, and covering of the seabed impacts will occur due to the moved material in the environment. These impacts are expected to be local and short-term. Following the laying of the pipes and covering of the ditches, transition roads will be removed and the rocks and stones used will be disposed of as per the relevant legislation.

Bottom dredging operation, will affect an area within the depth range of 0-30 m within the study area, causing habitat loss within a total area of 0.1108 km^2. As seen in Table 7.36 and Figure 7.77, four out of the six identified types of habitat (A3.15, A3.23, A3.34 and A5.23) will be affected by the bottom dredging operation.

Table 7.36: Types of habitats to be lost with bottom dredging operation and areas covered

EUNIS Code	Habitat Name	Area (km^2)
A3.15	Leafy algae communities	0,0021
A3.23	Mediterranean and Black Sea infralittoral algae communities exposed to intermediate level wave	0,0072
A3.34	Underwater fucoid, green or red marine algae (low salinity infralittoral rocks)	0,0051
A5.23	Infralittoral fine sand	0,0964
Total		**0,1108**

[4] This is the value obtained from this study, representative power of the fisheries in the region is low because of the sampling time.
[5] Ref. 7.56.

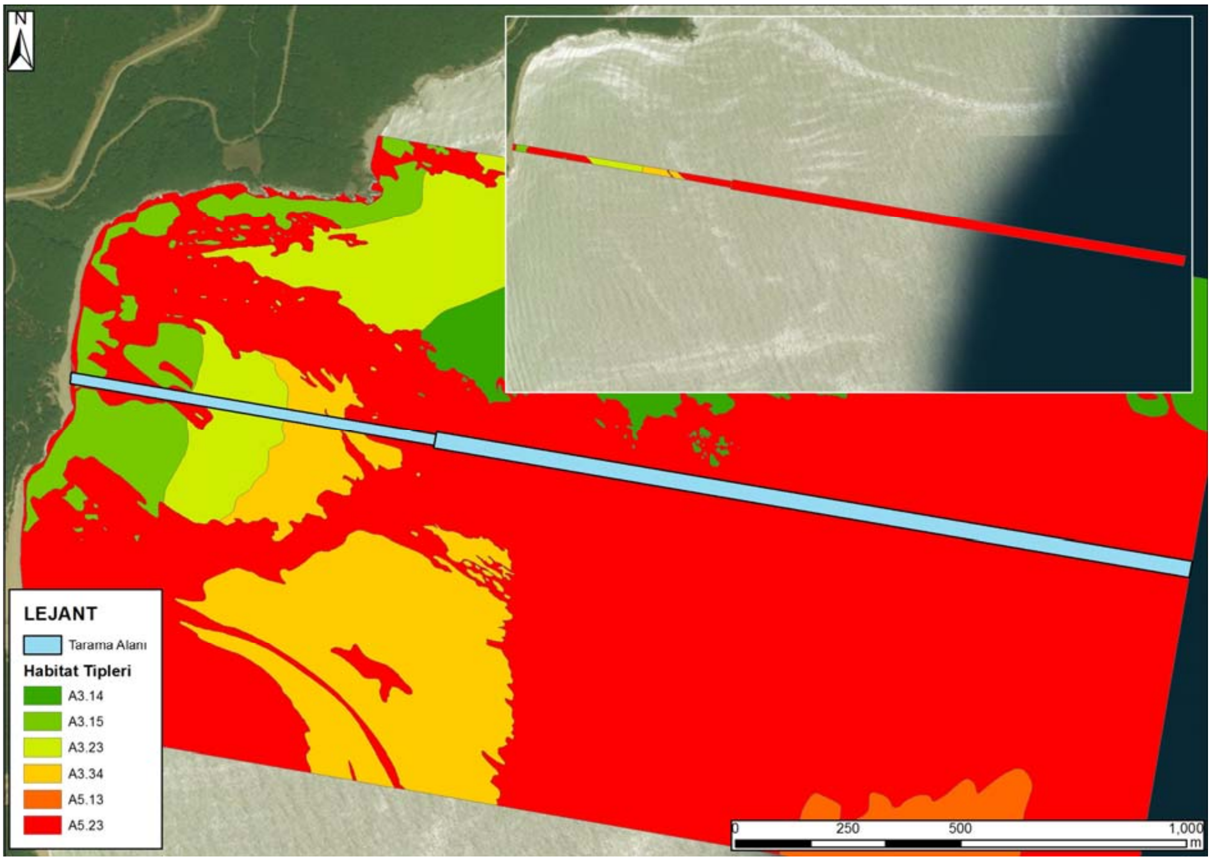


Figure 7.77: Types of habitat to be lost with dredging operation and the areas covered

During the dredging operation, demersal fauna and flora will also lose biomass. This hard-to-estimate loss is calculated based on the assumption of 100% biomass loss from dredging to evacuation/storage and biomass losses per group are given in Table 7.37.

According to the model findings obtained from the Bottom Dredging Environmental Management Plan, sediment movement during the dredging operation was resolved with an approach similar to that of the transition road construction. Accordingly, sediments on the bottom will horizontally move for a maximum of 165 m from the source under the worst circumstances, affecting a total area of 0.7679 km^2.

Table 7.37: Biomass to be lost with bottom dredging operation

Group	Biomass (kg/km^2)	Area (km^2)	Biomass loss (kg)
Demersal fish	65-1.688,8	0,0964	6,27-162,80
Marine flora	22,93	0,0964	2,21
Benthic fauna (soft ground)	1.019.070	0,0964	97.370,75
Benthic fauna (hard ground)	775.000	0,0144	11.160,00

As mentioned in the causeway construction section, seabed covering, increased suspended sediments and turbidity in the water column due to sediment movement could concentrate on the southern site according to the current data.

The dredged material is planned to be evacuated into and temporarily stored in two different locations named BHD and TSHD. The first of these two areas is planned to be used to store rocky-sandy material mixture, while the other one is planned for the storage of sandy material only. Hence, negative impact from the materials that may be obtained from different types of habitat will be minimised for other habitats. There will be habitat loss in BHD and TSHD evacuation/storage areas due to the evacuation of the dredged material. These losses, which will affect a total area of 0.2422 km^2, will impact habitats with A3.15, A3.23, A3.34 and A5.23 EUNIS codes (Table 7.38 and Figure 7.78).

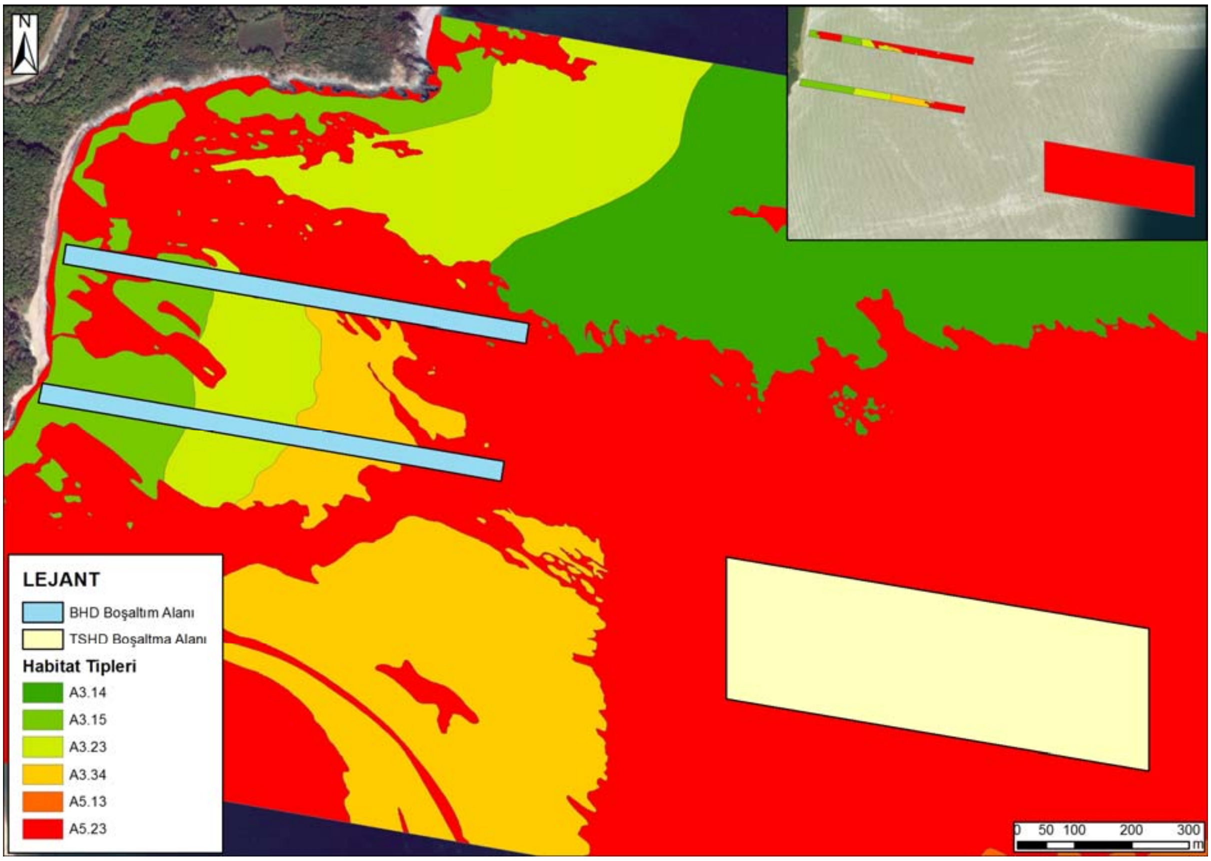


Figure 7.78: Types of habitat to be lost with evacuation/storage and areas covered

Table 7.38: Types of habitat to be lost with evacuation/storage and areas covered

EUNIS Code	Habitat Name	Area (km^2)
A3.15	Leafy algae communities	0,0145
A3.23	Mediterranean and Black Sea infralittoral algae communities exposed to intermediate wave	0,0096
A3.34	Underwater fucoid, green or red marine algae (low salinity infralittoral rocks)	0,0079
A5.23	Infralittoral fine sand	0,2101
Total		**0,2422**

Potential biomass loss due to the dumping of the dredging material into BHD and TSHD zones, as per the assumption of 100% loss in these areas, is expected to cause the biomass loss summarised in Table 7.39:

Table 7.39: Biomass to be lost due to evacuation/storage operation

Group	Biomass (kg/km²)	Area (km²)	Biomass loss (kg)
Demersal fish	65-1.688,8	0,2101	13,66-354,82
Marine flora	22,93	0,2101	4,82
Benthic fauna (soft ground)	1.019.070	0,2101	214.106,61
Benthic fauna (hard ground)	775.000	0,0320	24.800,00

Pouring operation of the dredging material will lead to seabed covering and increased suspended sediment and turbidity in the water column. Due to differences in the composition of the dredging material and the dredging methods, it was deemed appropriate to assess the material in the BHD area from the bottom, and the material in the TSHD area from a depth nearer the sea surface. Thus, for the BHD area, the material movement was considered to occur 165 m away from the source; while for the TSHD area, the findings indicating that in every evacuation operation an area of 150x180 m on the seabed would be affected (Ref: Bottom Dredging Environmental Management Plan) was considered. On the other hand, the identified TSHD location being approximately 120 m from the A5.13 habitat is considered to be the operation impact border.

To avoid covering the habitat of A5.13 with the material to be dredged from A5.23 habitat, evacuation operations will be required. Coordinates for the planned TSHD area operation borders are given in Table 7.40.

Table 7.40: TSHD and estimated operation border coordinates[6]

TSHD Evacuation Area Border			Operation Border		
Point	Latitude	Longitude	Point	Latitude	Longitude
A	41,656174	28,103758	A'	41,655521	28,104471
B	41,653919	28,103722	B'	41,654350	28,104462
C	41,652704	28,112580	C'	41,653354	28,111890
D	41,654954	28,112619	D'	41,654507	28,111893

7.1.2.5.2 Conclusion

In light of findings from the marine biology survey, coastal structure on the Project site could be considered representative of typical western Black Sea coasts of Turkey. Majority of the identified habitats and species in this area are not in the relevant annexes of Bern Convention or on the IUCN Red List. Important flora components that were found comprised Cystoseria spp. and Zostera spp. The first group is mostly seen in the hard substratum, while the second group is distributed in fine sand and almost non-existing in the area. With Cystoseria spp. being distributed in a two-piece area within a habitat that constitutes 4% of the Project site and although about 50% of these areas will be directly affected by the construction operations, the operations are not generally considered to have a large impact on this group in the western Black Sea.

[6] Coordinates are geographical latitude/longitude.

None of the osteichthyes are endangered species, although they are on the Red List. Because the site study on fisheries was carried out on 5-6 April 2017, the still very low water temperatures resulted in very low findings as can be seen in fish abundance/biomass values. In the event that the site study is conducted in the entire water column where water temperatures increased up to and above 13 ^{o}C with trawling/beam trawling operations, it could be said that the number of species will be positively impacted. In light of available data, it could be said that the construction work on the site will not have a significant impact on the identified economic fish species.

All Cetacea species, also observed in the Project site, in the Black Sea (N=3) are among the species requiring protection as per the IUCN Red List and Bern Convention. A potential threat to this taxon could be noise emission on the Project site before/during/after construction. Design controls developed in the scope of the Project and adoption of mitigation measures are expected to minimise the potential impact on these species.

Consequently, the biggest impact on all types of habitat and taxa identified in the Project's Shore Crossing Section, groups of benthic organisms in particular, is projected to be caused by the construction phase operations of the Project. If the strategy of removal of the pipes is adopted instead of leaving in situ after the operational phase, similar pressures to the impact created during the construction phase are likely to form in the project site. Therefore, similar mitigation measures to those adopted during the construction should be adopted. No significant impact is expected during the operational phase.

The impact to be produced because of the Project is expected to be local and short-term. Adoption of the design controls, developed in the scope of the Project and given below in Section 7.2, and implementation of mitigation measures are considered to ensure that the potential impact on the marine biology remains at a negligible level.

7.1.3 Onshore Section

7.1.3.1 Flora

7.1.3.1.1 Introduction and Methodology

A series of site studies were carried out to identify the flora surrounding the Onshore Section of the Project by flora experts from Gazi University, who worked on site for 8 days; 1 day in February 2015, 3 days in May and in June, and 1 day in August. Furthermore, considering the modified pipeline route due to reasons explained in Chapter 1 (General Characteristics of the Project) and the choice of open excavation technique, 2-day site studies were carried out in May 2017, covering areas that were not studied before within the Project Onshore Section.

Project site is in the north of Kıyıköy. The Receiving Terminal and the pipeline route starting from the coast as well as its vicinity constitute Project Onshore Section. As of the coast, there are habitat types within the Onshore Section such as fixed coastal dunes, back dune shrubbery, deciduous mixed oak forests, riparian woodland forming streams and in marshlands as well as swamp habitats. Deciduous mixed oak forests cover the largest area out of the said habitat types. However, majority of these forests were subjected to clear-cutting 8-10 years ago, hence they are in forest-shrubbery form, a far cry from how a typical forest looks like. Some forests on the pipeline route are in subclimax phase.

Onshore section flora was studied in two parts. The first one covers the coastal part (sand dunes) of the Onshore Section. There are fixed coastal dunes and behind-the-dune shrubberies in this part. The second part include the pipeline route, the Receiving Terminal and transportation roads. There are habitat types such as deciduous mixed oak forests, riparian woodland forming streams and in marshlands as well as swamp habitats.

Floristic lists developed in the scope of the study are based on the plants collected throughout field studies and observations, and they are believed to cover all flora species that may be identified at the Project Site. The plants collected on the Project Site were identified with the help of the "Flora of Turkey and East Aegean Islands" (Ref. 7.139). Turkish names of the identified plants were listed mostly using the publication: "Türkçe Bitki Adları" (Plant Names in Turkish) (Ref. 7.140). When identifying endangered species categories for endemic plants and non-endemic plants with rare distribution, "Red Data Book of Turkish Plants" (Ref. 7.141) was used as the main reference publication. These endangered species categories were also reinterpreted considering the population and threat factors of the endemic species identified as per the IUCN 2001 criteria within the site.

Floristic lists elaborated in the scope of the study are drafted in the phylogenetic order: the ferns (Pteridophyta), the gymnosperms (Gymnospermae) and flowering plants (Angiospermae). The species are listed with detailed information including their names in Turkish, if any; plant geography region; whether or not it is endemic; endangered category of the endemic species and non-endemic species with rare distribution; whether or not it is featured in Bern and CITES lists; its habitat and abundance status within the site, respectively, in**ANNEX-7.D**.

7.1.3.1.2 Findings

There are fixed sand dunes and shrubbery and rocky habitats behind the dunes within the first part of the study area. Therefore, flora of the area including the dunes of the Onshore Section is not very rich. However, the area is still interesting because it reflects the floristic structure of the Northern Marmara coastline.

In this part of the Study Area, 99 species and subspecies level taxa belonging to 38 different families were identified in the site studies conducted in February, May, June and August2015 as well as in May 2017. The vast majority of the identified species have broad distribution. Generally speaking, Thrace is a region of our country whose flora is well-known and endemism in the region is low. Still, 1 regionally endemic (*Jurinea turcica*) and 3 non-endemic species with rare distribution (*Ferulago confusa, Linum hirsutum subsp. byzantinum ve Heptaptera triquetra*) were identified. The endemic species among the four identified, namely *Jurinea turcica*was described to the scientific world in 2010. Type locality of the species is coastal rockfields of Kıyıköy. It was identified on the fixed sand dunes and back dune rock fields on the Project Site. Photographs of the species in question are provided in Figure 7..

Figure 7.79 (a) *Jurinea turcica*, (b) *Ferulago confusa*, (c) *Linum hirsutum subsp. byzantinum*

Flora characteristics of the area, which will host the Receiving Terminal and the pipeline and its transport route, (respectively, Figure 7. and Figure 7.) are being studied within the second part of the Study Area. The said areas seemingly have a homogenous vegetation structure; however, they include different habitat types with mixed deciduous oak forests, riparian vegetation developing along streams and on marshlands, and swamp habitats.

Figure 7.80: Outlook of the Project Site Onshore Section

Figure 7.81: Outlook from the Transport Route of the Project Site

Site studies carried out on the second part of the Study Area in February, May, June and August2015 and in May 2017 helped identify 290 species and subspecies level taxa belonging to 67 different families. Vast majority of these identified species have broad distribution. Thrace among those regions of our country whose flora is well-known and endemism is low in this region. That said, 2 species endemic to the region (*Centaurea hermannii and Euphorbia amygdaloides var. robbiae*), and 3 non-endemic species with rare distribution (*Ferulago confusa, Lilium martagon*and*Symphytum tuberosum subsp. nodosum*) were identified. Photographs of the species in question are provided in Figure 7..

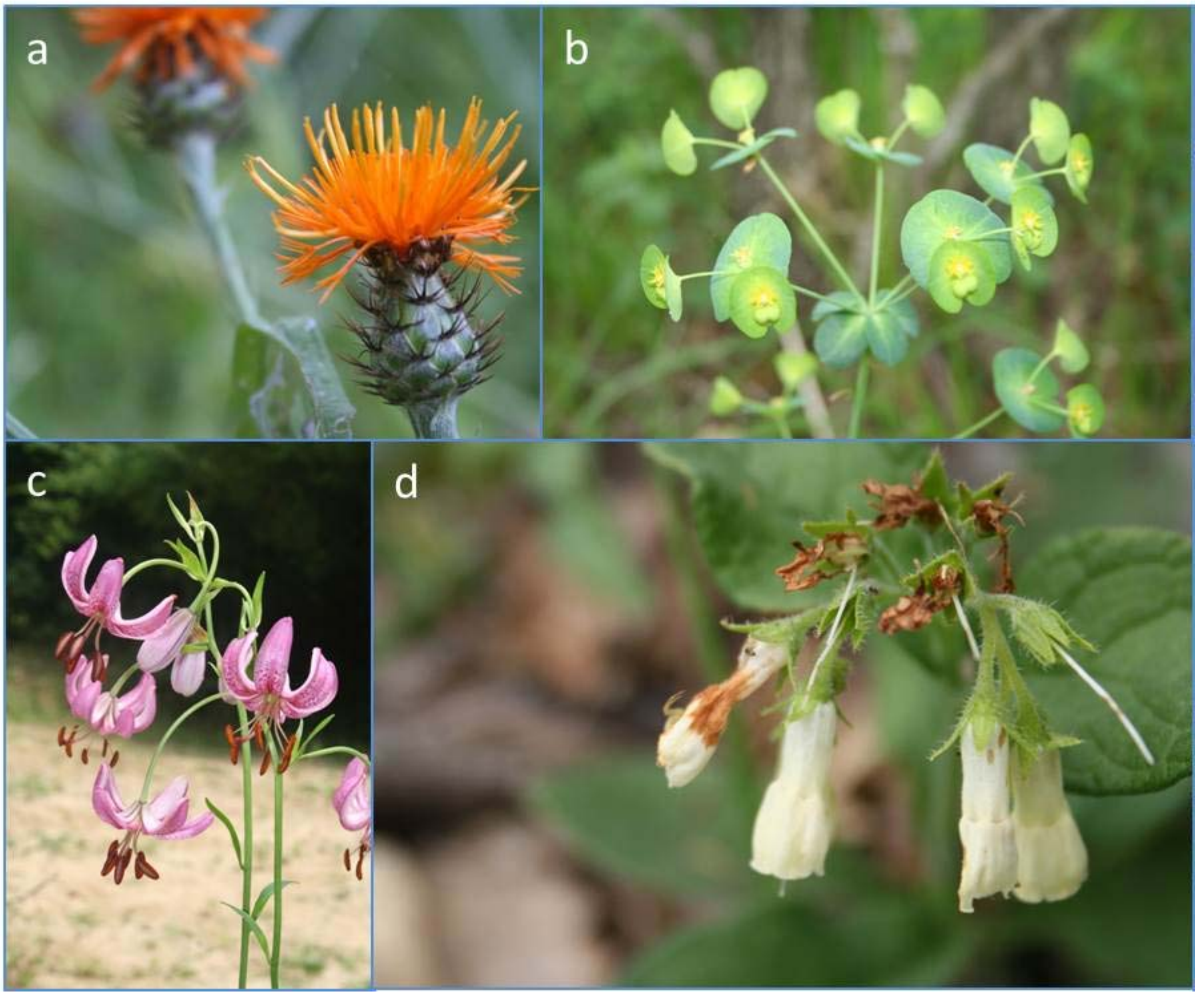


Figure 7.82: Examples of endemic and rare plant species from the Receiving Terminal area: (a) *Centaurea hermannii* (b) *Euphorbia amygdaloides var. robbiae* (c) *Lilium martagon* (d) *Symphytum tuberosum subsp. Nodosum*

Status of Onshore Section Plants in terms of Endangered species categories and Endemism

Within the first part of the Study Area, **1**regionally endemicspecies (*Jurinea turcica*) and**3**non-endemic species with rare distribution (*Ferulago confusa, Linum hirsutum* subsp. *byzantinum, Heptaptera triquetra*) were identified.

Within the second part of the Study Area, **2**regionally endemic species (*Centaurea hermannii* and *Euphorbia amygdaloides* var. *robbiae*) and**3** non-endemic species with rare distribution (*Ferulago confusa, Lilium martagon,* and *Symphytum tuberosum* subsp. *nodosum*) were identified.

Species *Jurinea turcica* was described to the scientific world in 2010. Type locality of the species is coastal rock fields of Kıyıköy. The species was also identified on the fixed sand dunes back dune and in rock fields of the Project Site. Despite having local distribution, the species was observed on all coastal rock fields in Kıyıköy and had a healthy population in all observed areas. Its IUCN Category is "**EN**: Endangered".

Non-endemic but rare species *Ferulago confusa, Linum hirsutum* subsp. *byzantinum, Heptaptera triquetra*are only distributed in rock fields on the Northern Marmara coastline and back dune shrubbery habitats in our country. Aside from our country, these species are distributed in Bulgarian and Greek regions that are in close vicinity of our border. Out of all the species mentioned, IUCN endangered category of *Heptaptera triquetra*species is **EN**: Endangered, those of *Ferulago confusa* and

Linum hirsutum subsp. *byzantinum*species is **VU**: Vulnerable. Species *Ferulago confusa's* population within the site is in good state, while the other species have poor population statuses.

The species *Centaurea hermannii* is distributed exclusively in the Marmara region in our country. It is classified **EN**: Endangered and included in the Bern Convention Annex List I. The species is distributed within the deciduous mixed oak forest habitat of the study area. The other endemic species identified on the site, *Euphorbia amygdaloides* var*. robbiae* is distributed throughout deciduous sub-forests in the Marmara Region. IUCN classification of this variety is **NT:** Near Threatened. Populations of endemic *Centaurea hermannii* and *Euphorbia amygdaloides* var. *robbiae* species within the Site are quite healthy. *Lilium martagon, Symphytum tuberosum* subsp. *Nodosum*species are IUCN-classified as **VU**: Vulnerable and population statuses are poor compared to that of *Ferulago confuse* species on the site.

Vegetation Characteristics of the Onshore Section

There are 2 different habitats and 2 different types of vegetation growing in these habitats within the first part of the study area. These are namely coastal sand dune vegetation and back dune shrubbery.

The second part of the study area is home to 3 different habitats and 3 different types of vegetation growing in these habitats, namely deciduous mixed oak forest vegetation, riparian vegetation and swamp vegetation. Some of the vegetation types in the second part occupy very small areas while others cover quite large areas. For example, majority of the Project site is covered by deciduous mixed oak forests. However, riparian and swamp habitats combined cover less than 10% of the entire habitat. Vegetation types identified within the Onshore Section of the project site as well as their dominant and characteristic species are given below.

Coastal Sand Dune Vegetation

Dune vegetation is poor in terms of flora (Figure 7.). Sand-loving species *Eryngium maritimum, Cakile maritima, Salsola ruthenica* and *Leymus racemosus* are distributed throughout this habitat. Population status of these species is not very good either.

Figure 7.83: Coastal Sand Dune Vegetation – Onshore section

Back Dune Shrub Vegetation

This vegetation is represented by short scrubs formed with the effects of winds in the back of the coastal sand dunes (see Figure 7.). Dominant species of this vegetation include *Phillyrea latifolia, Quercus petraea, Arbutus unedo, Quercus cerris, Ruscus aculeatus, Pistacia terebinthus, Osyris alba, Centaurea cuneifolia, Arbutus unedo, Cistus creticus*and*Juniperus oxycedrus*. Such species as *Jurinea turcica*, which was discovered and described to the scientific world in 2010, as well as non-endemic species with rare distribution in our country such as *Ferulago confusa, Linum hirsutum* subsp. *byzantinum, Heptaptera triquetra*are distributed within this habitat.

Figure 7.84: Back Dune Shrub Vegetation – Onshore Section

Deciduous Mixed Oak Forest

This vegetation type if broadly distributed within the second part of the study area. It is represented by deciduous mixed forests (Figure 7.). These forests are widely distributed throughout Marmara and the western Black Sea regions in our country. These forests within the study area are not at climax phase. *Erica arborea* and *Erica manupuliflora* communities are predominant in forest clearances. Characteristic species of the habitat are deciduous oaks. Dominant tree species of this habitatinclude *Quercus frainetto*, *Quercus cerris, Quercus petraea* subsp. *iberica, Carpinus betulus, Carpinus orientalis, Fraxinus ornus*.

Continuous closed forest cover is around 80%, and the height varies between 2-6 metres. The habitat also houses less dominant trees and shrubs such as *Erica arborea*, *Arbutus unedo, Chamaecytisus hirsutus, Rosa canina*, *Phillyrea latifolia*, *Ruscus aculeatus* var. *aculeatus, Osyris alba*, *Hypericum calycinum*, *Prunus divaricata* subsp. *divaricate, Pyrus elaeagnifolia*.

Figure 7.85: Mixed Oak Forest Vegetation – Onshore Section

This habitat also has a rich subforest flora. Subforest herbaceous, shade-loving species such as *Brachypodium sylvaticum*, *Pilosella piloselloides subsp. megalomastix*, *Dactylis glomerata subsp. hispanica*, *Verbascum bugulifolium*, *Salvia virgata*, *Primula vulgaris* and *Oenanthe silaifolia* (Figure 7.) are distributed throughout the habitat**.** This habitat is also home to endemic species *Centaurea hermannii*, *Cirsium baytopae* and *Euphorbia amygdaloides var. robbiae*. Non-endemic species with rare distribution *Ferulago confusa*, *Symphytum tuberosum subsp. nodosum*and *Lilium martagon* are also distributed in this habitat.

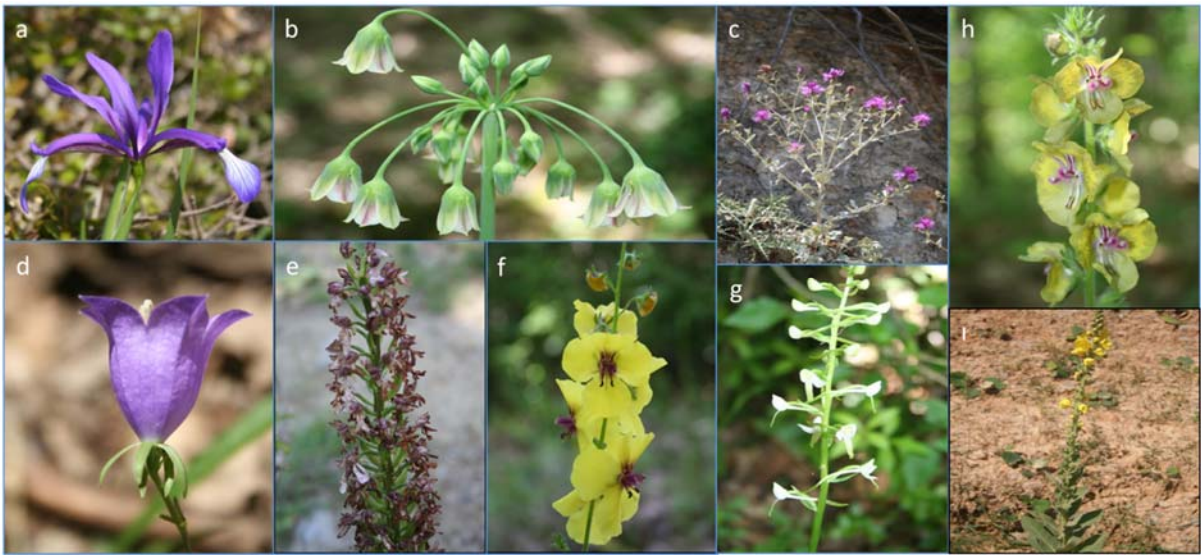


Figure 7.86: Sub-flora of deciduous oak forest (a) *Iris sintenisii* (b) *Nectaroscordum siculum subsp. Bulgaricum* (c) *Centaurea cuneifolia* (d) *Campanula rapunculus var. rapunculus* (e) *Orchis purpurea* (f) *Verbascum xanthophoeniceum* (g) *Platanthera chlorantha* (h) *Verbascum bugulifolium* (i) *Verbascum densiflorum*

Riparian Vegetation

This vegetation type in the Study Area develops along streams and fens with high groundwater located on the pipeline route (Figure 7.). Dominant species of the vegetation include *Fraxinus angustifolia* subsp. *oxycarpa, Alnus glutinosa, Carpinus betulus,* and *Acer campestre*. Species with high moisture demand which are endangered due to their economic potential, *Lilium martagon*and anornate species, *Nectaroscordum siculum* subsp. *bulgaricum* and the like are also distributed throughout this habitat.

Figure 7.87: Riparian Vegetation – Onshore Section

Swamp Vegetation

This vegetation develops in and around the wetlands within the Study Area. It does not invade large areas. Broadly distributed species of this habitat are *Juncus acutus, Juncus effusus, Thypha domingensis* and *Juncus capitatus*.

7.1.3.1.3 Conclusion and Evaluation on the Flora

Studies conducted in February, May, June and August2015 within the study area helped identify **5**vegetationtypes as well as a total of **297**taxa from **68**plant families. These taxa include **3**plant species that are endemic to the region (*Centaurea hermannii, Jurinea turcica* and *Euphorbia amygdaloides* var. *robbiae*), and **5**non-endemic species with rare distribution (*Ferulago confuse, Lilium martagon, Linum hirsutum* subsp. *byzantinum, Heptaptera triquetra, Symphytum tuberosum* subsp. *nodosum*). IUCN classification of the endemic taxa species *Centaurea hermannii* and *Jurinea turcica* is **EN:** Endangered, and that of *Euphorbia amygdaloides* var. *robbiae* is **NT:** Near Threatened.

All of the non-endemic rare species with limited distribution in our country (*Lilium martagon, Ferulago confusa, Linum hirsutum* subsp. *byzantinum, Heptaptera triquetra* and *Symphytum tuberosum* subsp. *nodosum)* are classified **VU**: Vulnerable. Both the endemic species and the **8** non-endemic species with rare distribution identified in the site are distributed throughout similar habitats outside of the Project site. *Jurinea turcica* species, which is distributed locally and was discovered in 2010 shows distribution starting from the coastal rock fields in Kıyıköy moving forward to both south and north. Population status where it is found is healthy.

Given the current findings, seeds of the aforementioned endemic species will be collected and submitted to the Turkish Seed Gene Bank in Ankara to minimise the Project's impact on the onshore flora and vegetation. Bulbs of the species *Lilium martagon* distributed along the streams on the open excavation area of the pipeline route construction will also be collected and translocated to suitable habitats in areas that are not affected by the Project. Although non-endemic, this species is included in the CITES II List because it is used for ornamental purposes. The best distribution of natural populations of this species is in the northern Marmara region. Thus, population loss will be minimised to protect the gene pool.

The most ideal months to collect the seeds of the above endemic plant species are as follows: August for *Jurinea turcica* seeds*,* July for *Centaurea hermannii,* June for *Euphorbia amygdaloides* var. *robbiae*. June and July are the most suitable months to collect *Lilium martagon* bulbs.

7.1.3.2 Fauna

To identify onshore fauna in the vicinity of Project's Onshore Section, fauna experts from Bülent Ecevit University carried out field studies that lasted for 17 days, 8 days from 26 May to 2 June 2015 and 9 days from 15 to 23 June 2015. To complement these studies, more site studies were conducted in May 2017 also to identify the onshore fauna within the pipeline route that was modified due to reasons explained in **Chapter 1**(General Characteristics of the Project) earlier.

In the scope of these studies, arthropods (butterflies, dragonflies, damselflies), amphibians, reptiles, birds and mammals within the onshore fauna groups present near Project's Onshore Section were researched, and later on some interesting insect species that were spotted accidentally were included in the study.

Due to its location, Turkey is part of an important bird migration route. Millions of birds fly over straits of Istanbul and Çanakkale in spring and autumn of every year, migrating between Africa and Europe. First entering the country from Thrace during the spring migration, birds then fly over the straits and continue their journey over the Anatolia and exit the Anatolia from Hatay region, moving on to Africa. They follow a reverse route during the autumn migration. Throughout these two migrations, their route within Thrace may vary a little.

Generally speaking, migratory birds mostly pass over the narrowest point of the strait of Istanbul in Garipçe-Sarıyer section during the spring migration, meaning they follow a migration route near the northern coasts of Thrace. Then during the autumn migration, they enter Thrace from the Balkans, this time advancing a little more in the south to move into the Anatolia by passing over the Çamlıca hill and Toygar hill in Üsküdar. Due to this variation, bird migration in Istanbul is watched from Çamlıca and Toygar Hill in autumn, and from Garipçe area in spring of every year. Because the onshore section of the Project is in Thrace, two different studies were carried out to identify bird movements in Autumn 2015 and Spring 2017 within the Onshore Section of the Project, all to describe the significance of the site for migratory birds and to record the bird migration in the area.

7.1.3.2.1 Introduction and Methodology

Transects were defined to help identify onshore fauna elements within the Study area. For each field trip, defined transects were walked out by two or three researchers who identified and recorded the fauna elements. A GPS equipment was used to help with identification of areas or habitats of the diagnosed species, and the GPS equipment was kept switched on throughout the studies to register the path of the site study.

50 Sherman live animal traps were installed for 8 consecutive days to identify small mammals.

8 camera traps were installed to identify larger mammals. Camera traps were run for 13 days from 2ndto 15th June. On 15th June, information collected by camera traps were transferred to digital media and 2 camera traps were then left on newly identified points within the Project site and run until the end of August. Points where camera traps were installed, species recorded through camera traps and locations where these species were recorded are given in Annex 7C, and detailed information regarding mammal species recorded during the studies is given below. Mist nets were set up for 6 consecutive nights to identify bat species and mist nets were kept up from 20:30 till 23:00. Sound recordings were also taken using bat detectors. During the walks along the transects, butterflies, dragonflies, damselflies, amphibians, reptiles, birds and mammals were recorded. Localities were recorded via GPS.

The study set out the findings regarding the fauna near the Project's Onshore Section based on field studies and literature data.

The following observations were made to monitor and record the autumn migration of birds: 9 days from 15 to 23 August 2015, 9 days from 1 to 9 September 2015, 7 days from 21 to 27 September2015, 7 days from 5 to 11 October 2015 and 11 days from 19 to 29 October 2015. Bird migration was observed for a total of 43 days with five interval periods as explained above. As for the observation of the spring migration within the area, a total of 20 days was allocated to the observation of bird migration with the following details: 6 days from 26 April to 1 May 2017, 7 days from 6 to 12 May 2017 and 7 days from 22 to 28 May 2017.This section of the EIA report addresses all the above site studies combined.

To monitor bird migrations on and over the Project site, a point which is overlooking the Project site and the overall area was selected (Figure 7.88); the selected point is on a hilltop neighbouring Pabuçdere and has a good viewing angle on the Project site from south to north (Figure 7.). Observations from the observation point were made from 08:00 in the morning until 19:00 in the evening. A Canon 7D Mark II camera mounted on a Gitzo tripod as well as Canon 500 mm f4 objective + Canon 1.4 TC (Total 700 mm zoom) fixed on the camera (Figure 7.) were used during the observations. A pair of Nikon 7x50 binoculars were also used to count and observe the species from afar. As much as reasonably practicable, efforts were made to photograph every passing individual using the camera setup and the photos taken were then transferred to a computer, also confirming the species definitions.

Birds passing by the observation area were recorded in the observation registry forms on a daily basis, including the time of their passing, flight direction, flight altitude and weather data.

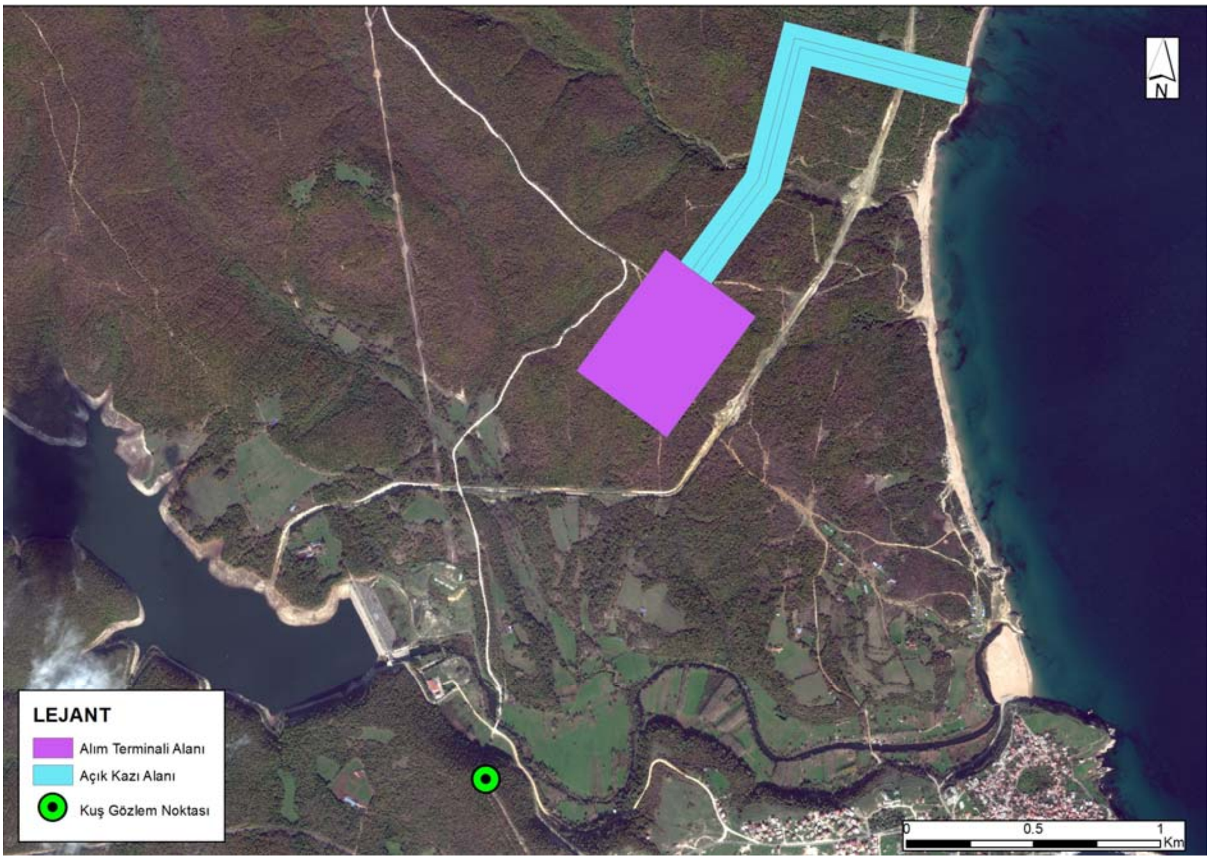


Figure 7.88 Study Area and Selected Bird Observation Point

Figure 7.89 Outlook of the Observation Direction from the Bird Observation Point

Figure 7.90 Equipment used at the Bird Observation Point to Record the Observation

7.1.3.2.2 Findings

Mammals

34 mammal species were identified in the study area.**11** out of these were included in Bern Convention Annex II, **14**in Bern Convention Annex III, **5** in Habitat Directive Annex II, **3** in Habitat Directive Annex IV and **1** in Habitat Directive Annex V.

As per IUCN, none of these species were classified as **CR:** Critically Endangered or **EN:** Endangered.

Some bat species identified within the Study area were listed in the IUCN Red List as **VU:** Vulnerable and **NT:** Near Threatened. Of these species, *Myotis capacciniiwas* classified as **VU:** Vulnerable, *Rhinolophus blasii*, *Rhinolophus ferrumequinum, Myotis bechsteini* and*Miniopterus schreibersii* as **NT:** Near Threatened in IUCN endangered species categories.

An otter species, *Lutra lutra*was listed on IUCN Red List as **NT:** Near Threatened (Table7.). The remaining **28**mammal species were listed on IUCN Red List as **LC:** Least Concern.

Table7.41: Mammals Classified VU and NT on the IUCN Red List – Onshore Section

Species	IUCN Red List	Bern Convention	Habitat Directive
Myotis capaccinii	VU	Annex II	Annex II
Myotis bechsteini	NT	Annex II	Annex II
Rhinolophus blasii	NT	Annex II	Annex II
Rhinolophus ferrumequinum	NT	Annex II	Annex II
Miniopterus schreibersii	NT	Annex II	Annex II
Lutra lutra	NT	Annex II	Annex IV

All bat species identified within the Study area were recorded during their evening feeding flight in the vicinity of water resources. All mammal species identified in the Study area as well as their statuses with regards the IUCN, Bern Convention and Habitat Directive are given **ANNEX-7.D**in detail.

The Project site is frequently used by domestic animals such as the sheep, goats, buffalos and water buffalos and the mammal concentration within the site is low. There is also intensive human pressure in the area. Furthermore, animal herds are released into the area usually without any humans and they are accompanied by a lot of dogs.

Some mammal species identified in the study area during site studies and traces of these species are presented in Figure 7. and Figure 7..

Figure 7.91: Some mammal species observed on the Project site– Onshore section (1. *Erinaceus* sp. 2. *Talpa levantis*, 3. *Myotis daubentonii*, 4. *Pipistrellus pipistrellus*, 5. *Rhinolophus blasii*, 6. *Apodemus agrarius*, 7. *Myotis capaccinii*, 8. *Rhinolophus ferrumequinum*, 9. *Sciurus vulgaris*, 10. *Glis glis*, 11. *Sus scrofa* skull, 12. *Capreolus capreolus*, 13. *Apodemus flavicollis*)

Figure 7.92: Some Mammal Species – Onshore section

Birds

A total of**112**bird species were observed throughout the field studies and migration observations carried out at the Project site. Out of these species, **80**were listed in Bern Convention Annex II, **23**inBern Convention AnnexIII;**12**inMAK(2016-2017)Annex I, **12** in MAK(2016-2017)Annex II; **3** in CITES Annex I, and **23** in CITES Annex II. All the bird species identified in the Study area as well as their statuses with regards the IUCN, Bern, MAK, CITES and the Bird Directive are given in **Annex 7.D** in detail.

While none of the identified species are listed in the IUCN**CR:** Critically Endangered category, *Neophron percnopterus* (small vulture)and *Aquila nipalensis* (Steppe Eagle)are listed in the IUCN **EN:** Endangered. It was observed during the study that these two species did not use the site for shelter or breeding, but only passed by this area during the migration.

Site studies revealed that some local species were common in the area. Using the data on courting behaviour, nest observations and youth spotting, it was revealed that species including *Falco subbuteo, Charadrius dubius, Charadrius hiaticula, Streptopelia turtur, Cuculus canorus, Caprimulgus europaeus, Merops apiaster, Dendrocopos major, Dendrocopos minor, Coccothraustes coccothraustes, Delichon urbicum, Emberiza cirlus, Fringilla coelebs, Garrulus glandarius, Hirundo daurica, Hirundo rustica, Lanius collurio, Lanius senator, Luscinia megarhynchos, Motacilla alba, Parus major, Parus caeruleus, Sylvia curruca, Phylloscopus collybita, Turdus philomelos* were breeding either in or near the site. Some of the species identified on the Project site are given in Figure 7..

Figure 7.93 Some Bird Species Identified on the Project Site (1. *Parus major*, 2. *Pernis apivorus*, 3. *Accipiter nisus*, 4. *Falco subbuteo*, 5. *Larus michahellis*, 6. *Dendrocopos major*, 7. *Luscinia megarhynchos*, 8. *Phalacrocorax carbo*, 9. *Fringilla coelebs*, 10. *Lanius collurio*, 11. *Hirundo daurica*, 12. *Hirundo rustica*, 13. *Delichon urbicum*)

Because the Project Site in on an important bird migratory route, two studies were organised in Autumn 2015 and in Spring 2017 to help identify bird migratory movements within the site and findings are given below:

Autumn 2015 Migration Monitoring Findings

The 25 species which were recorded during the bird migration observations in the scope of the autumn migration monitoring study are listed in Table7.. A total of 8.138 individuals from these 25 species were recorded throughout the observation.

The 15 most frequently recorded bird species during autumn migration in the site were Hawk, Lesser spotted eagle, Stork, Black stork, Bee-eater, Eurasian hobby, Common woodpigeon, Levant sparrow hawk, Honey buzzard, Hawk, Short-toed snake eagle, Red-footed falcon, Booted eagle, Black kite and Osprey, respectively (Table7.). The number of individuals within the top 10 species which are represented with the biggest number of individuals reach 98,4%. The other 15 species that were observed make up less than 2% of the total number (Figure 7., Table7.).

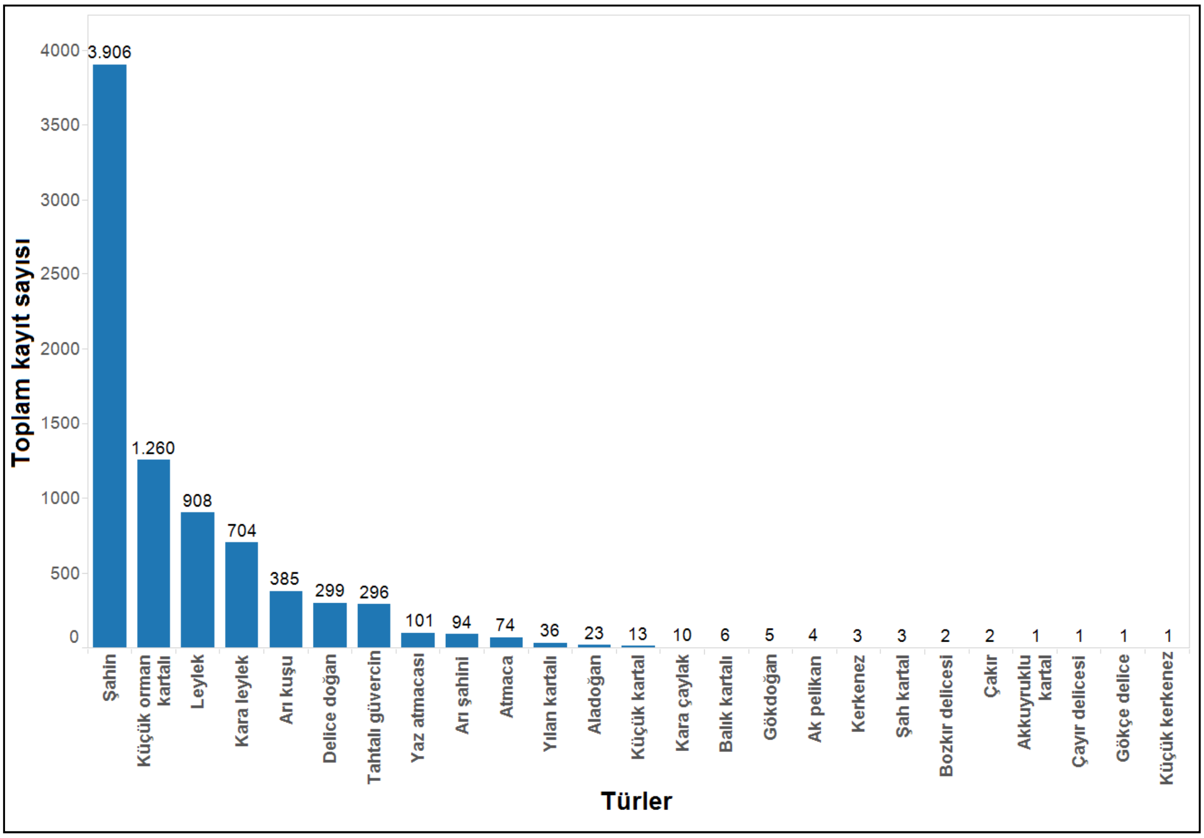


Figure 7.94 Identified Migratory Bird Species and Total Recorded Number

Table7.42: Identified Migratory Bird Species and Total Recorded Number

Order no	Species	Total Recorded Number	% within the total
1	Buzzard	3.906	48,0
2	Lesser spotted eagle	1.260	15,5
3	Stork	908	11,1
4	Black stork	704	8,6
5	Bee-eater	385	4,7
6	Eurasian hobby	299	3,7
7	Common woodpigeon	296	3,6
8	Levant sparrow hawk	101	1,2
9	Honey buzzard	94	1,1
10	Hawk	74	Negligible*
11	Short-toed snake eagle	36	Negligible
12	Red-footed falcon	23	Negligible
13	Booted eagle	13	Negligible
14	Black kite	10	Negligible
15	Osprey	6	Negligible
16	Peregrine falcon	5	Negligible

Order no	Species	Total Recorded Number	% within the total
17	Great white pelican	4	Negligible
18	Imperial eagle	3	Negligible
19	Common kestrel	3	Negligible
20	Northern goshawk	2	Negligible
21	Pallid harrier	2	Negligible
22	Lesser kestrel	1	Negligible
23	Hen harrier	1	Negligible
24	Montagu's harrier	1	Negligible
25	White-tailed sea-eagle	1	Negligible
	TOTAL	8.138	

* Where the proportion of the percentage of observation per species to the total observation records is below 1%, percentage within the total is given as negligible.

Migration observations were carried out on the Project Site in August, September and October. Different species fly over the area intensively in different months (Figure 7., Figure 7., Figure 7.).

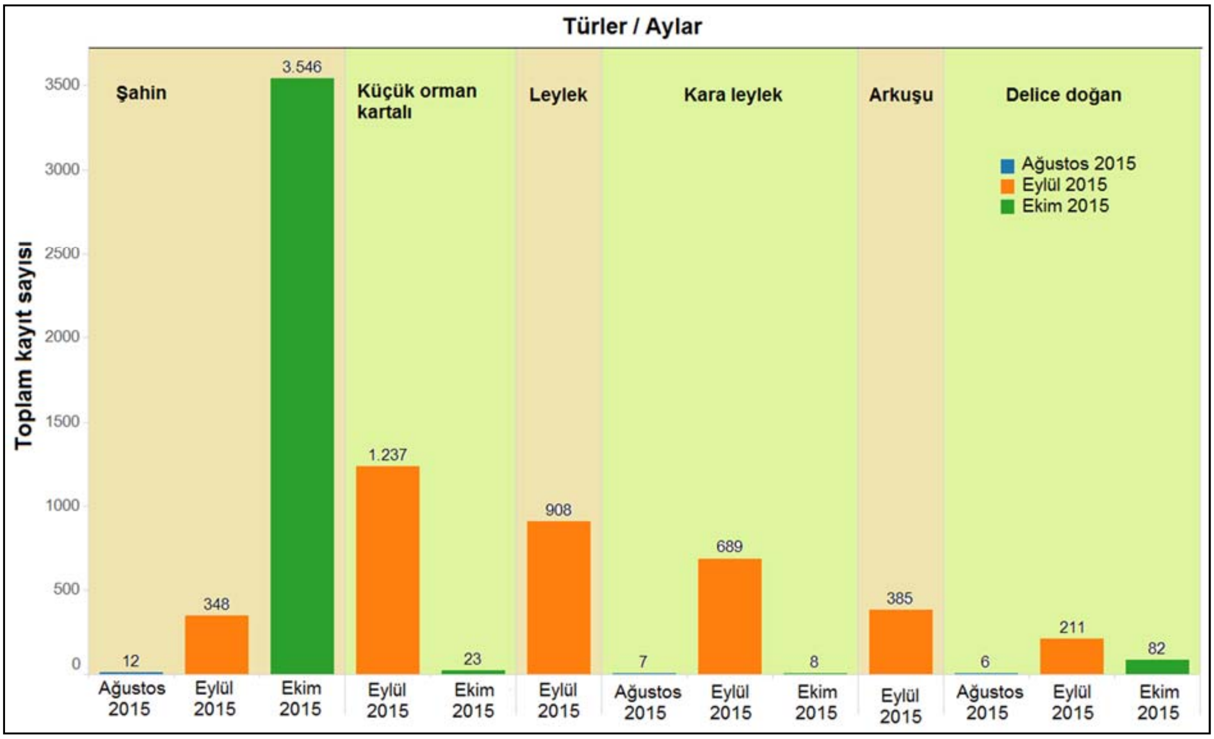


Figure 7.95 Monthly Record Distributions of Buzzard, Lesser Spotted Eagle, Stork, Black Stork, Bee-eater and Eurasian Hobby

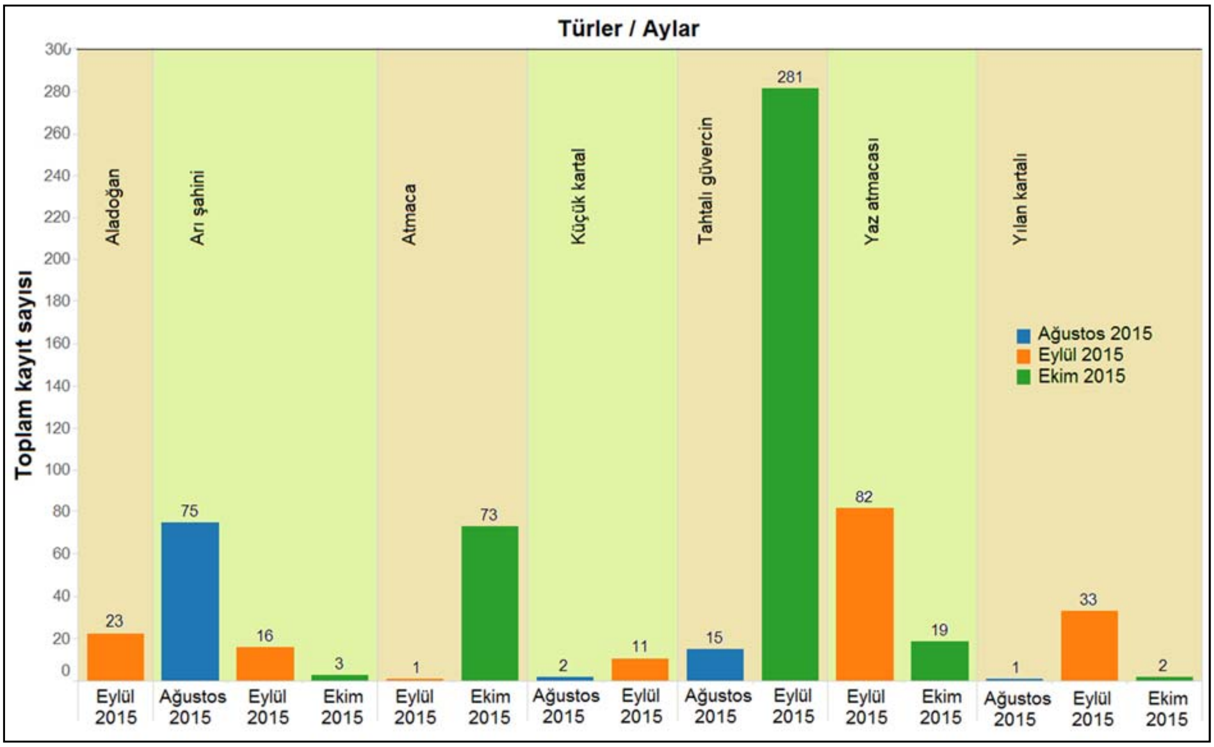


Figure 7.96 Monthly Record Distributions of Red-footed Falcon, Honey-Buzzard, Hawk, Booted Eagle, Common Woodpigeon, Levant Sparrow hawk and Short-toed Snake Eagle

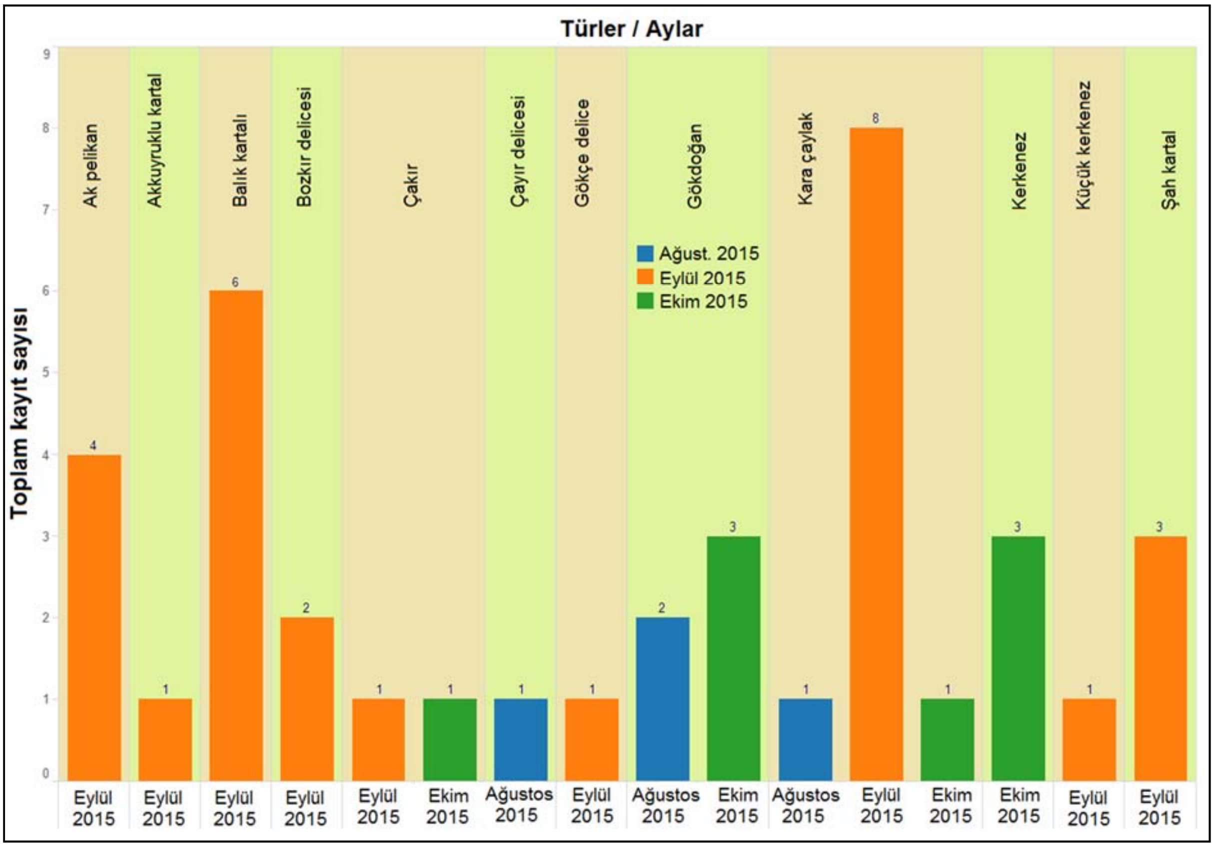


Figure 7.97 Monthly Record Distributions of Great White Pelican, White-tailed Sea-eagle, Osprey, Pallid Harrier, Northern Goshawk, Montagu's Harrier, Hen Harrier, Peregrine Falcon, Black Kite, Common Kestrel, Lesser Kestrel and Imperial Eagle

Honey-buzzard flew past mostly in **August**. Lesser spotted eagle, Stork, Black stork, Bee-eater, Peregrine falcon, Short-toed snake eagle, Great white pelican, White-tailed sea-eagle, Osprey, Steppe eagle, Hen harrier, Black kite, lesser kestrel and Imperial eagle flew by mostly in **September**. Buzzard, Hawk, Common woodpigeon, Peregrine falcon and Common kestrel mostly transitioned in **October**. The observations results showed that most of the species had flew over in September; however, most individual transitions took place in October.

Migration was observed on the site from 07:00 in the morning until 19:00 in the evening. Passage time of each individual was recorded on the "Daily Migration Registry Form". The records show which species transitioned at what time of the day, which indicate that bird migration was peaking between 10:00-12:00 in the morning and between 14:00-16:00 in the afternoon. After 17:00, however, bird passage was rarely observed (Figure 7.98).

Migratory birds usually use gliding flight opting for land for the migration, and to spend the least amount of energy they prefer to fly during the hours of the day when sun heats up the land, the air starts to heat up and rise in its turn, having contacted the heated land surfaces. They rise and glide within this mass of air that heats up and rises. Accordingly, migration within the site speeds up after 09:00 and dies down quite significantly towards the evening, or after 16:00 as the weather starts cooling down once the hot air no longer rises. Rarely any migratory movement was recorded after 17:00.

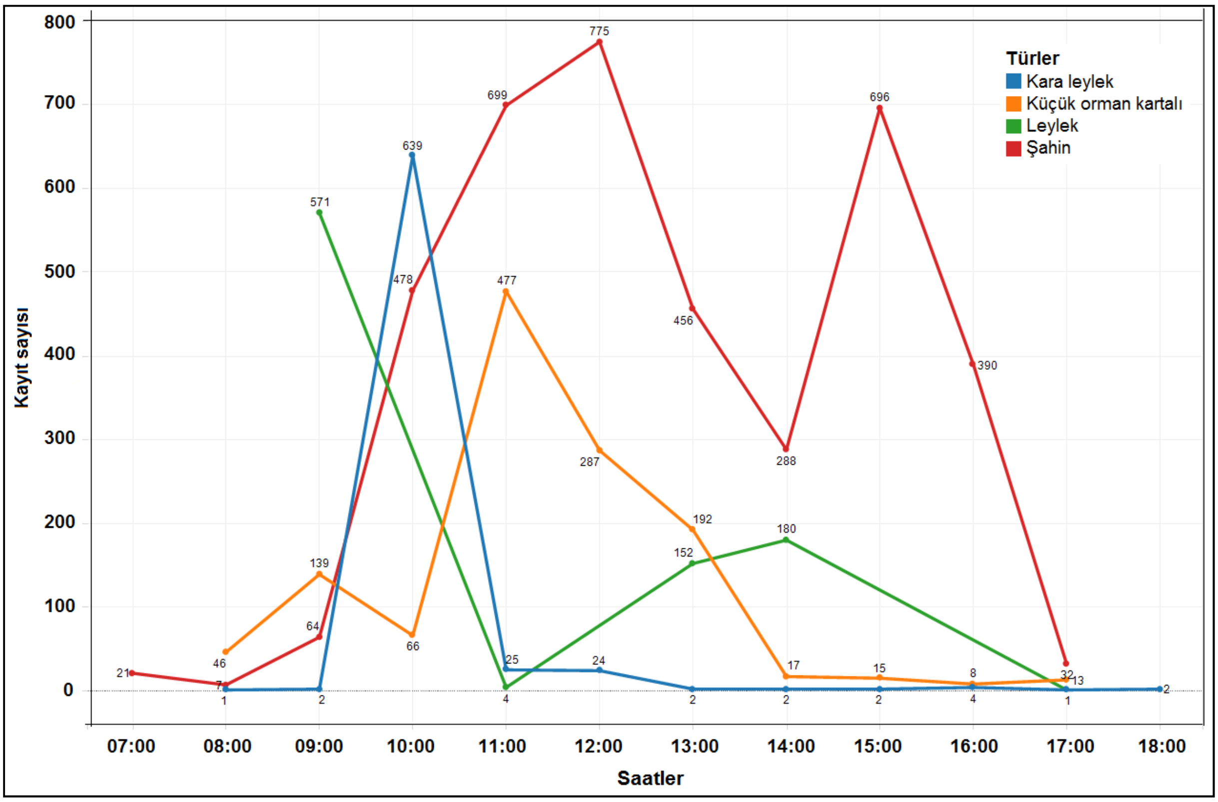


Figure 7.98 Passage times of the Black stork, the Lesser spotted eagle, the Stork and the Buzzard during the day.

Spring 2017 Migration Monitoring Findings

28 bird species recorded as a result of the observations during the spring migration monitoring study are listed in **Table 7.43**. Throughout the observation, a total of 9.598 individuals were recorded within these 28 species. The most frequently recorded species during the autumn migration in the site were Stork (*Ciconia ciconia*) (3.533 recordings, 36.81%), Honey buzzard (*Pernis apivorus*) (2.844 recordings, 29.63%), Bee-eater (*Merops apiaster*) (2.671, 27.83%) and Common Buzzard (*Buteo buteo*) (197, 2.05%), respectively (Figure 7.99).

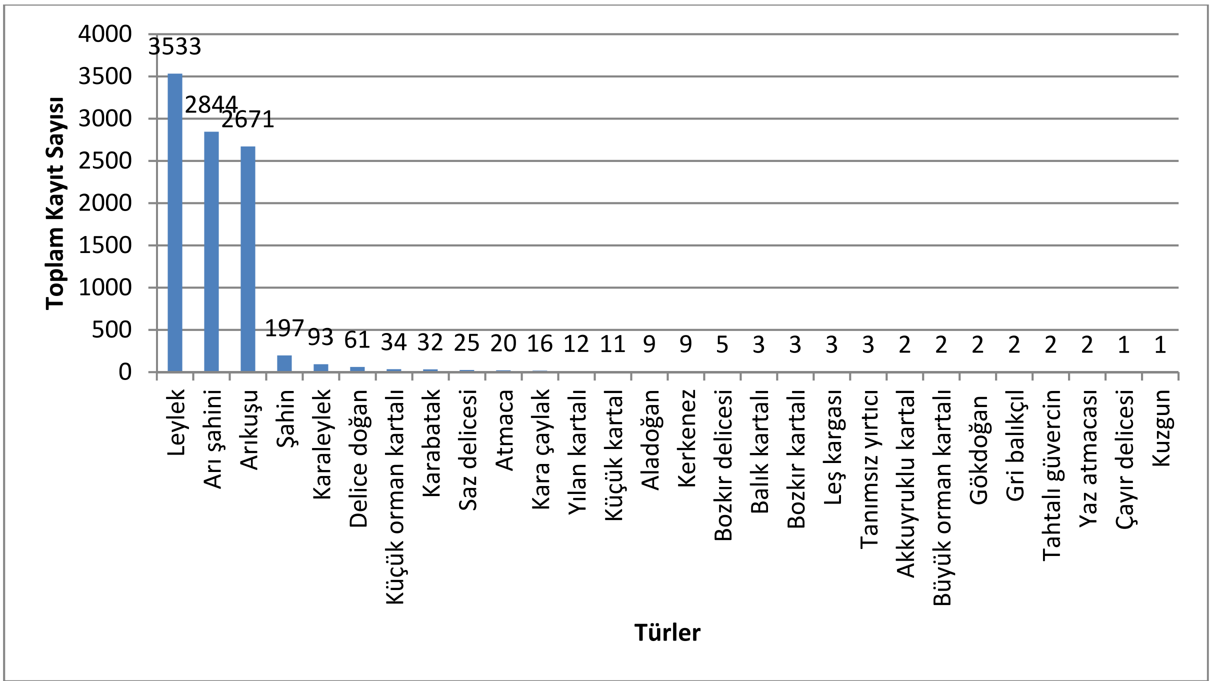


Figure 7.99: Identified Migratory Bird Species and Total Number of Recordings

Table 7.43: Identified Migratory Bird Species and Total Number of Recordings

No	Species	Total No. of Recordings	% Within Total
1	Stork	3.533	36,8
2	Honey buzzard	2.844	29,6
3	Bee-eater	2.671	27,8
4	Falcon	197	2,0
5	Black Stork	93	1,0
6	Hobby	61	Negligible*
7	Lesser spotted eagle	34	Negligible
8	Cormorant	32	Negligible
9	Marsh harrier	25	Negligible
10	Hawk	20	Negligible
11	Black kite	16	Negligible
12	Short-toed eagle	12	Negligible
13	Booted eagle	11	Negligible
14	Peregrine falcon	9	Negligible
15	Kestrel	9	Negligible
16	Pallid Harrier	5	Negligible
17	Osprey	3	Negligible
18	Steppe eagle	3	Negligible
19	Carrion crow	3	Negligible

No	Species	Total No. of Recordings	% Within Total
20	Unidentified cormorant	3	Negligible
21	White tailed eagle	2	Negligible
22	Greater spotted eagle	2	Negligible
23	Duck hawk	2	Negligible
24	Grey heron	2	Negligible
25	Wood pigeon	2	Negligible
26	Levant sparrowhawk	2	Negligible
27	Montagu's harrier	1	Negligible
28	Raven	1	Negligible
	TOTAL	9.598	

* Where the proportion of the percentage of observation per species to the total observation records is below 1%, percentage within the total is given as negligible.

During the study, 9,048 species belonging to the species Stork, Honey buzzard and Bee-eater, which passed through the site in highest numbers and comprise approximately 94% of the total observation recordings. Dates on which different species passed frequently vary. Distribution of observation recordings for these three species over the course of the study is given in Figure 7.100. The recordings on these species show that the most frequent passage during the day occurred in the morning from 09:00 to 14:00 (Figure 7.101).

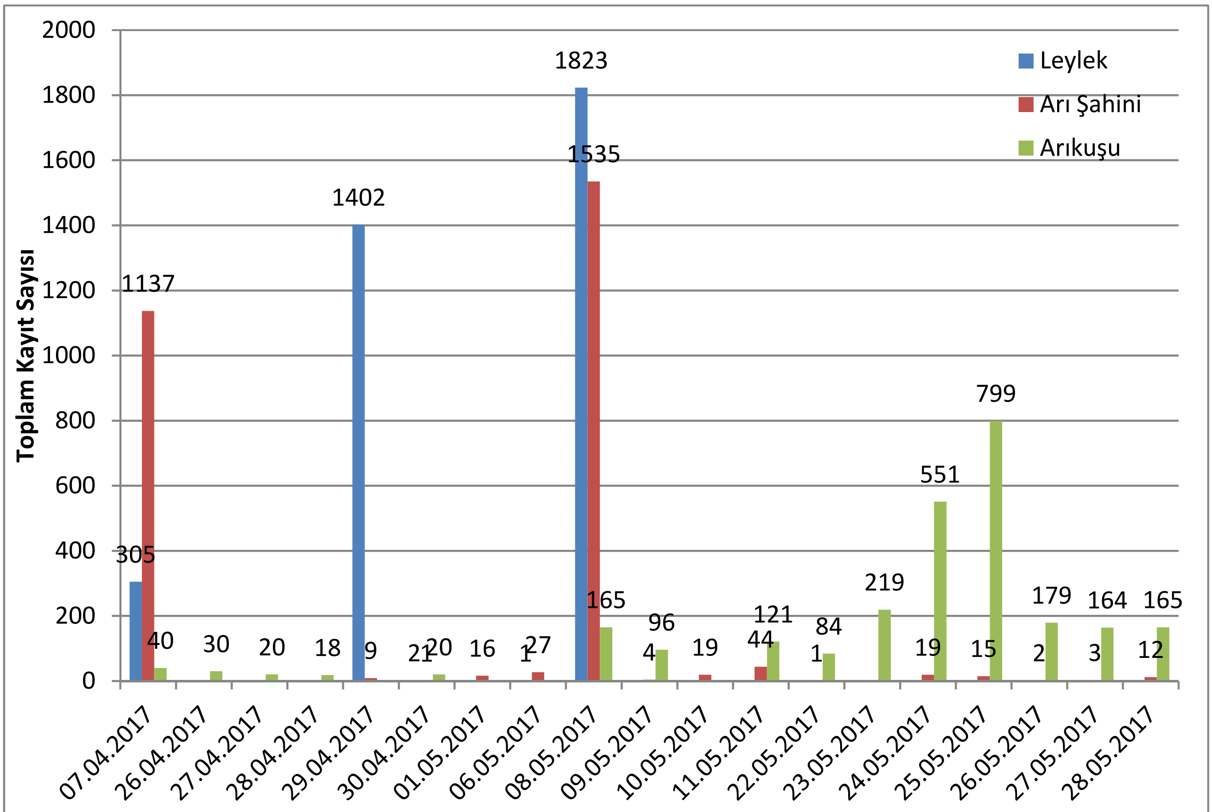


Figure 7.100: Distribution of Recordings for Stork, Honey buzzard and Bee-eater

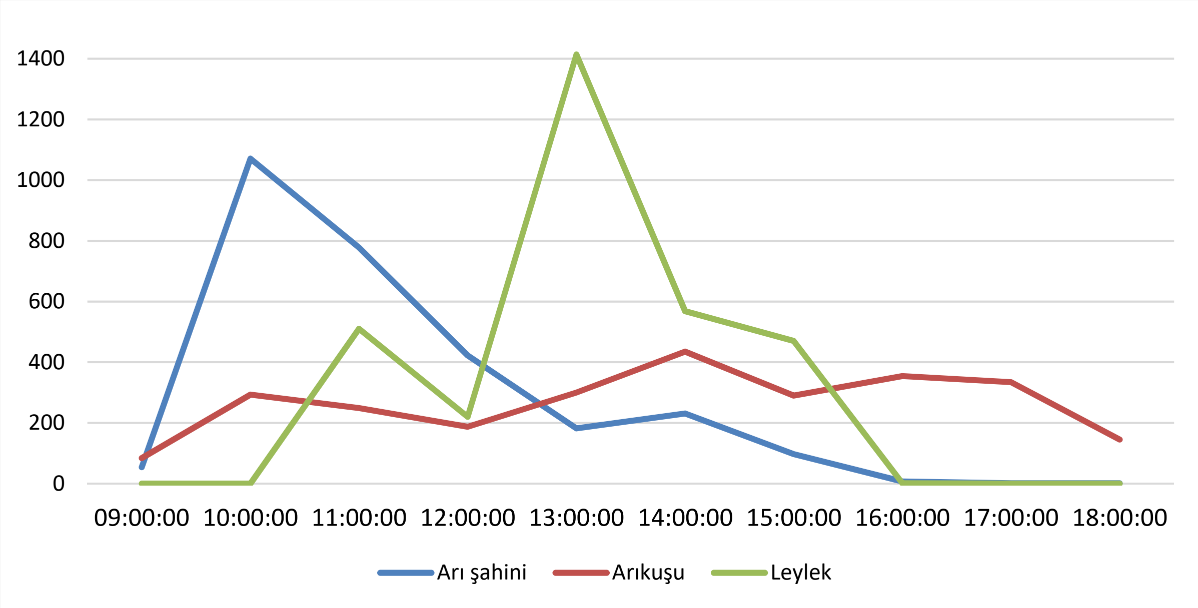


Figure 7.101: Passage Times of Stork, Honey buzzard and Bee-eater Species During the Day

Falcon, Black Stork and Hobby are the species that were observed to pass through the site the most frequently, and a total of 351 individuals of these species were counted (Table 7.43). Distribution of the observation records for these species throughout the study is given in Figure 7.102. Throughout the observation, the falcon is observed to pass continuously, while the other species passed intermittently. The recordings show that the Black Stork and Hobby passed during the day most frequently in the morning from 11:00 to 12:00, while Falcon passed from 13:00 to 14:00 (Figure 7.103).

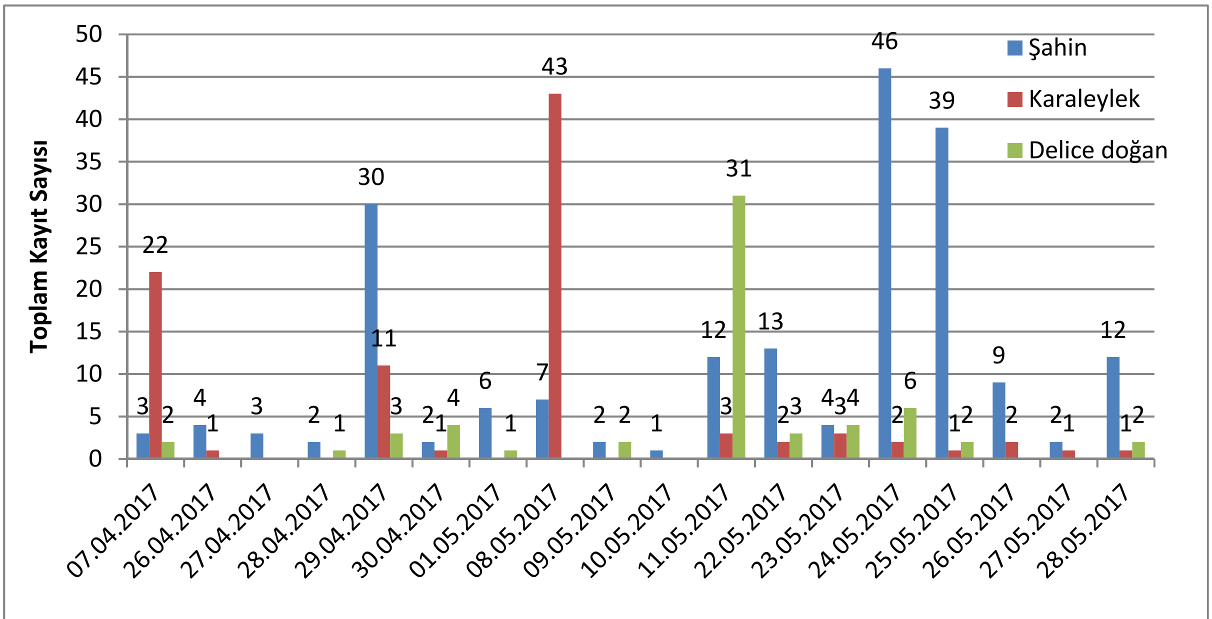


Figure 7.102: Distribution of Recordings for the Falcon, Black Stork and Hobby

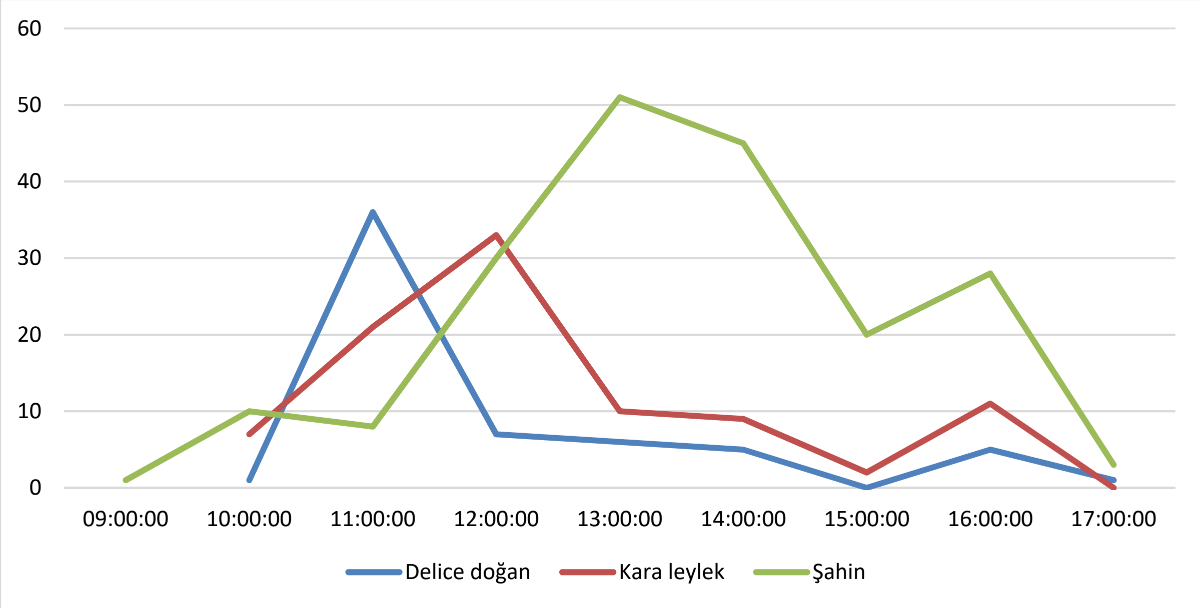


Figure 7.103: Passing Times for Falcon, Black Stork and Hobby Species During the Day

Lesser spotted eagle, marsh harrier and hawk are other species that were observed in the site, with 79 individuals counted for them (Table 7.43). Distribution of the observation recordings for these species during the study is given in Figure 7.104. The marsh harrier was observed to pass continuously throughout the observation, while other species passed intermittently. The recordings show that the highest number of passing occurred during the day between 09:00 and 12:00 (Figure 7.105).

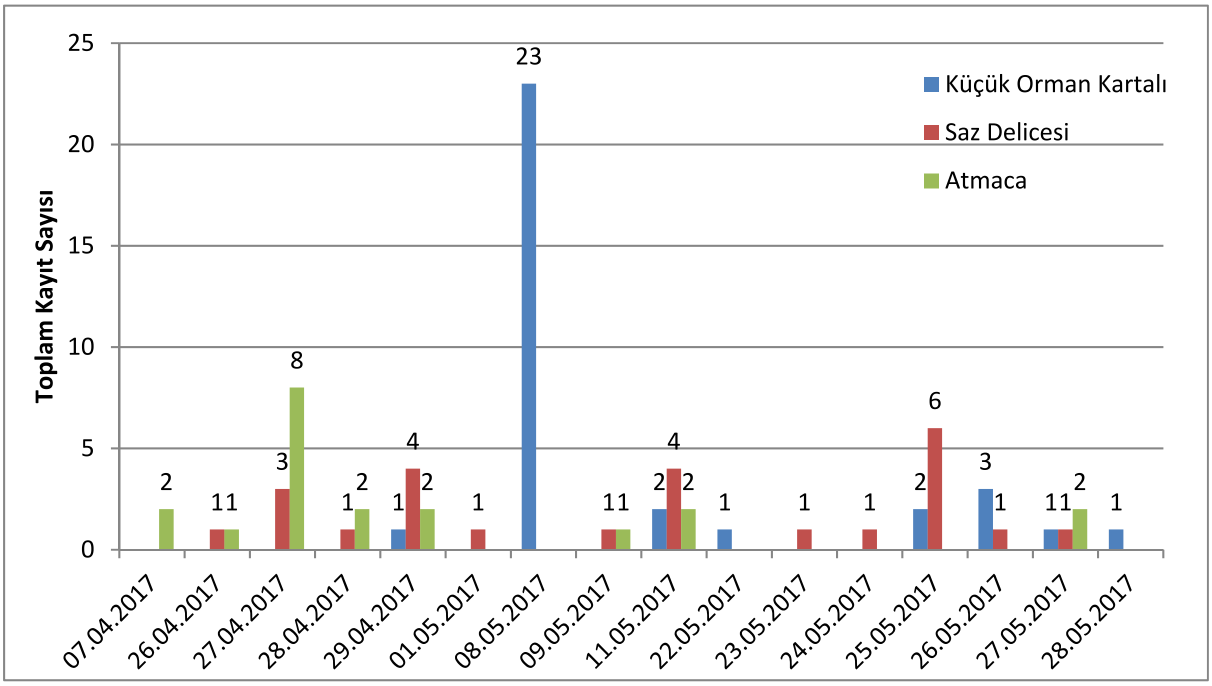


Figure 7.104: Recording Distribution for the Lesser spotted eagle, Marsh harrier, Hawk

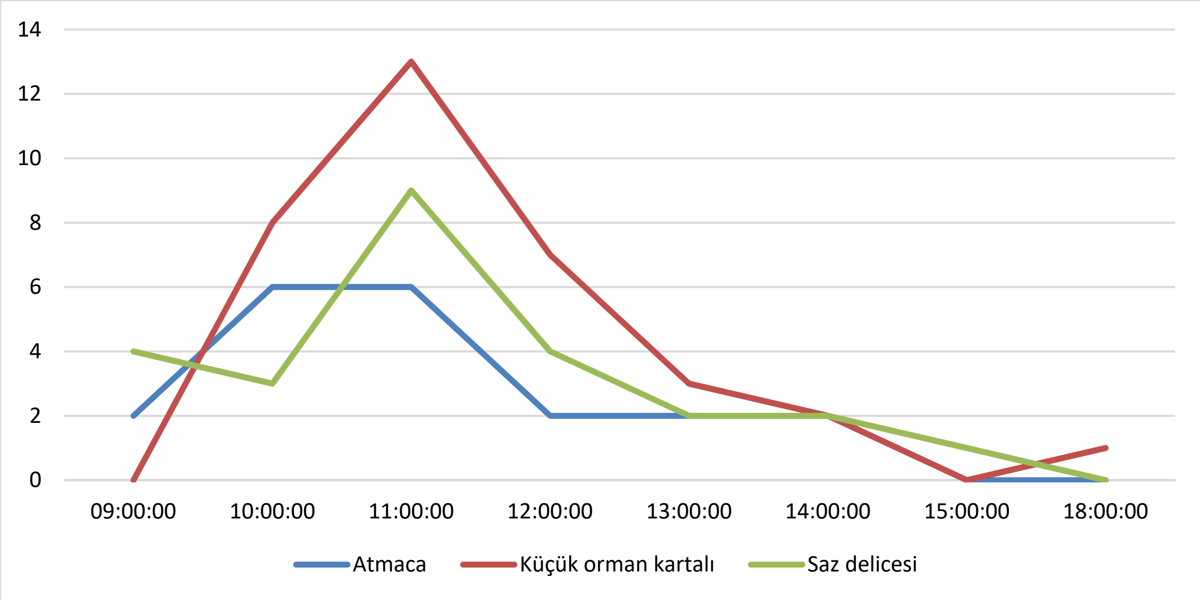


Figure 7.105: Passing Times for Lesser spotted eagle, Marsh harrier, Hawk Species During the Day

The other four species which passed across the site frequently are black kite, short-toed eagle, booted eagle and peregrine falcon, with 48 individuals observed among them (Table 7.43). Distribution of observation recordings for these four species throughout the study is shown in Figure 7.106. The most frequent passing times were observed as follows: 12:00 for the black kite, around 13:00 for the short-toed eagle and the peregrine falcon and 10:00-12:00 for the booted eagle (Figure 7.107).

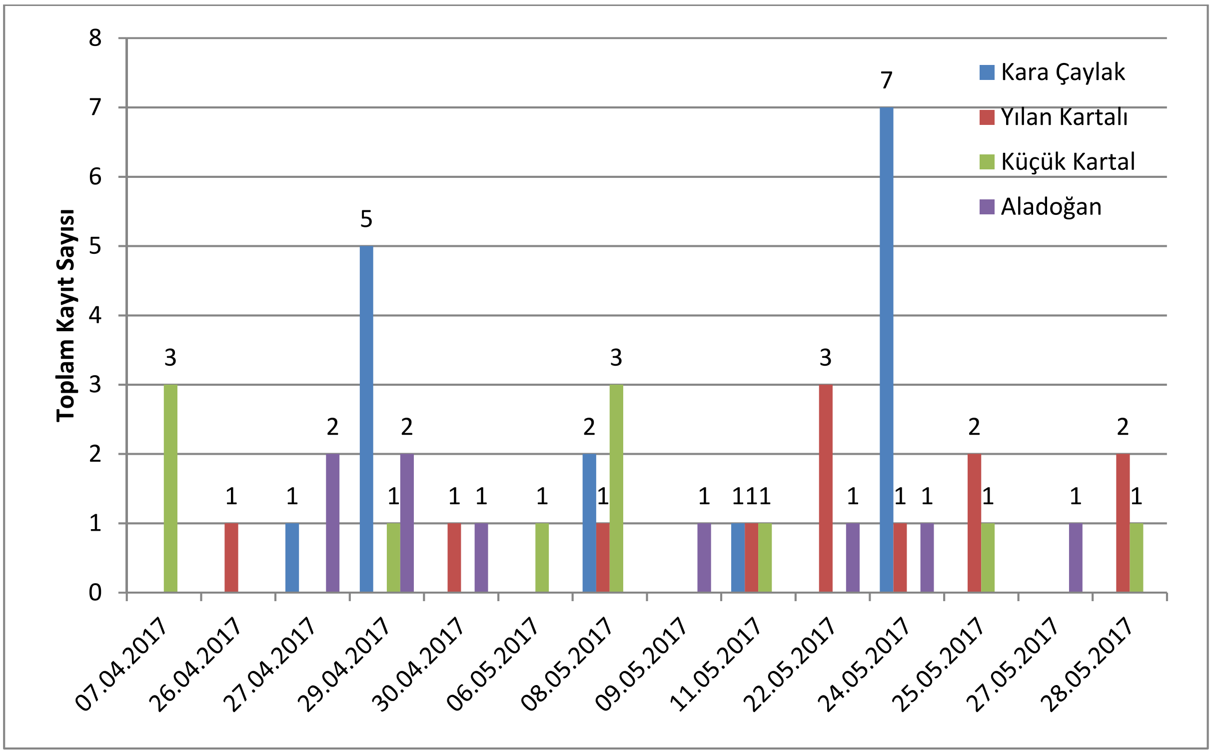


Figure 7.106: Recording Distribution for the Black Kite, Short-toed Eagle, Booted eagle and Peregrine falcon

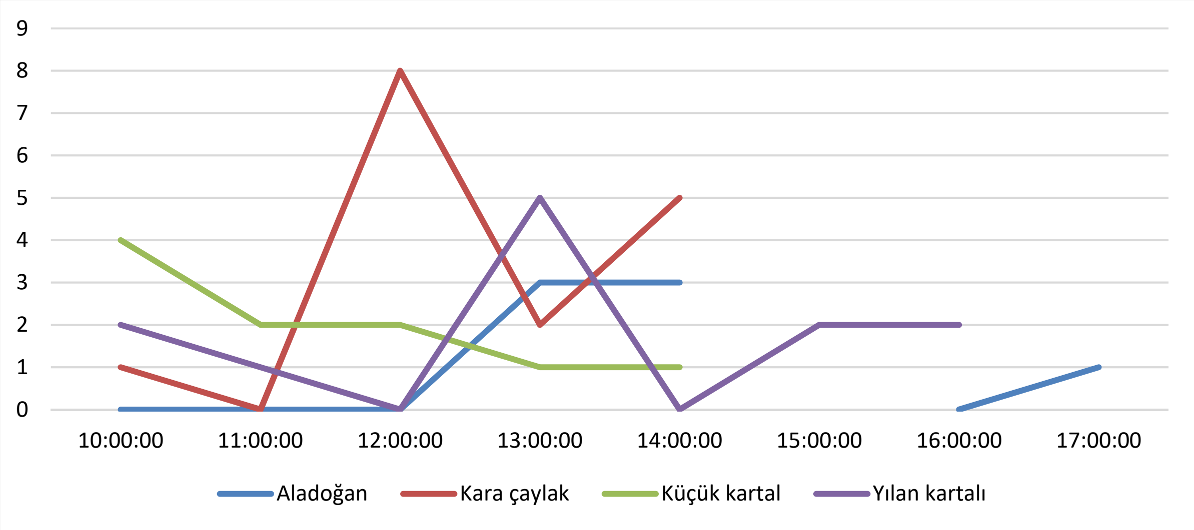


Figure 7.107: Passing Times of the Species Black Kite, Short-toed Eagle, Booted Eagle ve Peregrine Falcon During the Day

Arthropods

34 butterfly species, **16** dragonfly species and **8** damselfly species were identified in the study area. None of these species were on Bern Convention and Habitat Directive Annex Lists.

All the butterfly species are widely distributed ones and none are classified by the IUCN as **CR:** Critically Endangered or as **EN:** Endangered.

Some dragonfly species identified in the Study area are listed on the IUCN Red List as **VU:** Vulnerable and **NT:** Near Threatened. Out of these, *Somatochlora borisi* is listed **VU:** Vulnerable, and *Libellula pontica* was listed **NT:** Near Threatened (**Table7.**). Other species were on the IUCN Red List as **LC:** Least Concern.

All the arthropods identified in the Study area as well as their statuses as per the IUCN, Bern and Habitat Directives are presented in **ANNEX-7.D** in detail.

Table7.44: Arthropods Classified Vu and NT on the IUCN Red List

Species	IUCN Red List	Bern Convention	Habitat Directive
Somatochlora borisi	VU	-	-
Libellula pontica	NT	-	-

Reptiles and Amphibians

18reptile species and **7**amphibian species were identified in the Study area. **3**of the amphibian species are on the Bern Convention Annex II, **3**on the Bern Convention Annex III, **4** on **the** Habitat Directive Annex IV, **1**on Habitat Directive Annex V. **13**of the reptile species are on the Bern Convention Annex II, **3** on the Bern Convention Annex III, **1** on Habitat Directive Annex II, **14**on the Habitat Directive IV.

According to the IUCN, none of these species are classified **CR:** Critically Endangered or **EN:** Endangered.

Some of the reptile species identified in the Study area are on the IUCN Red List, classified **VU:** Vulnerable and **NT:** Near Threatened. *Testudo graeca*is classified **VU:** Vulnerable, *Emys orbicularis, Testudo hermanni and Darevskia praticola*are classified **NT:** Near Threatened (Table7.).

All the reptile and amphibian species identified in the Study area as well as their statuses as per the IUCN, Bern and Habitat Directives are presented in **ANNEX-7.D** in detail.

Table7.45: Reptiles Classified Vu and NT on the IUCN Red List (Onshore Section)

Species	IUCN Red List	Bern Convention	Habitat Directive
Testudo graeca	VU	Annex II	Annex II
Emys orbicularis	NT	Annex II	Annex IV
Testudo hermanni	NT	Annex II	Annex IV
Darevskia praticola	NT	Annex III	

Onshore section of the Project seems to be rich, particularly in turtles. Two different turtle species were seen living together using the same water resources within the site (*Emys orbicularis* and *Mauremys rivulata*). Of the other species identified within the site, *Pelophylax ridibundus*is distributed particularly in streams and puddles while *Testudo graeca* is widely distributed in clearance areas within forests.

Some amphibian and reptile species identified in the study site during site studies are presented in Figure 7..

Figure 7.108: Some Amphibian and Reptile Species – Onshore Section

7.1.3.2.3 Conclusions and Evaluation for the Fauna

34 mammal species, **34** butterfly species, **16** dragonfly species, **8** damselfly species, **18** reptiles and **7** amphibians were identified in the Study area.

Out of the mammals, **11** species are included in the Bern Convention Annex II, **14** in the Bern Convention Annex III, **5** in the Habitat Directive Annex II, **3** in the Habitat Directive Annex IV and **1** in the Habitat Directive Annex V. Among the identified mammal species, *Myotis capaccinii* is classified **VU:** Vulnerable, while *Rhinolophus blasii*, *Rhinolophus ferrumequinum, Myotis bechsteini, Miniopterus schreibersii and Lutra lutra* are classified **NT:** Near Threatened by the IUCN.

Of the dragonfly species identified in the Study area, *Somatochlora borisi* is classified **VU:** Vulnerable, and *Libellula pontica* is classified **NT:** Near Threatened.

Of the amphibians, **3** are in the Bern Convention Annex II, **3** in the Bern Convention Annex III, **4** in the Habitat Directive Annex IV, **1** in the Habitat Directive Annex V. The amphibian species that were identified are listed in **LC:** Least Concern category of the IUCN. Of the reptile species, **13**are included in the Bern Convention Annex II, **3** in the Bern Convention Annex III, **1** in the Habitat Directive Annex II, **14** in the Habitat Directive IV. Reptile species *Testudo graeca* is classified **VU:** Vulnerable, while *Emys orbicularis, Testudo hermanni and Darevskia praticola* are classified **NT:** Near Threatened in the IUCN list.

During the field studies as well as the Spring and Autumn bird migration observations carried out in the Project site a total of 112 bird species were observed. Out of these species, **80** are in the Bern Convention Annex II, **23** in the Bern Convention Annex III; **12** in the MAK (2016-2017) Annex I, **12** in the MAK (2016-2017) Annex II; **3** in the CITES Annex I, and **23** in the CITES Annex II.

In the scope of the bird observation study, a 43-day observation covered the Autumn 2015 period which generally lasts 2,5 months (15 August-31 October) in the site. Spring 2017 bird observation study was carried out from 7 April until 31 May on the Project Site, constituting an additional 20-day study. It is believed that bird migration movements in the site was recorded at a good level by keeping the number of observation days high and carrying out bird observation studies in both migration periods.

Results revealed that Kıyıköy region was used particularly by the Buzzard, the Lesser spotted eagle, the Stork and the Black stork during the autumn migration period; and by the Stork, Honey buzzard, Bee-eater during the spring period. While none of the bird species identified are classified by the IUCN as **CR:** Critically Endangered, *Neophron percnopterus* (Egyptian vulture) and *Aquila nipalensis* (Steppe eagle) are listed **EN:** Endangered. The observations showed that these two species did not use the site for shelter or breeding, and that they were only passing by the area during the migration.

To minimise the potential negative impact of the Project on the fauna within the area including the migratory birds, construction operations will be undertaken under the supervision of a specialist biologist, and the species that may be present in construction sites and that particularly are classified as IUCN category **EN**: Endangered, **VU**: Vulnerable and **NT**: Near Threatened will be collected and released into suitable habitats outside of the area under the supervision of the specialist biologist. In the event that the site entry permit for the construction coincides with the winter hibernation period, the methodology to be adopted to collect the species to release them into habitats outside of the site will be reviewed by the specialist biologist and determined based on the site conditions at that time. Otherwise, to reduce the dust generation due to excavation and construction traffic so as to prevent plant and animal species from harm due to dust and noise during the construction phase, dust suppression techniques will be applied; necessary measures will be put in place to control the noise emitted from the equipment used and to minimise the dissemination of the noise (mufflers, barriers, etc.).

7.2 Impact on the Biological Environment and Measures to Control and Mitigate the Impact in the scope of Project Operations and Transactions (Construction, Operation and De-Commissioning)

Potential impact on the biological environment due to Project’s Construction, Operation and De-Commissioning Phase activities were assessed and summarised in the following sections. For assessing impact on biological receivers, the adopted approach was the one described in EIA Report **Chapter 2** (Environmental Impact Assessment Approach).

Furthermore, in the scope of the EIA Report activities, opinions of the relevant official bodies regarding the feasibility of the Project were received. The measures to be put in place to minimise the impact of the proposed Project on the biological environment in line with the opinion letters in question are given below:

As suggested in the opinion letter dated 29.07.2015 of the Ministry of Forestry and Water Affairs, Directorate General for Nature Conservation and National Parks for the Project(**ANNEX-5.A**);

- The Project will comply with the Law no. 2873 on National Parks, The Law no. 4915 on Land Hunting and its Regulations, provisions of the Bern and CITES Conventions to which we are party both in operation and in construction phase.
- Ministry of Forestry and Water Affairs will be applied to for their opinion as to find out if the Project is outside of the scope of the Notice (2014/1) dated 03.03.2014 and no. 47644 of the Ministry of Forestry and Water Affairs.

As suggested in the opinion letter dated 29.07.2015 of the Ministry of Forestry and Water Affairs, Directorate General for Nature Conservation and National Parks for the Project (**ANNEX-5.A**);

- A seasonal monitoring programme will be drafted to monitor the changes in the marine ecology.
- In the scope of surface water monitoring, lead, cadmium, nickel, chromium, zinc, copper, sulphur and chlorine will be analysed every year. As for the soil, sulphur, pH, fluoride will be analysed every year in terms of sulphates and aggregate stability will be identified every five years to monitor the change in soil structure.
- Totality of the heavy metals in surface water and in soil will be analysed every three years.

As suggested in the opinion letter dated 10.07.2015 of the Ministry of Environment and Urbanisation, Directorate General of Environmental Impact Assessment, Permit and Inspection (**ANNEX-5.A**),opinions and permits for the Project in the framework of the relevant legislation of the Ministry of Food, Agriculture and Livestock will be obtained prior to Project’s construction phase.

To complement the aforementioned measures, the requirements of the Law on the Environment and its relevant regulations will be met in all Project phases and all permits will be obtained prior to construction phase. Necessary measures will be taken to protect and enhance the environment along the Project route.

Furthermore, fiscal liability assurances, which will be requested by the Republic of Turkey as part of the International and National legislative requirements, will be provided by the Project Owner.

7.2.1 Impact of the Construction Phase and Impact Mitigation Measures

7.2.1.1 Offshore and Shore Crossing Sections

Potential impact of the Project's construction phase activities on the marine biology was assessed for Offshore and Shore Crossing Sections, and the mitigation measures and/or design controls that were developed are given below in Table7..

There is potential for the underwater noise and vibration, water and waste discharges, light sources to be used for lighting, vessel traffic and mandatory operations requiring intervention to the seabed, all caused by the vessels and construction equipment to have certain impact on the aquatic biota found in the Project's Offshore and Shore Crossing Sections throughout the construction operations related to the Project. Furthermore, the impact from the pre-construction phase preparatory work and operations in the scope of the studies on the pipeline route within the Project's Offshore and Shore Crossing Sections is expected to be similar to that of the construction phase, however of shorter duration.

Table7.46: Project's Construction Phase Operations, Impact and Mitigation Measures/Design Controls – Offshore and Shore Crossing Sections

Phase	Operation	Potential Impact	Mitigation Measure / Design Control
Pre-construction, construction	Route studies prior to construction, ROV studies Usual vessel activities (running of engines, lighting, bilge and ballast production during vessel movements for the provision of pipes and other materials, crew changes from/to the site and within the construction spread) Pipe laying	• Physical impact on marine organisms including marine mammals and seabirds from vessel operations • Impact on fish populations including species with commercial value • Potential losses in habitats and species along with the introduction of invasive species into the marine environment • Impact on the water quality and marine ecology from accidental hydrocarbon spills, bilge and non-hazardous waste disposal into the sea. • Direct habitat loss in the area covered by pipelines • Disturbance of the seabed during the anchoring of vessels	• Project vessels to avoid birds and mammals flocking on the sea surface • Ban on approaching, feeding and throwing any objects to marine mammals • Ban on hunting of marine mammals and birds by the project staff • Storing the food waste on vessels and abiding by the relevant rules • Avoiding the use of noisy equipment wherever possible and not unnecessarily leaving the auxiliary equipment in "stand-by" or "on" • Taking maximum care to lighting controls against the risk of birds or group of birds crashing into vessels in the most active migration periods of migratory birds, namely end of March to end of May and mid-September to end of October and under poor weather conditions, when the visibility range is lowor at nights • Not using the lighting on vessel exteriors unless necessary • Developing and implementing a ballast water and sediment management plan based on the International Maritime Organisation's (IMO) International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) and including the quality standards requirements for ballast procedures and ballast discharges and the Guideline on Managing and Protecting Invasive

Phase	Operation	Potential Impact	Mitigation Measure / Design Control
			Species in Oil and Gas Industry, where appropriate. • All vessels are compliant with MARPOL and have the sea related certificates and appropriate qualified crew • Management of discharges and wastes from vessels handled as per MARPOL 73/78 within the Turkish EEZ and as per the provisions of the Water Pollution Control Regulation within the Turkish Territorial Waters • Developing a waste management plan and emergency plan for each vessel • Training of the staff on intervening in case of emergency spills • Monitoring and confirming that all pipe laying operations are contained within the approved construction corridor • Monitoring the anchoring operations
Construction	Intervention to the seabed Production of transition roads and excavation of ditches, Environmental management of bottom dredging operation and bottom dredging materials	• Disturbance of the seabed and habitat loss • Benthic habitats and potential impact on the relevant benthic fauna • Impact on the marine flora photosynthesis due to increase of suspended sediments during bottom dredging operations, negative impact on the fish and marine mammals within the region as well as on the marine flora and fauna due to bottom dredging materials • Impact on the water quality due to sediment mobilisation • Increase in the suspended sediment during backfilling operations • Habitat loss during backfilling operations	• Management of discharges and wastes from vessels handled as per MARPOL 73/78 within the Turkish EEZ and as per the provisions of the Water Pollution Control Regulation within the Turkish Territorial Waters • Running the bottom dredging operations within the Shore Crossing Section in line with the bottom dredging management plan • Analysis of bathymetry data from dredging site research and development of a dredging programme by the captain of the dredging ship and inspector • Monitoring of the dredging operation by the dredging company via a software • Using a satellite-based vessel monitoring system fitted on the bottom dredging equipment to ensure the highest efficiency in bottom dredging operation and to avoid any bottom dredging and disposal outside of the defined area • Developing and implementing an environmental monitoring programme to minimise the environmental impact from bottom dredging operations • Monitoring of macrobenthic organisms • Monitoring of turbidity level • Using turbidity-reducing equipment when necessary • Following the end of bottom dredging operations, rehabilitation of operation areas on the sea (including the temporary storage sites) to their former state as per relevant environmental permit requirements. Rehabilitation will

Phase	Operation	Potential Impact	Mitigation Measure / Design Control
			include removal of transition roads, backfilling of ditches and flattening of the sites where bottom dredging materials were stored temporarily) • Following the laying of pipes and filling of ditches, removal of transition roads and disposal of rocks and stones used for the transition road construction in line with the applicable legislation • Minimising the mixing of the bottom dredging materials into the water column with a draining pipe positioned as close as possible to the seabed in case of floating hose use for discharging the bottom dredging material on to temporary storage sites • Keeping and monitoring the mooring operations within area(s) identified with A5.23 EUNIS Code as much as possible • Implementing operations for the transition road construction within the approved construction corridor, using satellite navigation software • Using washed filling material for the construction to reduce siltation

Additionally, other impact during both pre-construction and construction phases of the Project as well as the measures to be taken and details of some of the measures above are as follows;

There is a potential for non-local invasive species, who may be found in the ballast water or on the biofilm in the ballast tanks or who cling on to the body of the vessels, to be accidentally introduced into the marine environment due to vessel operations. Despite the low possibility, if invasive species were accidentally introduced into the marine environment, they would potentially have impact in the overall population or community of the entire Black Sea ecology. Thus, vessels are not to discharge polluted ballast water to minimise the possible introduction of invasive species into the marine environment and the negative impact on the potentially affected marine habitats and relevant species. Furthermore, a ballast water and sediment management plan will be developed and implemented based on the International Maritime Organisation's (IMO) International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) and in line with the quality standards requirements for ballast procedures and ballast discharges and the Guideline on Managing and Protecting Invasive Species in Oil and Gas Industry, where appropriate.

As was suggested in the opinion letter dated July 2017 of the MoEU, Directorate General of Environmental Management, Marine and Coastal Area Management Department (**ANNEX-5.A**); vessel wastes produced in the scope of the Project will be managed in compliance with the following provision of the current Regulation on Reception of Wastes from Ships and Waste Control.

The stipulations of the Law on Environment and relevant legislation in force will apply for other wastes to be produced in the scope of the Project. Furthermore, it will be forbidden to discharge any liquid or solid waste material into the sea during construction and operation phases of the Project. Measures will be put in place to prevent construction debris from falling into the sea during construction operations, and oil and petroleum products from leaking into the sea. As the details of the eventual measures can be worked out throughout the detailed engineering studies, any information regarding this issue will be forwarded to the MoEU prior to construction phase upon request.

Fish present in the Offshore and Shore Crossing Sections of the Project are of great importance, especially in terms of fisheries in the Black Sea. Considered the most important fish source in the Turkish Black Sea due to its commercial value, the anchovy migrates to the northern basin of the Black Sea in February – April spawn and feed. As it starts to get colder from October through to December, the anchovy descends to the Turkish coasts, having fed and spawned in the north. It is a known fact that the anchovy has intensive reproductive activities also in the southern Black Sea. It is foreseen that the operations of the Project vessels will not cause any changes in the marine environment of the area given the fact that the fleets to be used in the construction of Project's Offshore and Shore Crossing Sections will show very little vessel activity compared to nearly 5.000-ship fishing fleet already operating in the area and because the design controls and mitigation measures mentioned earlier will be put in place. Thus, it does not seem probable that vessel operations related to the Project will cause any change to the migration behaviour of the anchovy, which is under immense fishing pressure in the Black Sea. Additionally, the Black Sea basin is used by close to 600.000 commercial vessels per year. The impact of the Project is considered negligible compared to the underwater noise and vibration due to operations of vessels and construction equipment, water and waste discharges and the intense vessel traffic in the region. Considering that the number of vessels and construction equipment to become operational in the Offshore and Shore Crossing Sections of the Project during the pre-construction and construction phases are quite lower than the overall number of operating vessels in the Black Sea, disturbances caused by the Project vessels and equipment are not expected to cause any significant change in the fish behaviour.

As suggested in the opinion letter dated July 2015 of the MoEU, Directorate General of Environmental Management, a monitoring programme will be developed to identify polluting impact of the Project operations on the marine environment, flora and fauna, recreational purposes, fisheries and other environmental elements. The programme will be planned to run twice a year before the construction starts, twice a year throughout the construction and once after the construction is complete. In the event that the analysis results in the scope of the monitoring programme exceed the standard values defined by the relevant regulations, Project's contribution to marine pollution will be investigated and additional measures will be put in place, wherever necessary.

As suggested in the opinion letter dated 27 July 2015 of the Ministry of Interior, Coast Guard Command (**ANNEX-5.A**); waste management practices that minimise waste generation and maximise the reuse and recycling of wastes will be developed to prevent marine pollution.

7.2.1.2 Onshore section

Potential impact on the onshore flora and fauna from the Project's construction phase operations were assessed for the Onshore Section, mitigation measures and/or design controls that were developed are given below in Table7..

Table7.47: Project's Construction Phase Operations, Impact and Mitigation Measures/Design Controls –Onshore Section

Phase	Operation	Potential Impact	Mitigation Measure / Design Control
Construction	• Building access roads • Preparing the site for the Receiving Terminal and coastal facilities, excavation and filling work	• Habitat loss/ disturbance • Permanent flora loss and habitat degradation	• Running construction operations under the supervision of a specialised biologist • Fencing the construction site • Collection of the species present in construction sites and included especially

Phase	Operation	Potential Impact	Mitigation Measure / Design Control
	• Opening ditches for laying the pipeline with open excavation • Laying the pipeline • Building the Receiving Terminal • Preparing temporary construction areas, building sites • Stream crossings • Traffic movements due to personnel and construction equipment	• Changes to the species composition, decrease • Disturbances and losses to plant and animal species	in the IUCN classification **EN:** Endangered, **VU:** Vulnerable and **NT:** Near Threatened and their release into suitable habitats outside of the site under the supervision of the specialised biologist. The methodology to be adopted for the collection of the species and their placement outside of the site in the event that site entrance permit for construction overlaps with hibernation period will be reviewed by the specialised biologist and determined based on the current conditions of the site. • Excavating the top layer of the vegetated earth separately, and its storage in a suitable area on the site and coverage where appropriate • Collecting the seeds of endemic species for submission to seed gene bank for their later use during site rehabilitation • Running a monitoring programme after identifying the areas, where plant analyses will be conducted in the surrounding area, and species during the Project's construction phase
		Harm on plant and animal species due to dust and noise	• Implementing dust suppression techniques against the dust generation from excavations and construction traffic • Implementing the Traffic Management Plan • Noise control for the equipment used in construction phase and measures to minimise noise emission (mufflers, barriers etc.)
		Harm on plant and animal species due to waste generation	• Developing a Waste Management Plan, also covering waste management practices in the Turkish legislation (incl. domestic, non-hazardous and hazardous, solid and liquid wastes) • Designating a person that will oversee waste management from collection, temporary storage in construction sites to final disposal of wastes throughout the entire construction phase • Taking necessary measures to minimise waste generation

Aside from the measures mentioned earlier that aim to minimise the impact of the construction phase on the flora and fauna, as suggested in the opinion letter dated 29.07.2015 of the Ministry of Forestry and Water Affairs, Directorate General of Nature Conservation and National Parks (**ANNEX-5.A**), sites where plant analyses will be conducted within surrounding areas and species will be identified and a monitoring programme will be run during the Project's construction phase. Monitoring reports will be submitted to the 1. Regional Directorate of the Ministry of Forestry and Water Affairs.

As suggested in the opinion letter dated 29.07.2015 of the Ministry of Forestry and Water Affairs, Directorate General of Nature Conservation and National Parks (**ANNEX-5.A**), construction and operation phases of the Project will comply with the Law no. 2873 on National Parks, Law no. 4915 on Land Hunting and its Regulations as well as with the provisions of the Bern and CITES Conventions. Additionally, the opinion letter dated 05.07.2017 of the Ministry of Forestry and Water Affairs, Directorate General of Nature Conservation and National Parks is presented in **ANNEX-5.A**.

Construction and Operation Phases of the Project Onshore Section will be in line with the Environmental Legislation including the "Regulation on Assessment and Management of Environmental Noise" and the "Regulation on the Control of Air Pollution Arising from Industrial Facilities" and the "Regulation on the Air Quality Assessment and Management".

7.2.2 Impact of the Operation and Commissioning Phases and Mitigation Measures

7.2.2.1 Offshore and Shore Crossing Sections

Potential impacts on the marine ecology which may arise as a result of activities during the pre-commissioning phase and the operational phase in the Offshore and Shore Crossing Sections of the Project will be the result of maintenance vessels that will be used for regular control of the pipeline. Such maintenance and control operations will take place every five years.

A monitoring programme will be applied in the construction and operational phases of the Project to make sure that the biodiversity within the impact area of the Shore Crossing Section of the Project is protected and least affected by the Project activities.
Hydrotests to be conducted before the project is commissioned are handled in this part of the report and summarised in
Table7.'de.

Table7.48: Activities before the Pre-Commissioning Phase and Operational Phase, Impacts and Mitigation Measures – Offshore and Shore Crossing Sections

Phases	Activity	Impact	Mitigation Measures / Design Control
Pre-commissioning	Hydrotest	Change in seawater quality due to hydrotest liquid discharge	Discharging sea water which will be used as hydrotest liquid after being treated physically
Operational	Surveillance and maintenance activities conducted every 5 years by the maintenance vessels	• Habitat loss/ disturbance • Change in species composition • Penetration of invasive species into sea water	• All vessels will be compliant with MARPOL and they will all have marine certificates and appropriate qualified crew • A waste management and emergency plan will be developed for each vessel • Staff will be trained on emergency spills • Vessels will be prohibited from discharging contaminated ballast water. • Based on the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) of the International Maritime Organization (IMO), a ballast water and sediment management plan will be developed and implemented to cover the quality standards requirements for ballast procedures and ballast discharges

			and the Guideline on Managing and Protecting Invasive Species in Oil and Gas Industry, where appropriate.

7.2.2.2 Onshore section

Potential impacts were assessed which may be seen as a result of activities during the pre-commissioning and operational phases on the territorial flora and fauna of the Onshore Section of the Project and Table7. informs about the mitigation measures taken for each potential impact. A monitoring programme will be applied in the construction and operational phases of the Project to make sure that the biodiversity within the onshore section of the Project is protected and least affected by the Project activities.

Table7.49: Onshore section Activities before the Pre-Commissioning Phase and Operational Phase, Impacts and Mitigation Measures

Phases	Activity	Impact	Mitigation Measures / Design Control
Pre-commissioning, Operational	• Operating receiving terminal and construction of safety zone along the route of the pipeline • Operating receiving terminal • Maintenance of the safety zone on the pipeline	The plant and animal species as well as the habitat may get harmed	• A plan of erosion, restoration and landscape will be put into practice by the subcontractor for temporary site use as required by the Turkish legislation • After completing the construction of the pipeline, appropriate species of plants and vegetation will be planted within the safety zone along the pipeline

7.2.1 Impacts which may appear in the Post-Operational (De-commissioning) Phase

The de-commissioning strategy of the Project has not been defined yet; however, Good International Industry Practice (GIIP) will be adopted.

7.2.2 Impacts of Unexpected Incidents / Emergency Situations and Measures to Mitigate their Impacts

7.2.2.1 Offshore and Shore Crossing Sections

Table7. below gives a summary of potential impacts of unexpected incidents and emergencies in Offshore and Shore Crossing Sections which may be seen on flora and fauna species (ecological environment) existent within Offshore and Shore Crossing Sections a well as the mitigation measures and design control developed against such impacts.

Table7.50: Impacts of Unexpected Incidents and Emergency Situations and Mitigation Measures - Offshore and Shore crossing Sections

Phases	Activity	Impact	Mitigation Measures / Design Control
Pre-Construction and Construction	Activities of the offshore vessels carrying out construction works such as pipe laying, bottom dredging and surveys	Impacts of discharging fuel or hazardous substances into sea on water quality and thus on ecology and sea users	• Risk Assessment and Emergency Plan will be kept available which are approved by the Ministry of Environment and Urbanization • The equipment and staff support needed to implement the Risk Assessment and Emergency Plan will always be made available made

Phases	Activity	Impact	Mitigation Measures / Design Control
			• All vessels will comply with MARPOL and have and they will all have marine certificates and appropriate qualified crew • Personnel will be trained on how to intervene in case of emergency spills
	Fire on board ship	Potential impacts on habitat, flora and fauna.	• Risk Assessment and Emergency Plan which will include measures to intervene in the emergency, water supply to extinguish fire and trained personnel whose duties are defined will be made available
Pre-operational and operational phases	Hydrotest	Impacts on sea ecology and sea users which may stem from loss of protection in the hydrotest section discharging hydrotest liquid (involving additives) or uncontrolled discharge of untreated hydrotest liquid involving additives due to failure in treatment system	• The equipment and staff support needed to implement Risk Assessment and Emergency Plan to apply in case of spills into sea will always be made available made • Regular and incidental maintenance programmes will be created and competent people will conduct regular maintenance
	Gas leakage from the pipe line (under water)	In addition to disturbance on the sea bed which is foreseen to create impacts of sediments in sea water and turbidity, gas emissions may appear and sea water quality may degrade.	• The Receiving Terminal will be isolated from the offshore pipeline in case of emergency. The gas in the isolated part of the Receiving Terminal will be ventilated in this scenario to prevent the emergency level from going up. If a fire starts in the Receiving Terminal because of gas, the leakage will be insulated in the shortest time possible. This practice will reduce the size of any gas leakage and the time and size of potential fire. When alarm systems installed in the facility detect gas leakage or fire, insulation will be achieved fast. • Continuous pressure monitoring and measurement to detect any leakage

Negative impacts on the flora and fauna of the Project's Offshore and Shore Crossing Sections may be caused by shipborne fuel or chemical leakages that may occur during the activities of the ship in the pre-construction, construction and operational phases of the Project, by the potential of invasive species to are introduced to the sea and any loss of integrity of the pipeline. However, it seems that such unexpected incidents have low probability to occur because of design controls which may be applied in the Project.

Invasive species which are not indigenous and exist in the ballast water or stick to biofilm on the ballast tanks or hulls of the vessels have the potential to accidentally penetrate sea. Despite this low probability, if invasive species are introduced to the sea which is undesired, this incident has the potential to create impacts on the population or community of the whole ecology of the Black Sea. Therefore, ships will not discharge contaminated ballast water to minimize the possibility of invasive species to be introduced to the sea and adverse impacts on sea habitats and related species which may potentially get affected. In addition, taking the International Convention for the Control and

Management of Ships' Ballast Water and Sediments (BWM) of the International Maritime Organization (IMO) as the basis, a ballast water and sediment management plan will be developed and implemented in a way to include the requirements of quality standards for ballast procedures and ballast discharges and the Guideline on Managing and Protecting Invasive Species in Oil and Gas Industry where appropriate.

As indicated in the letter of MoEU, General Directorate of Environment Management, Sea and Coastal Management Department dated July 2017 (**ANNEX-5.A**), an authorized agency prepared a Risk Assessment and Emergency Response Plan on behalf of the Project Owner which will cover Offshore and Shore Crossing Sections of the Project in compliance with the Law no 5312 Pertaining to Principles of Emergency Response and Compensation for Damages in Pollution of Marine Environment by Oil and Other Harmful Substances and related regulations. The Risk Assessment and the Emergency Response Plan was approved by relevant authorities. The Plan will be put into effect in any emergency. The construction works will start after the requirements of this plan are met. Furthermore, financial liability insurances which are requested as per national and international legislation will be arranged by the Project Owner.

As indicated in the letter obtained from Coast Guard Command of the Ministry of Interior dated July 27, 2015 (**ANNEX-5.A**), in case of accidental oil spills in connection with Project activities, Risk Assessment and Emergency Response Plan will be put into practice considering the potential adverse impacts on water quality.

It will be confirmed that all vessels comply with MARPOL and the relevant Turkish legislation; all vessels will obtain marine certificates and have crew who are qualified enough. Waste management plans and emergency plans will be developed for each vessel and the personnel will be trained on emergency spills. In addition, emergency plans will be made available. The emergency plan which will be developed for each vessel will be different from the Risk Assessment and Emergency Response Plan developed for the Project. The Risk Assessment and the Emergency Response Plan developed for the Project was approved by the relevant authorities.

7.2.2.2 Onshore Section

Table7. which is below gives the summary of potential impacts of unexpected incidents and emergencies which may be seen on territorial flora and fauna species (ecological environment) existent within the Onshore Section a well as the mitigation measures and design control developed against such impacts.

Table7.51: Impacts of Unexpected Incidents and Emergency Situations and Mitigation Measures - Onshore Section

Phases	Activity	Impact	Mitigation Measures / Design Control
Pre-Construction and Construction	• Site preparation for pipeline route and receiving terminal construction • Opening up ditches for the pipeline and laying the pipes • Construction of receiving terminal	Degradation of surface water quality due to uncontrolled erosion/ sedimentation, drainage and flood	• Selecting the pipeline route in a way to minimize geological hazards • Applying erosion control techniques • Restoration right after digging up the trenches and backfilling and monitoring to be sure that stability is ensured • Ensuring that design requirements are met for the operations and monitoring conducted in the course of operations to control any efflux or erosion
	Chemical storage, waste storage activities	Degradation of land and ground water	• Creating waste and chemicals management plan and making competent

Phases	Activity	Impact	Mitigation Measures / Design Control
		quality as a result of incidents such as spill, leakage etc.	personnel available after identifying their responsibilities • Having tanks and secondary containment appropriate for protecting storage areas of fuel and chemicals against leakage • Storing effluents in a safe manner with proper secondary containment before they are sent to an appropriate waste facility for reusing, recycling, treating and disposing them
	Movements by road tanker and refuelling	Pollution of surface water and land as a result of fuel or hazardous substance spill on the route and areas used by road tankers	• Traffic management plan will be put into practice • Awareness raising training to drivers • Safety and security checks will be done on the vehicles as per the relevant legislation • Emergency plans for spill will be created and staff will be informed
Pre-operational and operational phases	Operating the Receiving Terminal	As a result of forest fire or fire started at the facility, potential impacts on the habitat and other species	• Fire Action Plan will be prepared and involvement of the Fire Brigade Directorate of the relevant municipality as well as the Forestry Administration will be ensured • Emergency Plan which will include measures to intervene in the emergency, water supply to extinguish fire and trained personnel whose duties are defined will be made available
		Potential bloom formation as a result of incidental gas leakage from the pipeline and impacts on the habitat and other species	• Implementing the pipeline shutdown procedure and full automatic isolation of the pipeline with safety and pressure relief systems • Continuous pressure monitoring and measurement to detect any leak
	Chemical storage, waste storage, pigging (inspection and measurement) activities	Potential pollution risk which may affect land and ground water and other longer term impacts on controlled water bodies such as reservoirs	• Creating waste and chemicals management plan and making competent personnel available after identifying their responsibilities • Having tanks and secondary containment appropriate for protecting storage areas of fuel and chemicals against leakage • Storing effluents in a safe manner with proper secondary containment before they are sent to an appropriate waste facility for reusing, recycling, treating and disposing them
	Ventilation and gas release	Impact on air quality due to gas distribution which is related to incidental increase in the amount of ventilated (blown) gas	• In order to determine risk based designs for shafts and ventilation systems, emergency plan will identify the measures needed to be taken based on the results of air emissions and distribution modelling.

7.3 Other Issues

There are no other issues to be covered in this chapter.

Contents

8 Assessing the Lands which will be disposed of in the Project

This section aims to present an evaluation of the lands which will be disposed of within the Project. As it was noted in **Chapter 1.12** (Definitions of Environmental and Engineering Examinations), two different construction techniques, microtunnel and open excavation, were discussed for the Shore Crossing Section on the EIA Application File of the Project. Since the EIA Report was submitted to the Kirklareli Directorate of Environment and Urbanization (June 2015), a series of engineering works, geological and environmental investigations, and socio-economic evaluations have been made for the designation of pipeline route in the Shore Crossing Section of the Project, optimization of Onshore Section settlement, and selection of construction technique.

As a result of the preliminary assessments, because the microtunnel option has practical restrictions as a shore crossing technique in the light of the findings obtained during the comprehensive investigations and surveys done in 2014-2015, it is finally decided by the Project Owner in 2017 that open excavation technique will be used.

Therefore, the "Technical Report on Forestry (2015)" prepared by the expert forestry engineer who was included in the EIA Study Group in 2015; and "Agricultural Report (2015)" prepared by an expert agricultural engineer were updated in May 2017 in line with the changes mentioned above.

In this context, a revised "Technical Report on Forestry (2017) was prepared by VBM Energy and Engineering LLC *(VBM Enerji ve Mühendislik Limited Şirketi)* and a revised "Agricultural Report (2017)" was prepared by faculty members of Ankara University Department of Agriculture. There reports are presented in detail in the related sections of this EIA Report and in the sections below (Ref. 8.1 and Ref. 8.2). The expert evaluations made in this section comprehends only the Onshore Section of the Project.

The Settlement Plan in the area where the components of the Onshore Section of the Project is given in Figure 8.1.

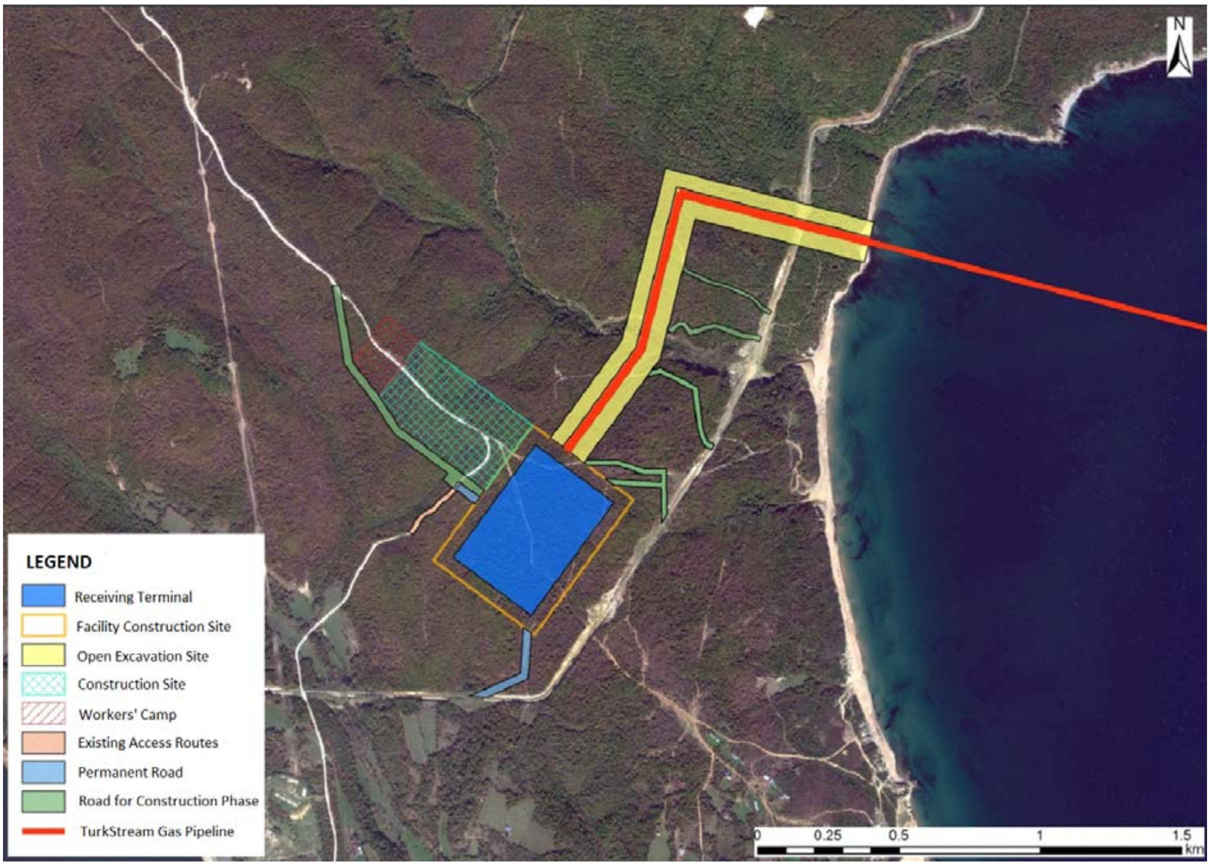


Figure 8.1: Settlement Plan of the components of the Onshore Section of the Project

8.1 Species and Number of Trees to be cut down during the Project, Forest Fires and Measures to be taken

This section is formed on the basis of "Technical Report on Forestry (2017)" prepared by an expert forestry engineer by using settlement plan of the Onshore Section of the Project and open excavation construction technique. The evaluations of the Onshore Section of the Project with respect to the forest cadastre status, road network and transportation status, Midye Forest Management Plan and forest protection and possible fire risks are also discussed in this section. Moreover, the impact of the Project on forest areas and the measures to be taken regarding this impact and designing criteria are given Chapter 5.

8.1.1 General Evaluation of the Onshore Section of the Project

The Onshore Section of the Project is located in Kirklareli Province, District of Vize, Kiyikoy Town, between Kurt Tepe - Cingene harbor and Kaz Limani cape, within the area of responsibility of the General Directorate of Forestry, Istanbul Regional Directorate of Forestry, Vize Directorate of Forest Management, Midye (Kiyikoy) Head of Forest Management.

As noted in the EIA Review and Evaluation Form (**Appendix 8.A**) prepared by Vize Head of Forestry Management on 05.06.2017 and approved by the General Directorate of Forestry, Istanbul Regional Directorate of Forestry, Directorate of Europe Permission and Easement Unit, the land that is planned to be used in the Onshore Section of the Project has a total area of 785.505,00 m^2, 783.378,00 m^2 of which is forest land and 2.217,00 m^2 of which is non-forestry land and all of the land is a national forest and public property. The coordinated Onshore Section of the Project Area with a scale of 1:5.000 is provided in **Appendix 8.B**. Road areas that are evaluated as non-standard and that remain outside the

'Forest Roads Plan and Standard' yet that are located inside the calculated area was also included in the total area calculation. The Project Area Onshore Section, which is located 2 km away from the center of Kiyikoy, reaches out from forest area to sea line, as it is shown on the photogrammetric map No. E20d1 with 1:25.000 scale **(Appendix 8.C)**.

8.1.2 General Evaluation regarding the Forest Cadastre

An area of 783.378,00 m^2 of the Onshore Section of the Project is situated within the borders Kerpice National Forest and there is no ownership conflict. The ownership of the area belongs to the State Treasury and all kinds of rights of usage belong to General Directorate of Forestry due to its characteristic. The location of the areas where the facilities in the Onshore Section of the Project are situated on the Vize/Kiyikoy Kerpice Forest Cadastre Map with 1:10.000 scale is shown in **Appendix 8.A** as it is presented in Technical Report on Forestry, and the EIA Review and Evaluation Form of General Directorate of Forestry dated 23 June 2017, respectively.

On the matters mentioned in the provisions of the application regulation of the Articles 17/3 and 18 of the Forestry Code no. 6831, General Directorate of Forestry might evaluate the requests that it deems suitable and grant authorization for the use of the land within the periods determined by the General Directorate of Forestry. Permissions for facility constructions or usages of any kind shall be obtained through written approval/permission from the General Direction of Forestry, after due consultation with the institutions concerned, as per related laws and regulations.

Moreover, because all kinds of immovable/fixed facilities established through permissions shall become the area of responsibility of the General Directorate of Forestry as of permission's end date, the owner of the permission cannot take action about these facilities. However, the owner might request a permission extension or a new permission from the General Directorate of Forestry to use the facilities after the designated period.

8.1.3 Evaluation regarding the Road Network and Transportation

Transportation to the facilities of the Onshore Section of the Project is possible under all climate conditions of summer and winter months. The transportation network of State Highways reaches out to Kiyikoy, and Midye Head of Forest Management forest road network starts where it ends.

There are Type B Forest Roads with numbers Code: 04, Code: 025, and Code: 026 in the forest area in the Onshore Section of the Project, according to the Midye Head of Forestry Management Road Network Plan (**Appendix 8.D**). Type B Forest Roads were constructed as required by the technical standards given in the "Statement on Forest Road Planning, Construction, and Maintenance" (No: 292). All kinds of rights of usage regarding these roads, used for general forestry practices and works, belong to the General Directorate of Forestry.

A written approval/permission shall be obtained before road network plan is changed and used. Necessary measures shall be taken against all kinds of deterioration and wearing out on the forest roads in the Road Network Plan (except those which were not authorized by the administration). The Project owner shall undertake the expenses of road maintenance and construction in the case of any kind of deterioration or wearing out due to the Project activities.

In the case of needs for roads that may arise during and after the construction and management activities of the Onshore Section of the Project, the Project Owner shall request permission from the General Directorate of Forestry as per the provisions of Implementation Regulations in Article 17/3 and Article 18 of the Forestry Code no. 6831. No transportation shall be provided or no new roads shall be built for the needs deriving from transportation, maintenance, management or any other reasons without the permission from General Directorate of Forestry. All the roads for which permission is obtained from Forestry Administration shall be planned and constructed as open to the public, except the special situations deemed suitable by the General Directorate of Forestry. The Project Owner shall prepare and submit to the administration the notarized contract deemed suitable by the administration before the site delivery of all kinds of written permissions and approvals. Forest Administration is authorized to add all kinds of reservations, precautions, and special provisions that it considers suitable to this type of contracts.

8.1.4 Evaluation regarding the Midye Forest Management Plan

The Onshore Section of the Project that is included within the "Midye Forest Ecosystem Based Functional Forest Management Plan" that was prepared and approved by the Midye Head of Forest Management for the years 2013-2022 corresponds to the plots no. 216, 217, 218, 219, 220, 221, 222, 247, 248, 249, 250, and 251 on the plan unit. The location of the Onshore Section of the Project on the Midye Forest Management Plan map with the scale of 1:25.000 is provided in **Appendix 8.E**.

The management functions in the aforementioned plots that correspond to the Onshore Section of the Project are defined as "Forests with Economic Function" and the definitions of the forests that are included in this function in the Midye Forest Management Plan Notes (Pages 159-160) are made as below:

"4. 1. 1- Forests with Economic Function

Forests where the forest asset or forest land is operated for economic purposes and where the other services produced by the forest are not harmed are called forests with economic function and they are grouped into separate management classes. These functions are given under main headings below.

a) Main Products: Logs, poles, industrial wood, fiber and cellulose, sapling and stick, firewood, maximum wood raw material regardless of its type.

b) Non-wood Forest Products (by-products): Plant-based, animal-based, water and mineral-based assets.

4.1.1.1- Distinguishing Criteria of Forests with Economic Function and Explanation of Justifications; forests that are designated to have economic function are areas operated in order to provide production of wood raw material and non-wood products with economic value and to meet the demands for these products in domestic and international markets on a continuous basis. Although ecological and social functions have started to gain importance in the recent years, economic function is still the most important function. Forest areas, apart from those designated for one or multiple ecologic or social functions, are meant to be designated for economic function. Even if the ecological conditions are suitable, the areas that do not have roads or means of transportation and/or where road construction is not economically viable, should be kept out of the areas that shall function economically. Besides, there could also be forest areas that have ecological and/or social functions in addition to its economic function in the same area. The areas that do not have roads or means of transportation and/or where road construction is not economically viable should not be planned as having economic function even though their ecological conditions are suitable.

4.1.1.2 – Management Classification of Forests with Economic Function and Justifications

According to the Article 12 of the management regulation, due to the tree species, administration time, management goals, forest form, differences in silvicultural interventions and the cultivation environment, plan unit forests are grouped under two production management classes based on a functional approach:

Maximum Amount of Industrial Wood Production Goal:

A- Oak Management Class

The oaks which are suitable for maximum industrial wood production within the plan unit are constituted of pure and mixed stands, black pine plantation stands that are formed as a result of forestation efforts after the removal of interrupted natural broad-leaved forests, and natural black pine stands. It includes pure stands or stands that consist of the mixture of oak, hornbeam, ash tree, linden tree and local species specific to the region. An important part of all leaved species in these management class was previously managed as coppice. Black pine areas that do not constitute a separate management class due to its area less than administration time as required by "Age Groups Method" in this plan period are planned under this management class. Black pine stands are either natural black pine stands or were artificially formed by species transformation. Although the main function of this management is production, it also serves for the functions of soil and water protection. Oak Management Class (A) is constituted of a total of 2.364,5 hectares of forest area, of which 2.299,6 hectares are fertile and 64,9 hectares are infertile.

B- Oak (Converted to Wood) Management Class

It is constituted of mixed and pure oak stands. All stands that are included in this management class are sprout-based and they were managed as coppices until the previous plan period. In order to provide firewood for the forest villagers and also a livelihood for the local people, these areas were planned as "converted-to-wood management class." The Oak (converted to wood) Management Class (B) consists of a total of 4801-hectare forest area, 4.709,4 hectares of which are fertile and 91,6 hectares are infertile. These areas that were reserved as production forest in the previous plan period as well are designated for production purposes. Although the main function of this management is production, soil and water protection function in particular is also carried out.

4.1.1.3- Classification of Forests with Economic Function regarding their Production Output

4.1.1.3.1- Forests with Function of Wood Raw Material Production

Areas that have natural, pure or mixed form and where there is no restriction due to growing environment conditions and social reasons regarding maintenance and rejuvenation works are evaluated in this management class as "Wood Production Forest". Maximum amount of quality forest production is the primary goal.

4.1.1.3.2- Non-Wood Production Forests

Forest areas with the function of non-wood production are not present in the plan unit.

According to the plan notes, it has been noticed that the forest areas in the Onshore Section of the Project that have economic function are in management classes A and B. In sum, it has been observed that there are no stand types under protection and that all of the forest area that intersects with the Project area was designated to be managed for wood raw material production. The areas of the Onshore Section of the Project that intersect with the related plots of the Midye Head of Forest Management (216, 217, 218, 219, 220, 221, 222, 247, 248, 249, 250, 251) and their sizes, and the distribution of these areas in respect with their stand types are shown in Table 8.1 and the stand map with 1:25.000 scale is presented in Figure 8.2 below. In addition, the Stand Map that was submitted in the EIA Review and Evaluation Form appendix of the General Directorate of Forestry dated 23.07.2017 is presented in **Appendix 8.E**.

Table 8.1: Plots and Stand Types in the Project Onshore Section

Plot No	Project Area (m²)	Classification as to Property Type		Classification as to Stand Type	
		Forest Area (m²)	Non-Forest Area (m²)	Stand Type	Area (m²)
216	4489.00	4489.00	0.00	Ma	3804.00
				BM-3	685.00
217	18305.00	18305.00	0.00	Ma	18305.00
218	177413.00	177413.00	0.00	Mb3-1	10847.00
				Mb2	24133.00
				Ma	142078.00
				EH	355.00
219	69314.00	69314.00	0.00	MDyab3-T	2448.00
				Mb3-1	32872.00
				Mab2	31906.00
				EH	478.00
				Deniz-Ku	1410.00
				BM-2	200.00
220	113122.00	113122.00	0.00	MDyab3-T	3952.00
				Mb3-1	35951.00
				Mb3-2	17352.00
				Mab3	40923.00
				Mab2	10478.00
				EH	4116.00
				Deniz-Ku	350.00
221	8590.00	8590.00	0.00	MDyab3-T	1540.00
				Mb3-1	50.00
				Mb3-2	6360.00
				EH	340.00
				Deniz-Ku	300.00
222	3567.00	3567.00	0.00	MDyab3-T	1742.00
				Mb3	95.00
				Deniz-Ku	1730.00
247	106105.00	106105.00	0.00	Ma3	106105.00
248	6600.00	6600.00	0.00	Ma3	6600.00
249	145625.00	145625.00	0.00	Mb3-1	22168.00

Plot No	Project Area (m²)	Classification as to Property Type		Classification as to Stand Type	
		Forest Area (m²)	Non-Forest Area (m²)	Stand Type	Area (m²)
				Mb2	123157.00
				EH	300.00
250	6551.00	6551.00	0.00	Mb2-1	6551.00
251	125824.00	123697.00	2127.00	Mb3-1	37914.00
				Mb2	85293.00
				EH	490.00
				Z-2	2127.00
TOTAL	**785,505.00**	**783,378.00**	**2,127.00**	**-**	**785,505.00**

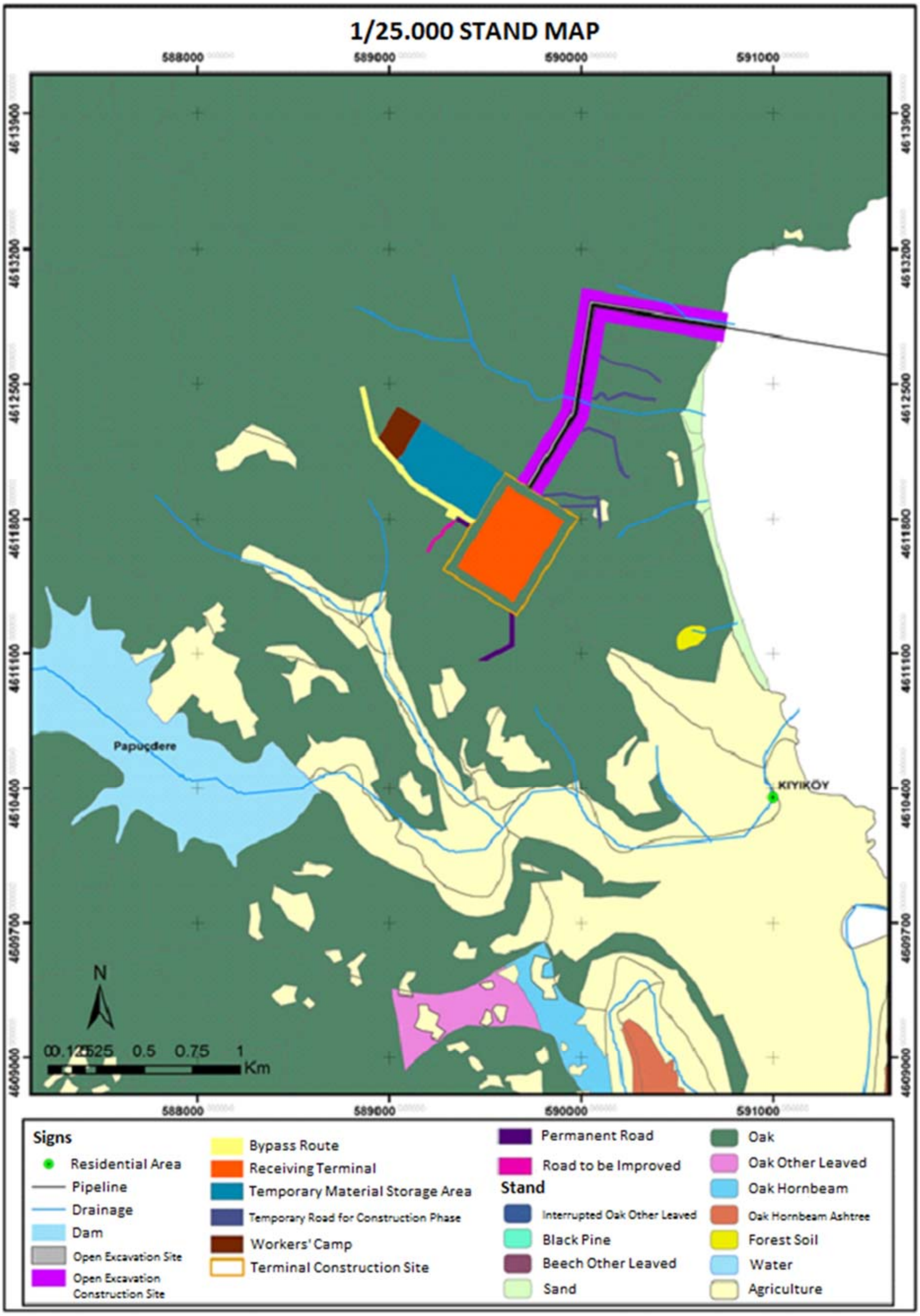


Figure 8.2: Stand Map with 1:25.000 scale (Resource: Ministry of Forestry and Water Affairs, General Directorate of Forestry, 2000)

In addition to the table above, the detailed calculations on the detailed Stand Distribution Table of the Onshore Section of the Project given in Table 8.2 below demonstrate the tree species in the area in question; total number of trees that are included in this area; and total wealth and increments in the area in m^3 on the basis of plots. According to the management data calculation prepared for the Onshore Section of the Project, there are 57.709 trees in the area with a total wealth of 3.691,156 m^3. The trees in the area are oaks and ash trees.

The canopy closure rates according to the stand types in the Onshore Section of the Project are given for each stand type corresponding to the plots. The data were collected in the light of real field data by the planning commission while creating the Midye Forest Management Plan. During the data collection, the data obtained from the experiment area that intersects with the plots are formed through general planning techniques. The planning approach used during the planning stage is explained below:

Stands are classified as seedling and stocked, sapling and pole timber, thin saw timber, medium saw timber, and thick saw timber regarding their development stages (Figure 8.3). The areas are classified with respect to their canopy closure as absent to sparse (10% or less), sparse (11%-40%), moderately closed (41%-70%), fully closed (71%-100%), tightly closed (more than 100%) and enumerated as “0”, “1”, “2”, “3”, and “4”, respectively. The symbols of the canopy closure are written next to the tree species that specify the stand type and stage class.

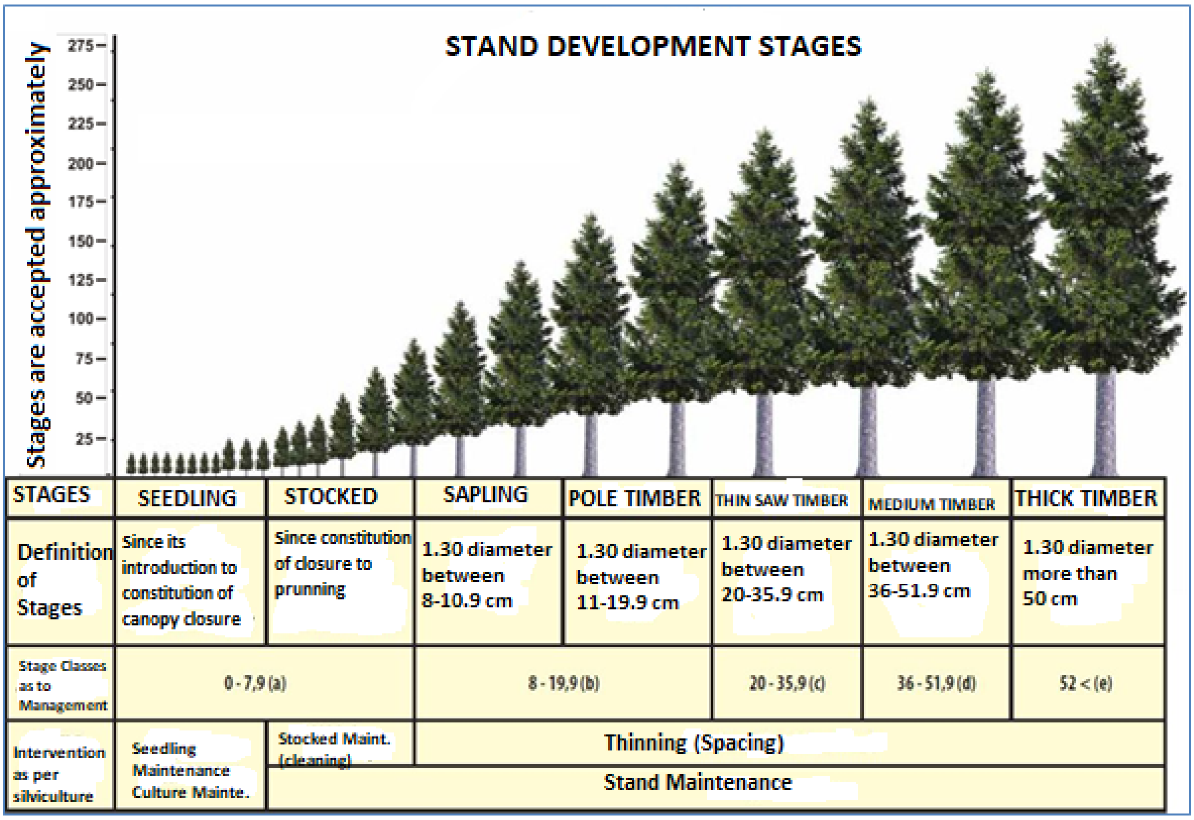


Figure 8.3: Stand Development Stages in the same-age forests (Natural and Artificial Forests)

Table 8.1: Detailed Table of Stand Distribution in the Project Area

Plot No	Project Area (m²)	Classification as to Property		Classification as to Stand Type		Midye Management Plan Data			Management Data Calculation in Project Area			
		Forest Area (m²)	Non-Forest Area (m²)	Stand Type	Area (m²)	Tree Species	Number of Trees per Hectare (Area)	Wealth per Hectare (m³)	Density Coefficient (%)	Tree Species	Total Number of Trees	Total Wealth (m³)
222	**3.567,00**	**1.837**	**1.730**	MDyab3-T	1.742	Oak	842	60,552	90	Oak	131	7,384
				Mb3	**95**	Oak	1.392	169,318	**90**	Oak	12	1,436
						Ash Tree	26	1,303		Ash Tree	1	0,000
				Deniz-Ku	1.730	-	-	-	-	-	-	-
221	**8.590,00**	**8.290**	**300**	MDyab3-T	1.540	Oak	-	-	-	-	-	-
				Mb3-1	**50**	Oak	1.392	169,318	**90**	Oak	6	0,756
						Ash Tree	26	1,303		Ash Tree	1	0,000
				Mb3-2	**6.360**	Oak	1.392	169,318	**90**	Oak	790	96,142
						Ash Tree	26	1,303		Ash Tree	1	0,006
				EH	340	-	-	-	-	-	-	-
				Deniz-Ku	300	-	-	-	-	-	-	-
220	**113.266,00**	**112.916**	**350**	MDyab3-T	3.952	Oak	-	-	-	-	-	-
				Mb3-1	**35.951**	Oak	1.392	169,318	**90**	Oak	4.468	543,461
						Ash Tree	26	1,303		Ash Tree	1	0,034
				Mb3-2	**17.352**	Oak	1.392	169,318	**90**	Oak	2.156	262,305
						Ash Tree	26	1,303		Ash Tree	1	0,016
				Mab3	40.923	Oak	842	60,552	90	Oak	3.076	173,458
				Mab2	10.478	Oak	446	28,823	70	Oak	327	21,141
				EH	4.260	-	-	-	-	-	-	-
				Deniz-Ku	350	-	-	-	-	-	-	-
219	**69.414,00**	**68.004**	**1.410**	MDyab3-T	2.448	Oak	842	60,552	90	Oak	184	10,376
				Mb3-1	**32.872**	Oak	1.392	169,318	**90**	Oak	4.085	496,917
						Ash Tree	26	1,303		Ash Tree	1	0,031
				Mab2	31.906	Oak	446	28,823	70	Oak	996	64,374
				EH	578	-	-	-	-	-	-	-
				Deniz-Ku	1.410	-	-	-	-	-	-	-

Plot No	Project Area (m²)	Classification as to Property		Classification as to Stand Type		Midye Management Plan Data			Management Data Calculation in Project Area			
		Forest Area (m²)	Non-Forest Area (m²)	Stand Type	Area (m²)	Tree Species	Number of Trees per Hectare (Area)	Wealth per Hectare (m³)	Density Coefficient (%)	Tree Species	Total Number of Trees	Total Wealth (m³)
				BM-2	200	-	-	-	-	-	-	-
218	177.413,00	177.413	0	Mb3-1	10.847	Oak	1.392	169,318	90	Oak	1.348	163,971
						Ash Tree	26	1,303		Ash Tree	1	0,010
				Mb2	24.133	Oak	917	85,000	90	Oak	1.992	184,617
				Ma	142.078	Oak	938	18,760	95	Oak	12.661	253,211
				EH	355	-	-	-	-	-	-	-
217	18.305,00	18.305	0	Ma	18.305	Oak	938	18,760	95	Oak	1.631	32,623
216	4.489,00	4.489	0	Ma	3.804	Oak	938	18,760	95	Oak	339	6,779
				BM-3	685	-	-	-	-	-	-	-
247	106.105,00	106.105	0	Ma3	106.105	Oak	1.313	26,250	95	Oak	13.235	264,599
248	6.600,00	6.600	0	Ma3	6.600	Oak	1.313	26,250	95	Oak	823	16,459
249	145.625,00	145.625	0	Mb3-1	22.168	Oak	1.392	169,318	90	Oak	2.755	335,107
						Ash Tree	26	1,303		Ash Tree	1	0,021
				Mb2	123.157	Oak	917	85,000	10	Oak	1.129	104,683
				EH	300	-	-	-	-	-	-	-
250	6.551,00	6.551	0	Mb2-1	6.551	Oak	917	85,000	10	Oak	60	5,568
251	**125.824,00**	**123.697**	**2.127**	**Mb3-1**	**37.914**	Oak	1.392	169,318	**90**	Oak	4.712	573,135
						Ash Tree	26	1,303		Ash Tree	1	0,036
				Mb2	85.293	Oak	917	85,000	10	Oak	782	72,499
				EH	490	-	-	-	-	-	-	-
				Z-2	2.090	-	-	-	-	-		
		783.378	**2.127**	**-**	**785.505**	**-**	**-**	**-**	**-**	**-**	**57.709**	**3.691,156**

Ma : Absent to sparse oak tree group that covers 10% or less of the soil surface with its shadow, with 0-7,9 cm diameter, in seedling and stocked stages
Ma3 : Fully closed oak tree group that covers 71-100% of the soil surface with its shadow, with 0-7,9 cm diameter, in seedling and stocked stages
Mab2 : Moderately closed oak tree group that covers 41-70% of the soil surface with its shadow, with 0-19,9 cm diameter, in seedling, sapling, and pole timber stages
Mb2 : Moderately closed oak tree group that covers 41-70% of the soil surface with its shadow, with 8-19,9 cm diameter, in sapling and pole timber stages
Mb3 : Fully closed oak tree group that covers 71-100% of the soil surface with its shadow, with 8-19,9 cm diameter, in sapling and pole timber stages
MDyab3-T : Oak forests mixed with other leaved trees, but where oaks are dominant
BM : Absent to sparse parse oak trees that covers 10% or less soil surface with its shadow, with various diameters and interrupted characteristic.

Z	: Agricultural Area
EH	: Water Transfer (Distribution) Line
Deniz-Ku	: Sea-Sand Area

According to the wealth data calculated after the permissions required by the Article 17/3 and 18 Implementation Regulation of the Forestry Code no. 6831 in the areas of which real land density rates, number, canopy closure, and wealth data of the tree species that only have economic function, Forestry administration shall cut down the valuable assets (usable assets). With the aim of keeping the permission area intact and allowing constructing the necessary structures, all of the wealth in the Onshore Section of the Project needs to be removed, and the area cleared out. All kinds of responsibility and rights of usage about the forest assets that shall be extracted from the Onshore Section of the Project belong to the Forestry Administration. The Forestry Administration shall decide on the cutting down operations in these areas and the way in which the assets shall be used. The Project Owner shall provide technical support on this operation and completion of these operations and clearing out the area. At least one forestry engineer shall be authorized in the works and operations in the field (without administration's request).

The net number of the trees that will be cut down within the Onshore Section of the Project has been calculated separately for permanent and temporary areas. The net number of the trees that will be cut down due to the activities to be done in the Onshore Section of the Project is 57.709,00. The number of trees that will be cut down for the permanent areas in the Onshore Section of the Project is calculated as 33.866,77 and the number of trees to be cut down for the temporary areas (workers' camp, temporary material storage area and temporary roads for construction phase is calculated as 23.842,23. Detailed information on the trees to be cut in the plots that fall into the temporary areas in the Onshore Section of the Project is given on Table 8.3.

Table 8.2: Detailed Table of Stand Distribution in the Temporary Areas within the Onshore Section of the Project

Temporary Area Name	Plot No	Project Area (m²)	Classification by Property		Classification by Stand Type		Midye Management Plan Data			Project Field Management Plan Data Calculations			
			Forest Area (m²)	Non-Forest Area (m²)	Stand Type	Area (m²)	Tree Species	Number of Trees per Hectare (Adet)	Wealth per Hectare (m³)	Density Factor (%)	Tree Species	Total Number of Trees	Total Wealth (m³)
Temporary Road for Construction Phase	216	290,00	290,00	0,00	Ma	290,00	Oak	938	18,760	95	Oak	26	0,517
	217	**4.489,00**	**4489,00**	**0,00**	Ma	3.804,00	Oak	938	18,760	95	Oak	339	6,779
					BM-3	685,00	Oak	-	-	-	-	-	-
	247	22.477,00	22477,00	0,00	Ma3	22.477,00	Oak	1.313	26,250	95	Oak	2804	56,052
	248	1.530,00	1530,00	0,00	Ma3	1.530,00	Oak	1.313	26,250	95	Oak	191	3,815
	249	1.815,00	1815,00	0,00	Mb2	1.815,00	Oak	917	85,000	10	Oak	17	1,543
	TOTAL	*30.601,00*	*30.601,00*	*0,00*	-	*30.601,00*	-	-	-	-	-	*3376*	*68.707*
Workers' Camp	217	15.097,00	15.097,00	0,00	Ma	15.097,00	Oak	938	18,760	95	Oak	1345	26,906
	218	288,00	288,00	0,00	Ma	288,00	Oak	938	18,760	95	Oak	26	0,513
	247	17.726,00	17.726,00	0,00	Ma3	17726,00	Oak	1.313	26,250	95	Oak	2211	44,204
	TOTAL	*33.111,00*	*33.111,00*	*0,00*	-	*33.111,00*	-	-	-	-	-	*3582*	*71,623*
Temporary Material Storage Field	217	2.873,00	2.873,00	0,00	Ma	2.873,00	Oak	938	18,760	95	Oak	256	5,120
	218	62.393.00	62.393,00	0,00	Ma	62.393,00	Oak	938	18,760	95	Oak	5560	111,197
	247	64.269,00	64.269,00	0,00	Ma3	64.269,00	Oak	1.313	26,250	95	Oak	8017	160,271
	248	814,00	814,00	0,00	Ma3	814,00	Oak	1.313	26,250	95	Oak	102	2,030
	249	11.990,00	11990,00	0,00	Mb2	11.990,00	Oak	917	85,000	10	Oak	110	10,192
	251	330,00	330,00	0,00	Mb2-1	330,00	Oak	917	85,000	10	Oak	3	0,281
	TOTAL	*142.669,00*	*142.669,00*	*0,00*	-	*142.669,00*	-	-	-	-	-	*14047*	*289,090*

Temporary Area Name	Plot No	Project Area (m²)	Classification by Property		Classification by Stand Type		Midye Management Plan Data			Project Field Management Plan Data Calculations			
			Forest Area (m²)	Non-Forest Area (m²)	Stand Type	Area (m²)	Tree Species	Number of Trees per Hectare (Adet)	Wealth per Hectare (m³)	Density Factor (%)	Tree Species	Total Number of Trees	Total Wealth (m³)
Temporary Road 1 to be used in Construction Phase	218	2.325,00	2.325,00	0,00	Mb3-1	227,00	Oak	1.392	169,318	90	Oak	28	3,431
							Ash Tree	26	1,303		Ash Tree	1	0,000
					Mb2	2.098,00	Oak	917	85,000	90	Oak	173	16,050
	251	10.541,00	8.451,00	2.090,00	Mb3-1	7.037,00	Oak	1.392	169,318	90	Oak	875	106,376
							Ash Tree	26	1,303		Ash Tree	1	0,007
					Mb2	924,00	Oak	917	85,000	10	Oak	8	0,785
					EH	490,00	-	-	-	-	-	-	-
					Z-2	2.090,00	-	-	-	-	-	-	-
	TOTAL	*12.866,00*	*10.776,00*	*2.090,00*	-	*12.866,00*	-	-	-	-	-	*1086*	*126,650*
Temporary Road 2 to be used in Construction Phase	218	8.235,00	8.235,00	0,00	Mb3-1	6.229,00	Oak	1.392	169,318	90	Oak	774	94,162
							Ash Tree	26	1,303		Ash Tree	1	0,006
					Ma	1.671,00	Oak	938	18,760	95	Oak	149	2,978
					EH	335,00	-	-	-	-	-	-	-
	TOPLAM	*8.235,00*	*8.235,00*	*0,00*	-	*8.235,00*	-	-	-	-	-	*924*	*97,146*
Temporary Road 3 to be used in Construction Phase	219	7.399,00	7.399,00	0,00	Mb3-1	4.805,00	Oak	1.392	169,318	90	Oak	597	72,636
							Ash Tree	26	1,303		Ash Tree	1	0,005
					Mab2	2.074,00	Oak	446	28,823	70	Oak	65	4,185
					BM-2	200,00	Oak	-	-	-	-	-	-
					EH	320,00	-	-	-	-	-	-	-

Temporary Area Name	Plot No	Project Area (m²)	Classification by Property		Classification by Stand Type		Midye Management Plan Data			Project Field Management Plan Data Calculations			
			Forest Area (m²)	Non-Forest Area (m²)	Stand Type	Area (m²)	Tree Species	Number of Trees per Hectare (Adet)	Wealth per Hectare (m³)	Density Factor (%)	Tree Species	Total Number of Trees	Total Wealth (m³)
	TOTAL	*7.399,00*	*7.399,00*	*0,00*	-	*7.399,00*	-	-	-	-	-	*663*	*76,825*
Temporary Road 4 to be used in Construction Phase	219	5.416,00	5.416,00	0,00	Mb3-1	21,00	Oak	1.392	169,318	90	Oak	3	0,317
							Ash Tree	26	1,303		Ash Tree	1	0,000
					Mab2	5.137,00	Oak	446	28,823	70	Oak	160	10,364
					EH	258,00	-	-	-	-	-	-	-
	TOTAL	*5.416,00*	*5.416,00*	*0,00*	-	*5.416,00*	-	-	-	-	-	*164*	*10,682*
SUM TOTAL	**-**	**240.297,00**	**238.207,00**	**2.090,00**	**-**	**240.297,00**	**-**	**-**	**-**	**-**	**-**	**23.842,23**	**740,72**

For the abovementioned areas as regards the Onshore Section of the Project, required permissions in line with the Article 17 of the Forestry Code No. 6831 shall be acquired and the permissions obtained from the General Directorate of Forestry shall not be misused. During the all phases of the project, the Forestry Administration shall conduct inspections as to whether no operations without permission and no misuse within the limits of permission are conducted. Any documents, plans, and opinions of other institutions (if any) requested by the Forestry Administration shall be submitted to the Administration on time. At the end of the temporary permission granted by the General Directorate of Forestry, the General Directorate of Forestry shall have the authority to evaluate permission extension requests.

As noted in the opinion letter of the General Directorate of Forestry dated 04.07.2017 (**Appendix 5.A**), this opinion letter does not comprehend the permission requests to be made within the context of the Forestry Code and permission processes should be conducted separately.

Excavation residue, waste or any other material shall not be discharged in the areas considered as forest. Besides, sludge oil or other pieces of construction equipment to be used during the construction shall not be discharged in the forest.

8.1.5 Evaluation regarding Forest Protection and Possible Fire Risks

There has been no cases of fire in the forest area in the Onshore Section of the Project. Within the framework of fight against forest fires, regions and activity areas that are sensitive to fire shall be detected, a “Fire Action Plan” shall be prepared for the Onshore Section of the Project in case an adverse situation takes place, and participation of the Fire Department of the municipality and Forestry Administration to this action plan shall be ensured. For a probability of all kinds of fire during the all phases, necessary first warning systems, cable and wireless communication and correspondence systems, and monitoring and recording systems for the environment at the Receiving Terminal shall be installed and the data acquired through these systems shall be simultaneously shared with the Forestry Administration.

The main responsibility in protection against forest fires belongs to the Forestry Administration. However, all kinds of responsibility in the Onshore Section and its surroundings shall belong to the Project Owner. No material shall be burned without proper control. Portable fire extinguishing equipment shall be kept ready at construction sites. These devices shall be supplied as required by the relevant articles of the “Occupational Health and Safety Code” and they shall be checked regularly. In addition, the staff shall be trained on the issue. In the case of a fire despite these precautions, immediate action shall be taken and nearest fire station shall be informed.

All the staff working within the project shall be trained regularly about facility fires and forest fires. In order to ensure that minimum damage is done to the area where the Project is located and the forest area nearby, all necessary precautions must be taken during the construction phase of the Project and after its operation starts. To that end, in addition to the provisions of the Forestry Code, provisions of the Environment Code, Coastal Code, Occupational Safety Code and all the legislation linked to these codes shall be complied.

Vize Directorate of Forestry Management and Plan Units (Heads of Forestry Management Departments) are included in the International Certification Program (FSC). Thus, all activities are made in consideration with the principle of minimum damage to the environment, and in line with the international standards prioritizing social participation. It shall be made sure that these standards are complied with in the aforementioned forest area as well as the adjacent forest areas and that working conditions determined by the Forestry Administration shall be fully implemented.

8.1.6 Evaluation regarding the Period after the End Date of Project Permission

General Directorate of Forestry has the authority to decide whether the permission granted by the General Directorate of Forestry will be extended after its exhaustion. Once the permission period is over, the area shall be cleaned out in compliance with the Environment Code and related regulations during and after the operations in the Onshore Section of the Project.

All necessary precautions shall be taken so that environment, settlements, and local people are not affected while all equipment used within the Project is being transported once the activities are completed. During the disassembly operations workers' safety shall be ensured and all kinds of necessary precautions shall be taken as per the Occupational Health and Safety legislation. Similarly, following the construction phase of the Project, during the disassembly and transportation activities of equipment that are or will be located inside the temporary areas, workers' safety shall be ensured and all kinds of necessary precautions shall be taken in line with the related legal regulations.

Following the completion of the Project, all kinds of disassembly and clearing activities within the Project Area shall be conducted in compliance with the rules determined by the Forestry Administration. Infrastructure components, electric lines and roads that were or will be established within the Project Area shall be restored to its original state through well-tended work. Electric wires shall be preserved under appropriate conditions or they shall be used in proper areas, and infrastructure components shall be cleared out without causing any damage to the environment. The polygon stones, warning plates and signs, and fences that were placed on the corners of the construction site at the beginning phase of the Project shall be dismantled and removed without causing any damage to the environment. Any concrete border walls that might have been built shall also be dismantled and transported without causing any damage to the nature.

8.2 The Size of the Agricultural Areas and Pastures which will be Disposed of; Land Usage Capability

Within the Project, experts from Ankara University Department of Agriculture prepared an Agriculture Report (May 2017). In this section, the size and characteristics of the areas to be used, official land maps, and detected findings according to the aforementioned report will be presented.

The state of the land cover on the Onshore Section of the Project with respect to the CORINE (2012) map, of which one of the stakeholders is the Ministry of Forestry and Water, is demonstrated in Figure 8.4. The area where the project activities are planned to be conducted is 785.505,00 m^2 and the whole of the land is national forest and public land. Due to this characteristic, any disposition belongs to the General Directorate of Forestry. The forest cover is defined as broad-leaved forest areas.

Because there is no land apart from the national forest and public lands within the Onshore Section of the Project, no appropriation shall be done according to the Appropriation Code No. 2942. While the Onshore Section of the Project activity area is located within public lands, the data collected from the agricultural plots map (Figure 8.5) drawn based on the data received from the Ministry of Food, Agriculture and Livestock General Directorate of Agricultural Reform, digital data obtained through current satellite images, national land cover database, and the Existing Land Use data (Figure 8.6) obtained from the Ministry of Food, Agriculture and Livestock General Directorate of Agricultural Reform Land Map Database (1982), the closest agricultural land to the Onshore Section of the Project is situated 320 m away to the south of the Onshore Section of the Project and the closest pasture is approximately 290 m away to the southwest.

Figures 8.4, 8.5, and 8.6 showing the land use related to the Onshore Section of the Project were received from databases of state institutions (Ministry of Forestry and Water Affairs and Ministry of Food, Agriculture and Livestock) differ from each other with respect to their updatedness. The data that the map of existing land use (SAK) date back to 1982. Figure 8.6 marks the dry farming lands without fallow in the region where the connecting roads will be situated to the southeast of the Receiving Terminal. However, these data collected in 1982 have lost their relevance. The areas marked as agricultural lands on the stand map with the scale of 1:25.000 of the Ministry of Forestry and Water Affairs were demonstrated as broad-leaved forest on the CORINE (2012) map (Figure 8.4). The most up-to-date information on the land use in the Onshore Section of the Project is presented on the CORINE land cover map as shown in Figure 8.4 and the agricultural plots map (Figure 8.5) that is based on the 2012 data from the Ministry of Food, Agriculture and Livestock General Directorate of Agricultural Reform. Accordingly, no agricultural areas or pastures exist within the Onshore Section of the Project.

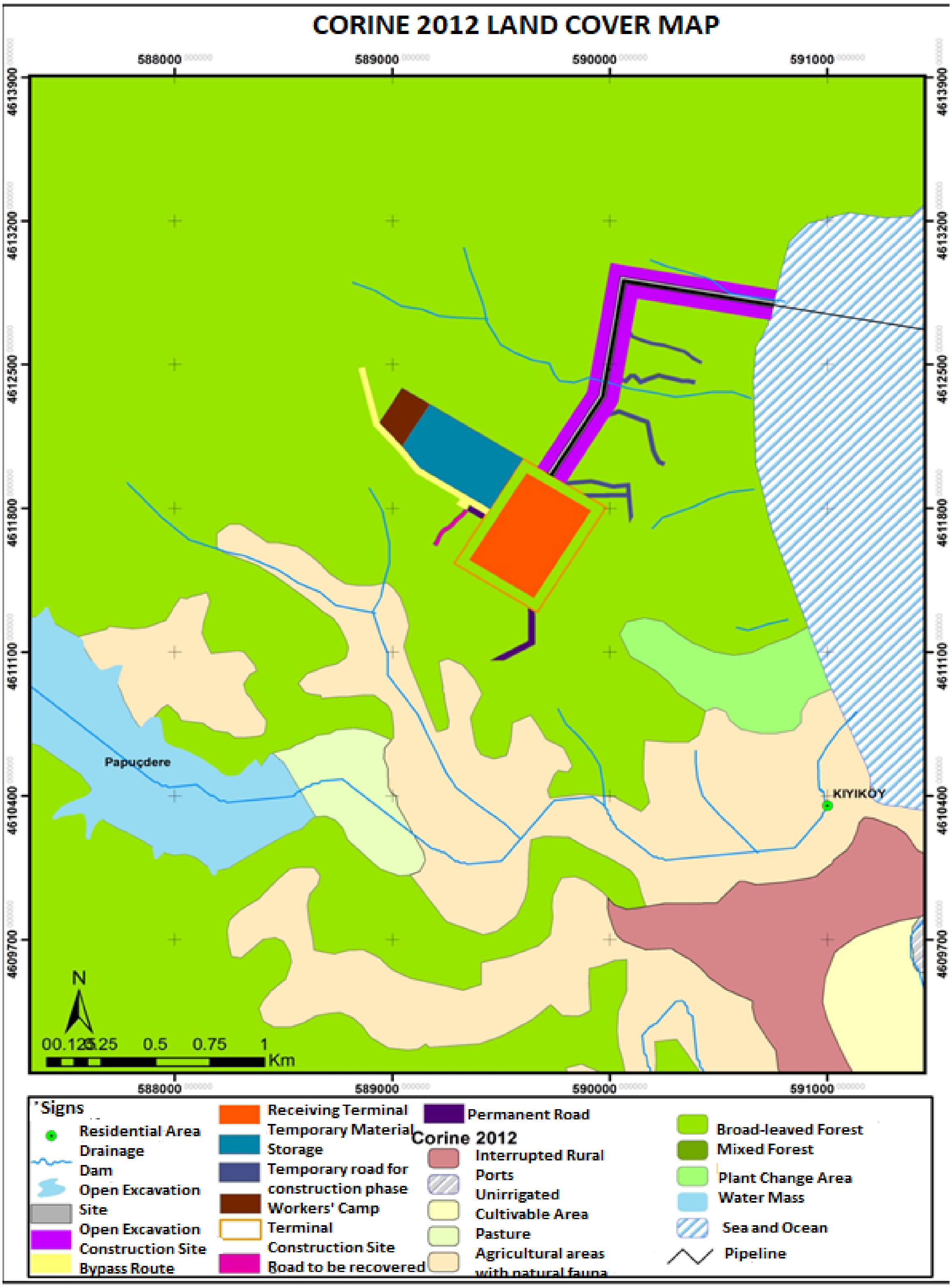


Figure 8.4: Onshore Section and Surroundings Land Cover Map (Corine, 2012)

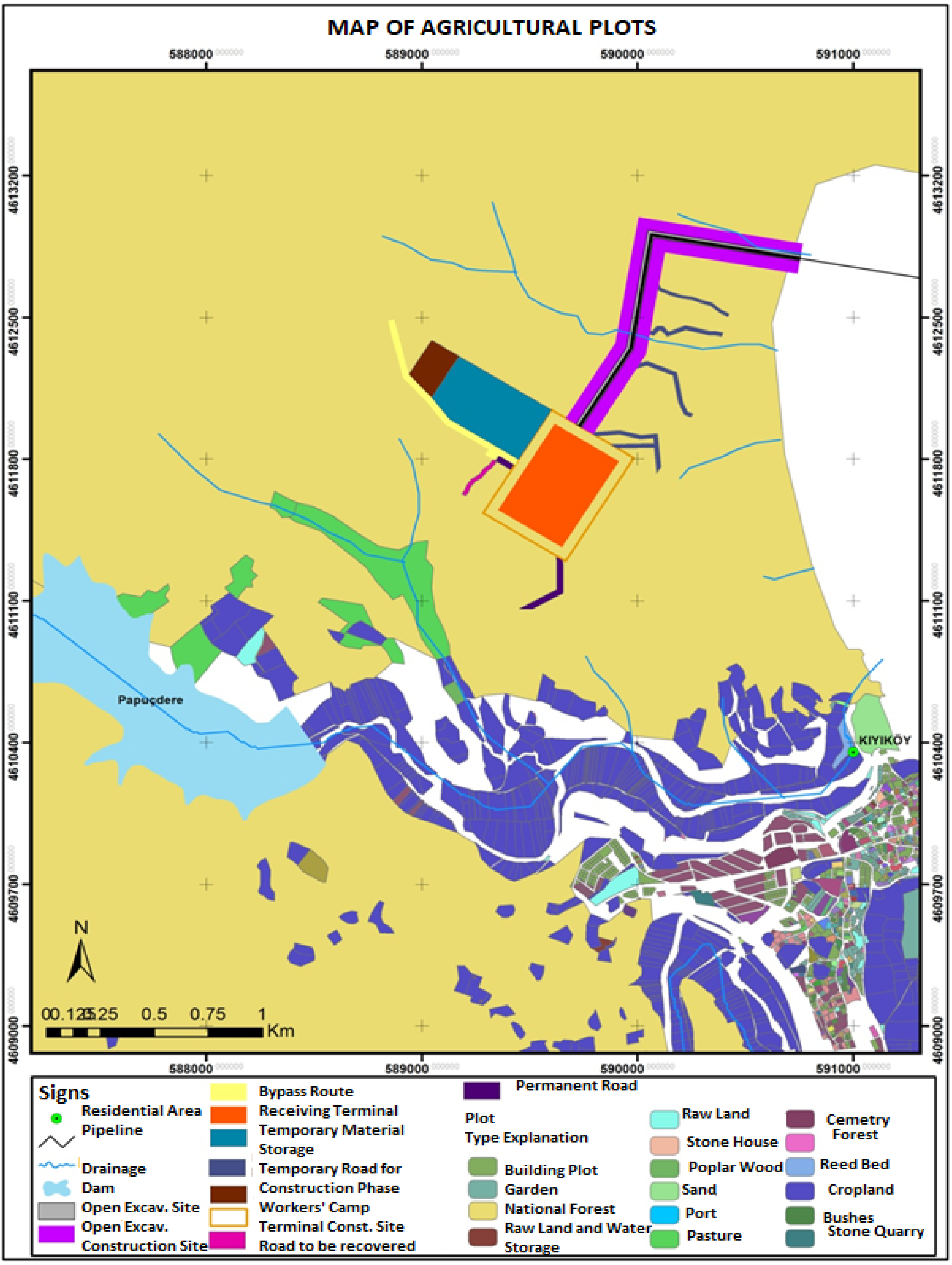


Figure 8.5: Onshore Section of the Project and its surroundings Map of Agricultural Plots (Ministry of Food, Agriculture and Livestock General Directorate of Agricultural Reform 2012)

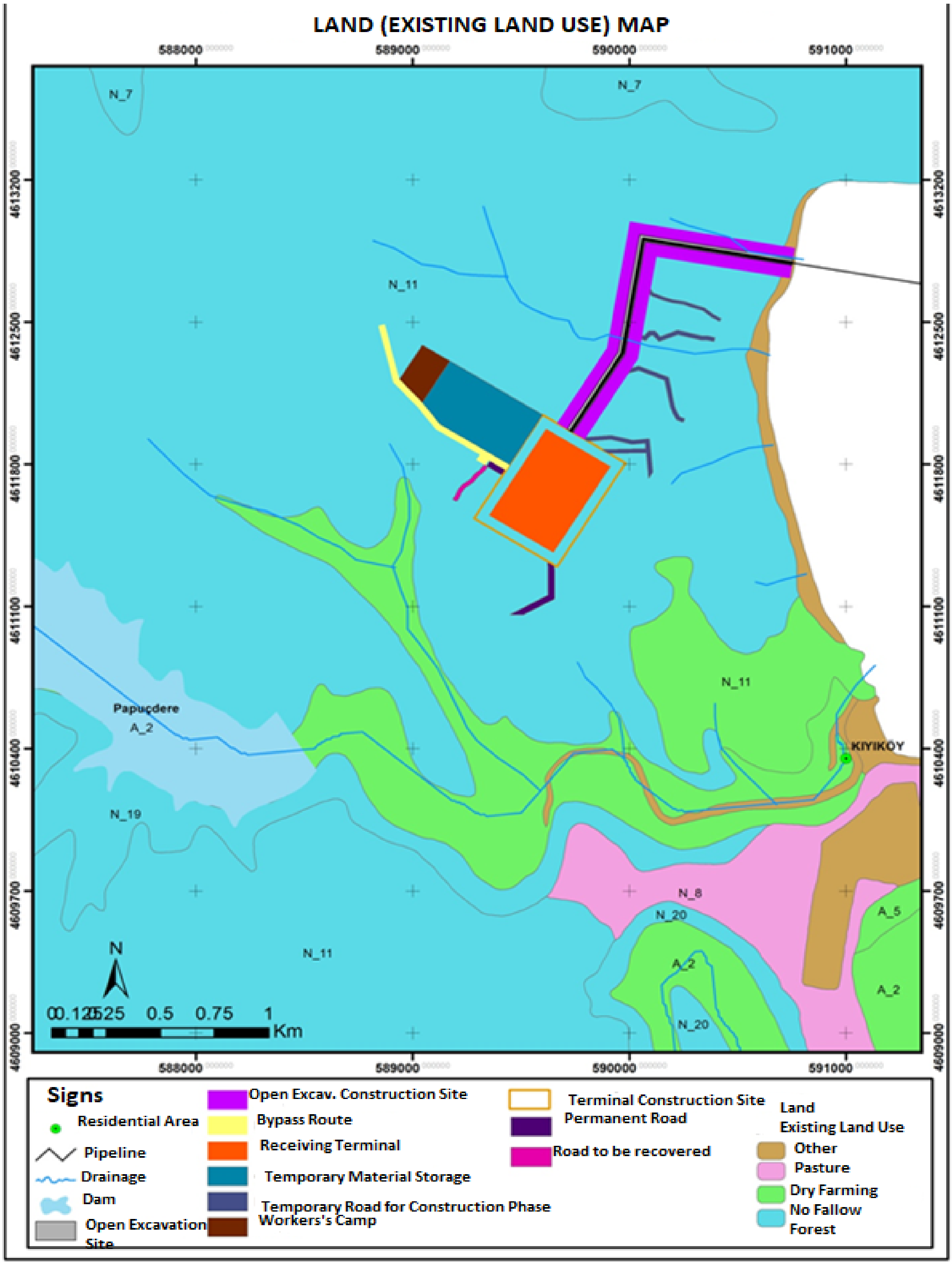


Figure 8.6: Existing Land Use (Ministry of Food, Agriculture and Livestock General Directorate of Agricultural Reform, 1:100.000, 1982)

8.2.1 The Size of the Irrigated and Dry Farming Lands

As seen in the Figures 8.4 and 8.5, the closest agricultural field is located 320m away to the south of the Onshore Section of the Project. Agriculture in Kiyikoy is made on the alluvial plains of the Pabucdere River. According to the data from the Ministry of Food, Agriculture and Livestock, most of the agricultural land in Kiyikoy is dry farming area without fallow. The construction of the Pabucdere Dam, which was established for the purpose of supplying drinking water for Istanbul, was completed in 2000.

8.2.2 Product Patterns and Their Annual Output

The most important economic activities in Kiyikoy is fishery, forestry, livestock, and tourism. The agricultural fields in Kiyikoy are dry farming fields and grains such as wheat, barley, and oat as well as oil plants such as sunflower and canola are cultivated.

The incline of the agricultural fields to the south of the Onshore Section of the Project and the pasture area to the southwest is around 1% according to the Stand Map with scale of 1:25.000 (Figure 8.7) and these areas are first class dry farming land according to the land use capability classification. Following an evaluation of the crops and their characteristics, it is thought that these crops will not be affected after the construction activities of the Project. However, as the field will be disturbed during the construction phase, it is thought that it might be affected from erosion and particularly the dust.

According to the agricultural use capability, the lands are divided into 8 categories. These range from the first class land where the best, easiest, and most economical agriculture is realized, to the eight class non-agricultural land that cannot even be used as meadow or woods but constitutes a habitat for natural life or that can be used as a recreation area or a national park by people. The land categories of the land within the Onshore Section of the Project and its surroundings are shown as per the digital land database in the Figure 8.8 (Ministry of Food, Agriculture and Livestock - General Land Map of Turkey, 1982), and land use capability categories and land structure are shown in the Figure 8.9 (Land Use Capability Classification Map).

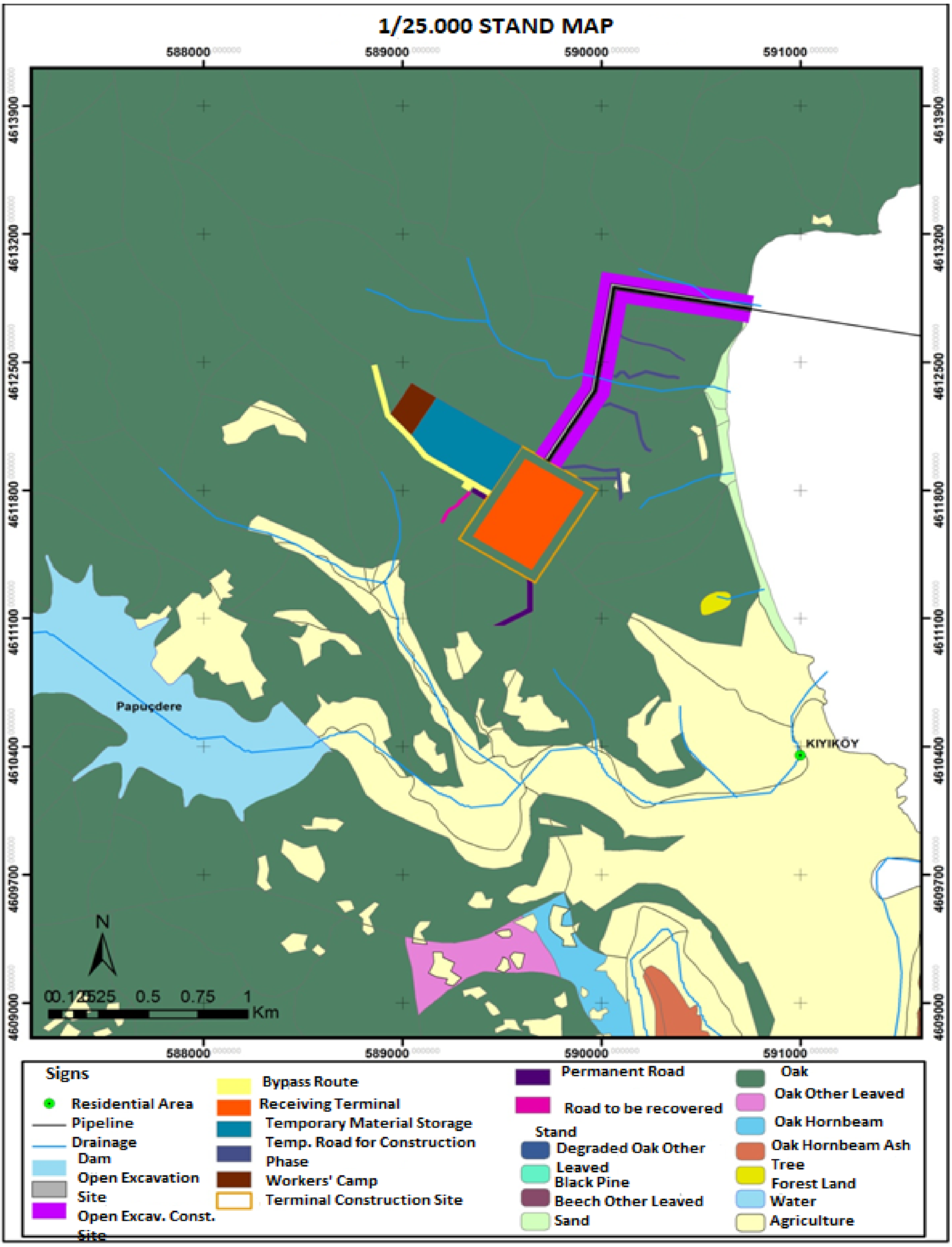


Figure 8.7: Stand Map with Scale of 1:25.000

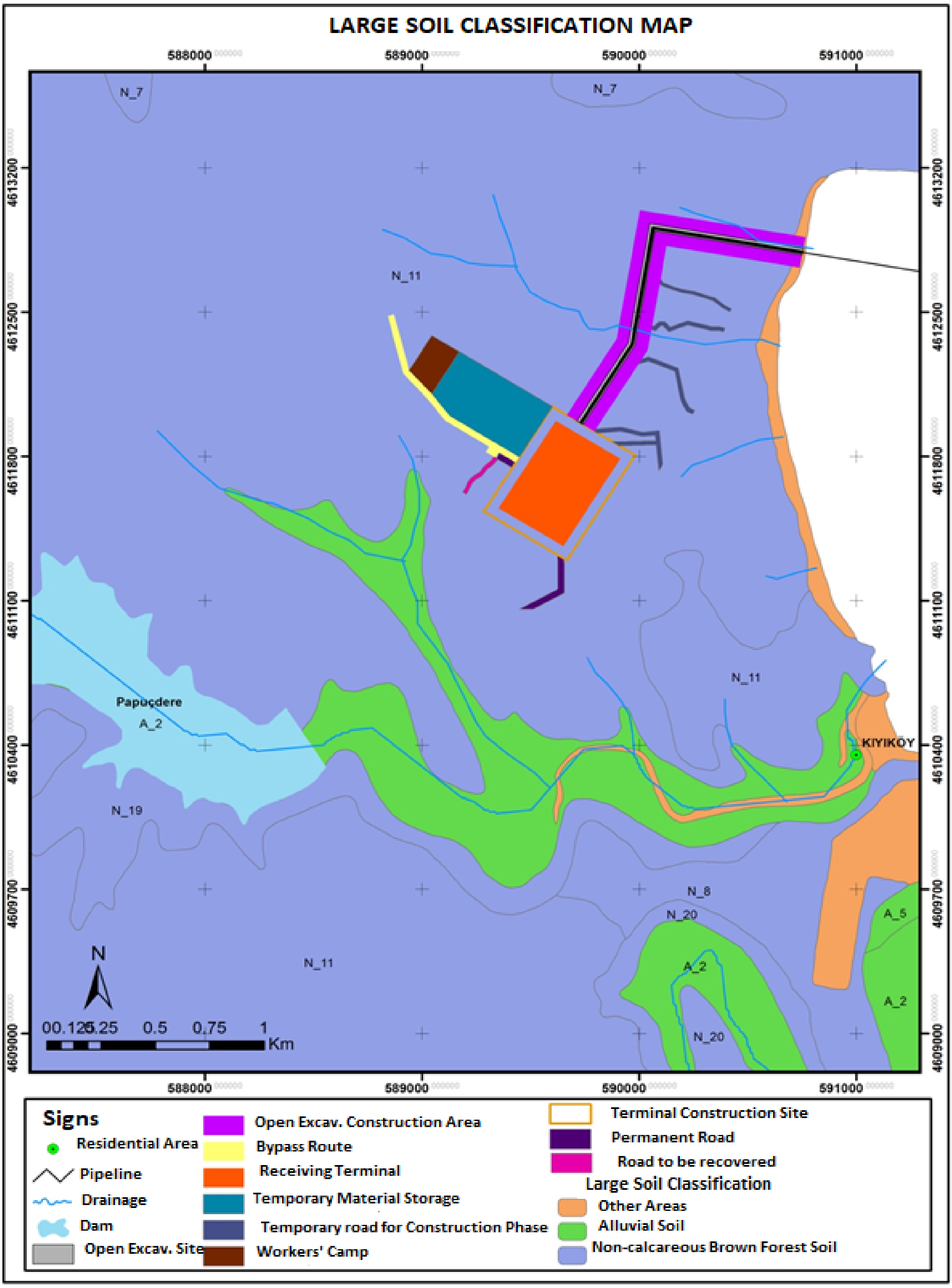


Figure 8.8: Large Soil Classification Map (Source: Ministry of Food, Agriculture and Livestock - General Soil Map of Turkey, 1982)

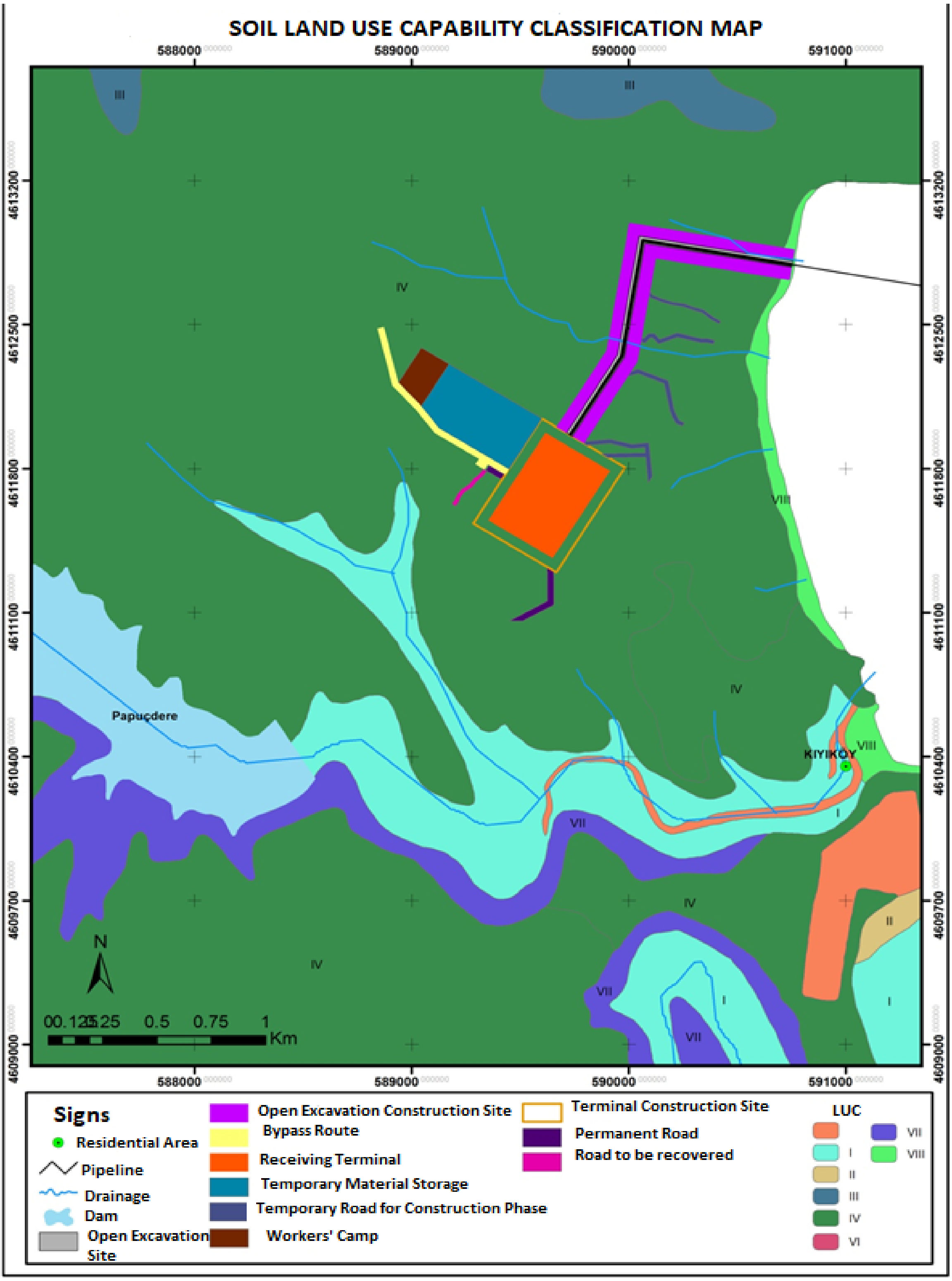


Figure 8.9: Land Use Capability Classification Map (Source: Ministry of Food, Agriculture and Livestock - General Directorate of Agricultural Reform, 1982)

According to the Land Use Capability Classification, all of the soil in the Onshore Section of the Project is located on class IV lands (Figure 8.9) and their characteristics are defined as follows according to "Technical Instructions and Related Legislation on Soil and Land Classification Standards"[1]:

Class IV Land: Fourth class land is the land that is especially suitable for permanent meadows. Agricultural crops can also be grown occasionally. Too much incline, erosion, poor soil and climate are the factors that limit the agriculture on this class of land. Soils with poor drainage and little incline are also included in this class. These are not exposed to erosion, yet because they dry up suddenly in the spring and have little fertility, they are not suitable for the cultivation of many crops. Implementation of cropping systems with legumes on fourth class lands in semi-dry regions is not usually possible due to climate conditions.

All the soil of the Onshore Section of the Project is determined to be belonging to the Non-Calcareous Brown Forest Soil large soil class. The properties of this soil is defined as follows according to the "Technical Instructions and Related Legislation on Soil and Land Classification Standards":

Non-Calcareous Brown Forest Soil: This kind of soil has a dark layer on top and another layer beneath which is a bit different. The soil is non-calcareous and reaction is acidic, neutral or alkaline. Its natural fertility is not high.

The area to be used for the Project, shown on Table 8.4 and defined as Class IV according to the land capability classification is situated within broad-leaved forest areas according to the 2012 Corine Land Cover Map.

Table 8.4: Lands to be Disposed of and Their Sizes

Area Info	Area m²
Road to be Improved	4.542,68
Receiving Terminal	174.861,91
Receiving Terminal Construction Site	94.925,04
Temporary Material Storage Area	142.669,14
Workers' Camp	33.111,40
Permanent Road	10.406,22
Permenent Road	2.607,45
Bypass Route	30.397,83
Open Excavation Construction Site	203.160,45
Open Excavation Site	54.909,46
Temporary Road for Construction Phase	5.419,37
Temporary Road for Construction Phase	7.398,78

[1] Technical Instructions and Related Legislation on Soil and Land Classification Standards, Ministry of Agriculture and Village Affairs, General Directorate of Agricultural Production and Development, 2008.

Temporary Road for Construction Phase	12.865,73
Temporary Road for Construction Phase	8.235,22

8.3 Natural Plant Species which will be Affected and the Size of the Area of Activity

The area to be affected as a result of the Project activities is an area of 785.505,00 m^2 and as it is seen on the Stand Map with 1:25.000 scale, the whole Project area is an oak forest. As noted in the Kirklareli Master Plan (2013-2023), no beech is found in the valleys formed by the rivers that disembogue into sea in Kiyikoy; however, this region is covered with Coruh oak, Croatian oak, and Turkey oak. The area between the Bulgarian border and Sukru Pasa-Armagan (Hediye) route on the east is dominantly covered with forests. As we head towards northwest, groups of hornbeam mix in the beech forests. The dominant species in the forests on the west of this field is English oak. In addition, red twig dogwood, whitebeam, maple tree, nut, medlar, and wild plum also grow in the area.

The areas marked as agricultural field in the year 2000 on the Stand Map with scale of 1:25.000 (Figure 8.7) of the Ministry of Forestry and Water Affairs General Directorate of Forestry are defined as broad-leaved forest areas on the CORINE (2012) map (Figure 8.4). As per the Forestry Technical Report (2017), the species of trees found in the Onshore Section of the Project are oak and ash trees. The stand distribution of the trees in the mentioned area according to their species and their amounts are explained in detail in the Section 8.1.4.

Besides, as a result of the ecological surveys in the Onshore Section of the Project, the properties of the flora were detected and an evaluation was made about the potential impact on the flora species. Findings of the ecological surveys are presented in Chapter 7 (Evaluation of Biological Environment) in detail.

8.4 The Status of the Cultural and Natural Assets within the Project Area

Thrace is a region rich in historical structures and stone houses. Edirne, Enez, Marmara Ereglisi, Kirklareli central district, and the district of Vize come to the fore as regards archaeological tourism in the region.

The locations of cultural assets and protected sites, noted in the document dated 13.03.2017 and No. 39.08.282/484 (**Appendix 5.A**) of the Edirne Directorate of Regional Board of Protection of Cultural Assets, are marked on Figure 8.10. Detailed information about the cultural assets and protected sites in question is presented in Chapter 6.10 (Cultural and Archaeological Heritage). According to map section no. E20d4 of the Environmental Plan with 1:25.000 scale obtained through the official letter dated 30.01.2017 of the Kirklareli Directorate of Environment and Urbanization, Directorate for Protection of Natural Assets Department, there are areas in the immediate surroundings of the Project that are defined as historical protected site, archaeological protected site, and mixed protected site (Figure 8.11). Kirklareli Directorate of Culture and Tourism and Edirne Regional Board for Protection of Cultural Assets organized a field trip to these sites. The opinion letter no. 39.08.282/957 dated 25.05.2017 (**Appendix 5.A**) that presents the findings of the field trip states: *"In the examination of the field, a necropolis area and church ruins were detected outside of the pipeline route. Thus, there may not be any works conducted in the area whose coordinates are given in the appendix of this letter. Apart from the latter, no immovable cultural assets that need protection were found within the Project field. However, on the condition that all activity shall be stopped and the closest local governmental authority or museum directorate shall be alerted (Article 4 of the Code no. 2863) in the case of an encounter with a ruin or findings which might meet the definitions* *made in the Code no. 2863 during the activities, there is no objection to the implementation of the Project "TurkStream Gas Pipeline-Onshore Section."*

As it is noted in the opinion letter dated 03.07.2017 of the Ministry of Environment and Urbanization General Directorate of Protection of Natural Assets **(Appendix 5.A)**, the Project Area is not situated in the Special Environmental Protection Region. Moreover, within the aforementioned area there are no natural protected sites or natural assets.

8.5 Impact of the Activities and Operations within the Project and Precautions to be taken (Land Preparation, Construction, Operation, and Post-Operation)

This section presents the evaluation of the impact of construction activities within the Project Area on the lands nearby. Surface and subsurface water hydrology has particularly utmost importance for an integrated evaluation of the impact. In this context, the map of micro basin borders and altitude status in the Onshore Section of the Project and its surroundings was prepared by using the topographic map with 1:25.000 of the General Command of Cartography and it is shown in Figure 8.12. When the topography of the area is taken into consideration, it is clear that the Onshore Section of the Project shares the same micro basin as the agricultural lands and pastures to the south and southeast and that it is heavily surrounded by rivers. Thus, an impact on the agricultural areas and pastures might be expected due to the activities to be implemented in the Onshore Section of the Project, taking into account the current conditions and the hydrological network.

In the examination made for the Onshore Section of the Project and its surroundings, it is observed that the area is located within the borders of three micro basins (Figure 8.12). The agricultural areas and pastures in the micro basin to the south of the area in question are located less than 500m away from the Onshore Section. The sediments to be cleared from the construction activities, land stripping, and grading operations have potential to cause pollution for the agricultural areas and pastures. In addition, unless necessary precautions are taken in case of pollution and sedimentation, there is a risk of ecological deterioration due to the connection of natural water ways in the onshore region with the sea.

Pabucdere, making its way from the south of the Onshore Section of the Project is used as a reservoir for drinking water for Istanbul as noted in the Kirklareli Master Plan (2013-2023). As it might be seen in Figure 8.12 below, the micro basin feeding this river is within the Onshore Section of the Project. Therefore, the probability of uncontrolled sedimentation and pollution in the Onshore Section of the Project constitutes a risk for Pabucdere, which is an important reservoir for drinking water, and the agricultural areas and pastures nearby.

So as to prevent these risks, as required by the Soil Protection and Land Use Act no. 5403, a "Soil Protection Project" shall be prepared and implemented in which natural pattern of the waterways shall be preserved, surface flows shall be redirected towards these routes, and stepping and terracing works shall be planned within construction area. The aim is to prevent sedimentation and pollution backed up by water and wind erosion in both the agricultural areas and pastures in the surroundings of the Project and the region where the Onshore Section of the Project is located.

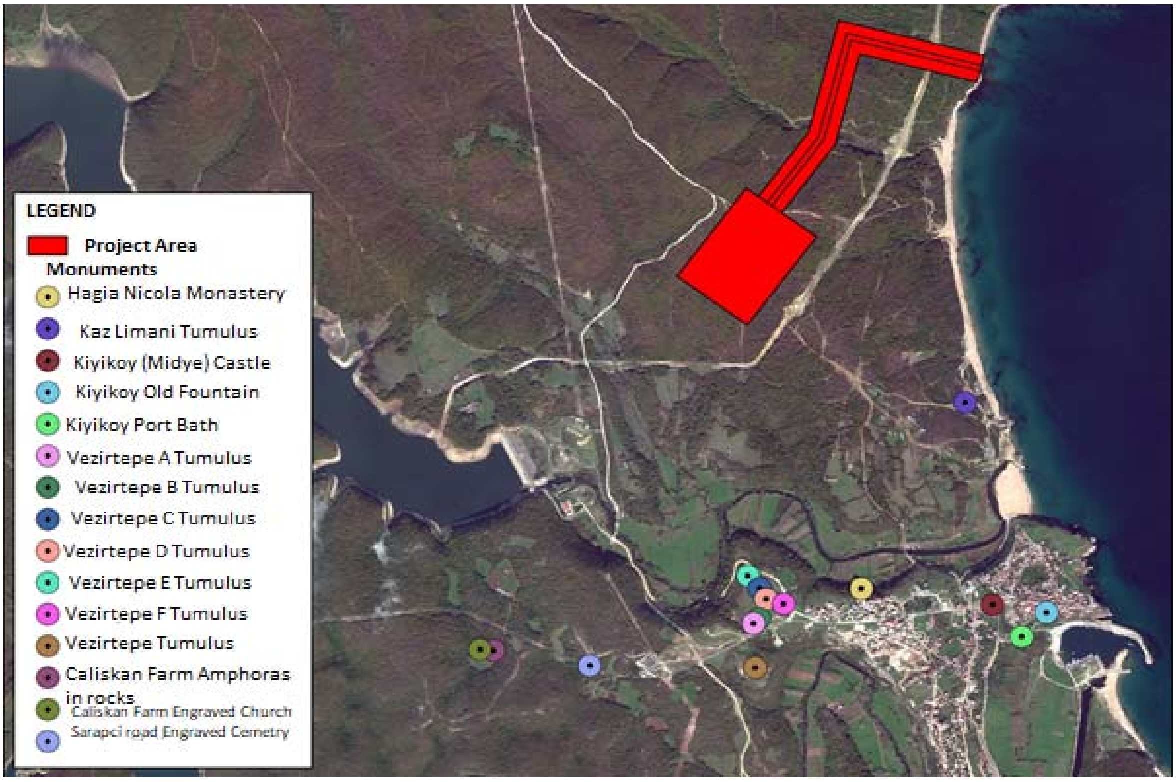


Figure 8.10: Onshore Section and Cultural Assets and Protected Sites nearby

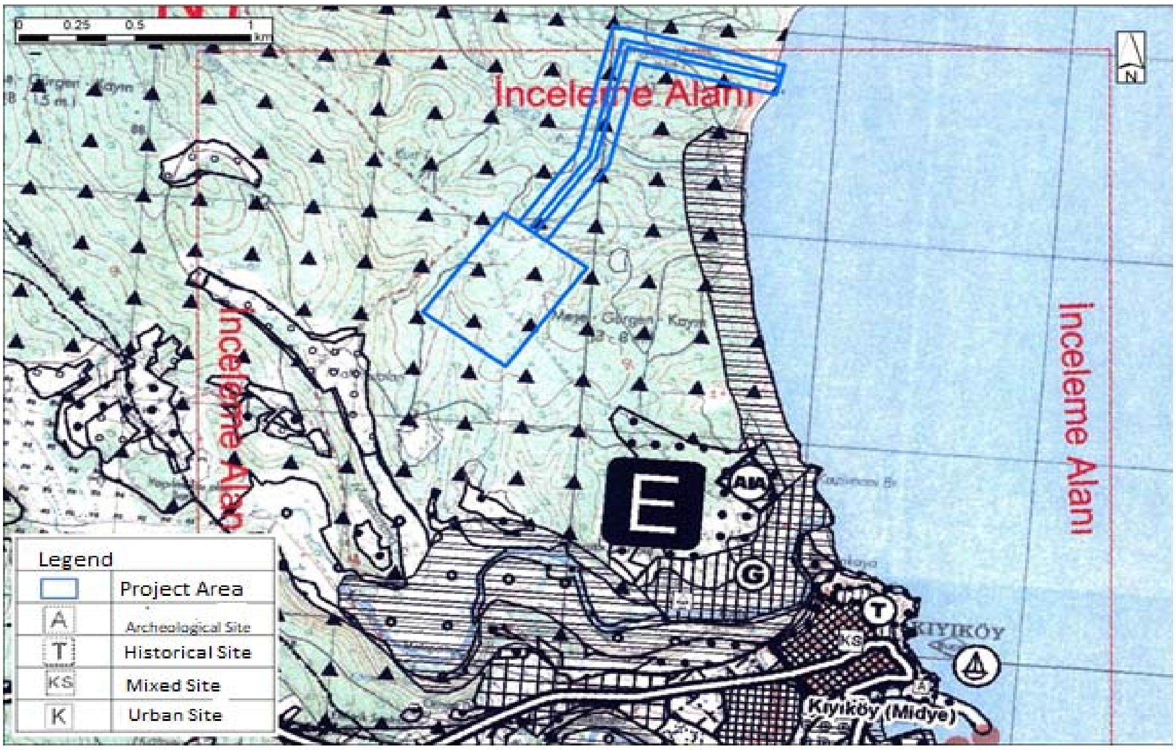


Figure 8.11: Historical, Archaeological, and Mixed Protected Sites near the Project Area, according to the Kirklareli Provincial Environmental Plan

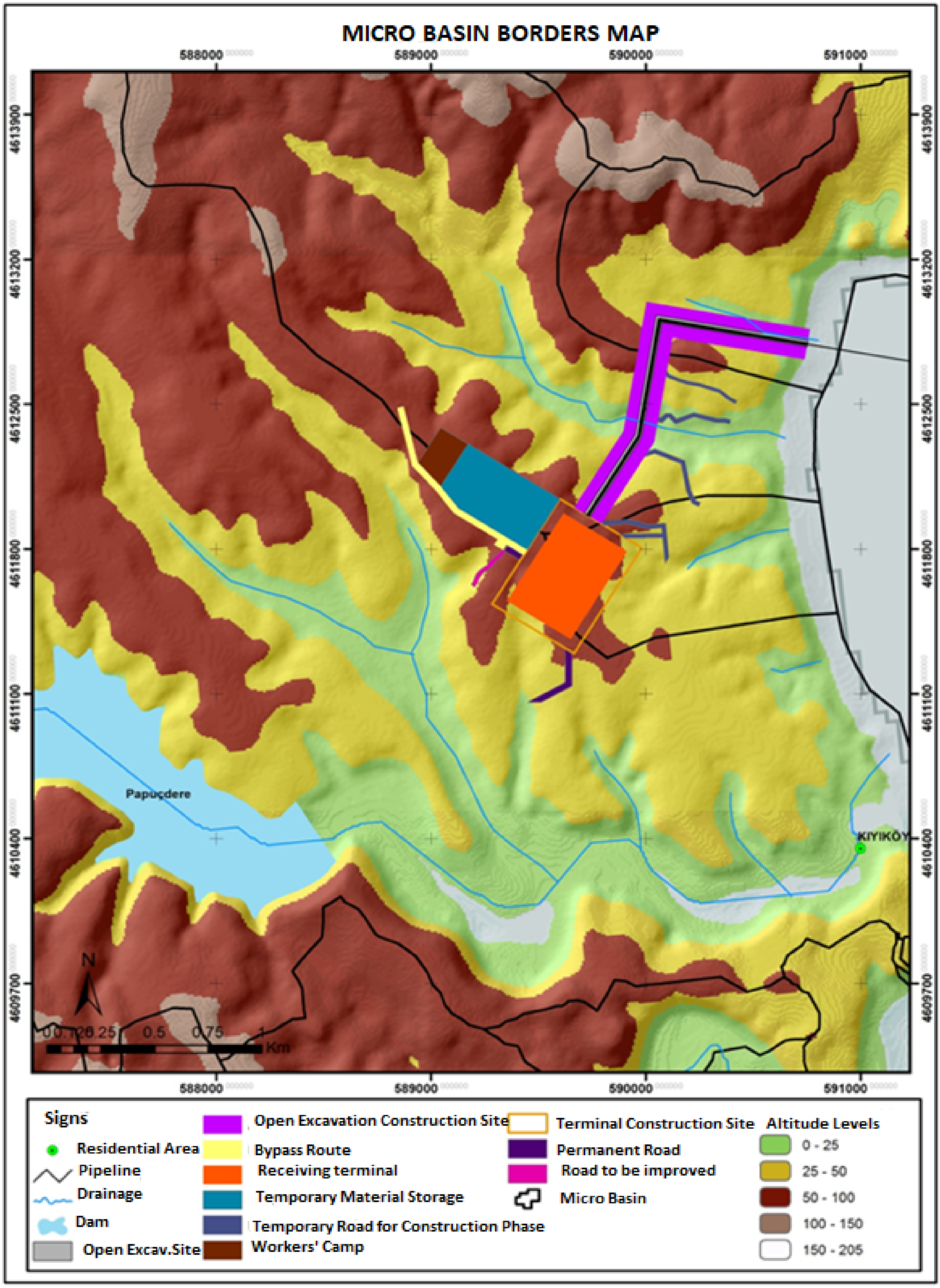


Figure 8.12: Micro Basin Borders and Altitude Map (Source: General Command of Cartography Topographic Map with 1:25000 scale)

In the construction phase, surface soil (vegetal fertile soil layer) and subsurface soil (real soil) will be carefully stripped and necessary precaution will be taken so that they can be preserved separately without any damage. Ditches (intercepting ditch and heel ditch) around the excavation slope and filling sections should be built within the excavation site. Erosion and sedimentation should be prevented by planting of the hillside of the slopes of the excavation and fillings. Moreover, an adequate number of water structures (thresholds, dams) to be built wherever it is needed in river networks and micro basins will prevent possible erosion and sediments due to construction from reaching other basins and water reservoirs. Rehabilitation and plantation works to be done once the construction activities are completed will prevent possible erosion and sedimentation in the long term. Re-plantation activities will also contribute significantly to ensure the natural balance and soil rehabilitation around the Onshore Section.

Additionally, protection in the slopes and hillsides will be ensured by the use of erosion control systems such as hydroseeding (spraying seeds with water), steel grid web systems and erosion geotextiles (polyester nets for slope control and erosion prevention) to decrease/eliminate the risks listed below:

- To prevent surface flow;
- To reduce the problems deriving from dust from bare soil surface or mud flow during the construction activities;
- To reduce the sediment drift to the areas in the direction of flow;
- To support drainage;
- To improve the image of the construction site; and
- To provide ground stability and hillside stability of the temporary construction sites to prepare for pre-operation stage of the Onshore Section of the Project.

The Project Owner shall implement the Soil Protection Project. Additional supportive mechanical precautions for soil protection (terracing, divisional channels, ditches, etc.) shall be designed as a detailed project for each slope when it is deemed as necessary and they shall be put into action immediately. Formation of sedimentation in the reservoirs will be prevented in this way.

Soil Protection and Land Use Code no. 5403 and Pasture Code no. 4342 and the legislation related to these codes shall be complied with in all phases of the Project.

When any kind of ruins or findings that might be considered within the scope of the Protection of Cultural and Natural Assets Code no. 2863 is encountered during the works to be done during the construction phase of the Project, works at the related area shall be stopped and the closest local governmental authority or museum directorate shall be notified.

With regard to the opinion letter of the Ministry of Forestry and Water Affairs - Directorate of State Hydraulic Works (DSI) - Survey, Planning and Allotment Department dated 29.05.2017 no. 359911, in all kinds of river beds that intersect with the TurkStream Gas Pipeline laying or installation, pipeline will pass minimum 3 meters deep under the thalweg elevation. This depth will be designed in a way so that it will exist 10m before and after the stream slope and necessary warning plates will be installed at these points. The matters about the Project noted in the Memorandum of the Office of the Prime Minister entitled “River Beds and Floods” no. 2006/27 shall be followed and the works about river pass will be conducted under the control of Tekirdag Directorate of State Hydraulic Works (DSI) Directorate of 113th Department.

The impact of the Project on the land use and cultural and natural assets, and precautions for their mitigation/design controls are given below on Table 8.5:

Table 8.3: Pre-Construction and Construction Stages of the Project: Activities, Impact, and Precautions for Impact Mitigation

Phase	Activity	Impact	Impact Mitigation Precaution / Design Control
Pre-construction, Construction	Temporary and permanent land purchase and construction activities	Loss of forest area and loss of function in the land (forestry, agriculture, etc.) Restrictions in the land use Permanent loss in flora Wear out in the forest area Risk of forest fire	The permissions for all kinds of use and facility buildings for the Onshore Section of the Project from the General Directorate of Forestry in the form of written permit/approval after taking the opinion and confirmation of related institutions as required by the related codes and regulations Preparation and implementation of Soil Protection Project as required by Soil Protection and Land Use Code no. 5403 Technical specifications for measures against forest fires, tampon distance, and impact on forest land (Soil, waste, and water management precautions for preserving the viability of the forest)
	Use of existing roads and new road construction if needed	Deterioration of existing roads due to traffic load increase Land use restrictions	Receiving written approval/permission from General Directorate of Forestry prior to change and use of road network Taking meaures against all kinds of deterioration and wearing out as a result of the use of Forest Roads that are in Road Network Plan (except those that are not permitted by the administration), otherwise undertaking by the Project Owner of maintenance and repair costs in case of any deterioration and wearing out due to Project activities Planning and building all the roads that are permitted by the Forestry Administration to be open to the public, except for the occasions deemed suitable by the General Directorate of Forestry Designation of the traffic in a way that it will avoid urban areas as much as possible
	All construction activities (excavation and field preparation) and equipment movements	Damage to or wearing out of potential cultural and natural assets Removal of cultural and natural assets from the field without permission or vandalism	Developing a Cultural Heritage Objects Management Plan including a Chance Find Procedure Awareness training among field workers on cultural and natural assets Stopping the activities when any kind of ruin or finding is come across and informing the closest local government authority or museum directorate
Operation and Pre-operation	Operation of the Receiving Terminal	Wearing out the pasture, agricultural and forest areas near the Project area Fire risk for the forest lands near the Project area	Examination of pastures and agricultural lands near the Project area and complying with the provisions of Pasture Code no.4342 Technical specifications for precautions against forest fires, tampon distance, and impact on

Phase	Activity	Impact	Impact Mitigation Precaution / Design Control
			forest land (Soil, waste, and water management precautions for preserving the viability of the forest) Making confirmation and commitments to preserve the integrity of the forest areas and controlling the access and activities within the permitted routes

8.6 Other Matters

No other matters are found to discuss in this chapter.

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9 Assessment of Socio-Economic Environment

This section provides an assessment of the current socio-economic situation based on the findings of the socio-economic field studies that are carried out by expert sociologists through in-person or phone meetings with local, regional and official stakeholders with the participation of the Project Owner's socio-economics experts in October 2015 and in January and April 2017 to identify the Project's socio-economic and demographic profile and socio-economic impacts and on the literature research carried out under the Project.

This section also includes socio-economically important information obtained as a result of the socio-economic research on fishery carried out in October 2015 for Shore Crossing and Landfall Sections of the Project.

Moreover, an analysis of potential socio-economic impacts of the Project was done and impact mitigation measures to be taken so as to mitigate, prevent or avoid these potential impacts are also given in this section.

TurkStream Gas Pipeline starting from the Russian coast near the town of Anapa passes through the Russian and Turkish EEZs (Exclusive Economic Zone), then runs through the Turkish territorial waters and comes ashore near the town of Kıyıköy in Kırklareli on the Black Sea coast of Turkey in the European territory.

Kırklareli Province is surrounded by Bulgaria to the north with a borderline of 159 km, by the Black Sea to the east with a coastline of 58 km, by Edirne Province to the west, by Istanbul Province to the southeast, and by Tekirdağ to the south. The area of Kırklareli is 655,000 hectares. And, the districts of Kırklareli are as follows: Babaeski, Demirköy, Centre, Kofçaz, Lüleburgaz, Pehlivanköy, Pınarhisar and Vize (Figure 9.1).

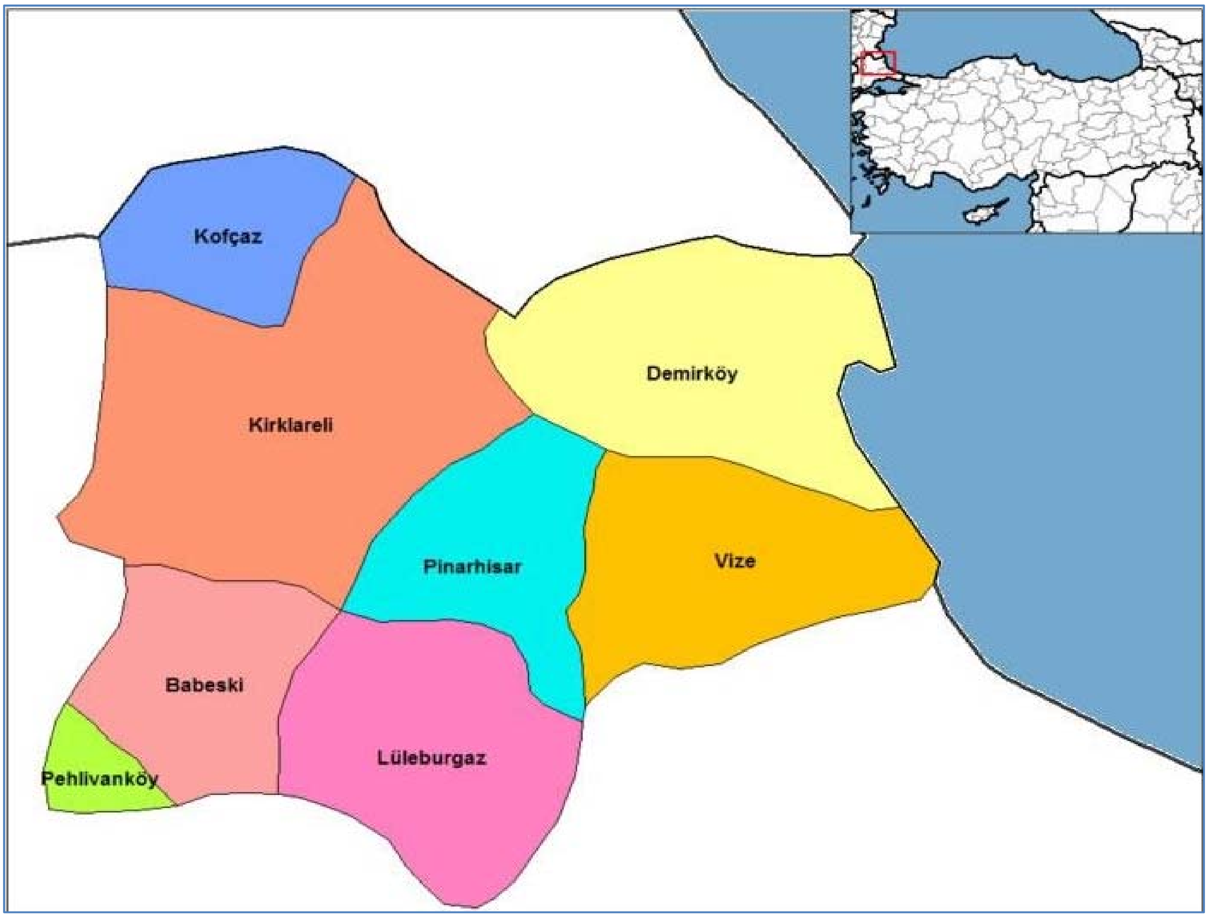


Figure 9.1: Kırklareli Province and its Districts (Ref. 9.1)

9.1 Economic Situation

Turkey's economy went through a substantially continuous economic development during the ten years from 2006 to 2016 excluding the years of global economic crisis in 2008 and 2009. In the meanwhile, Gross Domestic Product (GDP) per capita increased to TRY 1,689 in 2015 which was TRY 1,396 in 2006 based on fixed prices (taking 1998 as the base year) (Table 9.1). This figure equals to USD 9,257 per capita in 2015 based on current prices (instead of fixed prices which take 1998 as the base year) (Ref. 9.2).

Table 9.1: GDP[1] per capita in Turkey between 1998 and 2015 (Ref. 9.2)

		Based on Current Prices			Based on Fixed Prices of 1998	
Year	Mid-Year Population	TRY	Growth Rate %	$	TRY	Growth Rate %
1998	62,464,000	1,124	-	4,338	1,124	-
1999	63,364,000	1,651	46.9	3,907	1,071	-4.7
2000	64,269,000	2,593	57.1	4,129	1,127	5.3
2001	65,166,000	3,686	42.2	3,019	1,048	-7.0

[1] "Gross Domestic Product (GDP) is a value obtained by subtracting the sum of inputs used in the production of all goods and services that are created by resident producer units within a given period of time through domestic activities from the sum of the production values of these goods and services."

		Based on Current Prices			Based on Fixed Prices of 1998	
Year	Mid-Year Population	TRY	Growth Rate %	$	TRY	Growth Rate %
2002	66,003,000	5,310	44.0	3,492	1,099	4.8
2003	66,795,000	6,809	28.2	4,565	1,143	4.0
2004	67,599,000	8,270	21.5	5,775	1,235	8.1
2005	68,435,000	9,482	14.7	7,036	1,322	7.1
2006	69,295,000	10,944	15.4	7,597	1,396	5.6
2007	70,158,000	12,018	9.8	9,247	1,443	3.4
2008	71,052,000	13,378	11.3	10,444	1,434	-0.6
2009	72,039,000	13,223	-1.2	8,561	1,347	-6.1
2010	73,142,000	15,023	13.6	10,003	1,448	7.5
2011	74,224,000	17,484	16.4	10,428	1,552	7.2
2012	75,176,000	18,846	7.8	10,459	1,565	0.8
2013	76,055,000	20,607	9.3	10,822	1,611	3.0
2014	76,903,000	22,732	10.3	10,395	1,642	1.9
2015	77,738,000	25,118	10.5	9,257	1,689	2.9

According to the 2015 data, the three largest activity branches of Turkish economy in terms of their GDP share are specified as service (57.4%), industry (23.4%) and agriculture (7.5%) based on current prices and service (59.7%), industry (32.7%) and agriculture (9.0%) based on fixed prices of 1998 (Ref. 9.2). Additionally, looking at the shares of the sectors-in-Turkey in GDP according to the 2014 and 2015 data, it is seen that the three largest sectors are service, industry and manufacturing industry respectively based on current prices (Ref. 9.3).

The Socio-Economic Development Ranking Survey of Provinces and Regions (SEGE) 2011 Report of the Ministry of Development indicates that Kırklareli Province ranks 15th with a development index of 0.5923 among 81 provinces of Turkey in terms of socio-economic development. In general, the provinces of Edirne, Yalova, Kırklareli and Sakarya that are in close distance to Istanbul have indicator values higher than the country average (Ref. 9.4).

And, Vize District of Kırklareli which is the Project location, ranks 219th with a development index of 0.33640 in the socio-economic development ranking among 872 districts of Turkey (Ref. 9.5).

9.1.1 Offshore Section and Shore Crossing Section

9.1.1.1 Marine Transportation and Ports

The Bosphorus and the Dardanelles in Turkey are important waterways which ensure passage for vessels between the Mediterranean and the Black Sea.

The Bosphorus is a strait that has a busy traffic with approximately 3,000 to 4,100 vessels passing through (all of the northbound and southbound journeys) per month. The number of the vessels passing through the Bosphorus varies based on the season and has a tendency to decrease in winter (Figure 9.2).

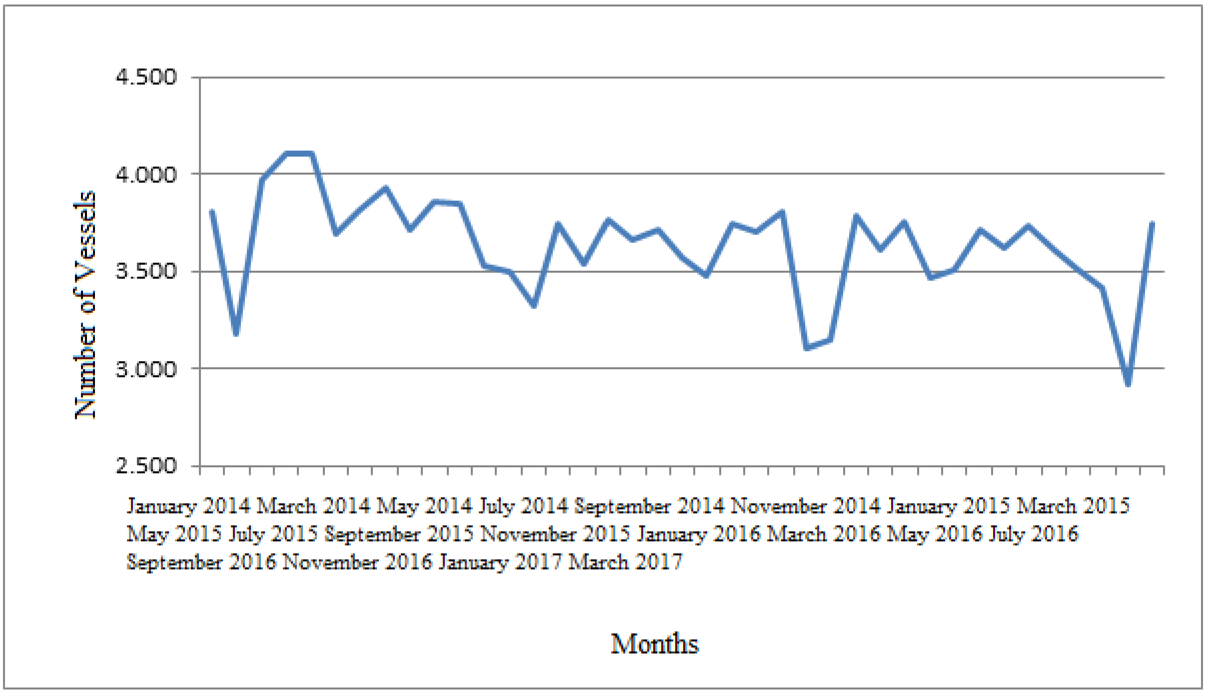
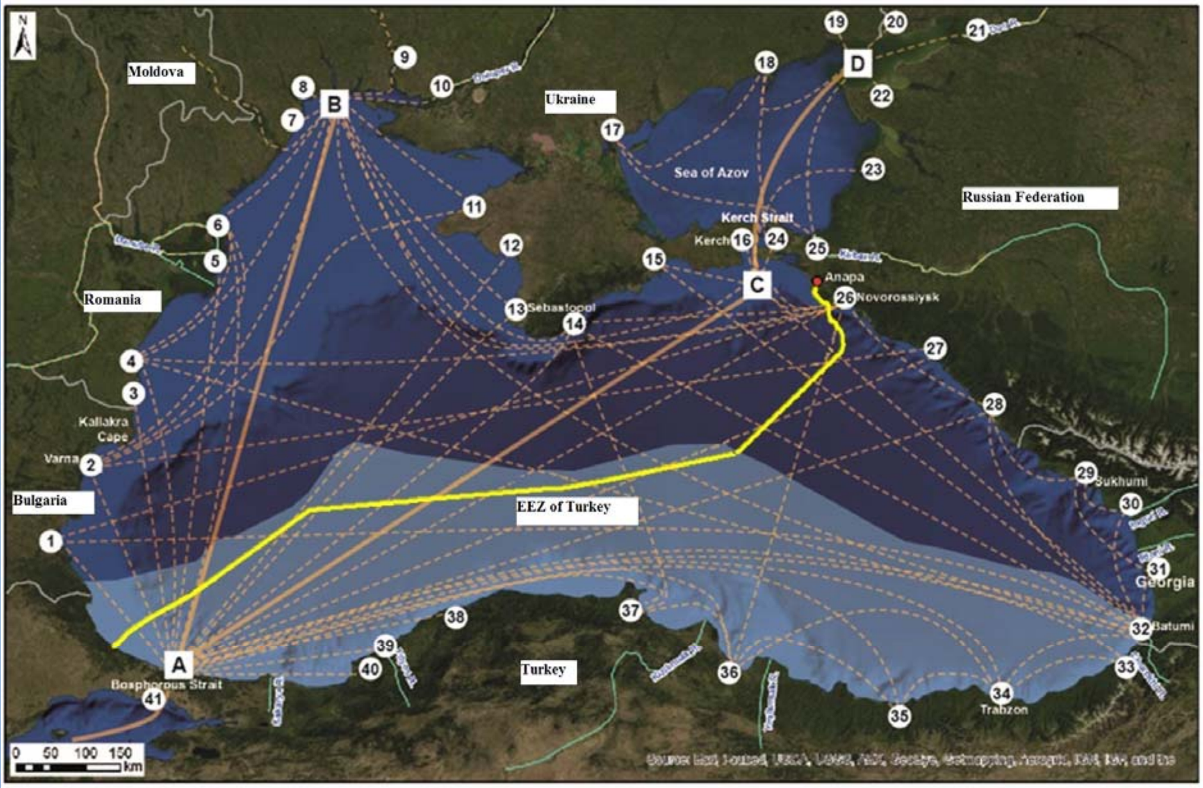


Figure 9.2: Vessel Traffic in the Bosphorus (January 2014 - March 2017) (Ref. 9.6)

Turkey has major port cities at the Black Sea coast including Istanbul, Zonguldak, Samsun, Trabzon and Rize (Table 9.2). As can be seen in Figure 9.3, the neighboring countries with a coast on the Black Sea also have a lot of important ports. The marine transportation in the Black Sea includes container, general cargo, liquid and dry bulk cargo, roll-on/roll-off (Ro-Ro) and railway-ferry goods transport (Ref. 9.7). Giresun, Trabzon and Artvin have the largest ports of Turkey at the Black Sea coast in terms of total marine transportation capacity. The main marine routes in the EEZ of Turkey interconnect Istanbul, Samsun and Trabzon ports, and it is known that a large number of routes between the neighboring countries in the Black Sea pass through the EEZ of Turkey.



Key

pipeline

A: Bosphorus marine traffic junction (Istanbul)
B: Northwest ports (Odessa)
C: Kerch strait marine traffic junction
D: Northeast ports

1: Burgaz
2: Varna
3: Mangala
4: Köstence
5: Sulina
6: Ust'-dunayski
7: Illichivsk
8: Odessa
9: Nikolayev
10: Herson
11: Chemomorskoye
12: Evpatoria
13: Sivastopol
14: Yalta
15: Feodosia
16: Kerç
17: Genichesk
18: Berdyansk
19: Mariupol
20: Taganrog
21: Rostov-na-Donu
22: Yeysk
23: Primorsko-Akhtarsk
24: Port Kavkaz
25: Temryuk
26: Novorossiysk
27: Tuapse
28: Soçi
29: Sohum
30: Ochamchire
31: Poti
32: Batum
33: Hopa
34: Trabzon
35: Giresun
36: Samsun
37: Sinop
38: Amasra (Bartın)
39: Zonguldak
40: Ereğli
41: İstanbul

Figure 9.3: Marine Transportation and Navigation Routes in the Black Sea (Ref. 9.8)

Table 9.2: Major Ports of Turkey at the Black Sea Coast (Ref. 9.9)

Province	Port Name	Operator	Facility Details/Services	Total Vessel Capacity (vessel/year)
Kırklareli	İğneada Port	Port Authority of İğneada affiliated to the Ministry of Transport, Maritime Affairs and Communications	Fishing ports Cargo transportation (50,000 tons/year)	175
Kırklareli	Kıyıköy Port	Port Authority of Kıyıköy	Fishing port	67

Province	Port Name	Operator	Facility Details/Services	Total Vessel Capacity (vessel/year)
Istanbul	Şile Port	Port Authority of Şile affiliated to the Ministry of Transport, Maritime Affairs and Communications	Fishing port, boatyard, boat building yard	215
Kocaeli	Kefken Port	Port Authority of Kefken affiliated to the Ministry of Transport, Maritime Affairs and Communications	Fishing port, marina	25
Sakarya	Karasu Port	IC İÇTAŞ İnşaat	Ro-Ro; General cargo (1,500,000 tons/year); 50,000 TEU[2]/year Construction ongoing.	-
Zonguldak	Erdemir Port (Karadeniz Ereğli)	Ereğli Demir Çelik San.	Bulk cargo dock (two docks with a length of 405 m and 350 m), General cargo dock (four docks with a length of 295 m, 300 m, 170 m and 150 m), Ro-Ro, Train ferry slip, Loading-unloading services, Warehouse services (general warehouse with a capacity of 139,000 m^2)	-
Zonguldak	Turkish Hard Coal Enterprise Institution (TTK) Zonguldak Port	TTK Port and Railway Management Directorate	Train ferry slip (200 m in length, 4 dolphins, 1 vessel locking structure and 1 hydraulic ramp), Cargo dock (Length: 215 m Width: 50 m), Bulk cargo dock (Length: 360 m Width: 50-150 m), Ro-Ro (Length: 125 m Width: 75 m)	-
Zonguldak	Karadeniz Ereğli Bozhane Port	Karadeniz Ereğli Municipality	Fishing port, General cargo/Bulk cargo (700,000 tons/year)	215
Zonguldak	Erdem Cement Factory Port	Erdem Ereğli Çimento İnşaat ve Denizcilik Sanayi ve Ticaret A.Ş.	Bulk cargo vessel	-
Zonguldak	Eren Port	Eren Enerji Elektrik Üretim A.Ş.	General cargo dock, Bulk cargo dock (4 docks in total with a discharge capacity of 13.5 million tons/year), General warehouse (54,174 m^2)	-
Bartın	Bartın Port	Bartın Municipality	Open to international marine traffic for cargo and passenger transportation and general cargo vessel, bulk cargo vessel and container vessel.	1,000
Bartın	Akkonak Dock (Amasra)	Alkan Madencilik İnşaat Sanayi ve Ticaret Ltd. Şti.	General cargo vessel, bulk cargo vessel (dock with a length of 112 m)	-

[2]Twenty-foot Equivalent Unit

Province	Port Name	Operator	Facility Details/Services	Total Vessel Capacity (vessel/year)
Kastamonu	İnebolu Port	İnebolu Municipality	General cargo vessel, Bulk cargo vessel	720
Sinop	Çakiroğlu Sinop Port	Çakıroğlu Sinop Limanı İşletmesi A.Ş	Bulk, dry cargo and general cargo activities, Waste reception, Potable water and power supply	400
Sinop	Ayancık (Sinop) Dock (Ustaburnu Port)	Ayancık Municipality	Bulk cargo, General cargo	180
Samsun	Yeşilyurt Port	Yeşilyurt Demir Çelik End. ve Liman İşl. Ltd. Şti.	Loading and unloading services (all kinds of solid bulk cargo groups, general cargos), Dock services, Indoor and outdoor storage, Warehouse services, Solid and liquid waste reception, Potable water and power supply, Weigher and customs services	-
Samsun	Samsunport	Samsun International Port Management	Container services (Container discharge/loading, Packing/unpacking, Full inspection services, Container storage, Container terminal, Container securing, Cargo services (Project cargo, Genera cargo (solid bulk, liquid bulk, bagged solid), Ro-Ro/Passenger transportation, Railway transportation services (cargo, container, bulk cargo, railway-ferry line), Pilotage, Towage, Anchorage, Potable water and power supply, Refuelling, Waste reception (bilge water, sludge, waste oil, slop and domestic waste)	-
Samsun	Sürsan Port	Sürsan Su Ürünleri San. ve Tic. A.Ş.	Oil tanker Waste receiving facility	-
Samsun	Toros Tarım Samsun Port	Toros Tarım Sanayi ve Ticaret A.Ş	Bulk cargo, General cargo, Chemical cargo tanker	-
Ordu	Çağıroğlu Ordu Port	Çakıroğlu Ordu Liman İşletmesi A.Ş	Bulk Cargo, Dry Cargo and General Cargo Activities, Tanker services (LPG, methanol and oil loading - unloading), Potable water and power supply, Waste reception	352
Ordu	Ünye Port	Ünye Municipality	Bulk cargo, General cargo Waste receiving facility: Domestic wastewater, bilge water, waste oil and domestic waste.	600
Ordu	Tügsaş Port	Türkiye Gübre Sanayi A.Ş.	Cargo transportation	-
Giresun	Çakıroğlu Giresun Port	Çakıroğlu Giresun Liman İşletmesi A.Ş.	Bulk cargo and general cargo activities, Power supply, Waste reception	1,400

Province	Port Name	Operator	Facility Details/Services	Total Vessel Capacity (vessel/year)
Trabzon	Alport	Trabzon Liman İşletmeciliği A.Ş.	Docks (8 in number - 1,525 m in total), Warehouses, Pilotage and towage services, Power and water supply, Bilge water treatment plant	2,500
Rize	Riport	Riport Rize Limanı İşletmesi Yatırım A.Ş.	Inner port (a dock rendering services to small ships and fishing boats), Main commercial port (3), Ro-Ro dock (1), Outer port (fuel filling facilities with a capacity of 200,000 tons/year), Waste receiving facility.	1,000
Artvin	Hopaport	Park Denizcilik ve Hopa Liman İşletmeleri A.Ş	Storage services (indoor warehouse of 18,220 m^2, outdoor area of 102,462 m^2), Cereal storage (10 silos with a capacity of 1,000 tons each), Tank terminal, Pilotage, towage, hawser services, Waste reception (Domestic wastewater, bilge water, waste oil and sludge), Potable water and power supply, Cargo services (General cargo, project cargo, bulk cargo), Container services (Container loading/unloading, Unpacking, full inspection services etc.), Tank terminal.	1,440

Findings of the Socio-Economic Study 2017

Kırklareli Province has two main centers, İğneada and Kıyıköy, in terms of marine transportation. Kıyıköy and İğneada ports are used as fishing ports. Section 0 provides detailed information on the ports located in Kırklareli. The information that it is planned to extend the Kıyıköy Fishing Port was obtained during face-to-face meetings held in January 2017 in Kıyıköy Municipality. 1st Regional Directorate of the Ministry of Transport, Maritime Affairs and Communications had a Project Introduction File dated March 2017 prepared for the "Construction Project for Kıyıköy Fishing Port Extension" (Ref. 9.54). According to the information obtained from the Project Introduction File, the cost of the construction project owned by the 1st Regional Directorate of the Ministry of Transport, Maritime Affairs and Communications is calculated as TRY 850,000.00.

The scope of this construction project is described as follows in the Project Introduction File:

"The total area of the Kıyıköy Fishing Port will be located in the sea side of the shore edge line which is fully owned by the state. 105-meter secondary breakwater will be completely dredged at a depth of -5 m to -6 m during the construction works for the extension of the fishing port. Besides, a 180-meter section of the 450-meter main breakwater starting from its lug will be dredged at a depth of -5 m to -6 m. Then, extension works with a size of 665 m x 20 m will be carried out by extending the main breakwater by 395 m. 144-meter secondary breakwater will be finalized as 284 m x 10 m with an extension of 14 meters. A 127-meter dock will be built adjacent to the 130-meter inactive dock on the main breakwater."

The location of the planned "Construction Project for Kıyıköy Fishing Port Extension" relative to the "TurkStream Gas Pipeline Project - Offshore Section" is demonstrated in Figure 9.4 below.

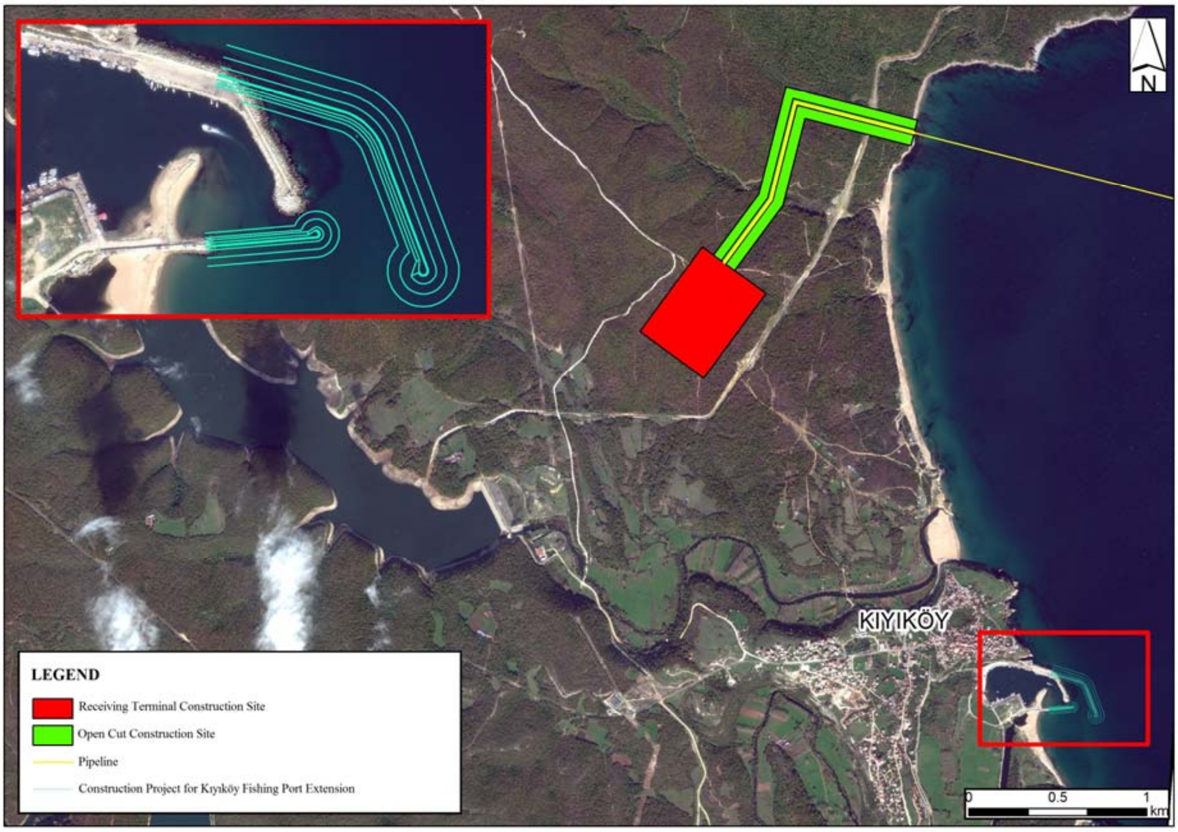


Figure 9.4: Location of the "Construction Project for Kıyıköy Fishing Port Extension" relative to the "TurkStream Gas Pipeline Project - Offshore Section"

The Project Introduction File specifies no exact business termination plan for the Construction Project for Kıyıköy Fishing Port Extension and states that the construction works will start following the completion of the EIA process. As this construction project which is planned to be completed within 2 years (midyear of 2019) within the limits of the funds is a public investment and the completion of the construction depends on the funds, it is also specified in the Project Introduction File that the extension of this period is possible.

9.1.2 Landfall Section

9.1.2.1 Forestry

The forests in Kırklareli Province are located within the boundaries of the Forestry Operation Directorates of Kırklareli, Demirköy and Vize (Ref. 9.10).

Kırklareli Province is highly rich in forests; and out of its total land of 655,000 hectares, 260,079 hectares are forest land and 35,526 hectares are meadow-pasture (Ref. 9.10). Kırklareli Province ranks 50th in the forest land ranking among 81 provinces of Turkey (Ref. 9.11). The ratio of the forest land in Kırklareli to the total area of the province is 39.7, and the share of the forest land of the province in the Turkey's total forest land is 1.14% (Ref. 9.11).

The forest land of Vize District is 71.701,00 hectares, and 31% of its forest land is high forest while 69% is coppice forest. 242,000 steres (the amount of woods stacked into a space of 1 m^3) of firewood and 10,634 steres of industrial round-wood are produced per year in these forests. 80% of the firewood obtained is offered to the forest villagers while 20% is given with the allocation by the municipality. Forest villagers sell these assets wherever they want for whatever price they wish (Ref. 9.12).

In the provisions of the 1/25.000 Scale Environmental Plan of Kırklareli (April 2011), it is stated that the utilization of the non-wood forest products (beekeeping-honey, mushroom, wild fruits, medicinal and aromatic plant collection, jam-making, wood handcrafting, etc.) through their integration with the agricultural and tourism sectors will be encouraged with the purpose of increasing the contribution of forests to national economy and the income of local villagers and that the agricultural production based on forest potential in the region and the sale of the handicrafts produced by processing the forest products will be improved within the framework of agro-ecotourism.

Findings of the Socio-Economic Study 2017 and Measures

As forestry makes up a majority of the means of livelihood for the citizens living especially in Kıyıköy town and Kışlacık village, it is one of the important economic activities in the region. According to the findings of the socio-economic field studies, forestry is performed in the region for the purposes of deriving economic income and meeting the need of firewood.

In the meetings held with the Kıyıköy Forestry Cooperative, it is learned that the cooperative has 670 members. There is an obligation to reside in Kıyıköy Town in order to be a member of the Kıyıköy Forestry Cooperative. According to the information provided by the Cooperative, at least one person from each family living in Kıyıköy is a member of the Kıyıköy Forestry Cooperative. It has been found out in the socio-economic studies that approximately 20% of the members of the Kıyıköy Forestry Cooperative are also a member of the Kıyıköy Fishery Cooperative.

According to the information provided by the Forestry Operation Directorate of Vize, the Directorate designates and announces the areas for lumbering every year and also marks the trees to be logged. According to the Forest Management Plan prepared to include the years between 2013 - 2022, it is informed that the forests of Kıyıköy are divided into 326 parcels.

It is found out in the meetings with the Kıyıköy Forestry Cooperative that some of the parcels located in Selves were allocated for lumbering in 2016 by the Forestry Operation Directorate of Vize. Accordingly, it is learned that approximately 6,700 tons of lumber were cut in 2016 and that approximately 4,700 tons of this amount were used to derive economic income while approximately 2,000 tons were used to meet the need of firewood. As a result of the meetings held with the Forestry Cooperative, it is also learned that it is up to the cooperative members how to use the assets obtained from forestry activities.

The entire Landfall Section of the Project Site falls within the forest land. Under the Project, temporary and permanent forest land acquisition that may potentially impact the forestry (lumbering) activities in Kıyıköy will be made. The estimated total space requirement for the onshore facilities to be used during the construction phase of the Project and the Receiving Terminal is 70.3 hectares, and this space includes a pipeline construction corridor (temporary), material storage areas (temporary), workers' camps (temporary), the site for the Receiving Terminal (temporary) and the construction site for the Receiving Terminal (permanent). **Chapter 1** (General Characteristics of the Project) provides detailed information on the estimated total space requirement for the onshore facilities, and the laydown area of 37.9 ha will be reclaimed after the reinstatement works planned to start in the 3rd quarter of 2019. However, the Project activities will still result in some sort of deforestation that may have an impact on forestry activities in Kıyıköy. This impact which is likely to occur will be substantially reversed with the trees to be planted in the laydown areas. Because the forest land to be affected makes up a small part of the existing forest lands in Kıyıköy and there are alternative forest lands to be designated by the relevant official bodies for the forestry activities, it is expected that the potential impacts of the Project on forestry activities will be limited.

The potential impacts of the Project on forestry will be strived to be minimized as much as possible through the measures given below as well as the general impact mitigation measures which are detailed in Section 9.17:

- Carrying out the lumbering activities in cooperation with the Forestry Operation Directorate of Vize to get the most out of lumbering locally, whenever possible;
- Ensuring coordination with the relevant competent authorities and Kıyıköy Forestry Cooperative to provide a safe access to the available lumbering sites, where applicable;
- Checking any opportunities -in cooperation with the Forestry Operation Directorate of Vize and other relevant stakeholders- to increase the capacity of or to support the operation of forest management and forestry activities instead of deforestation that may be caused by the Project activities; and
- Carrying out reinstatement works through applicable land restoration in the laydown areas –which will be used within the scope of the Project- after the completion of the construction.

9.1.2.2 Beekeeping

Beekeeping is a significant economic activity carried out in Kırklareli. The Turkish Statistical Institution's (TurkStat) 2016 beekeeping data for Turkey shows that there are a total of 49,306 beehives in the province. Vize district has a total of 5,098 beehives and the number of businesses engaged in beekeeping is 160 in this district (Ref. 9.13). Honey obtained as a result of beekeeping activities is generally sold in the region and in Istanbul's market (Ref. 9.17). Table 9.3 shows the beekeeping data from 2016 for Kırklareli Province and Vize District.

Table 9.3: Beekeeping Data from 2016 for Kırklareli Province and Vize District (Ref. 9.13)

	Number of Businesses Engaged in Beekeeping	Number of New Beehives	Number of Old Beehives	Total Number of Beehives	Honey Production (tons)	Beeswax Production (tons)
Kırklareli	691	41,665	7,641	49,306	770,404	20,490
Vize	160	4,355	743	5,098	85,658	1,500

Findings of the Socio-Economic Study 2017 and Measures

During the meetings held with the Forestry Operation Directorate of Vize and Vize District Directorate of the Provincial Directorate of Food, Agriculture and Livestock of Kırklareli within the scope of the socio-economic study, it is learned that beekeeping is a widely-performed activity especially in Kışlacık Village (to the south of Poliçe Beach, near the jetty of Panayır) in Vize. It is also learned from the Forestry Operation Directorate of Vize that future beekeeping activities are funded by the state in the region through "Beekeeping Loan" and beekeeping trainings provided by the General Directorate of Forest-Village Relations (ORKÖY).

According to the information obtained during the meetings held with Vize District Directorate of the Provincial Directorate of Food, Agriculture and Livestock of Kırklareli in 2017, there are four (4) persons who are a member of the Beekeepers Association of Kırklareli in the Kıyıköy Town and the total number of beehives belonging to these members is 267. Apart from this, it is known that there are some town dwellers engaged in beekeeping activities who are not registered with the Beekeepers Association of Kırklareli. It is learned from the Regional Directorate of Forestry of Vize that the number of the town dwellers who are not a member of the "Beekeepers Association of Kırklareli" and are engaged in beekeeping is around 20 to 30 and that these beekeepers utilize the honey -they produced as a results of their beekeeping activities- both for personal consumption and for selling it to the tourists visiting the region.

During the meetings held with the stakeholders within the scope of the socio-economic study, it is found out that beekeeping is an emerging sector even though there is a small number of people engaged in beekeeping activities in Kıyıköy.

According to the findings of a literature review made by an expert biologist in 2017 with the purpose of exploring the potential impact of the Project on beekeeping, the dust and vibrations in the air may not only make it hard for the bees find their directions but also pollute the nectars collected by the honey bees and lead to failure to find nectar sources as it suppresses the chemical smells that the bees get from nectars. However, such interactions occur in the regions where beekeeping activities are mostly performed. The Regulation on Beekeeping introduces some requirements such as locating apiaries at certain distances from the main and side roads. Therefore, it is not likely that the beekeepers will perform their activities in such places that may disturb the bees.

Bees do not have ears and they cannot hear sounds. However, they can detect the vibrations in the air and react to these vibrations. In this case, the bees may lose connection and it may result in failure to find their nutritional sources and to go back to their hives. Therefore, sounds or vibration sources over certain limit may hinder the communication between the bees.

As a result of the assessments based on the review of dust and noise maps which are prepared by the expert biologist for the Project and given in **Chapter 10**, it is envisaged that the probability of the bees to be affected by the emerging dust and vibration around the Landfall Section of the Project where the beekeeping activities are not widely performed is highly low and it can be reduced to a negligible level through the measures below in addition to the general impact mitigation measures detailed in Section 9.17:

- Ensuring coordination with the relevant parties to provide a safe access to the beehives, where applicable;
- Allowing for the transfer of available beehives -which may be affected by the Project activities- to alternative places in coordination with the beekeepers before the commencement of construction works; and
- Limiting the construction activities absolutely to the construction sites designated during the Project design phase.

9.1.2.3 Tourism

Tourism activities in Kırklareli include cultural tourism, coastal tourism, nature and trekking, speleological tourism, herborization, bird watching, wildlife viewing, photo-safari (nature photography), amateur handline fishing, hunting tourism, camping and caravan tourism, bicycle tourism, gastronomic tourism, and sea tourism (beaches) (Ref. 9.14). Particularly Kıyıköy and İğneada are important centers for sea tourism.

As of June 2012, Vize District of Kırklareli Province received the "cittaslow" (slow city) title and has become a part of the "International Network of Cities Where Living is Good" (Cittaslow Network -

Where the Life is Easy) (Ref. 9.15). The popularity of Kıyıköy Town has increased after Vize District received the "cittaslow" certificate. Therefore, tourism is an important means of livelihood for the community in Vize and Kıyıköy.

Findings of the Socio-Economic Study 2017 and Measures

According to the provisions of the 1/100.000 Scale Environmental Plan of Kırklareli (August 2009), the sports, agro-eco and nature tourism areas will be developed in Demirköy and Vize districts and İğneada - Kıyıköy towns will be considered as "eco-tourism" cities.

According to the information obtained from the meetings held with the Culture and Tourism Association of Vize Kıyıköy during the socio-economic study, tourism activities are mostly performed in summer (in June, July and August) in Kıyıköy. Besides, it is informed that Kıyıköy is visited for touristic purposes especially at weekends in spring and fall and even in temperate winter days.

According to the data provided by the Culture and Tourism Association of Vize Kıyıköy and by the Kıyıköy Municipality, approximately 18,000 tourists has visited and accommodated in Kıyıköy between May and September in recent years. In addition to the accommodating visitors, Kıyıköy is also preferred by same-day visitors for touristic purposes. It is learned that the number of the same-day visitors in Kıyıköy is 20,000 per day on national and religious holidays and around 13,000 to 15,000 per day at weekends in summer.

Kıyıköy is also a center of attraction for those who own summer houses in the neighboring districts. Summer house vacationists visiting Kıyıköy contribute to the tourism economy of the region, too.

It is learned that all hotels and hostels in the town run in full capacity especially during the summer season when the tourism activities increase, and the accommodation capacity fails to satisfy the demand during the holiday periods. Therefore, it is learned that a majority of the local people living in Kıyıköy rents out one or two rooms of their houses as a hostel or leaves their houses for rental for summer.

According to the information obtained from the Provincial Directorate of Culture and Tourism of Kırklareli, there is a total of 8 (eight) hotels and hostels registered with the Provincial Directorate of Culture and Tourism of Kırklareli in Kıyıköy. The total room capacity and the total bed capacity of the hotels and hostels registered with the Provincial Directorate of Culture and Tourism of Kırklareli in Kıyıköy is 84 and 185 respectively, and the room and bed capacity of these hotels and hostels are given in Table 9.4 below.

Table 9.4: Hotels and Hostels registered with the Provincial Directorate of Culture and Tourism of Kırklareli in Kıyıköy

	Number of Rooms	Number of Beds
Özgül Otel	15	30
Midye Pansiyon	8	15
Genç Otel	20	50
Marina Pansiyon	7	15
Kıyıköy Resort Otel	20	50
Efsane Motel	10	15
Esra Pansiyon	-	-

	Number of Rooms	Number of Beds
Koç Pansiyon	4	10
Total	84	185

During the meeting held with the Culture and Tourism Association of Vize Kıyıköy, it is found out that the total bed capacity of the hotels and hostels in Kıyıköy reaches up to 300 when the hotels and hostels which are not registered with the Provincial Directorate of Culture and Tourism of Kırklareli are taken into account. According to the information obtained from the Culture and Tourism Association of Vize Kıyıköy, approximately 250 people earn their livelihood by working in the hotels and hostels active in tourism sector and approximately 100 of these people work full-time. Almost 90% of the people working in the tourism sector is from local community.

Tourism is a seasonal means of livelihood for Kıyıköy; however, as a result of the meetings held with the stakeholders engaged in the food and beverage sector in Kıyıköy within the scope of the socio-economic study carried out in October 2015, it is learned that a majority of the restaurants is also open in winter and spring and high occupancy rates are noted especially at weekends, and that the seafood restaurants in Kıyıköy attract visitors from Istanbul and the neighboring provinces especially at weekends.

No large tourist facilities can be built in Kıyıköy because of the existence of natural and archeological sites. Therefore, it can be said that the tourism investment potential is limited.

Additionally, the results of the socio-economic study show that there are various ongoing projects to develop the tourism in the town. According to the information obtained from the Provincial Directorate of Culture and Tourism of Kırklareli, there are such ongoing works as Kıyıköy Walled City Street and Square Arrangements, Street Improvement and Building Facade Coating, Lighting of St. Nicholas' Monastery and its Road with the purpose of developing the tourism in Kıyıköy. These ongoing arrangements for touristic purposes are not located in the Project Site or its immediate vicinity.

9.1.2.3.1 Beaches and Camping

Kıyıköy has 3 (three) beaches which are Selves Beach (also known as Kaymakam Beach or Kazlimanı Beach), Municipal Beach and Port Beach. Figure 9.5 shows the location of these beaches relative to the Project. The Shore Crossing Section of the Project is located in the north of the Selves Beach. The meetings held with the relevant stakeholder within the scope of the socio-economic studies show that the Selves Beach is one of the beaches that are important for the regional tourism.

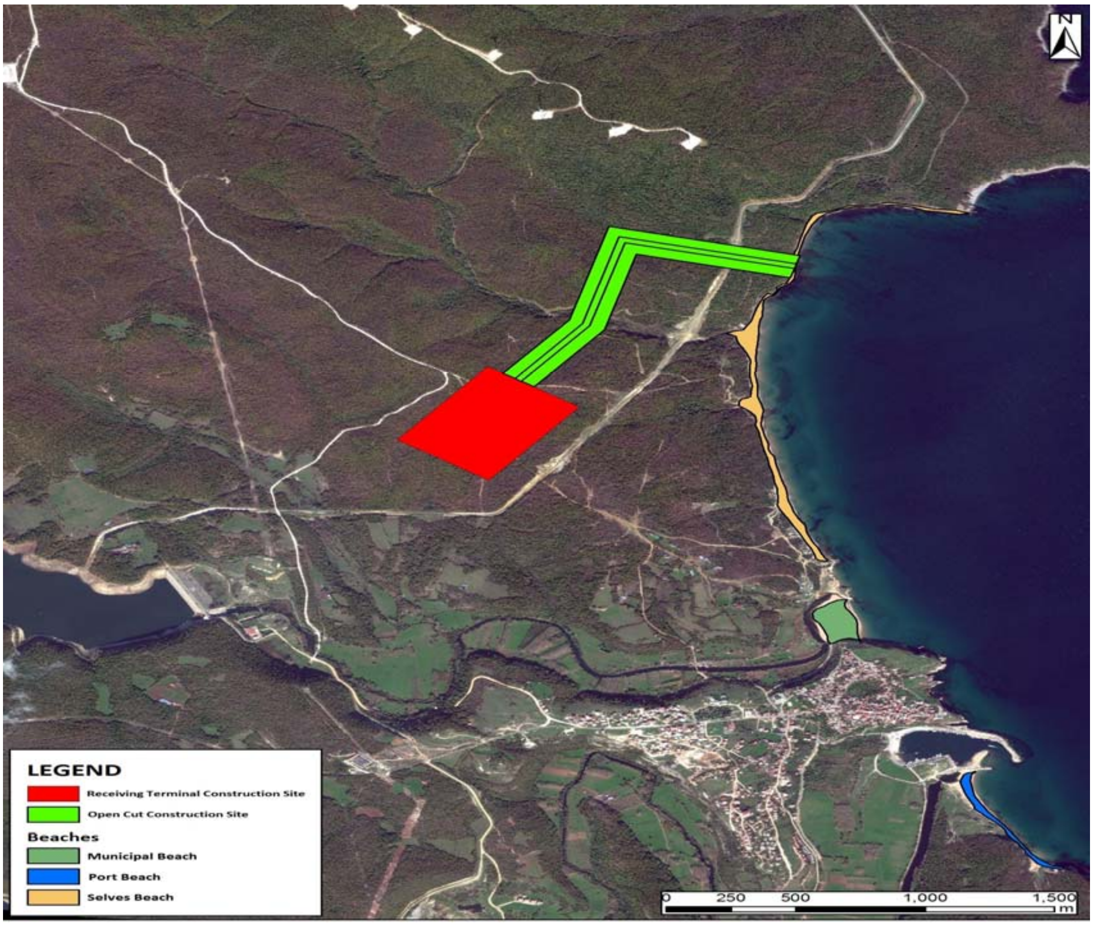


Figure 9.5: Beaches of Kıyıköy

It is not easy to access Selves Beach as the access roads are in bad condition. Selves Beach is about 4 km away from the Center of Kıyıköy and it is generally preferred by families. It is also known that this beach is especially preferred for camping activities. (Ref. 9.55). Figure 9.6 shows a picture of the Selves Beach.

Figure 9.6: Selves Beach

It is easy to access the Municipal Beach -which is located at the mouth of Pabuçdere- by walking or driving. It is learned within the scope of the socio-economic studies that the forest area behind the Municipal Beach is used for camping activities. Figure 9.7 shows a picture of the Municipal Beach.

Figure 9.7: Municipal Beach

According to the information obtained from the Culture and Tourism Association of Vize Kıyıköy and the Gendarmerie of Kıyıköy, camping activities are generally done near the beaches. According to the information obtained during the meetings held with the Kıyıköy Municipality, approximately 200 people per year set up a camp in the main camping site located near Pabuçdere behind the Municipal Beach (Figure 9.8). It is also learned from the municipality that, since this camping site is located on treasury lands, a camping site of about 3 hectares is designated behind the Port Beach near Kazandere and approximately 60 fixed tents will be transferred to this camping site. Another camping site is located behind the Selves Beach (Figure 9.9).

Figure 9.8: Camping Site behind the Municipal Beach

Figure 9.9: Camping Site behind the Selves Beach

Beach Count Study 2017

A beach count study was carried out between June 24-26, 2017 by Empiar İstatistiksel Danışmanlık (Statistical Consulting Firm) on behalf of the Project Owner with the purpose of obtaining more detailed information on the rate of preference of the beaches located in Kıyıköy (Selves Beach, Municipal Beach and Port Beach), on the demographic characteristics of people using these beaches and on the activities preferred in these beaches. Other aspects such as camping sites and accommodation areas, temporary or permanent community facilities, cafeteria and market around the beaches were also observed within the scope of the beach count study.

The date from June 24 to 26 when the beach count study was conducted was the Eid al-Fitr holiday which corresponds to the summer season anticipated to be one of the high seasons for tourism in the region. Therefore, it is aimed to assess how the beaches in Kıyıköy are utilized during a period busier than other months of the year in terms of tourism. It has been seen that the data from the beach count study support the findings of the socio-economic study conducted in 2017. The findings of the beach count study are summarized below.

Camping Sites and Facilities around the Beaches

Camping sites are divided into two categories as permanent and temporary within the scope of the beach count study.

No permanent camping sites are observed in the Selves Beach. A temporary camping site is observed in the north of the Selves Beach. This camping site in the north of the Selves Beach is shown in Figure 9.10. This camping site in the north of the Selves Beach is located in the hard-to-reach hills, and the maximum number of tents in this site is identified as 36 on the third day of the study.

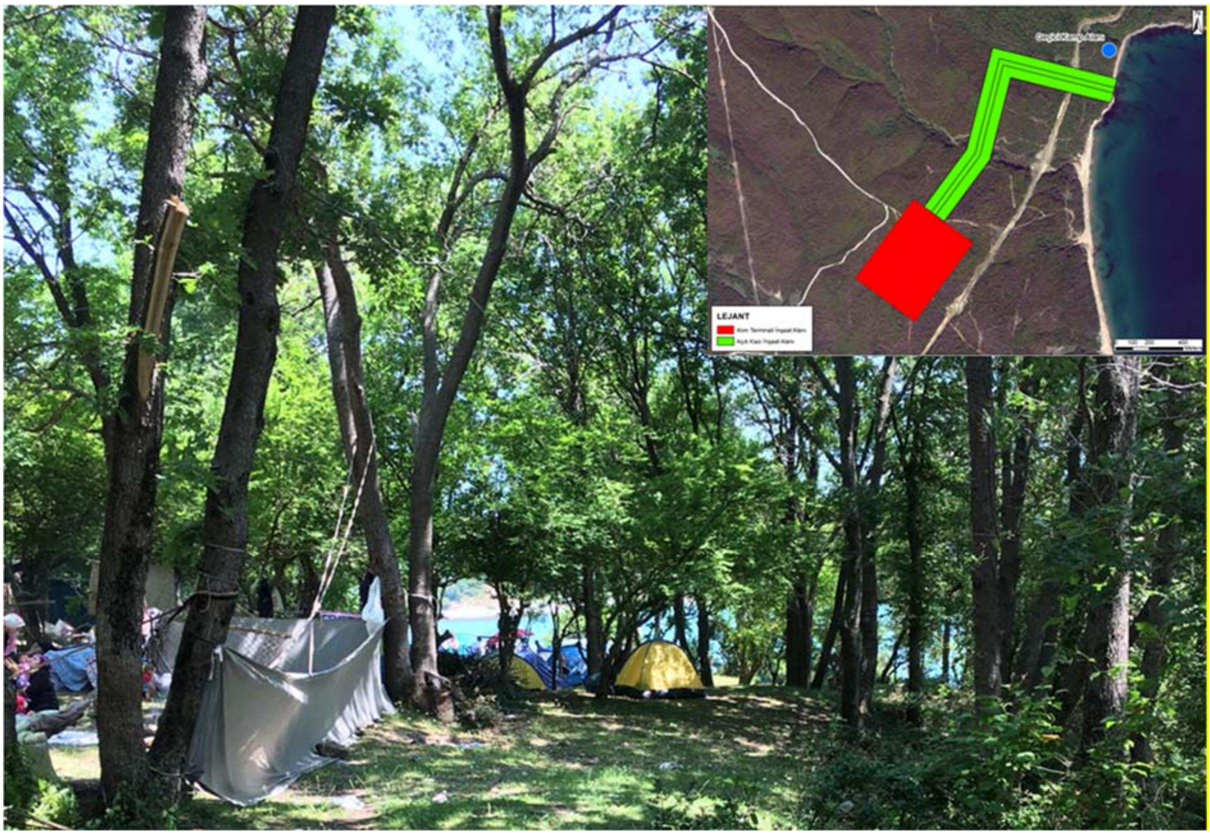


Figure 9.10: Temporary Camping Site in the North of the Selves Beach

Another temporary camping site is observed in the south of the Selves Beach (at the junction of the Selves Beach and the Municipal Beach) during the beach study, and as a result of the three-day study, 6 tents are identified in this site.

It is identified, during the beach count study, that there is a small establishment in the Selves Beach which serves as a restaurant and a cafeteria and where one can purchase various stuff needed.

A total of 2 (two) camping sites are observed in the Municipal Beach, and as a result of the three-day count study, 14 tents in average are identified in these sites. The camping sites in the Municipal Beach are shown in Figure 9.11.

In the beach count study, it is identified that the Municipal Beach has 2 (two) permanent establishments which serve as a restaurant and a cafeteria and 2 (two) temporary establishments which serves as a caravan where one can purchase various stuff needed.

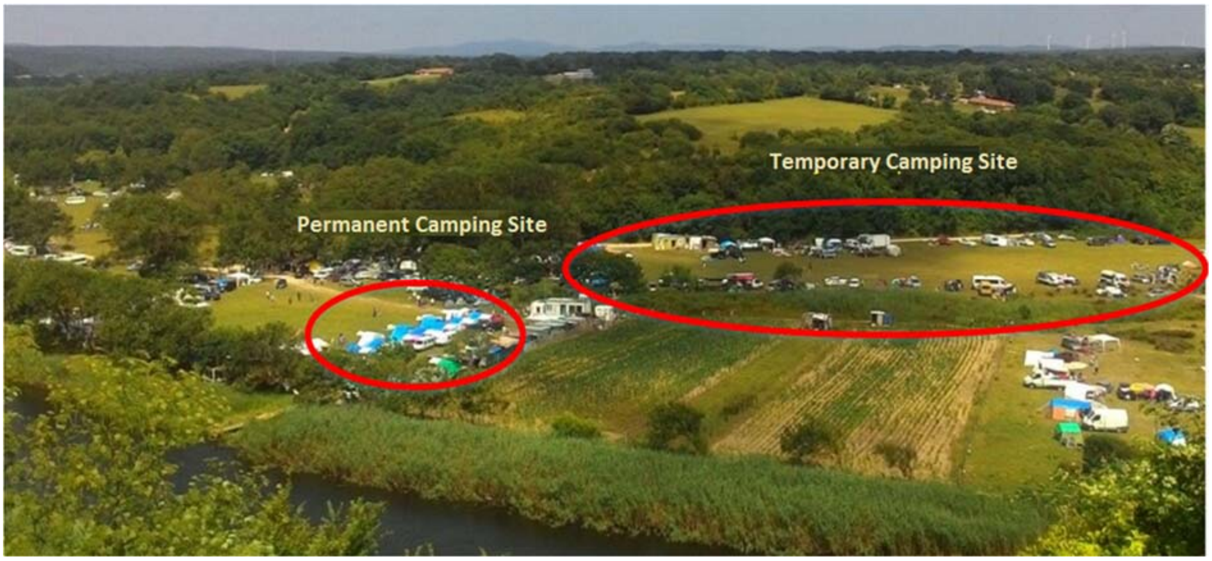


Figure 9.11: Camping Sites in the Municipal Beach

One temporary camping site is observed in the Port Beach, and as a result of the three-day count study, it is identified that there are 18 tents in average in this site. The temporary camping site in the Port Beach is shown in Figure 9.12.

In the beach count study, it is identified that the Port Beach has a cafeteria and a temporary establishment where one can purchase various stuff needed.

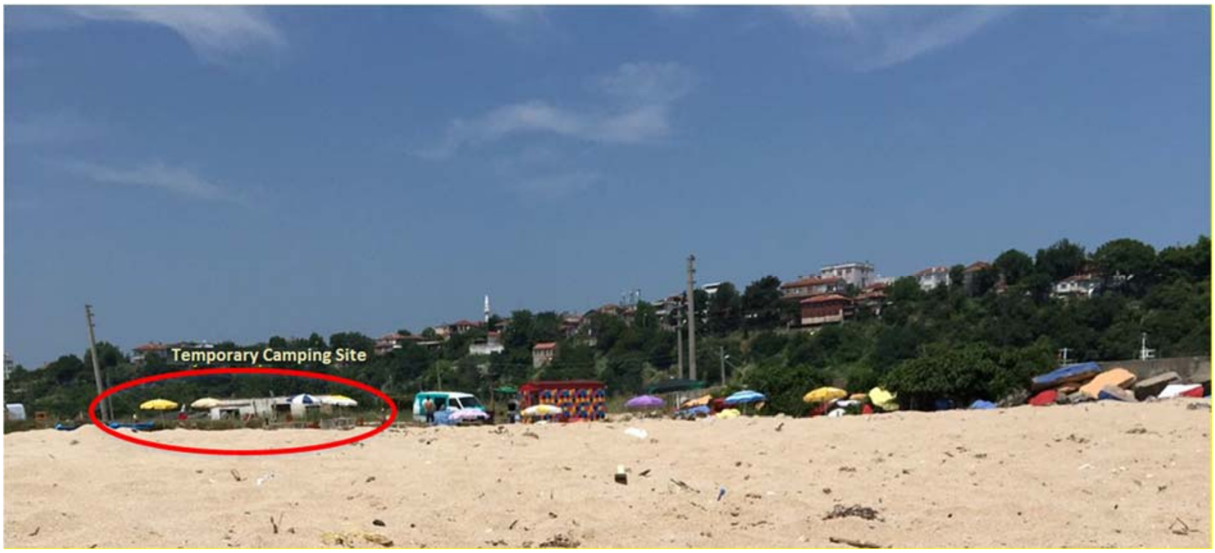


Figure 9.12: Temporary Camping Site in the Port Beach

Table 9.4 summarizes the distribution of camping sites and facilities around the beaches in Kıyıköy Town based on the findings of the beach count study.

Table 9.5: Distribution of Facilities and Camping Sites around the Beaches

Beaches	Number of Camping Sites (Permanent or Temporary)	Number of Tents	Number of Facilities (Cafeteria/Restaurant)
Selves Beach	2	42*	1
Municipal Beach	2	14	2
Port Beach	1	18	1

* The maximum number of tents observed during the three-day count is taken into account.

Rate of Preference of the Beaches, Demographic Characteristics of People Using the Beaches, Activities Preferred in the Beaches

The rate of preference of the beaches is identified as 36.7% for the Port Beach, 35% for the Municipal Beach and 28.3% for the Selves Beach respectively as a result of the beach count study. (Figure 9.13). Accordingly, the most preferred beaches in Kıyıköy Town are Port and Municipal Beaches.

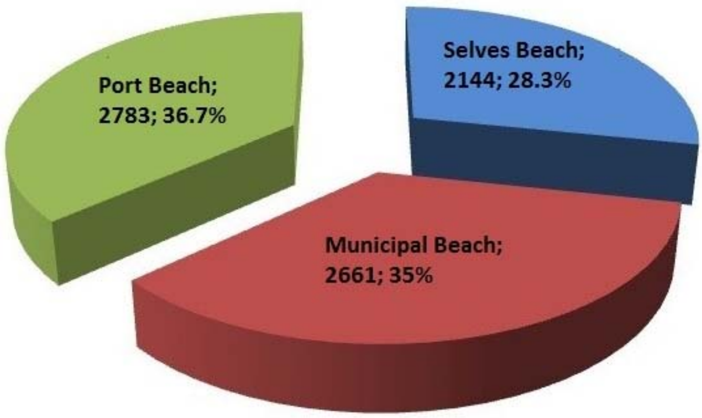


Figure 9.13: Rate of Preference of the Beaches in Kıyıköy Town

In three full days; out of 2,144 persons counted in the Selves Beach 36% were sighted during the morning hours, 43.9% during the noon hours and 20.1% during the evening hours; out of 2,661 people counted in the Municipal Beach 27% were sighted during the morning hours, 52.2% during the noon hours and 20.8% during the evening hours; and out of 2,783 people counted in the Port Beach 23.8% were sighted during the morning hours, 44% during the noon hours and 32.2% during the evening hours. It is determined that the Selves Beach is busier than the other beaches during the morning hours while the Municipal Beach is busier during the noon hours and the Port Beach is busier during the evening hours when compared to the other beaches.

As a result of the beach count study, the rate of female users benefiting from all beaches in Kıyıköy Town is identified as 42.2% while the rate of male users is identified as 57.8% (Figure 9.14).

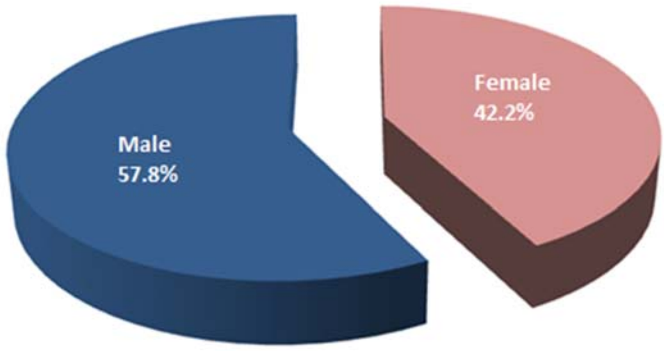


Figure 9.14: Beach Utilization Rate by Gender in Kıyıköy Town

In three full days; it is identified that 46.1% of the users of the Selves Beach were female while 53.9% were male. And, it is found out that 36.5% of the users of the Municipal Beach were female while 63.5% were male. For the Port Beach, the ratio of the female users to the total users of the beach is 44.6% while the ratio of the male users to the total users of the beach is 55.4%. Figure 9.15 shows the beach utilization rates by gender on a beach-by-beach basis in the entire Kıyıköy. In general, it is found out that the rate of male users is higher than the rate of female users in Kıyıköy Town.

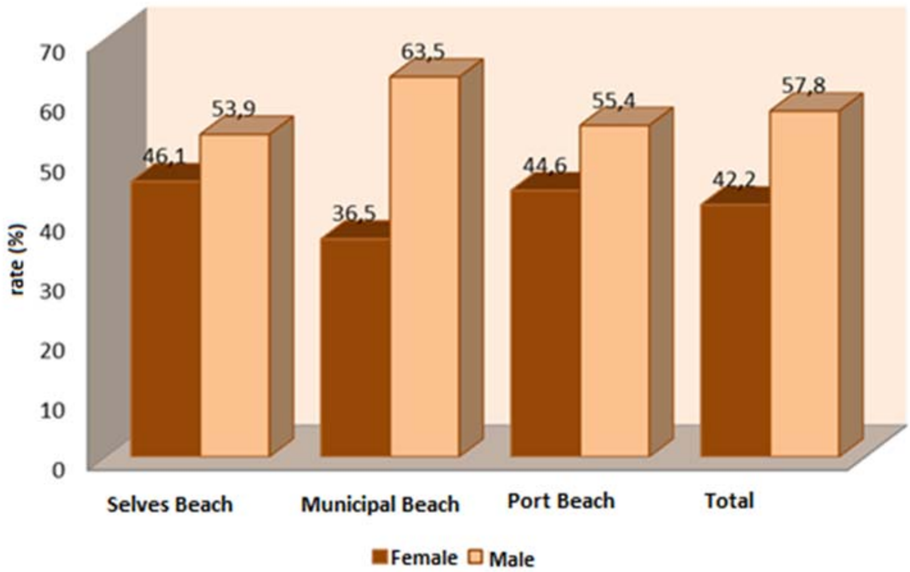


Figure 9.15: Beach Utilization Rates by Gender in Kıyıköy Town (On a Beach-by-Beach Basis)

Looking at the ages of all beach users in the town, it is determined that the ratio of persons between the ages of 15 and 30, the ratio of persons between the ages of 30 and 60 and the ratio of persons under the age of 15 to the total number of beach users were 36.1%, 32.9% and 22.1% respectively. And, the ratio of persons over the age of sixty to the total number of beach users was 8.9%. Figure 9.16 shows the beach utilization rates by age in the entire town.

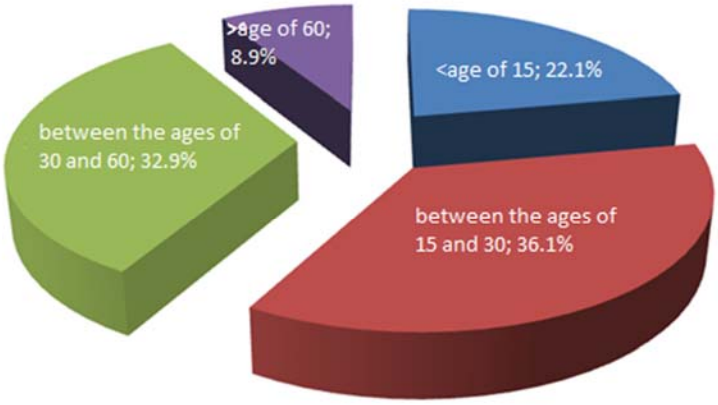


Figure 9.16: Beach Utilization Rates by Age in Kıyıköy Town

In three full days; it is identified that 25.2% of all users in the Selves Beach were under the age of 15, 31.3% were between the ages of 15 and 30, 38% were between the ages of 30 and 60 and 5.5% were above the age of 60. It is identified that 15.2% of all users in the Municipal Beach were under the age of 15, 41.3% were between the ages of 15 and 30, 32.3% were between the ages of 30 and 60 and 11.2% were above the age of 60. And, it is determined that 26.5% of all users in the Port Beach were under the age of 15, 34.8% were between the ages of 15 and 30, 29.5% were between the ages of 30 and 60 and 9.2% were above the age of 60. Figure 9.15 shows the beach utilization rates by age on a beach-by-beach basis in the entire town.

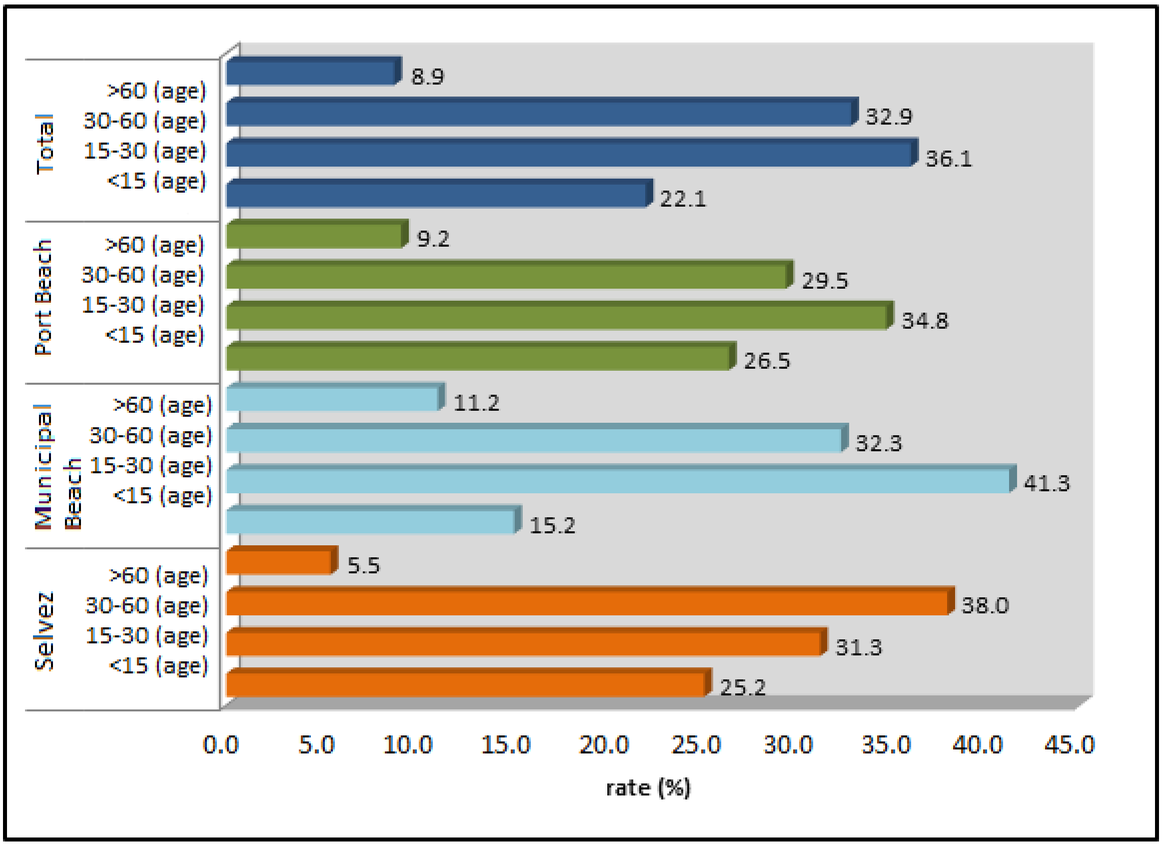


Figure 9.17: Beach Utilization Rates by Age in Kıyıköy Town (On a Beach-by-Beach Basis)

According to the findings of the beach count study, the most preferred activities in all beaches of Kıyıköy are identified as swimming and sunbathing. The ratio of sunbathing to all activities is 55.1% which is followed by swimming with a rate of 41.7%, water and beach sports with a rate of 1.2%, fishing with a rate of 0.7% and group activities with a rate of 0.1%. Figure 9.18 shows the distribution of beach activities in the entire Kıyıköy Town.

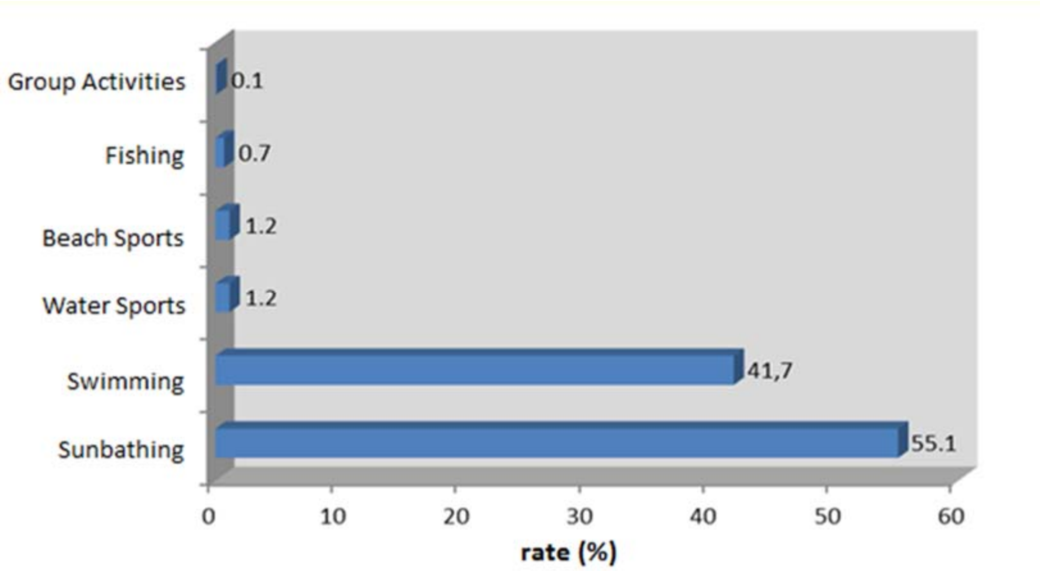


Figure 9.18: Distribution of Beach Activities in Kıyıköy Towns

The potential impacts of the Project on tourism and the impact mitigation measures are given under Section 9.5 (Impact of the Project on Tourism).

9.1.2.3.2 Trekking

The topography of Kırklareli Province is suitable for trekking tourism and allows for arranging trekking and nature trips from the neighboring provinces at weekends (Ref. 9.56).

Findings of the Socio-Economic Study 2017 and Measures

It is learned that there are areas suitable for trekking in Kastro, Pabuçdere and Kazandere regions. In the meetings held with the Culture and Tourism Association of Vize Kıyıköy, it is informed that an average of 5,000 people visits Kıyıköy per year for trekking and approximately 3,000 of these visitors join guided trekking tours. Trekking activities are arranged throughout the year in Kıyıköy, and especially spring and fall are the high seasons for trekking. And, it is known that the people visiting Kıyıköy for trekking prefer the businesses engaged in food and beverage sector in Kıyıköy during their visit and thus contribute to the tourism economy.

In the meetings held with a stakeholder providing professional guidance service for trekking tours, it is learned that there are two routes designated for trekking tours in Kıyıköy (Figure 9.19).

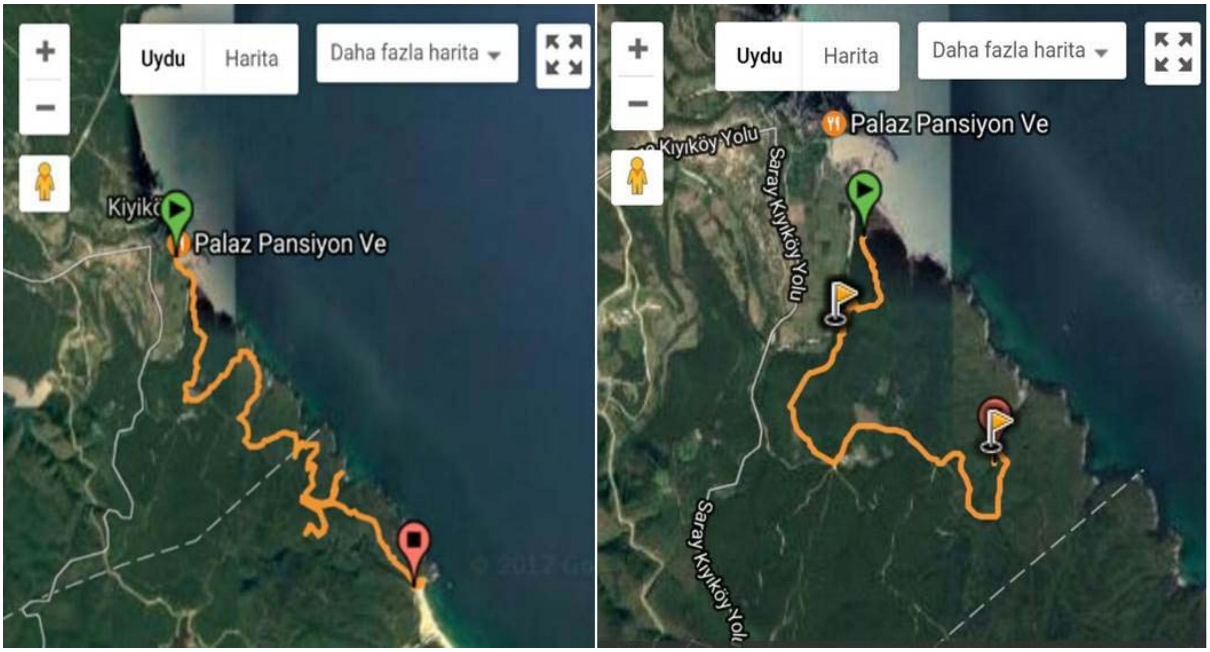


Figure 9.19: Kıyıköy Trekking Routes

The above trekking routes are located in about 2 km south of the Project Site and thus, they do not pass through the Project Site or its immediate vicinity. Therefore, it is not likely that the trekking routes be affected by the Project.

The potential impacts of the Project on tourism and the impact mitigation measures are given under Section 9.5 (Impact of the Project on Tourism).

9.1.2.3.3 Hunting

Figure 9.20 presents the "Hunting Grounds Map of Kırklareli Province" of the 1st Regional Directorate, General Directorate of Nature Conservation and National Parks, Ministry of Forestry and Water Affairs. In this context, the whole Kıyıköy is specified as State Hunting Ground.

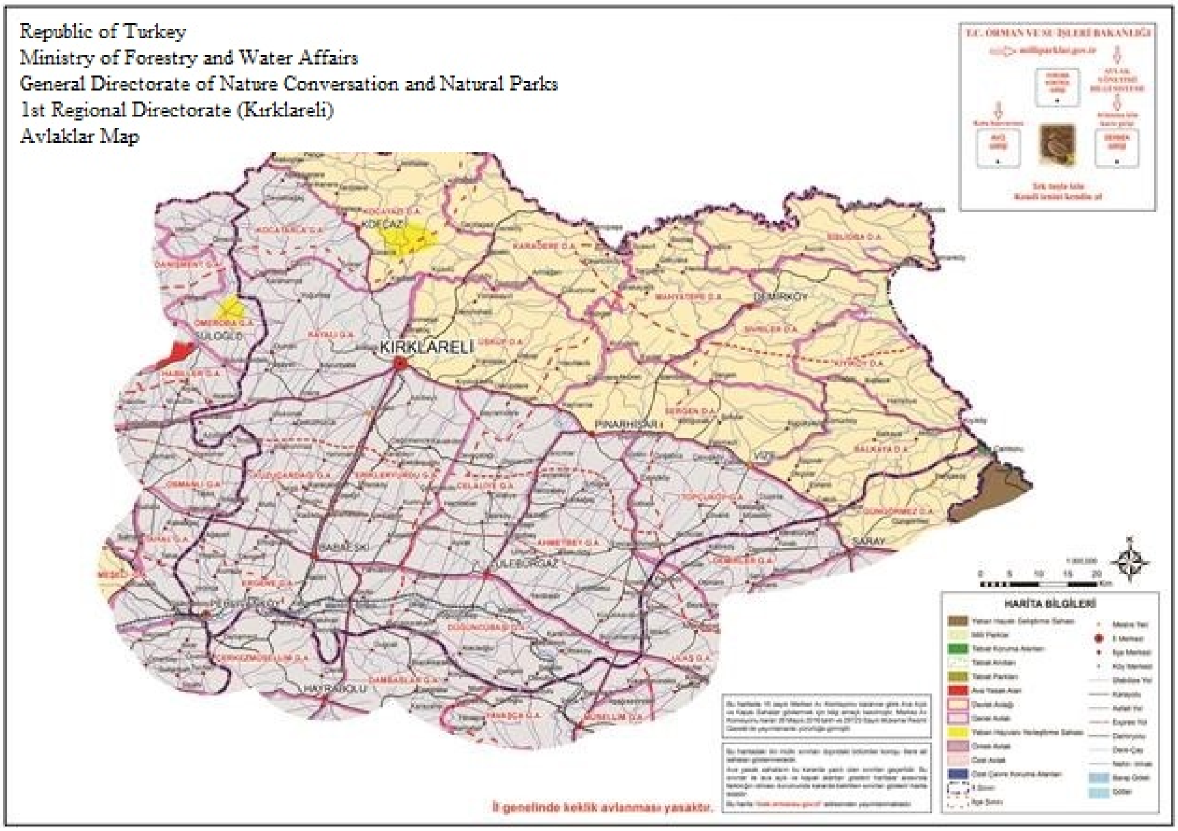


Figure 9.20: Hunting Grounds Map of Kırklareli Province

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During the meetings held with the Provincial Directorate of Culture and Tourism of Kırklareli within the scope of the socio-economic study, it is learned that the hunting activities in Kıyıköy are mostly performed by the hunters coming from Istanbul, Çorlu and sometimes from Greece and Bulgaria. The foreign hunters generally hunt wild boars while the other hunters hunt flying animals (ducks, snipes, etc.) in addition to wild boars.

According to the meetings held with the stakeholders engaged in hunting in Kıyıköy, there are approximately 15 local hunters in the town. The rules and procedures about hunting including hunting periods, hunting types and hunting days are determined by the "Central Hunting Commission Decision" published in the official gazette every year. According to the findings of the socio-economic studies, hunting activities can be performed in the whole forest area in Kıyıköy on condition of obtaining relevant permits. Therefore, it is envisaged that the hunting activities will not be affected by the Project.

9.1.2.4 Livestock

Livestock has an important place in Vize District of Kırklareli Province. All of the cattle in the plain section of the district is transformed into culture race while the native livestock generally maintains its importance in the forest villages (Ref. 9.17). It is known that 12,552 cattle, 29,800 sheep and goats, and 9,280 poultry are raised in the whole district as of 2016 (Ref. 9.13). Table 9.6 presents the number of animals by type for Kırklareli Province, Central District and Vize District.

Table 9.6: Number of Animals of All Ages by Type in Kırklareli Province, Central District and Vize District, 2016 (Ref. 9.13)

Name of Animal	Kırklareli	Center	Vize
Sheep and goats	285,908	92,661	29,800
Cattle	143,224	37,088	12,552
Equidae (horses, mules, donkeys)	1,787	997	53
Number of poultry	295,103	25,383	9,280
Beekeeping - Total number of hives	49,306	8,583	5,098

Table 9.7, Table 9.8 and Table 9.9 show the number of cattle, sheep and goats, and poultry by age group and the animal production amounts for 2016 in Vize District of Kırklareli.

Table 9.7: The Number of Cattle and the Amount of Animal Production in Vize District of Kırklareli, 2016 (Ref. 9.13)

Name of Animal	Adult	Young-Baby	Total	Number of Dairy Animals (heads)	Milk (tons)
Water Buffalo	959	243	1,202	605	571.914
Cow (Culture)	5,180	1,320	6,500	3,182	12,432.074
Cow (Cross-bred)	3,180	1,620	4,800	1,806	5,078.472
Cow (Local)	45	5	50	26	33.592

Table 9.8: The Number of Sheep and Goats and the Amount of Animal Production in Vize District of Kırklareli, 2016 (Ref. 9.13)

Name of Animal	Adult	Young-Baby	Total	Number of Dairy Animals (heads)	Milk (tons)	Wool, Hair/Fur, Mohair (tons)
Goat (Hair)	9,700	900	10,600	4,316	410,020	9,520
Sheep (Local)	17,400	1,800	19,200	7,280	611,520	30,144

Table 9.9: The Number of Poultry and the Amount of Animal Production in Vize District of Kırklareli, 2016 (Ref. 9.13)

	Name of Animal	Current Number	Number of Slaughtered Poultry	Poultry Meat (tons)	Number of Eggs (1000)
Vize	Turkey	450	-	-	-
	Goose	640	-	-	-
	Duck	740	-	-	-
	Laying Hen	7,450	-	-	-

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Livestock breeding is an important source of economic income in Kıyıköy. According to the information obtained from the Kıyıköy Livestock Cooperative, livestock activities generate a source of economic income for almost half of the town's population. It is conveyed that livestock activities constitute a line of work for a majority of the town's population engaged in these activities. It is also learned that a majority of the enterprises in livestock sector throughout the town engage in livestock raising instead of animal production.

According to the information obtained from the Directorate of Food, Agriculture and Livestock of Vize, there are 70 livestock enterprises throughout Kıyıköy and 24 in Selves area.

Under the Project, temporary and permanent forest land acquisition will be made. As there is no pasture area within the Project site, it is not likely that the construction site of the Receiving Terminal, the pipeline construction corridor and the laydown areas intersect with the areas of livestock activities. In the meetings held with the stakeholders within the scope of socio-economic studies in 2017, it is learned that there are areas used by the local people engaged in livestock breeding around the Landfall Section of the Project Site. Therefore, it is likely to cause losses in the places where the local people engaged in livestock pasture or keep their animals or to cause changes in the access routes to these places during the Project activities. The potential impacts of the Project on livestock breeding will be strived to be minimized as much as possible through the measures given below as well as the general impact mitigation measures which are detailed in Section 9.17:

- Planning and programming the onshore construction (including onshore pipeline construction) activities of the Project in a way to cause minimum interruption in the access routes needed by the forest users (including those engaged in livestock breeding and beekeeping), where applicable;
- Collaborating with the relevant parties and the Livestock Cooperative to allow as much as possible for providing and maintaining a safe access to available pastures or other routes that can be used by those engaged in livestock breeding, where applicable;
- Identifying places or measures to provide alternative areas for meadows or pastures in coordination with the relevant forestry authorities, in case of a failure to avoid the loss of pastures or meadows during the Project activities;
- Minimizing access restrictions to meadows when fulfilling the safety requirements of the Project;
- Carrying out reinstatement works through applicable land restoration in the laydown areas –which will be used within the scope of the Project- after the completion of the construction; and
- Using the Good International Industry Practices (GIIP) as a basis in settling the dust and managing the noise, lighting and traffic impacts.

9.1.2.5 Agricultural Activities

The economy of Kırklareli is mostly based on agriculture. The land suitable for tillage-based agriculture is mostly plain, and people perform dry farming without fallow in approximately 82% of the agricultural land in the province and irrigated farming in nearly 18% (Ref. 9.10).

Table 9.1 and Figure 9.21 demonstrate the land use in Kırklareli in 2015. Accordingly, the agricultural land in the province accounts for 40.32% of the total area of the province.

Table 9.10: Land Use in Kırklareli (Ref. 9.10)

	Area (ha)	%
Agricultural Land	264,532	40.32
Meadow - Pasture Ground	35,526	5.42

Forest Land	260,079	39.71
Other Lands	94,863	14.48
Total Area	655,000	100

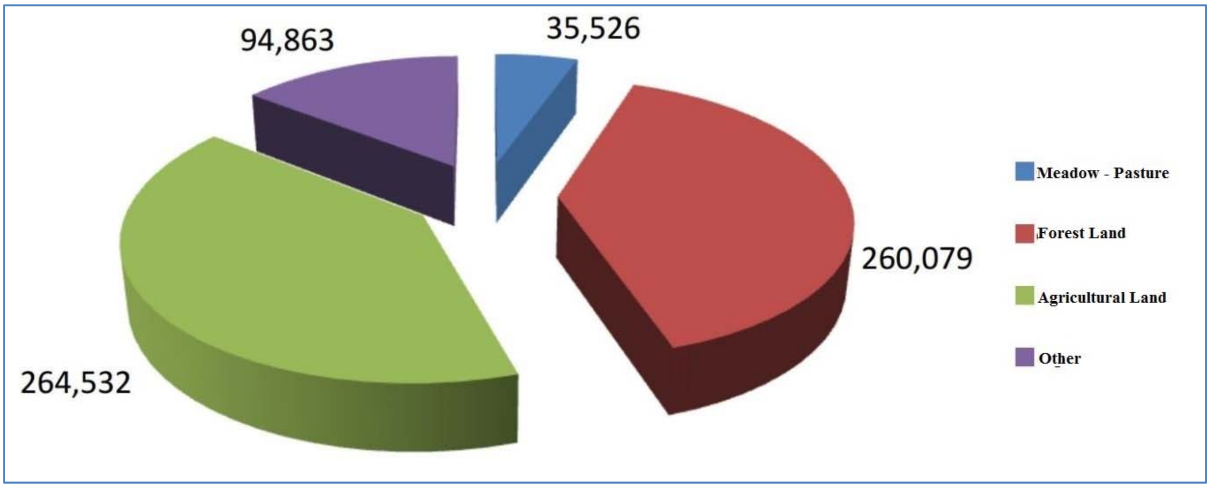

Figure 9.21: Land Use in Kırklareli (Ref. 9.10)

As dry farming areas are wider than irrigated farming areas in Kırklareli, they mainly produce field crops in the province and wheat ranks first in terms of its share in cultivation in the total arable land. The share of wheat in cultivation varies between 55-60% by years. Sunflower takes the second place in ranking and its share in cultivation varies between 20-25% by years. (Ref 9.10).

There have been also remarkable developments in greenhouse vegetable cultivation in Kırklareli. Facilities built by the farmers' own resources have been added to the facilities built using the sources of the Special Provincial Administration and the Social Cooperation and Solidarity Fund (Ref. 9.10) Table 9.11 shows the distribution of greenhouse cultivation areas in the entire Kırklareli province and in Vize district according to the 2016 data of TurkStat.

Table 9.11: Qualitative Distribution of Greenhouse Cultivation Areas in Vize District of Kırklareli, 2016 (Ref. 9.18)

	Total Area	Glass Greenhouse	Plastic Greenhouse	High Tunnel	Low Tunnel
Kırklareli	72	0	48	24	0
Vize	7	0	7	0	0

Units in decare.

A majority of the population in Vize district of Kırklareli lives in the countryside. And, agricultural activities in the district are generally performed employing modern techniques. That the forest land is divided into small parcels and that the slope of some areas is too much play an efficient role in the continuation of primitive agricultural techniques while all sorts of agricultural tools are used in the plain land (Ref. 9.12).

According to the 2016 data of TurkStat, the total area of agricultural land in Vize is 197,165 decares. Grain and other plant products are cultivated in 95% of this agricultural land while fruits, beverage and spice plants are cultivated in about 1%, and the remaining 4% is covered by fallow areas and vegetable gardens. Table 9.6, Table 9.7 and Table 9.8 below provide information on the agricultural land use and the production status of agricultural product patterns in Vize in 2016.

Table 9.6: Agricultural Land Use in Vize District of Kırklareli, 2016 (Ref. 9.18)

	Total Cultivated Agricultural Area and Area for Perennial Plants	Total Cultivated Agricultural Area				Perennial Plants		
		Total Cultivated Agricultural Area	Area for Grain and Other Plant Products		Area for Vegetable Gardens	Area for Ornamental Plants	Total	Area for other fruits, beverage and spice plants
			Cultivated	Fallow				
Vize *	197,165	195,260	187,401	2,599	5,260	0.00	1,905	1,905

*Units in decare

Table 9.7: Cultivation, Yield and Production Status of Grain and Other Plant Products Produced in Vize District of Kırklareli, 2016 (Ref. 9.18)

	Grain and Other Plant Products (Based on CPA[1] Classification)					
District	Name of Group	Name of Product	Cultivated Area (in decare)	Harvested Area (in decare)	Production (tons)	Yield (kg/da)
Vize	Potato-Legumes-Edible Roots and Tubers	Potato (Other)	229	229	331	1,445
		Chickpea	40	40	5	125
		Beans (Dry)	150	150	18	120
	Straw and Grass	Alfalfa (Green Grass)	400	400	800	2,000
		Sainfoin (Green Grass)	100	100	100	1,000
		Sorghum (Green Grass)	30	30	120	4,000
		Corn (for Silage)	2,000	2,000	9,000	4,500
		Fodder Beet	30	30	240	8,000
		Vetch (Common) (Green Grass)	125	125	125	1,000
		Vetch (Hungarian) (Green Grass)	265	265	265	1,000
	Plants for Sugar-Making	Sugar Beet	23	23	130	5,652
	Grain	Wheat (Other)	98,000	98,000	40,363	412
		Corn (Sweet Corn)	500	500	263	526
		Barley (Other)	8,000	8,000	3,075	384
		Oat	1,500	1,500	549	366
		Triticale	101	101	42	416
	Oil seeds	Sunflower (for Oil)	76,698	76,698	17,768	232

	Colza (Canola)	50	50	14	280

[1] Statistical Classification of Products by Activity in the European Economic Community

Table 9.8: Production Status of Greenhouse Products in Vize District of Kırklareli, 2016 (Ref. 9.18)

District	Name of Group	Name of Product	Cultivated Area (in decare)	Production (tons)
Vize	Greenhouse (Plastic)	Cucumber	7	49
		Lettuce (Curly)	7	14

Land distribution based on the number of farmer families is not balanced in Kırklareli as is the case throughout Turkey. Having looked at the structure of agricultural enterprises, it was observed that enterprises focus on 50 to 200 decares in terms of soil size and most of them perform both livestock and agricultural production activities (Ref. 9.10).

Agricultural production still maintains its importance while industry advances throughout Kırklareli. Downsizing of enterprises due to the distribution of agricultural land by inheritance poses an important problem for agricultural production and employment (Ref. 9.10). In parallel with this information, it is stated that the incomes of the people who depend on agricultural production made in rural areas throughout the Thrace Region have started to decrease due to such reasons as trying to continue agricultural and livestock activities by traditional techniques, making mistakes in agricultural investment decisions and distributing agricultural lands by inheritance and thus causing the agricultural land per household to fall under 50 decares (Ref. 9.19).

According to the findings of the report on agriculture prepared for the Project in May 2017, there is no areas of agricultural activity within the interaction areas of the Project site. The closest agricultural land is located in the alluvial plain created by the Pabuçdere stream in 320 meters south of the Project site. According to the data from the Ministry of Food, Agriculture and Livestock, a large portion of the agricultural lands in Kıyıköy is composed of dry farming lands without fallow. The closest pasture area is located in 290 meters southwest of the Project Site.

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It is learned that the total size of the cultivated area in Kıyıköy is 77.86 hectares. Table 9.9 shows the use of agricultural areas in Kıyıköy.

Table 9.9: Use of Agricultural Areas in Kıyıköy Town

	Total Amount of Cultivated Area	Meadow	Poplar	Dry beans	Vetch
Kıyıköy	77.86	12.86	11.41	0.57	53.02

Looking at the use of agricultural areas, it can be said that meadow and vetch farming is performed mainly to support the livestock activities in the town. It can be concluded from the meetings held with the relevant stakeholders that the agricultural activities in Kıyıköy are carried out mostly for household consumption especially because of the fact that the arable agricultural area per household is small.

Given the agricultural activities in Kıyıköy is highly limited and performed individually, it is not anticipated that the environmental impacts due to Project activities cause an important negative socio-economic impact. **Chapter 8** (Assessing the Lands which will be disposed of in the Project) provides an assessment of the environmental impacts on meadows and agricultural areas in the immediate vicinity of the Project Site.

9.2 Economic Conditions in Fishery

9.2.1 General Information

The fishery resources of the Black Sea are shared by Bulgaria, Georgia, Romania, Russia, Ukraine and Turkey. Russia which has the largest population is followed by Turkey and Ukraine. The total population living in the cities on the Black Sea coast is nearly 16 million and a large portion of this population resides in Ukraine and Turkey. These two countries have a total shoreline of 2,782 km and 1,329 km respectively (Ref. 9.20).

As seen in Table 9.10, data from 2014 show that Turkey (142,660.4 tons) which ranks first in fish production in the Black Sea is followed by Russia (32,721.4 tons) and Georgia (11,550 tons).

Table 9.10: Comparison of Fish Amounts Caught in the Black Sea Countries

Data	Bulgaria	Georgia	Romania	Russia	Turkey	Ukraine
Total Population[1] (x 1,000)	9,855	4,000	19,511	143,457	78,74	44,824
Length of Shoreline[2] (km)	354	310	225	800	1,778	2,782
Amount of Fish Caught in the Black Sea[3] (ton)	3,709	11,550	229	32,721.4	142,660.3	3,880.8

[1] 2015 Demographic data (United Nations) (Ref 9.21)
TurkStat, Population and Demographic Indicators Statistics, 2015, (Ref. 9.36)
[2] Ref 9.20
[3] 2014 data from the General Fisheries Commission for the Mediterranean (GFCM) (Ref 9.22)

As seen in Table 9.10, Turkey has the largest share in fishery production among all Black Sea countries. The reasons for this include advanced fishery infrastructure, specific legal framework and fishery tradition going a long way back in the region. All fishery and aquaculture activities in Turkey are regulated in accordance with the *"Fisheries Law No. 1380"*. Accordingly, non-Turkish citizens are prohibited to enter the territorial waters specified in Article 1 of or the inland waters specified in Article 4 of the "*Act No. 2674 on Territorial Sea"* for aquaculture hunting and go aquaculture hunting in these waters. However, the foreigners who will make aquaculture production by small-sized means in unrestricted areas for non-commercial or sportive purposes and the foreigners who will work in surveys and research on aquaculture by the permission of the Ministry of Food, Agriculture and Livestock are exempted from this provision.

Fisheries Law also requires those who are engaged in aquaculture production and the vessels used for aquaculture production to have a license. Since 1997, there has not been a license issuance for the fishing vessels engaged in hunting activities in seas in order to ease off the hunting pressure on fish stocks and to ensure sustainable fishery (Ref 9.23). However, licenses were issued for a limited number of fishing vessels within limited periods in some years.

Since 2002, those who work in fishery sector have not been allowed to extend their fleet except for replacing a vessel physically with another one. In cases where a vessel is replaced with another one, maximum 20% increase is allowed in the overall length of the vessel (Ref 9.51).

Turkish Government made various subsidies available to support production in fishery sector, including export refunds for ready-to-use and shelf-stable fishery products, tax reduction for diesel fuel used in fishing boats, culture fishing support plan, and subsidized loan facilities for fishers and owners of fish farms (Ref 9.51). Multilateral and bilateral agreements are signed with the aim of determining measures for fish stock management (

Table 9.11).

Table 9.11: Multilateral and Unilateral Agreement for Fish Stock Management (Ref 9.52)

Commission/Country	Agreement
Common Fisheries Policy of the European Union (EU CFP)	Council Regulation No 2371/2002 of 20 December 2002 on the Conservation and Sustainable Exploitation of Fisheries Resources under the Common Fisheries Policy
Food and Agriculture Organization of the United Nations (FAO)	General Fisheries Commission for the Mediterranean (GFCM) European Inland Fisheries and Aquaculture Advisory Commission (EIFAAC)
General Fisheries Commission for the Mediterranean (GFCM)	Agreement for the Establishment of the General Fisheries Commission for the Mediterranean (GFCM)
Organisation for Economic Co-operation and Development (OECD)	Introduction of Stock Assessment to the Fisheries Management System of Turkey
EUROFISH International Organization	Agreement for the Establishment of the International Organisation for the Development of Fisheries in Eastern and Central Europe (EUROFISH)
International Commission for the Conservation of Atlantic Tunas (ICCAT)	International Convention for the Conservation of Atlantic Tunas
European Inland Fisheries and Aquaculture Advisory Commission (EIFAAC)	EIFAAC Rules of Procedure as of 19 April 2012
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
Ukraine	Agreement between the Cabinet of Ministers of Ukraine and the Government of the Republic of Turkey on Cooperation in Fishery
Georgia	Agreement on the Central Asian and Caucasus Regional Fisheries and Aquaculture Commission (CACFISH)
Bulgaria	Law on the acceptance and approval of the trade agreement concluded and signed between Turkey and Bulgaria
Bulgaria	Law on the acceptance and approval of the trade agreement concluded and signed between Turkey and Bulgaria
Romania	Free Trade Agreement between the Republic of Turkey and Romania
Yemen	Memorandum of Understanding on Technical, Scientific and Economic Cooperation in Fishery and Aquaculture
Morocco	Cooperation Agreement on Capture Fishing and Culture Fishing between the Republic of Turkey and the Kingdom of Morocco
Black Sea Economic Cooperation (BSEC)	Black Sea Economic Cooperation Agreement

In accordance with the Notification regulating Commercial Fishing in place numbered 4/1 (No. 2016/35), bottom trawling and aquaculture production are not allowed in the Mediterranean Sea between April 15 and September 15 and in our other seas between April 15 and August 31. Additionally, bottom trawling is prohibited within 3 miles between the Bulgarian border and the Cape Alacaağzı in Zonguldak Province, within 2 miles between the Cape Tekke in Amasra District of Bartın Province and the Cape Kerempe in Cide District of Kastamonu Province, within 3 miles between the

Cape Kerempe and Inceburun of Sinop Province, and within 3 miles between the Cape Çayağzı in Yakakent District of Samsun Province in the Black Sea. There are exceptions to this case in special closed areas and these exceptions include the prohibition of the use of some fishery equipment in certain regions (as specified in the circular issued annually by the Ministry of Food, Agriculture and Livestock).

Fishery activities are regulated according to the following criteria (Ref. 9.24):

- Minimum fishing net mesh sizes (for example; for bottom trawling, the trawl net mesh cannot be smaller than 40 mm and the net mesh of the cover around the trawl cannot be smaller than 80 mm in the Black Sea.);
- Minimum fishable size (length (cm) and/or weight (g));
- Indoor areas and conditions for particular equipment and/or vessels;
- Closed season and regions for fishing;
- Unfishable species: sea trout, shark (sandbar, basking, porbeagle), spiny dogfish, sea turtles, seagrass, sturgeons, dusky grouper, white grouper, oily fish, kangal fish, red coral, murex, whelk, abalone, noble pen, lamellaridae, spiny spider crab, seahorse, dolphins and whales, seal, sea turtle, commercial sponges, red coral, black coral and sturgeons;
- Completely-banned fishing methods and equipment;
- Equipment restriction for particular species;
- Equipment or fishing method restrictions.

"Closed season" is applied for the protection of the spawning stock against trawling and seine fishing between May and August. Besides, "region restriction" refers to the prohibition of fishing within three miles starting from the shore.

9.2.2 Fishery Infrastructure

Kırklareli, Istanbul and Kocaeli are the three provinces which are located in the Marmara Region and have a coast on the Black Sea and which can be associated with the Project. Table 9.12 shows information on primary fishing ports located on the Black Sea coast around the Project Site.

Table 9.12: Fishing Ports of Turkey on the Black Sea coast (Ref. 9.25)

Province	Fishing Port	Operator
Marmara Region Provinces on the Black Sea Coast		
Kırklareli	Kıyıköy Fishing Port	Private/Kıyıköy Fisheries Cooperative
Kırklareli	İğneada Fishing Port	Public/İğneada Municipality
Kırklareli	İğneada Beğendikköyü Fishing Port	-
Istanbul	Ağva Fishing Port	Public/Ağva Municipality (Ağva Fisheries Cooperative)
Istanbul	Şile Fishing Port	Public/Şile Municipality
Istanbul	Poyrazköy Fishing Port	Private/Örnek Fisheries Cooperative
Istanbul	Garipçe Village Fishing Port	Fisheries Export and Sale Cooperative
Istanbul	Karaburun Fishing Port	Public/Karaburun Village Headmanship

Province	Fishing Port	Operator
Kocaeli	Kefken Fishing Port	Private/Kefken and Neighboring Villages Fisheries Cooperative
Kocaeli	Bağırganlı Fishing Port	Private/Bağırganlı Village Fisheries Cooperative
Sakarya	Karasu Fishing Port	-

As of 2015, there are 5,766 fishing vessels operating in the Black Sea. Trammel nets, beam trawls and dredges, longlines and fishing rods, surrounding and drive-in nets, drag-nets, lift nets and fyke nets constitute 89.8% of the fishing vessels in the Black Sea while the remaining 10.2% consists of trawl vessels (5.86%), seine vessels (3.23%), carrier vessels (0.79%) and other vessels (0.35%) in the entire East and West Black Sea. A majority of the vessels (82.81%) weighs 1 to 4 tons. More than half of the vessels (69.9%) consist of 5 and 7.9m-long vessels (Ref. 9.26).

Table 9.13 below provides a comparison table for the characteristics of the Black Sea fishing fleet.

Table 9.13: Comparison of the Characteristics of Available Fishing Fleet in the Black Sea as of 2015 (Ref. 9.26)

Characteristic	Categories	Number of Vessels	% of Vessels
Activity Type	Trawler	338	5.86
	Seine	186	3.23
	Carrier Vessel	46	0.79
	Other vessel	5196	90.1
Construction Material	Wood	5272	91.4
	Sheet Metal	452	7.8
	Fiberglass	42	0.7
Tonnage (gross ton)	1-4	4775	82.81
	5-9	329	5.71
	10-29	199	3.45
	30-49	110	1.91
	50-99	145	2.51
	100-199	117	
	200-499	84	2.03
	500+	7	0.12
Engine Power (HP/kW)	1-9.9	2167	37.6
	10-19.9	562	9.7
	20-49.9	1189	20.6
	50-99.9	903	15.7
	100-199.9	413	7.2
	200-499.9	289	5.0

Characteristic	Categories	Number of Vessels	% of Vessels
	500+	243	4.2
Length (m)	5 – 7.9	4032	69.9
	8-9.9	969	16.8
	10-11.9	146	2.53
	12-14.9	134	2.3
	15-19.9	127	2.2
	20-29.9	211	3.7
	30-49.9	139	2.4
	50+	8	0.1
Total number of vessels operating in the Black Sea	5766		

Seine, trawler and carrier vessels constitute a large portion of the fishery activities carried out in Turkey. These vessels can be classified as industrial fishing vessels and their main areas of activity are the Black Sea and the Sea of Marmara. The vessels operating in the Aegean Sea and the Mediterranean Sea are smaller types (Ref. 9.27).

More than 90% of pelagic fish production in Turkey is carried out by seine vessels3. Seine fishing focuses especially on the Black Sea and the Sea of Marmara. More than 90% of demersal (bottom) fishery in Turkish seas are carried out by trawlers focusing especially on the Black Sea, the Aegean Sea and the Mediterranean Sea (in order of importance) (Ref. 9.27).

In the letter dated 20.04.2017 and numbered 13157321 of the Provincial Directorate of Food, Agriculture and Livestock of Kırklareli regarding the fishery activities in the town, it is stated that there are 90 boats in Kıyıköy Town and 25 of these boats perform fishery activities with a trawl, which varies due to transfers between provinces. It is learned that, out of all vessels in Kıyıköy, mostly trawlers and small fishing boats with a length below 12 m (gillnet, trammel net, drive-in net) carry out fishery activities and also seine boats and trawlers coming from other provinces perform substantial amount of fishing in fishing seasons.

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In the meetings held with the Kıyıköy Fishery Cooperative, the total number of fishing vessels in the town is stated as 139 and the distribution of these vessels by categories is given in Table 9.20.

Table 9.20: Fishing Vessels and their Categories in Kıyıköy

Category	Number
Trawler	27
< 12 m	40
4 m – 7 m	72

[3] Seine vessels are used to catch the large schools of pelagic fish in mid-water or near-surface by surrounding them with a deep net fence supported by barges on the surface. Small front loads in the lower side of the net fence make the leadline sink faster and the net shrinks after passing under the school of fish with a thread or rope passing through the steel ropes attached to the lower edge of the net.

Category	Number
TOTAL	139

9.2.3 Production Amounts in Fishery

Marine aquaculture represents the largest percentage of fish farming in Turkey. It is reported that the total amount of aquaculture production in 2015 was 672,241 tons; this production includes marine products (59.2%), farming products (35.8%) and fresh-water products (5.1%). (Ref. 9.26).

The marine fishery regions in Turkey are the Marmara Region, the Black Sea, the Aegean Sea and the Sea of Marmara. Of all these regions, the Black Sea accounts for the largest portion of the production. The fishery area of the Black Sea is divided into two sub-regions, East and West Black Sea. The East Black Sea Region covers the coastal provinces stretching from Artvin to Sinop while the West Black Sea Region covers the provinces stretching from Kastamonu to Kırklareli. Kırklareli Province has a shoreline of 60 km in the Black Sea, and it is highly rich in regional fish fauna even though it accounts for only 3.4% of the Black Sea shore (1,778 km) in Turkey. (Ref. 9.28)

Out of the total amount of fish caught in Turkish seas in 2015 (345,765 tons); 79.5% (274,741.7 tons) is caught in the Black Sea (68.1% in the East Black Sea and 11.4% in the West Black Sea), 8.5% (29,337.7 tons) in the Sea of Marmara, 9.6% (33,085.7 tons) in the Aegean Sea, and 2.5% (8,599.9 tons) in the Mediterranean Sea. When compared to other seas of Turkey, the East Black Sea is the most productive sea in terms of fishery (Ref 9.26).

Shallow waters are the main feeding and growing grounds for most of the species, and seasonal migration is observed in these more shallow waters (e.g. Black Sea horse mackerel) or water near the shore and in the deep-sea (e.g. bonito).

The fish species caught by Turkey in the Black Sea consist of the pelagic and demersal (bottom) fish which are the migrating species. Four small pelagic species which are important in Turkish waters of the Black Sea are anchovy, Black Sea horse mackerel, bonito and sprat respectively in terms of the amount caught.

Anchovy is the most caught fish species by Turkey in the Black Sea. The ratio of the amount of anchovy caught by Turkey in the Black Sea in 2015 to the total amount of marine fish caught by Turkey in the Black Sea was 59.3% while the same ratio was 44.04% in 2014. And, the ratio of the amount of anchovy caught in Turkey to the total amount of marine fish caught in Turkey was 55.95% and 41.74% in 2015 and 2014 respectively. Table 9.14 below demonstrates the top 10 species caught by Turkey in the Black Sea (based on the data related to the fish caught in 2014 and 2015) and the catch rates of these species in the Black Sea and Turkey.

Table 9.14: Rates of Marine Fish Caught in the Black Sea and Turkey in 2014 and 2015 (Ref 9.26)

Common Name in Turkish	Name in English	Species	Its Ratio to the Total Amount of Marine Fish Caught in the Black Sea (2014) (Ref. 9.14)	Its Ratio to the Total Amount of Marine Fish Caught in the Turkey (2014) (Ref. 9.14)	Its Ratio to the Total Amount of Marine Fish Caught in the Black Sea (2015) (Ref. 9.14)	Its Ratio to the Total Amount of Marine Fish Caught in the Turkey (2015) (Ref. 9.14)
Hamsi	Anchovy	Pelagic Migratory	44.04%	41.74%	59.03%	55.96%
İstavrit (Kraça)	Horse mackerel	Pelagic Migratory	5.78%	5.29%	4.10%	4.13%
Palamut - Torik	Atlantic bonito	Pelagic Migratory	10.50%	8.24%	1.17%	1.32%
Çaça	Sprat	Pelagic Migratory	26.03%	18.02%	27.99%	22.27%
Mezgit	Whiting	Demersal Migratory	5.51%	4.14%	4.59%	3.81%
Lüfer	Blue fish	Pelagic Migratory	3.79%	3.63%	0.92%	1.19%
İstavrit (Karagöz)	Scad	Pelagic Migratory	0.99%	1.78%	0.33%	0.69%
Tekir	Striped red	Demersal	1.86%	1.57%	1.05%	1.01%
Sardalya	Pilchard	Pelagic	0.37%	7.82%	0.12%	4.83%
Kefal	Grey mullet	Demersal	0.22%	0.74%	0.18%	0.52%

In the letter dated 20.04.2017 and numbered 13157321 of the Ministry of Food, Agriculture and Livestock regarding the fishery activities in Kıyıköy; it is stated that the most busy months for fishery activities in Kırklareli Province are September, October, November and December and the amount of fish caught varies by years. Furthermore, it is stated that the amount of fish caught in Kırklareli Province including İğneada and Kıyıköy varies annually between 1,000 tons and 4,000 tons and the products are obtained mostly from Kıyıköy Fishing Port.

Findings of the Socio-Economic Study 2017

In the meetings held with the Kıyıköy Fishery Cooperative, it is learned that the average amount of fish caught in Kıyıköy in 2016 is around 2,500 tons. Table 9.15 shows the amounts of fish caught in Kıyıköy according to the 2016 data of the Kıyıköy Fishery Cooperative.

Table 9.15: Annual Amount of Fish Caught in Kıyıköy, 2016

Fishing Vessel	Fish Species	Annual Amount Caught in Kıyıköy (tons)
Trawler	Turbot	40.5
	Whiting	1,013
	Striped Red	972
<12 m	Bluefish, Bonito, Striped Red	450

4 m – 7 m	Whiting, Bluefish, Grey Mullet, Horse Mackerel, Anchovy, Pilchard, Shad, Sea Snail, Gurnard, Seabass	27
TOTAL		2,502

9.2.4 Economic Value of Fishery

Fishery Sector (including inland fishery, culture fishery and secondary sectors such as handling and manufacturing) represents 0.3% of GDP in Turkey and considered as an important part of national economy (Ref. 9.29). The total value of marine fish in Turkey was calculated as TRY 1,033.27 million in 2015 and the marine fish coming from the Black Sea account for approximately 74% of this value. Table 9.16 below shows the most valuable marine fish products caught in the Black Sea, their economic value and their percentage relevant to the national total values of marine fish products. Anchovy is the most important species in the Black Sea in terms of both caught amount and economic value; however, it represents approximately 32% of the total value of marine fish in Turkey according to the 2015 data (Ref. 9.26).

Table 9.16: Top 10 Species in the Black Sea based on their Economic Value (Ref. 9.26)

Species (Name in Turkish)		Name in English	Price (TRY/Kg) (2015)	Value of Species Caught in the Black Sea (TRY)	% of the total value of marine products in Turkey
Hamsi	Hamsi	Anchovy	3.67	333,551 million	32.28
	Balık unu ve yağ	Fish meal and oil	0.76	77,980 million	7.55
İstavrit (Kraça)		Horse mackerel	5.81	65,52 million	8.04
Palamut-Torik		Atlantic bonito	9.64	30,99 million	4.27
Mezgit		Whiting	6.59	83,11 million	8.39
Lüfer		Blue fish	18.41	46,30 million	7.37
Tekir		Striped red	13.16	37,79 million	4.43
İstavrit (Karagöz)		Scad	6.7	6,09 million	1.54
Turbot		Turbot	57	12,77 million	1.32
Barbunya		Red mullet	24.08	10,00 million	2.93
Kefal		Grey mullet	7.17	3,46 million	1.24
Other species			7.4	0,03 million	0.11
Total value of marine aquaculture products in the Black Sea				757,357 million	73.29
Total value of marine aquaculture products in Turkey				1.033,27 million	

Fishery activities in Kırklareli focus on a small number of species; turbot, red mullet and whiting are main species caught by bottom trawling while bonito, bluefish and anchovy are main species caught by seine nets. As a majority of the schooling fish move counterclockwise during their migration in the

Black Sea, a large number of high-tech boats come from other ports to the shores of Kırklareli with the start of fishing season.

Marine fishery is generally performed by boats and motor-boats, and any species of fish can be caught based on the season. According to the findings of the aquatic ecosystem study conducted, it is found that the commonly caught fish species in the region are bonito (Sarda sarda) and striped red (Mullus surmuletus). In addition; horse mackerel (Trachurus trachurus), turbot (Psetta maxima), sole fish (Solea solea) and seahorse (Hippocampus hippocampus) are also detected in the region during the field study. It is known that the most important fish species in the region are bonito and striped red and that they play a crucial role in the region's economy; however, it is observed that there has been a decrease in the bonito population of the region in recent years. Other economic fish species caught include turbot, bluefish, horse mackerel, anchovy, gurnard, whiting, small bluefish, bream and seabass.

Kırklareli Province has three small fishing ports, one in Kıyıköy and other two in İğneada. Table 9.17, Table 9.18 and Table 9.19 provide information on the characteristics of the fishing ports in Kıyıköy and İğneada.

Besides, Figure 9.22 demonstrates the approximate distance between the Project Site and Kıyıköy, İğneada and İğneada Beğendik Village Fishing Ports.

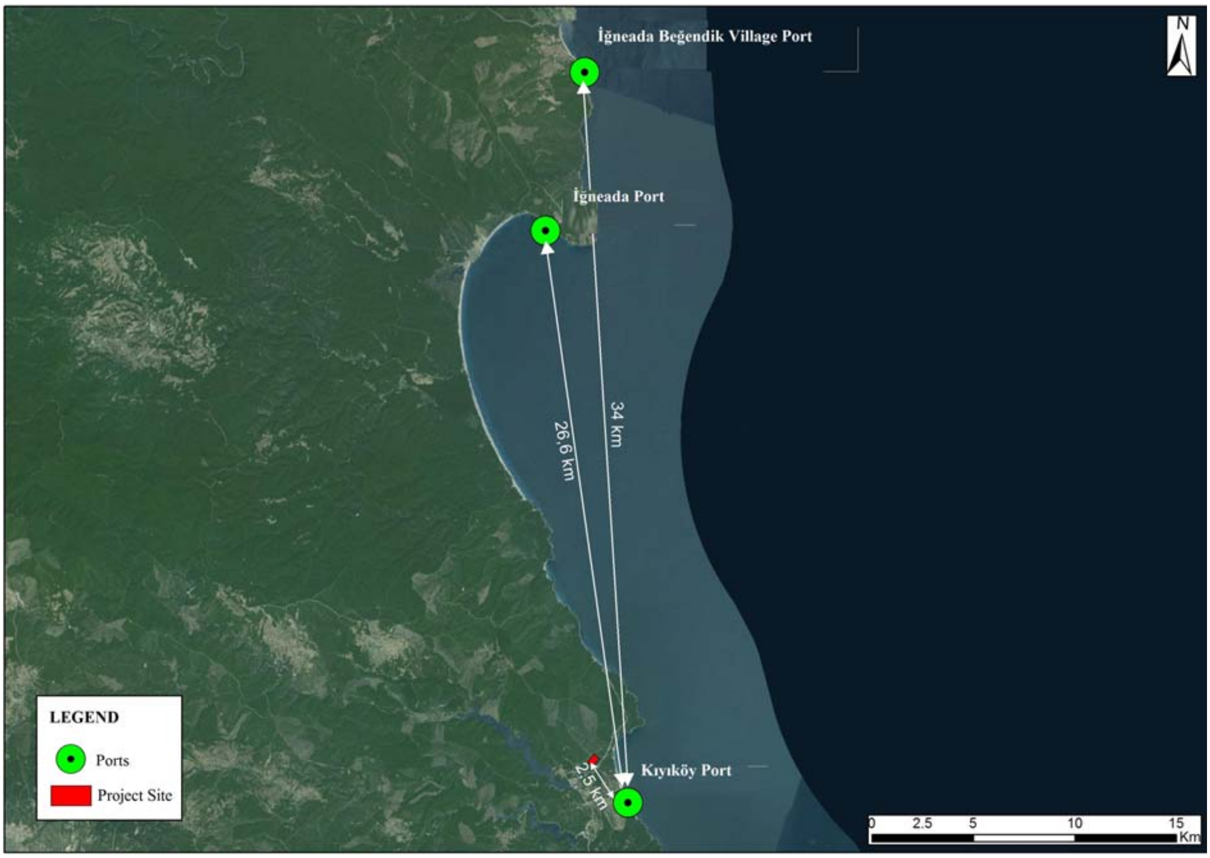


Figure 9.22: Distance between the Project Site and İğneada, İğneada Beğendik Village and Kıyıköy

Table 9.17: Kıyıköy Fishing Port / Kırklareli, Vize (Ref. 9.25)

Category - Geographical Item No	Coastal Fishing Facility in Operation - 161
Type/Sector of Funds	Fishing Port, Funds Allocated from Agriculture Sector
Length of Main Breakwater (m)	290
Length of Secondary Breakwater (m)	140
Length and Depth of Dock (m)	251.5 m (-2 m)
Sheltered Area of Water (ha)	4.05
Infrastructure	Electricity, Water, Lighthouse
Superstructure	-
Current Dock Capacity (quantity)	63
Addable Dock Capacity (quantity)	157 (Total Capacity: 220)
During Fishing Season	
Number of Fishing Boats Used	300
Number of Other Boats Used	0
Density (%)	136.4
Off-Season	
Number of Fishing Boats Used	180
Number of Other Boats Used	16
Utilization Rates of Sectors during Fishing Season	Agriculture (100%)
	Tourism (0%)
	Transportation (0%)
Operator	Kıyıköy Fisheries Cooperative
EIA Status	
Hinterland Transport Connection	Asphalt (30.2 km)

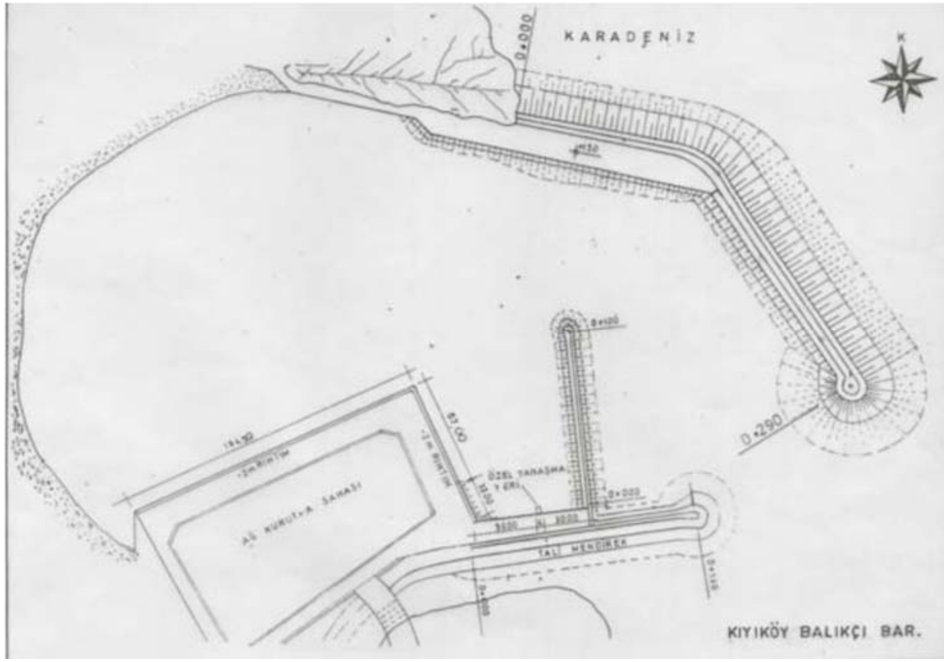


Table 9.18: İğneada Fishing Port / Kırklareli, Demirköy (Ref. 9.25)

Category - Geographical Item No	Coastal Fishing Facility in Operation - 162
Type/Sector of Funds	Fishing Port, Funds Allocated from Agriculture Sector
Length of Main Breakwater (m)	890
Length of Secondary Breakwater (m)	340
Length and Depth of Dock (m)	60 m (-3,5 m), 150 (-5 m)
Sheltered Area of Water (ha)	18
Infrastructure	Electricity, Water, Lighthouse, Boatyard
Superstructure	-
Current Dock Capacity (quantity)	53
Addable Dock Capacity (quantity)	247 (Total Capacity: 300)
During Fishing Season	
Number of Fishing Boats Used	81
Number of Other Boats Used	0
Density (%)	27
Off-Season	
Number of Fishing Boats Used	81
Number of Other Boats Used	0
Utilization Rates of Sectors during Fishing Season	Agriculture (100%)
	Tourism (0%)
	Transportation (0%)
Operator	İğneada Municipality
EIA Status	
Hinterland Transport Connection	Asphalt (64.5 km)

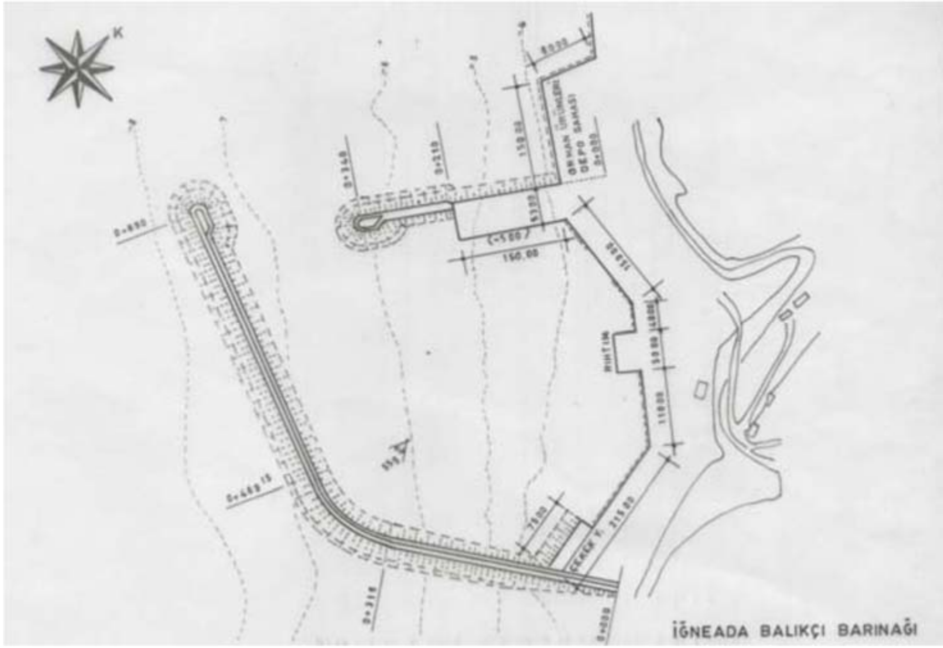
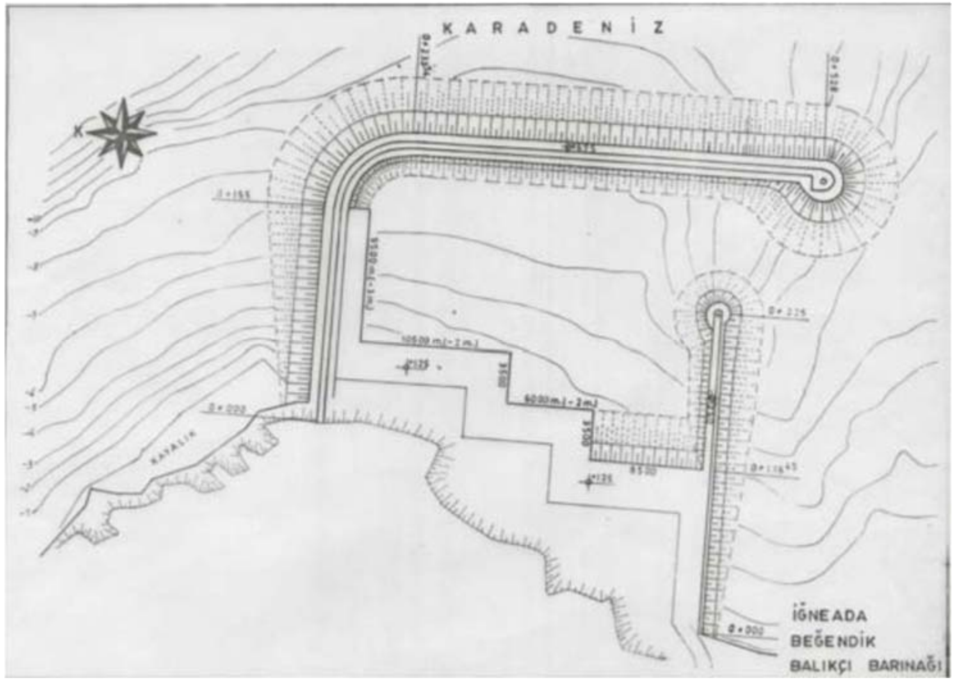


Table 9.19: İğneada Beğendik Village Fishing Port / Kırklareli, Demirköy (Ref. 9.25)

Category - Geographical Item No	Coastal Fishing Facility under Construction - 161
Type/Sector of Funds	Fishing Port, Funds Allocated from Agriculture Sector
Length of Main Breakwater (m)	528
Length of Secondary Breakwater (m)	225
Length and Depth of Dock (m)	165 m (-2 m), 95 m (-3 m)
Sheltered Area of Water (ha)	3.48
Infrastructure	-
Superstructure	-
Current Dock Capacity (quantity)	69
Addable Dock Capacity (quantity)	51 (Total Capacity: 120)
During Fishing Season	
Number of Fishing Boats Used	-
Number of Other Boats Used	-
Density (%)	Information not available
Off-Season	
Number of Fishing Boats Used	-
Number of Other Boats Used	0
Utilization Rates of Sectors during Fishing Season	-
	-
	-
Operator	-
EIA Status	Available, 16.11.1995
Hinterland Transport Connection	Asphalt (76 km)



In the meetings held with Kıyıköy Municipality within the scope of the socio-economic studies carried out in January-March 2017, it is learned that there are planning works going on for the extension of Kıyıköy fishing port and an application will be made to official bodies for the approval of the plan. Section 9.1.1 provides detailed information on the planned "Construction Project for Kıyıköy Fishing Port Extension".

Moreover; trout, barbel and carp are mainly caught by line fishing in rivers and streams. The amount of carps caught in Kırklareli accounts for approximately 94% of the total amount of fresh-water products in the province. Trout is abundant in natural environments especially in Dereköy, Balaban, Karadere, Kula, Çağlayık, Kazan and Pabuçdere. (Ref. 9.17).

The production amount of fresh-water trout in Turkey was 437.5 tons, 431 tons and 371 tons in 2013, 2014 and 2015 respectively. It is reported that the production amount of inland trout (rainbow and salmo species) and the production amount of sea trout (rainbow and salmo species) were 101,166 tons and 6,872 tons in Turkey in 2015 (Ref. 9.26), and approximately 0.21% of inland trout production was made in Kırklareli Province.

There are 30 fish hatcheries in Kırklareli Province. Fish hatcheries in Kırklareli Province are given in Table 9.20.

Table 9.20: Fish Hatcheries in Kırklareli Province (Ref. 9.10)

Hatchry Name	Location	Hatchry Name	Location
Hakkı Yen	Kaynarca-Pınarhisar	**Ömer Aydın**	Balaban-Demirköy
Gökçen	Vize	**Tikveşli**	Balaban-Demirköy
Kardeşler Alabalık	Balaban Village Demirköy	**F.Yalçındağ**	Balaban-Demirköy
Harun Omaç	Demirköy	**Kartal Alabalık**	Kömürköy –Dolapdere Quarter-Vize
Aras Alabalık	Dereköy	**Zafer Yılmaz**	Kömürköy-Dolapdere-Vize
Salmona	Balaban Village Demirköy	**Bekir Çetin**	Armağan Dam Reservoir
Aydınlar Alabalık	Çifte Kaynaklar Papuçdere	**Mergen Alabalık**	Küçük Yayla Village-Vize
Ergül Alabalık	Geçitağzı Village	**Yeşil Vadi**	Aksicim Village-Vize
Kartal Kaya Alabalık	Balkaya Village	**Balaban 1**	Aksicim Village-Vize
Filiz Su Ürünleri	Balkaya Village-Vize	**Balaban 2**	Aksicim Village-Vize
Balkaya Alabalık	Balkaya Village-Vize	**A.G.D.Su Ürün.San**	Panayır Dere Quarter-Vize
Kofcaz Su Ürünleri	Kocayazı Village-Kofcaz	**Kaya Alabalık Üretim**	Kula Village Düztarla Quarter-Kofcaz
Ü.M.H	Karanlık Neighborhood Arnavut veren village-Demirköy	**Alabalık Üretim Tesisi**	Kızılaşaç Village-Vize
Istranca Alabalık	Balkaya Village-Vize	**C.Güldütuna**	Velika Dere Quarter-Demirköy
Gülbiten Alabalık Ür.	Karacadağ Village-Demirköy	**Mergen Alabalık**	Küçük Yayla Village-Vize

9.3 Employment Conditions in Fishery

Fishery and aquaculture provide a means of livelihood for nearly 54.8 million people in the world as a primary production activity. In addition to primary production sector, nearly 660-820 million people in the world considering researchers and families make a living from this sector through handling, packaging, marketing, distribution, manufacturing handling machines, manufacturing nets, ice production and supply, and vessel construction and maintenance activities (Ref 9.30).

As of 2015, the fishery activities in the Black Sea region of Turkey provide employment for 14,339 people which correspond to approximately 45.7% of the total labor force engaged in fishery activities in Turkey. According to the 2015 data, the ratio of employees engaged in fishery activities in Turkey to national employment is 0.12% (Ref. 9.26, Ref 9.32).

Fishery in Turkey is a practice that is traditionally and most commonly handed down from father to son in a family. A majority of the people engaged in fishery come from the families who traditionally work in the fishery sector. Employees range from paid crew in fishing vessels to partners and family members of fishers working for free. Full-time employees in fishery sector in the Black Sea account for 86.5% of all fishers working in the Black Sea; 86% of them are aged between 20-55, 11.7% are aged over 55 and 2.3% are aged under 20. However, this employment figures do not include the people engaged in secondary activities such as handling, packaging, marketing and distribution, manufacture and maintenance of fishing materials, nets and gear. Approximately 12.5% of the employees are family members or partners -who work for free- of fishers, and it is likely that these employees are engaged in secondary services such as fish cleaning and handling; however, the exact figures cannot be calculated. Food and Agriculture Organization of the United Nations assumes that three to four relevant employment opportunities were created in secondary activities for each person directly engaged in aquaculture production globally in 2010 (Ref. 9.26).

Table 9.21, Table 9.22, Table 9.30 and Table 9.23 show the employment situation in fishery activities according to the 2015 data of the Turkish Statistics Institute.

Table 9.21: Employees in Fishery Sector by Production Region, 2015 (Ref. 9.26)

Employees in Fishery Sector	Total	East Black Sea	West Black Sea	Marmara	Aegean	Mediterranean
Total	*31,350*	*8,157*	*6,182*	*6,730*	*6,909*	*3,372*
Fisher	11,829	2,953	1,789	2,110	3,504	1,473
Partners working for free	1,122	466	170	276	147	63
Family members working for free	2,773	630	520	390	950	283
Paid crew	7,324	2,384	2,179	1,098	685	978
Crew working in exchange for a share out of the fish caught	7,290	1,345	1,373	2,615	1,495	462
Paid partners and family members	780	234	135	193	105	113
Other	232	145	16	48	23	-

Table 9.22: Employees in Fishery Sector by the Type of the Operating Vessel, 2015 (Ref. 9.26)

Employees in Fishery	Total	Trawler	Seine	Carrier Vessels	Trammel Nets	Beam Trawls and Dredges	Longlines and Fishing Rods	Surrounding and Drive-in	Drag-Nets	Lift Nets	Fyke Nets	Other
Total	*31,350*	*3,482*	*8,267*	*204*	*11,231*	*1,145*	*4,355*	*2,355*	*57*	*30*	*27*	*197*
Fisher himself	11,829	530	342	40	6,023	373	3,488	882	12	20	15	104
Partners working for free	1,122	104	156	12	577	89	79	92	3	5	3	2
Family members working for free	2,773	131	118	3	1,579	113	402	372	6	5	2	42
Paid crew	7,324	1,392	4,496	103	801	205	172	130	4	-	3	18
Crew working in exchange for a share out of the fish caught	7,290	1,089	2,757	26	2,058	311	176	822	28	-	4	19
Paid partner	293	64	64	3	96	7	13	34	-	-	-	12
Paid family members	487	155	131	10	97	46	25	19	4	-	-	-
Other	232	17	203	7	-	1	-	4	-	-	-	-

Table 9.30: Distribution of Employees in Fishery Sector by Age Group, Working Hours and Marine Regions, 2015 (Ref. 9.26)

Regions of marine products	Total	Age groups							
		Working Hours		Under 20		20-55		Above 55	
		Full-Time	Part-Time	Full-Time	Part-Time	Full-Time	Part-Time	Full-Time	Part-Time
Total	*31,350*	*27,981*	*3,369*	*619*	*178*	*23,719*	*2,679*	*3,643*	*512*
East Black Sea	8,157	7,159	998	161	75	6,331	769	667	154
West Black Sea	6,182	5,249	933	131	31	4,335	791	783	111
Marmara	6,730	6,050	680	178	39	5,135	461	737	180
Aegean	6,909	6,335	574	88	32	4,947	476	1,300	66
Mediterranean	3,372	3,188	184	61	1	2,971	182	156	1

Table 9.23: Distribution of Employees in Fishery Sector by Age Group, Working Hours and Activity Type, 2015 (Ref. 9.26)

Activity Type	Total	Age groups							
		Working Hours		Under 20		Between 20-55		Above 55	
		Full-Time	Part-Time	Full-Time	Part-Time	Full-Time	Part-Time	Full-Time	Part-Time
Total	*31,350*	*27,981*	*3,369*	*619*	*178*	*23,719*	*2,679*	*3,643*	*512*
Trawler	3,482	3,252	230	88	32	3,028	195	136	3
Seine	8,267	7,571	696	229	52	7,114	638	228	6
Carrier Vessel	204	150	54	3	15	137	39	10	0
Trammel Nets	11,231	10,162	1,069	147	47	8,139	799	1,876	223
Beam Trawls and Dredges	1,145	1,098	47	35	2	974	44	89	1
Longlines and Fishing Rods	4,355	3,666	689	67	7	2,606	481	993	201
Surrounding and Drive-in Nets	2,355	1,799	556	22	23	1,516	457	261	76
Drag-Nets	57	55	2	0	0	46	2	9	0
Lift Nets	30	30	0	10	0	0	0	20	0
Fyke Nets	27	27	0	6	0	16	0	5	0
Other	197	171	26	12	0	143	24	16	2

Findings of the Socio-Economic Study 2017

The findings of the socio-economic studies and literature reviews conducted within the scope of the Project show that fishery is the main source of income of Kıyıköy. According to the data from TurkStat, nearly 573 people are categorized as employees earning a livelihood by fishing in Kıyıköy whose total population was 1,977 in 2016. Table 9.24 provides the number of employees earning their livelihood by fishing in Kıyıköy according to the information obtained from the Kıyıköy Fishery Cooperative. (Ref. 9.31). According to the information obtained from the Kıyıköy Fishery Cooperative, nearly 1,500 people (including those who are engaged in fishery and their families) in the town depend on fishery to earn a living. This accounts for about 75% of the town's population. As of February 2017, the cooperative has 126 members.

Table 9.24: Number of Employees Earning a Livelihood by Fishing

	Number of Vessels	Number of Vessel Owners and Crew	Total Employees
Trawler	27	7	189
<12 m	40	6	240

4 m - 7 m	72	2	144
Total			573

Fishing season is between September 1 and April 15, and it varies based on the boat type. According to the findings of the socio-economic studies carried out in October 2015 and January-March 2017, trawlers operate only during the period between September 1 and April 15 which is the fishing season. However, they do not operate in bad weather conditions in winter. Large vessels (larger than 12 m), too, operate for 7.5 months during the fishing season between September 1 and April 15. Vessels smaller than 12 m have a permit to operate all year long, and they can only operate for 3 months (September-October-November) because of the fish species they catch. Small vessels which operate as angling, trotlining and drive-in fishing vessels go on fishing for 6 months as of April, and they are beached in winter for maintenance and repair. Therefore, fishing is performed all year long in Kıyıköy.

Trawlers cast off for fishing around 04.30 - 05.00 in the morning and go back to the port around 19.00 in the evening. Vessels with a length between 7 m - 12 m fish for 12 hours. And, small vessels cast their nets during nightfall and collect them earlier in the morning.

Fishery provides in-kind incomes in addition to cash incomes for the households in Kıyıköy. Fishers sell the products they catch to Istanbul through middlemen (Figure 9.23). Istanbul Fish Market is the most important point-of-sale for fishers from Kıyıköy. There are secondary lines of work including those who work as a middleman and those who engage in net repair and vessel maintenance in Kıyıköy.

Figure 9.23: Sales Chain of the Fish Caught in Kıyıköy

9.3.1 Social Survey Study on Fishery

A social survey study was conducted with the fishers living in and around Kıyıköy by a fish expert on July 9-10, 2015, in addition to the socio-economic studies carried out by sociologists for the Project, with the purpose of making a comprehensive assessment of the employment conditions in fishery activities in Kıyıköy. The results of the social survey study conducted with the fishers living in and around Kıyıköy are summarized below: It is learned that, out of 14 people taking part in the social survey study, 11 people are vessel owner fishers (skipper), 1 person is a vessel crew member, one of the other two people is the operator of one of the fish markets owned by the Kıyıköy Fishery Cooperative and the other one is an employee under this operator (Interviews are made in a conversational manner and the course of the conversation is determined by the pre-prepared questions);

- It is learned, as a result of the interviews made with the Kıyıköy Fishery Cooperative and the fishers in field, that approximately 1,500 people out of nearly 2,000 people living in Kıyıköy Town earn their living from fishery activities;
- When making a distinction between vessels based on their sizes in the interviews made with fishers, the terms "large-scale fishers" and "small-scale fishers" are used. The term "large-scale fisher" refers to the fishers owning a boat larger than 12 m while the term "small-scale fisher" refers to the fishers owning a boat smaller than 12 m;

- The number of crew members working in large-scale boats is minimum 5, and this may increase depending on the productivity of the season. It is learned, as a result of the interviews, that small-scale boats cast off with minimum 1 and maximum 4 crew members. Crew members working in the boats are not generally family members;
- It is learned that all of the fishers in Kıyıköy are engaged in fishery just to provide for their own families and that they do not own any companies or company partnership;
- It is learned that large-scale fishers perform fishing activities with trawling and seine techniques while small-scale fishers carry out fishing activities with trotline, trammel and other types of nets;
- Small-scale fishers go fishing in the area extending from 3 to 6 miles offshore while large-scale fishers go fishing generally in the area extending from 3 to 25 miles offshore. The area between the shore and 3 miles offshore is a restricted zone;
- It is learned, as a result of the interviews, that the fishing activities of small-scale fishers are adversely affected by the use of trawling technique by large-scale fishers;
- Fishing season lasts for the period between September 1 and April 15, however, this restriction is only meant for the vessels larger than 12 m;
- It is learned that 15 to 20 large boats other than Kıyıköy fishers come to the region in the fishing season; It is stated that these are seine boats and they come generally from Rumeli Hisarı (Rumeli Fortress) of Istanbul;
- It is learned that bonito and striped red have the most important role in the region's economy and other fish species caught in the region include turbot, bluefish, horse mackerel, anchovy, gurnard, whiting, small bluefish, bream and seabass. Besides, brown crab (a species of crab) is one of the sea products caught in the region.
- It is observed, during the interviews, that there are a couple of small motor boats other than fishing boats in the port. It is stated in the interviews that these boats belong to amateur anglers coming from Saray.

9.4 Impact of the Project on Fishery

As explained in Sections 9.2 and 9.3, fishery is a line of work which is the locomotive of the local economy in the immediate vicinity of the Project. It is likely that the Project activities will have some temporary (limited to the construction phase) impacts on fishery which has an economic value for Kıyıköy Town.

In the meetings held with the Kıyıköy Fishery Cooperative, it is learned that the fishery activities closest to the shore are performed by the boats smaller than 12 meters (up to maximum 1 mile) or by the boats of the anglers (up to maximum 10 miles).

On contrary to the construction equipment which are fixed and will stay in the Landfall Section for a long duration, pipe-laying vessels will lay pipes by maintaining their constant speed in general throughout the entire line. Therefore, they will have short-term and temporary impacts. Where applicable, the operation duration of the vessels in the Shore Crossing Section will be minimized.

Meetings to reach a mutual agreement will be held with official authorities with the purpose of creating a navigational safety zone with a radius of approximately 2 km (1.1 nautical miles) for a dynamic positioning vessel and with a radius of 1.5 km (0.8 nautical mile) for an anchored pipe-laying vessel (in a water depth of 30 meters) in order to ensure navigational safety around the pipe-laying vessel and also a navigational safety zone with a radius of approximately 500 m (0.3 nautical mile) around the dredging vessel during the dredging activities in the Shore Crossing Section. The navigational safety zone will not restrict the access of the boats/vessels to the onshore docks or ports. Boats/vessels will always be provided with a passage way to go to the ports. The exact location of the vessels will be notified to the competent authorities as per Turkish legislation during the construction.

Additional meetings will be held with the Kıyıköy Fishery Cooperative and the sea users (including fishers) to explain the details of the Project activities in the Shore Crossing Section and to address the questions and concerns.

The Turkish Government sent a diplomatic note dated February 13, 2017 and numbered 2017/87769974-Moskova BE/11978880 to the Government of Russia regarding an operational safety zone with a width of 420 m that can be applied in the TurkStream Gas Pipeline - Offshore Section. Activities performed to the sea floor such as trawling and/or anchoring will be restricted in this operational safety zone; however, the safety zone will not prevent vessels from passing above the pipeline or carrying out fishery activities that do not include dredging and/or anchoring. It is not anticipated that the Project will have an impact on trawling activities in the operation phase because of the fact that the area where the trawlers can carry out their fishery activities is larger than the operational safety zone and that they can continue fishing outside the operational safety zone. Kıyıköy Fishery Cooperative and other fishery communities will be informed on the safety risks of trawling near the pipeline in the operation phase of the Project. Besides, coordination will be ensured with the Kıyıköy Fishery Cooperative and maritime authorities for the marine safety zones to be established in the operation phase of the Project.

The efficiency of the impact mitigation measures to be taken will be monitored in addition to the monitoring of potential impacts on fishery activities through ongoing meetings with the Kıyıköy Fishery Cooperative. The potential impacts of the Project on fishery will be strived to be minimized as much as possible through the measures stated above as well as the general impact mitigation measures which are detailed in Section 9.17.

The impacts of the construction and operation phases of the Project on aquaculture and fishery are analyzed in detail in Chapter 6.9 (Fishery and Aquaculture).

9.5 Impact of the Project on Tourism

The construction activities for the Shore Crossing Section of the Project are planned to start in the second quarter of 2018 and continue until the end of the year. It is likely that the construction activities will increase the turbidity of the sea water and cause visual impacts on the panoramic view of the Selves Beach. A sediment distribution model which is detailed in Chapter 6.3.2 is prepared by the Institute of Marine Sciences and Technology of the Dokuz Eylül University under the Project. Moreover, the same institute is preparing a "Dredging Environmental Management Plan" within the scope of the "Draft Regulation on Dredging and Environmental Management of Dredged Material". The draft plan will be finalized after sharing it with the Directorate General of Environmental Management, Ministry of Environment and Urbanization and receiving their comments, and it will be shared as a separate document with the relevant commission members and other official bodies if requested. Chapter 7.1.2 provides detailed information on the draft plan.

The turbidity that will occur in the sea water will have relatively local and short-term socio-economic impacts since the shore crossing construction activities of the Project will be carried out only in the area which is not preferred due to transportation constraints in the north of the Selves Beach.

Therefore, the potential of the turbidity that will occur during the construction phase to have an impact on the southern parts of the Selves Beach is assessed as low.

It is envisaged that the dust which will occur due to the construction activities of the Project will have local and short-term impacts on the visitors who will be near the construction site. An area in the north of the Selves Beach will be temporarily closed to public due to health and security reasons during the shore crossing construction. Therefore, the dust exposure levels are not anticipated to be high during the construction phase. Chapter 10.5 (Air Quality Assessment) explains the measures to be taken in order to minimize the environmental impacts of the dust that will occur due to the Project activities.

It is envisaged that the noise and vibration which will occur in the construction and pre-commissioning phase of the Project will have local and short-term impacts on the visitors who will be in and around the Selves Beach. Chapter 10.6 (Noise and Vibration) explains the measures to be taken in order to minimize the environmental impacts of the noise and vibration that will occur due to the construction activities. Campers in the region may be adversely affected by the construction activities that will continue for 24 hours in the Shore Crossing Section of the Project and by the noise to be generated by the air compressors that will be used in the pre-commissioning phase of the Project. However, the noise-induced socio-economic impacts will be short-term and temporary impacts as they are limited to the construction phase. Additionally, it is not expected that the Project will have impacts on camping as there are alternative camping sites for camping activities.

Some temporary visual impacts may occur in the construction phase due to the Project. It is anticipated that the most important visual impacts will be caused by the construction activities in the Shore Crossing Section of the Project which will be seen from the Selves Beach. Besides, the visitors going to the Selves Beach may be exposed to visual impacts associated with the onshore Project activities while they are moving along the ISKI (Istanbul Water and Sewerage Administration) road used for access to the Selves Beach or travelling to Kıyıköy through the main road from Vize. However, it is expected that there will be temporary and short-term impacts as they are limited to the construction period.

The construction activities in the Shore Crossing Section will not be seen from the Municipal Beach and the Port Beach.

The construction activities of the Shore Crossing Section in the north of the Selves Beach will not be substantially seen in the panoramic view at the highest spot which is located in the north of Kıyıköy Town and sees the Selves Beach except for a couple of spots in the easternmost part of Kale Neighborhood. Construction vessels will be seen from a couple of high spots in the north of the town. However, these visual impacts will be temporary and shore-term impacts as they will be limited to the construction phase. There are "view points" that may include such tourism establishments as cafes, restaurants and accommodation providers where the Receiving Terminal can be seen in Kıyıköy Town. Especially, the establishments in the north of the town may be exposed to visual impacts. However, it is not envisaged that the view of the Receiving Terminal will affect the tourism activities. A majority of the tourists go to the beaches in Kıyıköy; the Receiving Terminal will not cause any visual impact on these beaches and there will be no restrictions on the use of beaches in the operation phase of the Project. The mitigation of visual impacts caused by the existence of the Receiving Terminal through planting and landscape management is addressed in Chapter 10.11 (Visual Impacts).

The potential impacts of the Project on tourism establishments and local people engaged in tourism will be strived to be minimized as much as possible through the measures given below as well as the general impact mitigation measures which are detailed in Section 9.17:

- There will be temporary utilization restrictions in the north of the Selves Beach during the construction, and this area will be temporarily closed to public due to public health and safety reasons. There will be temporary swimming restrictions in the north of the beach while the construction vessels are operating near the shore and the causeway. In this case, the restricted areas will be announced with warning signs;
- Where applicable, a construction schedule will be prepared to minimize the total duration of temporary access restrictions to the beach and the camping site and the duration of construction activities in summer which is the busiest season. Warnings about the restrictions will be hanged in the beach as early as possible;
- Local authorities, tourism establishments and local community will be contacted before the commencement of the construction activities regarding the safety restrictions and potential impacts as well as the construction and pre-commissioning activities;
- Coordination will be ensured with the relevant authorities and the stakeholders (e.g. Kıyıköy Municipality, Kıyıköy Culture and Tourism Association) regarding the provision of safe access to available trekking routes, hunting regions and Selves Beach and the use of other alternative areas;
- The affected parts of the beach and the surrounding area will be reinstated right after the completion of the construction;
- It is important to implement such strategies that will eliminate the adverse impacts of the construction works in order to control the factors including dust, noise and road deformations in summer months which are the main source of tourism incomes. In this context, dust suppression methods and regular noise monitoring activities will be implemented especially in summer; and
- Cooperation will be ensured with the relevant authorities so as to take necessary measures for hunting activities performed by third parties near the construction activities.

9.6 Cultural Heritage and Archeology

9.6.1 Offshore and Shore Crossing Sections

Anaerobic conditions that prevent corrosion and microbiological degradation in the Black Sea make it substantially easy to safeguard any cultural heritage elements present at depths below 120-200 m. Therefore, it is highly probable that the remains of any existing wooden ship are safeguarded. Potential cultural heritage remains in the Project site and impact mitigation measures are addressed in Chapter 6.10 (Cultural Heritage and Archeology).

The archeology of the Black Sea basin reflects a mixture of European, Anatolian and Eurasian steppe cultures. Settlement on the Black Sea coasts started during Middle and Upper Paleolithic period and this region served as a link for interactions between the East Europe and the Caucasus. It is believed that the Black Sea coastal plain was substantially larger during that period as the water level was nearly 150 m below the current level. It is believed that villages engaged in agriculture emerged on the southern and western coasts in the 6th and 5th centuries BC. Ceramic and metal samples collected from the coasts of Bulgaria and Turkey point out that there were interactions between the coastal regions probably through sea voyage in the 4th century BC. In the Bronze Age following this period, an intensive settlement activity consisting of villages engaged mainly in agriculture and pastoral nomadic settlements in various parts of the Black Sea coast is observed. The distribution of artifacts belonging to the Bronze Age in the 3rd and 2nd centuries BC in the regions surrounding the Black Sea basin points out an efficient trade network (Ref. 9.33).

With the emergence of Greek colonization period in 800-700 BC, the Black Sea became an important junction point of the ancient world. Economies depending on marine trade did business between the central-southern Black Sea coasts and Crimea.

This trade business done in the north-south direction is documented with a substantial amount of amphora and ceramic remains detected in the settlements in Sinop located on the central-northern Black Sea coast (Ref. 9.33). In the coastal geology and underwater cultural landscape of the Black Sea, ancient shipwrecks which date back to the Hellenistic period in the coasts of Bulgaria, Turkey and Ukraine are documented (Ref. 9.34).

For the Offshore Section of the Project, no cultural heritage elements are observed on the pipeline route on the maps supplied from the Office of Navigation, Hydrography and Oceanography (ONHO) in February 2017. In addition, a study was conducted by the Project Owner for the detection of potential cultural heritage elements that may be found in the Offshore Section. This study includes an identification search by means of the sensors mounted to the Heater Sea vessel and more detailed searches made by an Autonomous Underwater Vehicle (AUV). The results of the studies completed were evaluated together and the cultural heritage elements found were listed.

For the Shore Crossing Section of the Project, along with the desk-based assessments, an archeological underwater research was conducted between 07.11.2015 and 13.11.2015 with the participation of a team from the Institute of Marine Sciences and Technology affiliated to the Dokuz Eylül University and two experts -one from Bodrum Museum of Underwater Archeology and one from Kırklareli Museum- upon the request and under the coordination of the Department of Excavations and Research - General Directorate of Cultural Heritage and Museums - Ministry of Culture and Tourism. Following the marine study which lasted for 7 days, the office work including mapping and interpretation was completed and a scientific report dated 11.12.2015 was prepared. According to the report prepared, no remains or ruins falling under the laws no. 2863 and 3386 were found -except for natural formations- as a result of seismic and sonar scanning and scuba diving performed in the region covering the Selves Beach and the pipeline planned to be laid offshore. An up-to-date letter of comment was requested from the Ministry of Culture and Tourism because of the change in the Project Site, and it is stated in the letter dated 30.03.2017 that the conducted study is valid. It is stated in the same letter that the General Directorate of Cultural Heritage and Museums - Ministry of Culture and Tourism has no objection to carrying out necessary studies in line with the results of the underwater research made in the sea side of the area where the pipeline will be connected to onshore and that the Governorship of Kırklareli has been notified of the matter.

9.6.2 Landfall Section

Thrace is a region that is quite rich in historical structures and stone houses. Edirne, Enez, Marmara Ereğlisi, Central District and Vize District of Kırklareli stand out in terms of archaeological tourism in the region.

In the letter dated 13.03.2017 and numbered B.16.0.KVM.4.22.00.02/39.08.282/484 of the Board of Edirne given in **ANNEX-5.A**, it is identified that there are 15 registered archeological sites around the Project Site. None of these 15 archeological sites will be directly affected by the Project activities. According to the information obtained from the "Cultural Heritage Inventory of Kırklareli" website which is prepared by the Provincial Directorate of Culture and Tourism of Kırklareli with the Project

Support of the Trakya Development Agency, the details of the archeological sites and monuments located in and around the shore crossing and landfall sections of the Project Site are given below (Ref 9.35):

Kaz Limanı Tumulus: It is located in Kıyıköy territory of Vize district in Kırklareli province and it is about 1.1 km away from the Project Site. It is declared as 1st degree archeological site by the decision dated 20.01.2016 and numbered 2901 of the Board of Edirne. It has a height of 4-5 m and a diameter of 25-30 m. It is a tumulus ruined by treasure hunters, and it dates back to the Early Iron Age.

Vezirtepe Tumulus: It is located in Kıyıköy territory of Vize district in Kırklareli province and it is about 1.6 km away from the Project Site. It is declared as 1st degree archeological site by the decision dated 10.07.1991 and numbered 942 of the Board of Edirne. It is a tumulus which dates back to the Early Iron Age. This tumulus which is located 1.6 km west of the town center is ruined. A water tank is built on it and so it is deformed.

Vezirtepe A Tumulus: It is located in Kıyıköy territory of Vize district in Kırklareli province and it is about 1.4 km away from the Project Site. It is declared as 1st degree archeological site by the decision dated 11.05.2000 and numbered 6092 of the Board of Edirne. It dates back to the Early Iron Age. The tumulus covers an area with a height of approximately 3 m and a diameter of 18 m. There are destruction pits on the tumulus.

Vezirtepe B Tumulus: It is located in Kıyıköy territory of Vize district in Kırklareli province and it is about 1.3 km away from the Project Site. It is declared as 1st degree archeological site by the decision dated 11.05.2000 and numbered 6092 of the Board of Edirne. It is a tumulus dating back to the Early Iron Age.Southern foothills of the tumulus located in the 1st Degree Natural Site are ruined. The tumulus has a height of approximately 3.5 m and a diameter of 16 m.

Vezirtepe C Tumulus: It is located in Kıyıköy territory of Vize district in Kırklareli province and it is about 1.3 km away from the Project Site. It is declared as 1st degree archeological site by the decision dated 11.05.2000 and numbered 6092 of the Board of Edirne. It is a tumulus dating back to the Early Iron Age.The tumulus has a height of approximately 3 m and a diameter of 20 m. There are illegal excavation traces on it.

Vezirtepe D Tumulus: It is located in Kıyıköy territory of Vize district in Kırklareli province and it is about 1.2 km away from the Project Site. It is declared as 1st degree archeological site by the decision dated 20.01.2016 and numbered 2901 of the Board of Edirne. It is a tumulus dating back to the Early Iron Age.The tumulus has a height of approximately 2 m and a diameter of 25-30 m (Figure 13). There are illegal excavation destructions on it.

Vezirtepe E Tumulus: It is located in Kıyıköy territory of Vize district in Kırklareli province and it is about 1.1 km away from the Project Site. It is declared as 1st degree archeological site by the decision dated 20.01.2016 and numbered 2901 of the Board of Edirne. It is a tumulus dating back to the Early Iron Age. The tumulus on which there are trees has a height of approximately 4-5 m and a diameter of 30-35 m. There are illegal excavation traces on it.

Vezirtepe F Tumulus: It is located in Kıyıköy territory of Vize district in Kırklareli province and it is about 1.3 km away from the Project Site. It is declared as 1st degree archeological site by the decision dated 20.01.2016 and numbered 2901 of the Board of Edirne. It is a tumulus dating back to the Early Iron Age. The tumulus on which there are trees has a height of approximately 3 m and a diameter of 25-30 m. There are illegal excavation traces on it.

St. Nicholas Monastery: It is located in Kıyıköy territory of Vize district in Kırklareli province and it is about 1.4 km away from the Project Site. It is declared as 1st degree monumental site by the decision dated 16.03.1969 and numbered 4537 of the Board of Edirne. It dates back to the Byzantine Period in the 6th century. The monastery is devoted to St. Nicholas who was believed to protect the sailors. It consists of three sections which are shaped by purely carving a rock mass. These sections include a church, a holy spring and two successive places adjacent to the narthex of the church. This monastery is in a good state when compared to similar examples from the same period (such as Bulgarian examples under the Thracian influence).

Kıyıköy (Midye) Fortress: It is located in Kıyıköy territory of Vize district in Kırklareli province and it is about 1.7 km away from the Project Site. It is declared as 1st degree archeological site by the decision dated 13.05.1988 and numbered 36 of the Board of Edirne. The fortress was built in the 6th century and it is located on a ridge stretching toward the sea between Kazandere to the south and Pabuçdere to the north. Today, its two main gates still exist which provide entrance with the west-side fortification walls. The walls were repaired in the 9th and 10th centuries. Kıyıköy Fortress is situated in the 1st degree site, and Kıyıköy settlement where the modern Kıyıköy community lives is declared as 3rd degree site.

Kıyıköy Port Hamam: It is located in Kıyıköy territory of Vize district in Kırklareli province and it is about 2.1 km away from the Project Site. It is declared as 1st degree archeological site by the decision dated 13.05.1988 and numbered 7 of the Board of Edirne.The Hamam is in a complete state of ruins. Its walls are built of lime-plastered rubble stone while its arch, domes and vaults are brickwork. Domes and vaults are carried by lancet arches. The interior space is full of earth up to the haunch of the arch.

Kıyıköy Old Fountain: It is located in Kıyıköy territory of Vize district in Kırklareli province and it is about 2.1 km away from the Project Site. It is declared as 1st degree archeological site by the decision dated 13.05.1988 and numbered 7 of the Board of Edirne. It is in a ruined state with its top cover fully destroyed, and the walls of its water basin remains standing up to 1.5 m.

Çalışkan Çiftliği Rock-Cut Church: It is located in Kıyıköy territory of Vize district in Kırklareli province and it is about 2.2 km away from the Project Site. It is declared as 1st degree archeological site by the decision dated 20.01.2016 and numbered 2901 of the Board of Edirne. It is a rectangular-planned structure the entrance of which faces the south; it is positioned in the east-west direction with a height of approximately 3 m; and its approximate size is 4x7 m. It has an abscissa in the east side. Its top is carved as a vault. Two arched niches are craved side-by-side into the northern wall. There are also small niches at the right and left side of the abscissa. Treasure hunters destroyed the interior space by carving the floor and the walls.

Çalışkan Çiftliği Rock-Cut Chambers (Kaya Küpleri): They are located in Kıyıköy territory of Vize district in Kırklareli province and they are about 2.2 km away from the Project Site. It is declared as 1st degree archeological site by the decision dated 20.01.2016 and numbered 2901 of the Board of Edirne. There are natural-rock-cut chambers on the floor in the form of a pithos with a depth of 1.5 m to 2 m and with circular openings. Up to 7 independent chambers are detected at 5-6 m intervals. It is believed that they were used for storage or grave. Treasure hunters destroyed the interior space by carving them.

Şarapçı Road Rock-Cut Tomb: It is located in Kıyıköy territory of Vize district in Kırklareli province and it is about 1.7 km away from the Project Site. It is declared as 1st degree archeological site by the decision dated 20.01.2016 and numbered 2901 of the Board of Edirne. The size of the structure the entrance of which faces the south is approximately 2.5x3 m and its interior height is about 1.5 m. A small niche is carved into the northern wall. Its front side has been recently closed by adding a rubble stone section with a concrete slab roof. It dates back to the Byzantine Period.

In addition to archeological sites and monuments in Kırklareli Province, it is known that there are stone and wooden houses -especially in the city center- which were left behind by the people who had to migrate to Bulgaria and Greece. In the letter dated 13.03.2017 and numbered 39.08.282/484 of the Board of Edirne given in **ANNEX-5.A**, it is stated that there are a total of 21 houses -20 of them are privately-owned houses while 1 belongs to the municipality-, one mosque and one old PTT (Post and Telegraph Organization) building, with a 2nd degree monumental protection status within the boundaries of Kıyıköy Town.

Furthermore, other structures and places which are located in Kırklareli Province and have archeological importance include Sivriler Village, Lake Pedina and its surrounding (1st Degree Archeological Site-Demirköy), interior space of Alpullu Sugar Factory (Natural site, Historical site, Industrial structure, Urban site-Babaeski) and Evrenli Village (1st Degree Natural site and Archeological site-Vize) (Ref 9.35). Figure 9.24 shows the location of the archeological sites and monuments detailed above relevant to the Project Site.

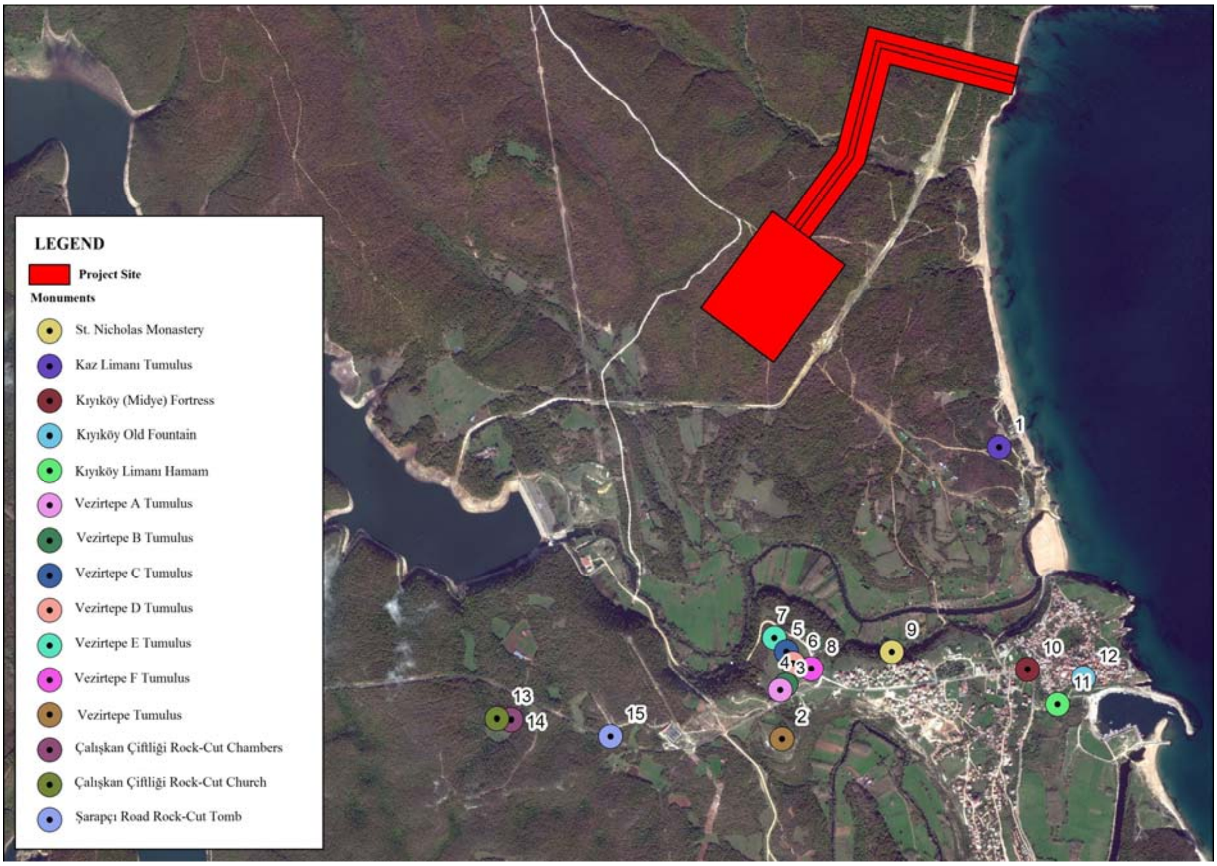


Figure 9.24: Archeological Sites and Monuments in and around the Landfall Section

Potential archeological sites which are not registered in the inventory of the Regional Board Directorate of Cultural Heritage Conservation of Edirne have been detected in the area where a field visit was made within the scope of the Project. The following are the information on these areas.

Çingene Pier

This area detected in the vicinity of Çingene Pier is located in the north of the landfall section of the pipeline. Also, many illegal excavations were observed in the area. Bedrock-cut architectural works, wall remains, artificial hillocks that may be considered as small-diameter tumulus and a large number of ceramic pieces, including rectangular-planned building foundation remains have been observed in this area. Most of the hillocks that may be considered as tumulus were ruined by the treasure hunters through illegal excavations. It is observed, in the sections where topographic structure and archeological traces can be followed, that these hillocks were placed as sets on the land. A large number of tile pieces have been found around the hillocks which were ruined by illegal excavations. In the north of the open cut section of the archeological site, there are platforms and structural complexes which are cut into the bedrock with hands and may be associated with aquatic or different cults (e.g. sacrifice). A marble plate with a "cross" on it has been detected a bit away from these structures.

Mahmutalan

Glazed and thin-walled ceramic pieces dating back to the Early Byzantine period have been found on the southernmost one of the temporary access roads planned and at the starting point of the permanent road construction site in Mahmutalan quarter. As the material has a low intensity, the archeological value of this region needs to be determined by the official competent bodies.

According to the map sheet no. E20-d4 of the 1/25.000 Scale Environmental Plan obtained with the official letter dated 30.01.3017 and numbered 81158300 of the Section of Natural Heritage Conservation of the Provincial Directorate of Environment and Urbanization of Kırklareli, there are areas identified as historical site, archeological site and mixed site in the immediate vicinity of the Project Site (Figure 9.25). Regarding these sites, a site visit was made by the Provincial Directorate of Culture and Tourism ıf Kırklareli and the Regional Board of Cultural Heritage Conservation of Edirne. In the letter of comment dated 25.05.2017 and numbered 39.08.282/957 including the findings of the field visit (ANNEX-5.A), it is stated that "During field visit, a necropolis area and church remains have been detected within the Project site and outside the pipeline route. Therefore, the area whose coordinates are given in the annex of this letter cannot be used for any practice. No immovable cultural heritage requiring conservation are found within the Project site, other than the area with the said coordinates. We have no-objection to the implementation of the 'TurkStream Gas Pipeline-Offshore Section' project on condition of freezing the work in this area and notifying the nearest Local Authority or Museum Directorate if any remains or ruins that may fall under the law no. 2863 are found during the works (Article 4 of the law no. 2863)."

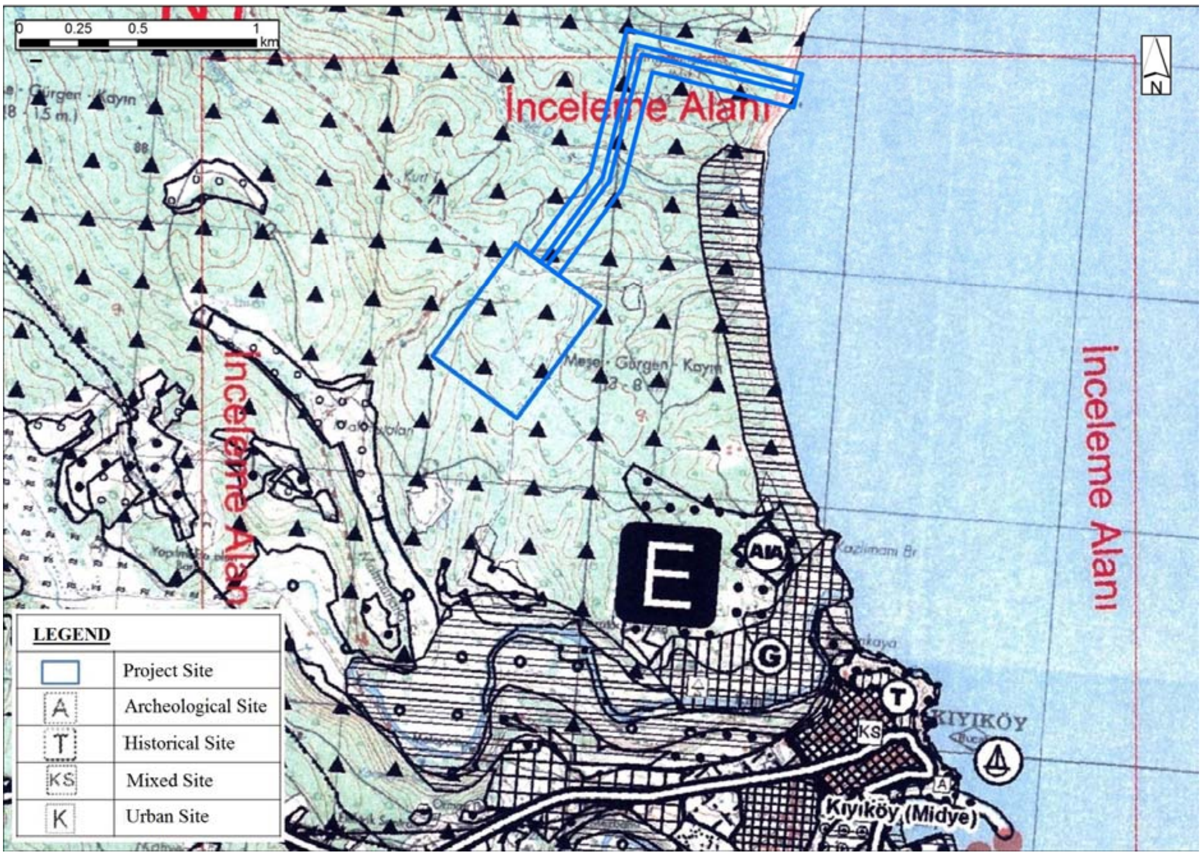


Figure 9.25: Historical, Archeological and Mixed Sites in the Immediate Vicinity of the Project Site according to the Provincial Environmental Plan of Kırklareli

As also stated in the letter of comment; if any remains or ruins that may fall under the law no. 2863 Article 4 of the law no. 2863) are found during the works to be conducted within the scope of the Project, the works in this area will be frozen and the nearest Local Authority or Museum Directorate will be notified.

It is anticipated that the Project will have no socio-economic impacts on cultural heritage and archeology as no receptors that may be socially or economically affected are defined in Chapter 6.10

(Cultural Heritage and Archeology). Chapter 6.10 (Cultural Heritage and Archeology) provides an assessment of the potential environmental impacts of the Project on cultural heritage and archeology.

9.7 Population

9.7.1 Population Size and Density

The total population of Turkey as of 2016 is 79,814,871, and the rate of male population is 50.2% while the rate of female population is 49.8% (Ref 9.36). Figure 9.26 below shows the population change from 1965 to 2016 in Turkey.

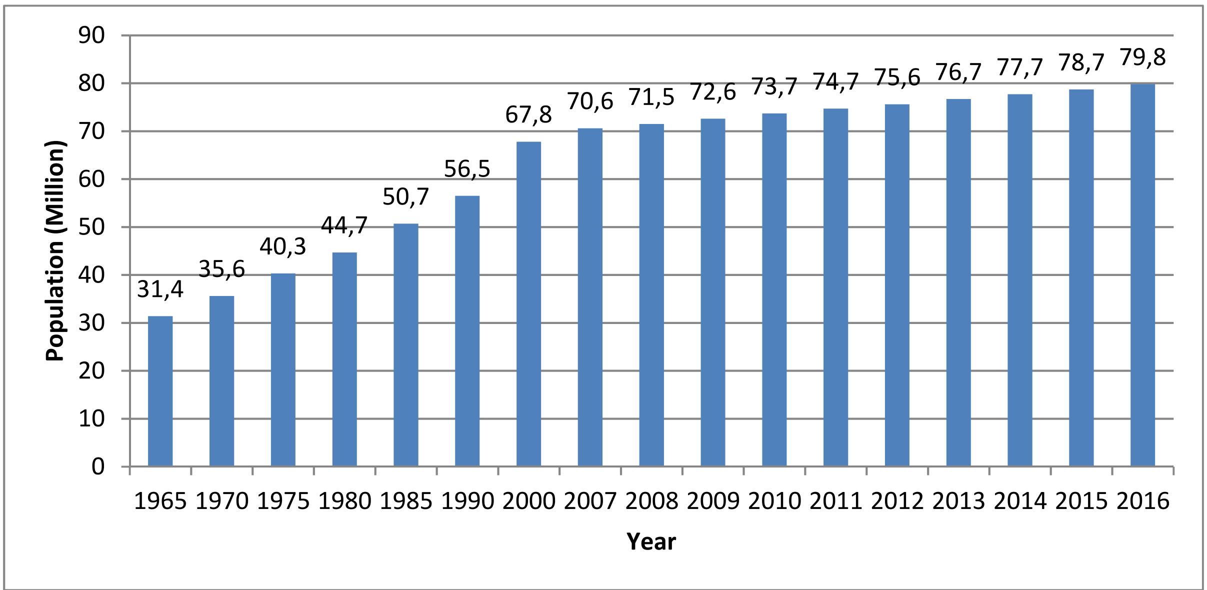


Figure 9.26: Population of Turkey from 1965 to 2016 (Ref. 9.28)

Istanbul, Kocaeli and Samsun have the largest population among the provinces on the Black Sea coast. Istanbul Province has the largest population also in Turkey with a population of 14,804,116 as of 2016 and accounts for 18.5% of the total population.

The population living in the other three provinces (Kırklareli, Kocaeli and Sakarya) which are located in the Marmara Region and have a coast on the Black Sea represents less than 4% of the total population of Turkey while 14 provinces on the Black Sea coast other than Istanbul account for about 11% of the total population of Turkey. (Ref 9.36)

As of 2016, the population (351,684 persons) living in Kırklareli Province which is one of the provinces located in the Marmara Region and has a coast on the Black Sea accounts for about 0.44% of the total population of Turkey. Out of the total population in the province, 248,017 persons live in the province and district centers while 103,667 persons live in villages and towns. (Ref 9.23).

The male population constitutes about 51% of the total population of Kırklareli Province while the female population accounts for about 49% (Ref 9.36).

The population living in Vize District of Kırklareli Province (27,556) represents 0.035% of the total population of Turkey and 7.8% of the total population of Kırklareli Province. The male population constitutes about 51% of the total population of Vize District while the female population accounts for about 49% (Ref 9.36). Table 9.25 shows the population change in Kırklareli Province and its districts in Turkey from 2007 to 2016.

Table 9.25: Population of Kırklareli Province and its Districts in Turkey from 2007 to 2015 (Ref. 9.36)

	Population									
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Turkey	*70,586,256*	*71,517,100*	*72,561,312*	*73,722,988*	*74,724,269*	*75,627,384*	*76,667,864*	*77,695,904*	*78,741,053*	*79,814,871*
Kırklareli	333,256	336,942	333,179	332,791	340,199	341,218	340,559	343,723	346,973	351,684
Center	83,378	84,868	86,663	84,085	87,798	88,956	89,509	92,514	95,274	97,626
Babaeski	51,815	51.78	50,131	50,041	51,249	50,559	49,992	49,121	47,851	47,950
Demirköy	9,128	9,054	8,708	8,578	8,750	8,782	8,455	8,566	8,448	8,464
Kofçaz	3,288	2,963	2,879	2,798	3,001	2,924	2,702	2,707	2,644	2,564
Lüleburgaz	130,375	132,912	131,438	134,073	136,783	137,872	138,827	140,236	142,840	145,263
Pehlivanköy	4,586	4,823	4,634	4,481	4,308	4,211	4,140	3,965	3,790	3,681
Pınarhisar	20,338	20,456	19,813	19,582	19,699	19,686	19,035	18,914	18,704	18,580
Vize	*30,348*	*30,086*	*28,913*	*29,153*	*28,611*	*28,228*	*27,899*	*27,700*	*27,422*	*27,556*

According to demographic information, the total population growth rate for Kırklareli showed an increasing and decreasing trend during the period from 2007 to 2016. It is noted that the annual population growth rate for Kırklareli was 13.4‰ in 2016 while it was 1.9‰ in 2013. Figure 9.27 shows the annual population growth rate for Kırklareli from 2007 to 2016.

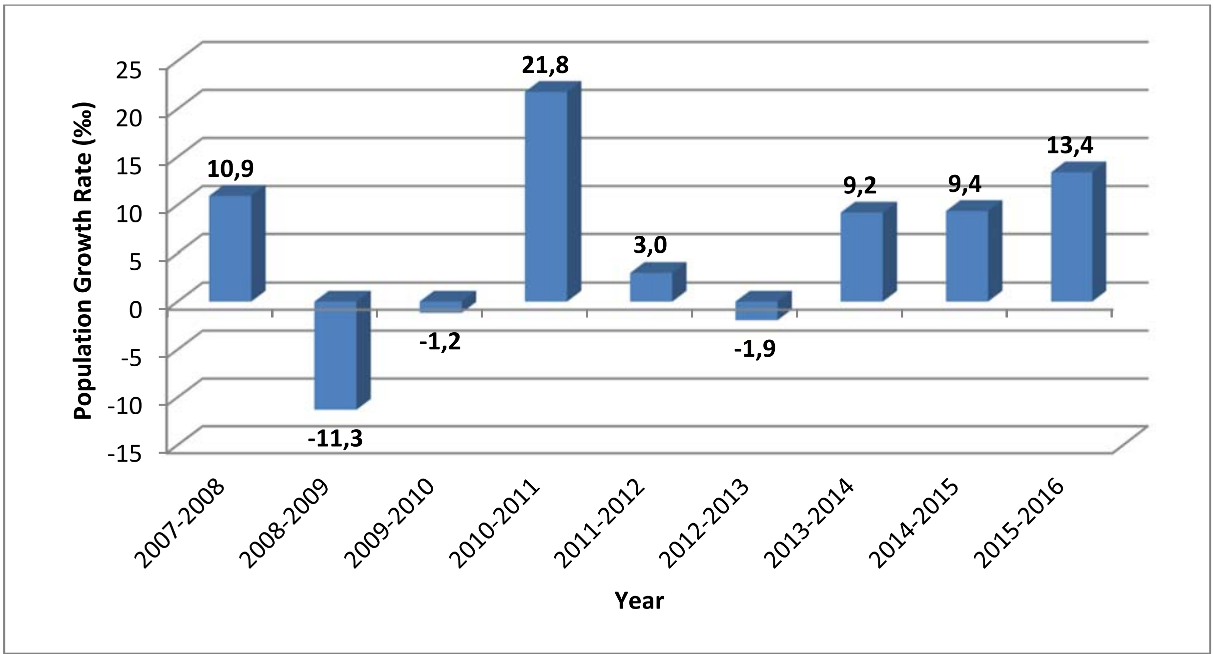


Figure 9.27:Annual Population Growth Rate for Kırklareli Province (‰), (Ref. 9.36)

Table 9.26 summarizes the population density by years for Kırklareli (from 2007 to 2016).

Table 9.26: Population Density of Kırklareli Province (Ref. 9.36).

	Population Density (person/km²)									
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Kırklareli	53	54	53	53	54	54	54	55	55	56

As seen in Table 9.26, the population density per km^2 of Kırklareli increased from 53 persons to 56 persons between 2007 and 2016.

The rural population rate of Kırklareli Province is higher than the average of Turkey. Table 9.27 provides a comparison of general demographic indicators between Turkey and Kırklareli Province.

Table 9.27: Comparison of General Demographic Indicators between Turkey and Kırklareli Province, 2015 (Ref. 9.37).

Indicators	Turkey	Kırklareli
Total population	78,741,053	346,973
Rural population (%)	12.4	38.5
Urban population (%)	87.6	61.5
Population between the ages 0-14 (%)	24	15.7
Population aged 65 and above (%)	8.2	12.4
Annual population growth (‰)	13.4	9.4
Age dependency ration (%)	47.6	39
Crude birth rate (‰)	16.9	10.7
Crude death rate (‰)	5.2	8.5

The total population of Kıyıköy as of 2016 is 1,977, and this accounts for 0.56% of the total population of Kırklareli Province and 7% of the total population of Vize District. The male population rate in the town is about 53% while the female population rate is 47%.

Table 9.28 shows the distribution of the total population by gender in Kırklareli Province, Vize District and Kıyıköy Town.

Table 9.28: Distribution of the Total Population by Gender in Kırklareli Province, Vize District and Kıyıköy Town, 2016 (Ref 9.36)

	Province/District Center			Town/Village			Total		
	Total	Male	Female	Total	Male	Female	Total	Male %	Female %
Kırklareli	248,017	125,880	122,137	103,667	53,242	50,425	351,684	51	49
Vize	13,484	6,852	6,632	14,072	7,163	6,909	27,556	51	49
Kıyıköy	-	-	-	1,977	1,039	938	1,977	53	47

Based on the analysis of TurkStat data representing the population of Kıyıköy and the distribution of the population by gender in 2016, 2015 and 2017, no significant changes are observed in the population and the gender balance of the town in the last three years (Table 9.29).

Table 9.29: Distribution of the Total Population Living in Kıyıköy Town in 2014, 2015 and 2016 by Gender

	2014			2015			2016		
	Total	Male %	Female %	Total	Male %	Female %	Total	Male %	Female %
Kıyıköy	1,966	52	48	1,948	52	48	1,977	53	47

According to the data from TurkStat and the findings obtained from the socio-economic study conducted in January-March 2017, the population of Kıyıköy Town which was 1,977 in total in 2016 reaches up to 15,000 at summer weekends including same-day visitors. It is known that the fact that the Town is a center of attraction for tourists has a share in this temporary migration.

9.7.2 Age Distribution

Kırklareli is a province with mostly young population. Table 9.30 shows the distribution of age groups in the total population for 2016 in Kırklareli Province and Vize District.

Table 9.30: Distribution of Age Groups in the Total Population in Kırklareli Province and Vize District, 2016 (Ref 9.36)

Age Group	Kırklareli		Vize	
	Total	Ratio of Age Group to Total Population	Total	Ratio of Age Group to Total Population
0-4	18,216	5.2	1,206	4.4
5-9	17,883	5.1	1,288	4.7
10-14	18,650	5.3	1,456	5.3
15-19	24,247	6.9	1,694	6.1
20-24	29,377	8.3	1,758	6.4
25-29	25,011	7.1	1,632	5.9

Age Group	Kırklareli		Vize	
	Total	Ratio of Age Group to Total Population	Total	Ratio of Age Group to Total Population
30-34	25,633	7.3	1,771	6.4
35-39	27,781	7.9	1,868	6.8
40-44	25,532	7.3	1,866	6.7
45-49	24,503	6.9	1,861	6.8
50-54	24,842	7.1	2,108	7.7
55-59	24,240	6.9	2,192	8.0
60-64	21,774	6.2	2,160	7.8
65-69	14,995	4.3	1,494	5.4
70-74	10,400	2.9	1,115	4.0
75-79	8,361	2.4	918	3.3
80-84	6,121	1.7	708	2.6
85-89	3,207	0.9	354	1.3
90+	911	0.3	107	0.4
Total	351,684		27,556	

Table 9.31 shows the distribution of age groups in the total population in Kıyıköy Town according to the 2016 data from TurkStat that are analyzed within the scope of the socio-economic study conducted in January-March 2017.

Table 9.31: Distribution of Age Groups in the Total Population in Kıyıköy Town, 2016

Age Group	Kıyıköy	
	Total	Ratio of Age Group to Total Population (%)
0-14	293	15
15-29	387	20
30-39	267	13
40-64	774	39
65+	256	13
Total	1,977	

As a result of the analysis on the distribution of age groups in population for 2016 in Kıyıköy Town, it is seen that about 48% of the total population is aged under 40. About 53% of the total population in Kırklareli Province and about 46% of the total population in Vize District are aged under 40. The ratio of the people aged between 40 - 64 to the total population is 34.4%, 37% and 39% for Kırklareli province, Vize district and Kıyıköy Town respectively. The ratio of the people above the age of retirement (65+) to the total population is 17% and 13% in Vize District and Kıyıköy Town respectively while this ratio is 12.5% in Kırklareli Province.

9.7.3 Migration Trends

There is migration from the residential areas in Edirne and Kırklareli provinces to the city centers near the industrial centers in the east of the region depending on the agricultural economy of the Thrace Region. The region has two different migration dynamics. As Kırklareli is a border province, it has always been the first place where the migrants coming from Balkan countries settle. That's why the population of the province has been highly affected by the migration movements from past to present. According to the observations made during the socio-economic field study, it is known that Bulgarian, Romanian, Greek, Albanian and Yugoslavian migrants live in the region and that Thessaloniki migrants live especially in Kıyıköy Town. On the other hand, the movement of migration was accelerated after 1960 because it has gone through an economic development faster than the neighboring provinces as it is close to Istanbul even though it has limited economic activities, socio-cultural infrastructure and job opportunities. There is also a population flow to Kırklareli -which loses population due to migration- from outside the province. However, the main reason for this flow is temporary residence because of public service (Ref. 9.1, Ref. 9.50). The number of in-migrants in Kırklareli was 16,882 between 2015-2016 while the number of out-migrants was 13,175; and the net migration is calculated as 3,707.

According to the 2016 data of TurkStat, the net migration rate in Kırklareli is 10.6 per mille and Kırklareli ranks 11th in the rankings of the provinces in Turkey in terms of net migration rate. Table 9.40 shows the number of in-migrants and out-migrants, the net migration and the net migration rate in the province from 1990 to 2016.

Table 9.40: The Number of In-migrants and Out-Migrants, the Net Migration and the Net Migration Rate in Kırklareli from 1990 to 2016 (Ref. 9.38)

	1990 - 2000	2007 - 2008	2008 - 2009	2009 - 2010	2010 - 2011	2011 - 2012	2012 - 2013	2013 - 2014	2014 - 2015	2015-2016
In-migrants	29,968	10,565	10,359	12,844	11,979	12,548	14,120	14,553	16,098	16,882
Out-migrants	24,698	11,027	11,242	12,088	11,829	11,232	13,297	13,678	13,816	13,175
Net Migration	5,270	-462	-883	756	150	1,316	823	875	2,282	3,707
Net Migration Rate (per mille)	18.03	-1.37	-2.65	2.27	0.44	3.86	2.42	2.55	6.59	10.6

Table 9.32 shows the provinces from which most in-migrants come and to which most out-migrants go in Kırklareli in 2016.

Table 9.32: In-Migration and Out-Migration Data of Kırklareli for 2016, (Ref. 9.38)

Provinces most in-migrants come from	Number
Istanbul	6,815
Tekirdağ	2,057
Edirne	1,003
Ankara	470
İzmir	403

Provinces most out-migrants go to	
Istanbul	3,970
Tekirdağ	2,082
Edirne	888
Ankara	489
İzmir	418

As a result of the analysis on the population registers of Kıyıköy Town, it is seen that the population of the town decreased each year by nearly 1% to 3% from 2007 to 2015. There is an increase by 1.5% in the population only between 2015 and 2016. Table 9.33 shows the population figures of Kıyıköy Town from 2007 to 2016.

Table 9.33: Population Figures in Kıyıköy Town from 2000 to 2016 (9.31)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Population	2,220	2,191	2,136	2,077	2,041	2,002	1,978	1,966	1,948	1,977

In the interviews made with the local people within the scope of the socio-economic studies conducted in January-March 2017, it is stated that the reasons of the overall decrease in the population may be the young population who do not prefer to stay in the town due to limited job opportunities.

9.8 Employment

9.8.1 Sectoral Distribution of Labour Force

The population aged 15 and above is 67.2 million in Turkey as of 2016 and the national rate of unemployment is noted as 10.9%. The rate of unemployment in Kırklareli is below the national average. According to the 2015 labour force statistics of TurkStat, the TR21 Region (Tekirdağ, Edirne, Kırklareli) has the second highest rate of employment with 53.5% and the highest labour force participation rate with 57.9% (Ref 9.32). As of January 2017, 18.3% of the active population in Turkey is employed in agriculture, 19.8% in industry, 6.5% in construction and 55.4% in service sector (Ref 9.32). In parallel to the national trends, service sector is the main line of work in Kırklareli Province. In 2013, 46.6% of the active population in Kırklareli was employed in service sector, 36.3% in industry and 17.1% in agriculture.

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The active population in Kıyıköy Town where the Landfall Section of the Project is located earns their primary economic income from fishery, tourism, forestry and livestock. According to the results of the socio-economic studies, the majority of the people living in the town are engaged in multiple lines of work.

As explained in Section 9.3, according to the data from TurkStat, nearly 573 people are categorized as employees earning a livelihood by fishing in Kıyıköy whose total population was 1,977 in 2016. Accordingly, about 29% of the population of Kıyıköy earns their living from fishery.

The following information is obtained within the scope of the socio-economic study:

- According to the information obtained from the Culture and Tourism Association of Vize Kıyıköy, approximately 250 people earn their livelihood by working in the hotels and hostels active in tourism sector and approximately 100 of these people work full-time. In addition to these people, it is learned that a majority of the local people living in Kıyıköy rents out one or two rooms of their houses as a hostel or leaves their houses for rental for summer.

- In the meetings held with the Kıyıköy Forestry Cooperative, it is learned that the cooperative has 670 members and about 20% of the cooperative members are also a member of the Kıyıköy Fishery Cooperative.
- According to the information obtained from the Kıyıköy Livestock Cooperative, livestock activities generate a source of economic income for almost half of the town's population. It is conveyed that livestock activities are performed as a secondary line of work for a majority of the people in Kıyıköy who are engaged in these activities.
- In meetings held with the stakeholders, it is learned that approximately 150 persons from Kıyıköy are employed as paid workers in 4 (four) factories -three of them are active in textile sector and one is active in glass sector- in Saray and Çorlu Districts of Tekirdağ Province.
- In the meetings held with the Chamber of Merchants and Craftsmen of Vize, it is learned that a majority of the merchants are registered with the Chamber of Merchants and Craftsmen of Vize. It is stated that the total number of establishments which are located in Kıyıköy Town and registered with the Chamber is 103 and the sectoral distribution of these establishments is given in Table 9.34.

Table 9.34: Sectoral Distribution of the Establishments Registered with the Chamber of Merchants and Craftsmen of Vize

Sector	Number of Establishments	Its Ratio to All Establishments (%)
Real estate consulting	1	1
Hotel and hostel management	9	8.7
Timber manufacturing and selling	2	1.9
Commerce by means of buffets, groceries and markets	15	14.6
Handling and selling of aquaculture products	4	3.9
Hawkers	1	1
Hairdressers	1	1
Restaurants, food and beverage businesses	27	26.2
Firewood and wood coal manufacturing and selling	4	3.9
Coffee shops and tea gardens	12	11.7
Counter sales	1	1
Pastry manufacturing	2	1.9
Construction material manufacturing and selling	2	1.9
Bakeries	4	3.9
Perfume and jewelry sales	1	1
Running picnic areas	1	1

Sector	Number of Establishments	Its Ratio to All Establishments (%)
Meat packing and selling	2	1.9
Commission agent for buying and selling firewood and wood coal	3	2.9
Running dormitories	2	1.9
Groceries	1	1
Running marble quarry	1	1
Measuring instrument manufacturing and selling	1	1
Underwear production and sales	1	1
Cleaning supplies manufacturing and selling	2	1.9
Charcuterie	1	1
Clothes production and sales	1	1
Internet cafe and game arcade	1	1
TOTAL	103	100

Chapter 9.12 explains the impacts of the Project on the current labour force and the fields of activity.

9.9 Education

The education system of Turkey consists of pre-school education (kindergartens), primary education (primary and secondary schools), general and vocational high school education (high schools and technical high schools) and higher education (universities). It is known that 26,522 primary schools, 17,343 secondary schools and 10,550 high schools were in service in 2015-2016 school year in Turkey. There are 13 detached kindergartens, 116 pre-school institutions, 92 primary schools, 74 secondary schools and 46 general and vocational high schools in Kırklareli Province as of 2015. (Ref. 9.40)

When it comes to the higher education institutions, there is a state university in Kırklareli (Kırklareli University) which was founded in 2007. Kırklareli University has 3 Institutes in the city center, 10 faculties in total including the Faculty of Technical Education, Faculty of Science and Letters, Faculty of Economics and Administrative Sciences, Faculty of Tourism, Faculty of Technology, Faculty of Engineering, Faculty of Theology, Faculty of Architecture, Faculty of Law and Faculty of Aeronautics and Astronautics in Lüleburgaz, and 7 Vocational Schools. About 23 thousand students received education in 2015-2016 school year in Kırklareli University. The University serves with 655 academic staff and 281 administrative staff (Ref. 9.41).

Table 9.35 shows the percentage of the school enrollment rates for primary and secondary education institutions in Kırklareli Province according to the data on 2015-2016 school year. The school enrollment rate for secondary schools and high schools in Kırklareli Province is above the average of Turkey.

Table 9.35: 2015-2016 Net School Enrollment Rate for Turkey and Kırklareli

	Primary School (%)	Secondary School (%)	High School (%)
Turkey (Ref. 9.42)	94.87	94.39	79.79

Kırklareli (Ref. 9.43)	93.75	95.14	86.87

Education status of a region is another factor that needs to be considered when assessing the socio-economic characteristics of that region. Table 9.36 summarizes the information on educational status by age group and gender for Kırklareli Province.

Table 9.36: Educational Status by Age Group and Gender in Kırklareli Province (2015) (Ref. 9.35)

Age	Gender	Illiterate	Literate but not a graduate	Primary School Graduate	Primary Education Graduate	Secondary School Graduate	High School Graduate	Academy or Faculty Graduate	Master's Degree	Ph.D and Above	Not Known	Total
06-13	Male	144	7,695	7,123	3*	10	-	-	-	-	31	15,006
	Female	131	7,241	6,781	19 **	21	-	-	-	-	20	14,213
14-17	Male	5	116	602	1,963	6,231	4	-	-	-	12	8,933
	Female	4	126	578	1,906	5,700	5	-	-	-	15	8,334
18-21	Male	14	421	80	5,115	89	7,014	468	-	-	24	13,225
	Female	20	279	17	1,932	53	7,765	649	-	-	25	10,740
22-24	Male	23	203	25	1,710	299	3,761	2,414	6		19	8,460
	Female	54	214	4	1,243	172	2,451	2,658	3	-	35	6,834
25-29	Male	73	280	220	2,354	480	5,288	4,809	154	4	115	13,777
	Female	129	320	387	2,066	395	3,614	3,994	198	12	73	11,188
30-34	Male	79	164	1,474	2,024	1,202	4,931	3,391	246	43	150	13,704
	Female	139	206	2,357	1,620	895	3,792	2,934	258	27	84	12,312
35-39	Male	79	97	2,128	2,191	1,232	5,288	2,596	255	60	74	14,000
	Female	140	164	3,369	1,970	1,088	3,865	2,124	187	34	61	13,002
40-44	Male	93	66	2,439	2,429	1,530	3,843	2,075	147	42	82	12,746
	Female	161	181	4,076	2,269	1,316	2,796	1,302	76	21	66	12,264
45-49	Male	80	82	2,844	2,401	1,763	3,419	1,580	164	34	79	12,446
	Female	199	213	4,779	1,860	1,240	2,283	842	62	12	55	11,545
50-54	Male	108	122	4,365	1,864	1,565	3,036	1,189	92	24	85	12,450
	Female	264	304	6,619	1,453	894	2,143	610	41	9	62	12,399
55-59	Male	98	179	5,916	972	1,257	2,214	1,151	67	16	88	11,958
	Female	332	374	7,473	787	675	1,315	728	14	5	60	11,763
60-64	Male	101	255	6,198	434	913	1,285	889	33	18	82	10,208
	Female	441	553	7,206	290	519	624	461	19	5	76	10,194
65 +	Male	679	1,621	12,660	269	1,092	1,213	1,119	41	13	181	18,888
	Female	4,334	3,538	14,054	94	728	494	440	13	1	270	23,966
	Total	7,924	25,014	103,774	41,238	31,359	72,443	38,423	2,076	380	1,924	324,555

* 2014 data.
** 2013 data.

The number of people who have not finish any schools is 25,014 in Kırklareli, and 11,301 are male while 13,713 are female. The ratio of the number of people who have not finished any schools in the province to the total population is calculated as 7% (Ref 9.44).

Table 9.37 summarizes the information on educational status by gender for Vize District and Kıyıköy Town.

Table 9.37: Education Status by Gender for Vize District and Kıyıköy Town (Ref 9.44)

	Gender	Illiterate	Those Not Finished Any Schools	Primary School	Primary Education	Vocational School Equivalent to	High School or Vocational School	College or University	Master's Degree Graduate	Ph.D Graduate	Unknown Graduation
Vize (2015)	Total	865	2,127	10,474	3,593	2,326	4,212	2,044	88	11	210
	Male	196	936	4,982	1,736	1,362	2,659	1,152	52	5	106
	Female	669	1,191	5,492	1,857	964	1,553	892	36	6	104
Kıyıköy*	Total	359	976	502	109	294	89	-	-	89	-
	Male	173	508	252	71	174	58	-	-	48	-
	Female	186	468	250	38	120	31	-	-	41	-

*The most up-do-date data available on the educational status by gender for Kıyıköy Town belong to 2013.

As of 2015, 314,685 people in total (about 90.7% of the total population) in the province are literate and the ratio of the illiterate people to the total population is 9.3%. Table 9.38 summarizes the literacy status for Kırklareli Province, Vize District and Kıyıköy Town.

Table 9.38: Literacy Status for Kırklareli province, Vize district and Kıyıköy Town (aged 6+) (Ref. 9.44)

	Gender	Literate	Illiterate	Literacy Status Unknown
Kırklareli (2015)	Total	314,685	7,924	1,924
	Male	163,200	1,576	1,022
	Female	151,485	6,348	902
Vize (2015)	Total	24,875	865	210
	Male	12,884	196	106
	Female	11,991	669	104
Kıyıköy*	Total	2329	85	88
	Male	1236	21	48
	Female	1093	64	40

*The most up-do-date data available on the literacy status for Kıyıköy Town belong to 2013.

According to the information obtained within the scope of the 2017 socio-economic studies, Kıyıköy Town has 1 (one) kindergarten, 1 (one) primary school and 1 (one) high school.

9.10 Health

There are 1,533 hospitals in total in Turkey as of 2015 and the total number of beds is 209,648. The sectoral distribution of the qualified beds in 2015 is identified as follows: 122,331 beds in the affiliates of the Ministry of Health, 38,361 beds in university hospitals and 43,645 beds in private institutions. According to the Nomenclature of Territorial Units for Statistics (NUTS), the number of beds per 1,000 persons in the West Marmara Region is 2.70 while this rate is 2.66 for the average of Turkey. (Ref. 9.37)

The total health expenditure of Turkey in 2015 was TRY 104,568,000 and this amount represents 5.4 percent of GDP (Ref. 9.45, Ref. 9.37). This is a low value when compared to more developed countries.

Kırklareli Province has 9 hospitals (5 public hospitals and 4 private hospitals) affiliated to the Ministry of Health, 4 medical centers, 98 family medicine centers and 17 emergency (112) departments (Ref 9.37). Table 9.39 provides information on health institutions in Kırklareli.

Table 9.39: Health Institutions in Kırklareli Province (Ref. 9.37)

Number of Public Hospitals	Number of Private Hospitals	Medical Center (Private)	Oral and Dental Health Center	Community Health Center	Family Health Center	Family Medicine	Number of 112 Emergency Departments
5	4	4	-	-	-	98	17

The total number of beds in Kırklareli is 867, and the province ranks 51st in Turkey in terms of the number of hospital beds, 53rd with 441 physicians, 52nd with 640 nurses, and the lowest 2nd with an infant mortality rate of 4.6% (Table 9.40) (Ref. 9.37).

Table 9.40: Selected Health Indicators in Kırklareli Province (Ref. 9.37)

Selected Health Indicators in Kırklareli Province	Number of persons
Total number of hospital beds	867
Number of hospital beds per hundred thousand	250
Total number of physicians	441
Number of persons per physician	787
Number of specialist physicians	244
Number of persons per specialist physician	1,422
Number of general practitioners	197
Number of persons per general practitioner	1,761
Number of nurses	640
Infant mortality rate (‰)	4.6

According to the information obtained within the scope of the 2017 socio-economic study, Kıyıköy Town has 1 family health center, 1 emergency unit and 1 ambulance for healthcare services.

9.11 Industry

Industry has a large share in the economy of Kırklareli and it develops rapidly. "Food and beverage manufacturing", "textile manufacturing", "chemical manufacturing" and "other non-metallic mineral product manufacturing" are the leading sectors in Kırklareli. And, the leading sub-sectors are "dairy business and cheese manufacturing" other than manufacturing including bakery products and milled cereal products, "ready-made feed for farm animals", "refined oil and fat manufacturing" and "cocoa, chocolate and confectionery manufacturing" in food and beverage manufacturing sector; "ready-made textile manufacturing other than clothing" and "finishing" in textile manufacturing; and "pharmaceutical preparation manufacturing" and "manufacturing of coating materials such as paints and varnish as well as printing ink and putty" in chemical manufacturing. Glass manufacturing has an important place in other non-metallic mineral product manufacturing.

Industry in Kırklareli is mostly centered around the state road D-100 and especially in Lüleburgaz. One of the main reasons for this has to do with the closeness of Kırklareli to Istanbul and Europe (Ref. 9.10). There are 807 industrial plants, 4 organized industrial zones and 6 small industrial areas in total in the province. (Ref. 9.46)

There are 82 industrial parcels in Kırklareli Organized Industrial Zone. It is installed on an area of 367 hectares with the 1st Stage being 93 hectares and the 2nd Stage being 274 hectares. All infrastructure construction works of the 1st Stage are completed, and 90% of the construction of the 2nd Stage is completed and the infrastructure construction continues (Ref. 9.46). There are two mineral deposits affiliated to Vize District and its towns: manganese with a possible reserve of 54,000 tons and %32 Mn grade in Çakıllı Town and 2,500,000 m^3 marble in Sergen Village. Vize Pink Marble in Sergen Village of Vize district in Kıyıköy is fine-crystalline and pink in color, and it consists of calcite crystals showing pressure twinning (Ref. 9.48). Table 9.50 shows information on the mine enterprises given a Non-Sanitary Enterprise License (GSM) in 2014 within the boundaries of Kırklareli Province.

Table 9.50: Mine Enterprises Given a GSM License in 2014 within the boundaries of Kırklareli Province (Ref. 9.10)

License Holder	Type of Mine	Date of License	District/Village/Quarter	Area of License (hectare)
Trakya Maden Madencilik ve Pat.Mad.San.Tic.Ltd.Şti.	GROUP I-b (TRAS)	20.06.2011 21.06.2021	Yenice Town/Pınarhisar	24.63
Limak Batı Çimento San. ve Tic. A.Ş. (Transferred from Set Çimento San. ve Tic. A.Ş.)	GROUP II.a LIMESTONE QUARRY	05.05.2009 05.05.2019	Çukurçeşme Quarter / Pınarhisar	31.69
Limak Batı Çimento San. ve Tic. A.Ş. (Transferred from Set Çimento San. ve Tic. A.Ş.)	GROUP II.a LIMESTONE QUARRY	05.12.2003 05.12.2013	Çukurçeşme Quarter / Pınarhisar	108.8
Limak Batı Çimento San. ve Tic. A.Ş. (Transferred from Set Çimento San. ve Tic. A.Ş.)	GROUP II.a LIMESTONE QUARRY	16.04.2004 16.04.2014	Akören Village / Pınarhisar	31.16
Limak Batı Çimento San. ve Tic. A.Ş. (Transferred from Set Çimento San. ve Tic. A.Ş.)	GROUP I.b CLAY QUARRY	18.06.2007 19.06.2017	Poyralı Village / Pınarhisar	23.66
Limak Batı Çimento San. ve Tic. A.Ş. (Transferred from Set Çimento San. ve Tic. A.Ş.)	GROUP I.b CLAY QUARRY	15.06.2007 15.06.2017	Poyralı Village / Pınarhisar	24.13

License Holder	Type of Mine	Date of License	District/Village/Quarter	Area of License (hectare)
Aker İnş. Mad. Nak. San. Tic. Ltd. Şti.	GROUP IV QUARTZ SAND QUARRY	27.03.2012 27.03.2022	Katranca Village / Kırklareli	18.74
1st Regional Directorate of Highways (Issued based on the Raw Material Production License for Yenice-Demirköy Highway Connection Road)	GROUP II LIMESTONE QUARRY	07.09.2010 07.09.2015	Yenice Town / Pınarhisar	10.54
Bağdan Kardeşler İnş. Taah .San. ve Tic. Ltd. Şti.	GROUP IV MONTMORILLONITE QUARRY, CRUSHING-SCREENING-WASHING PLANT READY-MIXED CONCRETE PLANT	20.06.2005 20.06.2015	Şeytandere Quarter / Kırklareli	26.63
Taşeli İnş. Tic. ve San. Ltd. Şti. (Issued based on the Raw Material Production License for DSİ (General Directorate of State Hydraulic Works) Çayırdere Dam Construction)	GNEISS (STONE CHIPS) QUARRY, READY-MIXED CONCRETE PLANT AND CRUSHER PLANT	16.01.2013 16.01.2017	Çayırdere Village / Pınarhisar	20.8

Besides, it is known that a GSM (Non-Sanitary Enterprise License) was issued between 02.06.2012-02.06.2016 for Traçim Çimento Sanayi ve Ticaret A.Ş. which is located in Evrencik Village of Vize District and has an area of 215.15 hectares. It is found out that the type of mine there is integrated cement plant and group II.a limestone quarries. (Ref. 9.47).

In the industrial capacity reports, it is found that the top five activities which were coded the most in 2015 are respectively dairy business and cheese manufacturing (28), gravel pit and sand quarry activities (clay and kaoline extraction) (26), underwear manufacturing (25), other outwear manufacturing (21), and milled cereals and vegetable manufacturing (19). Accordingly, in the Industrial Capacity Reports, the top five products which were coded the most are respectively white cheese, clothes such as t-shirt and undershirt, stone chips, nightgowns and pajamas for women and girls, and kashar cheese. (Ref. 9.49)

9.12 Expected Income Growth; Employment Opportunities to be Created; Population Movements

The number of people to be employed in the construction phase of the Project will be confirmed after the completion of the detailed Project design. However, Table 9.41 below provides the maximum number of staff estimated to work in the Project during the busiest time of the construction activities.

Table 9.41: Estimated Labour Force for Construction Phase

Project Section	Highest Number of Staff (approximately)
Offshore	950

Shore-Crossing	250
Landfall	600

It is anticipated that the construction activities in Offshore, Shore Crossing and Landfall Sections of the Project will take about 24 months (2018-2019). The construction schedule of the Project is provided in **Chapter 1** (General Characteristics of the Project).

It is envisaged that the labour force to be provided for pipe-laying in the Offshore and Shore Crossing Sections of the Project will be supplied by the construction contractor and it is expected that a few local people (on condition that they have necessary qualifications) will be employed. It is also foreseen that the majority of the landfall section works will be short-term and temporary while it is considered that some works may continue during the whole construction phase.

Unqualified, qualified and administrative/expert labour force will be needed for the Project. However, it will be a must to employ mostly qualified labour force for the construction phase of the Project and it is anticipated that this labour force will come from outside Kıyıköy. Additionally, it is likely that some temporary positions which may be filled by the local labour force or the labour force coming from the neighboring places will be created. At national level, a majority of the labour force to be employed during the onshore construction works of the Project will be the citizens of the Republic of Turkey. The job openings will be announced by means of local and regional institutions and authorities, if available. The Project Owner will comply with the regulations on work permit of the Ministry of Labour and Social Security.

In addition to the employment opportunities directly provided by the Project for the construction activities, there may be a limited increase in local employments due to indirect and triggering impacts of the construction activities. Indirect employment includes the employment opportunities that may be created in local firms in association with the procurement of goods and services from these local firms. Services such as cleaning, food&beverage, security and driving may be procured from the firms in Kırklareli or Tekirdağ which may contribute to the creation of indirect employment in these provinces.

Even though the labour force to be supplied from the local community is limited, it is likely that it will lead to a short-term and temporary beneficial impact on Kıyıköy community and neighbor community at construction and pre-commissioning phases of the Project as a result of the direct or indirect employment to be created.

Although it is limited due to the special nature of the Project construction, local employment will be encouraged in the Project and unqualified/qualified positions will be applied for the construction of especially Landfall Section. Local employment will bring advantages in increasing the household incomes. The Project Owner will encourage the utilization of local employment by applying to the local and regional media and local employment institutions or similar contacts and making it necessary for contractors to put a local advertisement for available job opportunities, when applicable, in order to provide access for local community to employment opportunities created by the Project. Contractors will have to provide regular information to the Project Owner regarding the scope of the local employment and the latest situation of the measures taken to ensure local employment at maximum level. Local employment will also be supported by the local business contracts that may occur as a result of goods and service procurement.

The Project will also require the procurement of some materials and equipment from Turkey, and it is probable that large-scale goods and services contracts will be made with the national firms active in Turkey. The fields of work of the Project likely to show an increase in goods and service demand at national, regional or local level are as follows:

- Construction contractors (road construction, land cleaning, etc.), construction materials and equipment suppliers;
- Local accommodation service providers, restaurants, stores; and
- Auxiliary services such as transportation, supplies, cleaning and security services.

Enterprises will be able to supply goods and services for the Project through contractor agreements on condition that they meet the technical and other requirements determined based on the Project requirements.

Considering the above information, the demand for goods and service provision from national, regional and local enterprises may lead to a temporary and limited but beneficial impact on economy.

It is anticipated that local and regional enterprises will benefit from expenditures on goods and services (including contracts for construction, accommodation and relevant services). The utilization of local services and contractors will be encouraged, when applicable, even though it will be limited due to specific nature of the Project construction.

It is foreseen, within the scope of this EIA Report, that the labour force who will go to Kıyıköy for the Project in construction and pre-commissioning phases will stay in workers' camp(s). It is likely that catering service for those who stay in workers' camp(s) will be supplied from a subcontractor firm.

Some administrative and expert staff of the Project may accommodate in Kıyıköy, Vize, Saray or other close districts other than temporary workers' camp(s). If the administrative staff stay in local hotels or hostels, local accommodation facilities may benefit from the resulting economic income during off-season.

Even though limited, it is likely that the accommodation service providers, restaurants and stores in Kıyıköy will benefit from the potential goods and service demands of the non-local labour force of the Project. It is expected that this beneficial impact will continue during the construction phase of the Project.

The Project Owner will make it necessary for contractors to announce appropriate goods and services contracts in local and regional media, to contact the local Chamber of Commerce and trade unions or will encourage the procurement of local goods and services for the Project in a way to include similar activities, when applicable, in order to allow local suppliers and contractors to search for subcontractor role and/or to supply goods and equipment for the Project. Contractors will have to provide regular information to the Project Owner regarding the scope of the local goods and service provision and the latest situation of the measures taken to ensure local procurement at maximum level.

9.13 Housing and Other Technical/Social Infrastructure Needs of the Staff and the Population Dependent on this Staff

It will be necessary to build up workers' camps in the construction site of the Landfall Section so as to provide accommodation for workers. It is estimated that the number of people working in the Landfall Section during the busiest period will reach up to 600 based on a cautious approach. It is not known yet how many workers' camps will be built up at that point.

Electric power demand will be met by generators during the construction phase of the Project. There will be domestic wastewater generation (black water + grey water) that will caused by the staff who will lay pipelines and build Landfall Section facilities in the Construction Phase of the Landfall Section of the Project. Domestic wastewater will be temporarily stored in the site and then disposed by the licensed disposal facilities. Therefore, it is anticipated that there will be no impacts on these systems as no extra burden will be imposed on the capacity of local power or sewage systems depending on the staff who will work during the construction phase of the Project and the infrastructure needs of this staff.

The potential impacts on municipal infrastructure services will be strived to be minimized as much as possible through the measures given below as well as the general impact mitigation measures which are detailed in **Section 9.17**:

- Electric power, sewage and telecommunication demand will be met by means of the systems independent of available infrastructure systems which provide service for houses or commercial users in the local community, where applicable; and
- An assessment will be made including meetings with the relevant stakeholders regarding the water use before the commencement of the construction and if necessary, additional impact mitigation measures will be taken to mitigate adverse impacts or avoid them.

Kıyıköy has 1 family medicine center, 1 emergency department and 1 ambulance. The Project will probably have its own medical staff and medical arrangements for emergencies; therefore, it is anticipated that the Project will not have an important impact on the health facilities/services in Kıyıköy.

The potential impacts on health facilities/services can be mitigated through the measures below:

- An assessment will be made on healthcare and emergency requirements including the capacity of local health facilities before the commencement of the construction activities;
- Healthcare and emergency arrangements necessary for the Project will be made in conformity with the Project requirements and national regulations during the construction phase; and
- Where it is planned to use local health facilities, additional preparations will be made so as to cope with the demand created by the healthcare needs of the local community and other visitors and to avoid extra pressure on healthcare service providers.

9.14 Residential Areas, Land Use and Ownership Status Affected by the Project

9.14.1 Offshore and Shore Crossing Section

The Offshore Section of the Project will run through the Exclusive Economic Zone (EEZ) of Turkey and Turkish territorial waters. In accordance with the relevant legislation, land use and ownership status are not the same for the EEZ of Turkey and Turkish Territorial Waters.

The EEZ of Turkey starts on the border of Turkish territorial waters at the sea side and extends to maximum 200 nautical miles offshore (or to another neighbor EEZ). Turkey declared an "Exclusive Economic Zone (EEZ)" in the Black Sea by the Decree of the Council of Ministers and the legal structure of the "EEZ" is defined by this Law.

The Decree of the Council of Ministers dated 5/12/1986 and numbered 86/11264 on the declaration of an EEZ of 200 miles by Turkey in the Black Sea is published in the Official Gazette dated December

17, 1986 and numbered 19314. According to this Decree, the EEZ of Turkey that is declared to search, operate, maintain and manage the living and non-living natural resources in the waters over the seabed, in the seabed and under the seabed of the sea areas adjacent to Turkish territorial waters in the Black Sea and to protect other economic interests of the Republic of Turkey stretches from the main lines which are the starting point for the measurement of the size of Turkish territorial waters in this sea to 200 nautical miles.

The rights of Turkey in this zone is regulated in Article 2 of the above-mentioned Decree of the Council of Ministers. Furthermore, Turkey's right to use Turkish Territorial Waters is defined by the Law on Territorial Waters.

Since Turkey did not sign the United Nations Convention on the Law of the Sea, it has no liabilities under the provisions of this convention.

Moreover, in accordance with the Regulation on the Implementation of the Coastal Law, the structures to be built on the coastline are allowed to approach the shore edge line by maximum 50 meters. The coasts and the lands acquired through filling and drying are fully owned by the State. Coasts are open to equal and free public use. The protection of public interest has priority in utilizing shorelines and coastlines.

The provisions of the Fisheries Law No. 1380, the Environmental Law No. 2872 and the regulation issued in accordance with the same law are reserved. There has to be an approved shore edge line for planning and implementation on the coast and coastline.

"Land Use and Ownership Status" in Turkish territorial waters and the EEZ of Turkey is addressed in detail in Chapter 6.1 (Land Use and Ownership Status).

9.14.2 Landfall Section

All of the permanent and temporary areas of use in the Landfall Section of the Project are located in the forest land. There are no parcels owned by a person, no agricultural areas or pastures in the area. As stated in the letter of comment dated June 22, 2017 of the Provincial Directorate of Environment and Urbanization of Kırklareli, there is no area with construction ban in accordance with the Coastal Law No. 3621 in and around the Project Site. Furthermore, no zoning plan with a Ministerial approval within the boundaries of the Project Site is found in the Directorate’s archive. The Project operations will be carried out in conformity with the legislation in force, especially with the upper scale plans in force and the Coastal Law No. 3621.

The Project is designed in a way to minimize the acquisition of temporary or permanent lands as much as possible. Chapter 6.1 (Land Use and Ownership Status) and Chapter 8 (Assessing the Lands which will be disposed of in the Project) provide detailed information on land use and ownership status.

9.15 Economic Life of the Project

The expected service life of the Project is 50 years.

9.16 Cost-Benefit Analysis of the Project

TurkStream Gas Pipeline will create a reliable source of energy for Turkey, and for Southern and Southeastern Europe through Turkey by connecting large gas reserves in Russia directly to Turkey's gas transmission network. TurkStream Gas Pipeline as the first pipeline system in the world to be laid with a depth over two (2) kilometers and a diameter of 81 cm in the bottom of the Black Sea so as to supply gas to Turkey and to Eastern and Southeastern Europe is one of the largest energy projects being developed in Europe today and it will make a significant contribution to the energy supply of Turkey and Europe in addition to introducing a new technical comparison criterion for the sector. It is anticipated that its total capacity of 31.5 billion cubic meters with two pipelines will meet the energy consumption demand of about 20 million households in Turkey and Europe.

Gas delivery from Russia to Europe and Turkey started in 1970s and has proved its reliability for the last 40 years, even during the most violent years of the cold war. The natural gas trade between Russia and Turkey has turned into a very successful cooperation between these two countries and Turkey has become the second biggest buyer of Russian natural gas. Based on this concrete framework, it can be said that TurkStream Gas Pipeline will be an important cornerstone for the sustainable energy future in the entire region.

Gazprom, a Russian natural gas export company, spends billions for infrastructure investments every year for the purpose of ensuring a safe gas delivery, maintaining the current situation of the safe natural gas networks and avoiding any interruptions that may occur in natural gas supply. Gazprom has made an investment over 90 billion Euro in the last decade for the provision of additional pipeline capacity, for the modernization of the existing networks and for additional underground natural gas storage facilities4. As an indication of the commitment to supplying gas to natural gas market in a consistent manner, Gazprom also allocated 10 billion Euro for such investments in 20165. Similarly, TurkStream Gas Pipeline is an investment of multibillion euros of Gazprom which contributes to safe gas supply and ongoing growth of Turkey.

Russia (55%) is the biggest natural gas supplier of Turkey and it is followed by Iran (16%) and Azerbaijan (13%)6. Algeria (8%), Qatar (4%) and Nigeria (3%) are the primary LNG (Liquefied Natural Gas) suppliers of Turkey7. A total of 30 billion cubic meters natural gas is transferred from Russia to Turkey every year through Blue Stream and Trans-Balkan (Western Line) natural gas pipelines. Therefore, it can be said that more than half of Turkey's current natural gas demand is met by the natural gas transported from Russia through these two lines.

Looking at the energy demand, it is seen that the share of natural gas in total energy demand of Turkey reached up to an amount more than 30% today while this rate was around 20% nearly 10 years ago. 12.5 million households and 43 million people meet their energy demand for cooking, boiling water and heating from natural gas8. According to a recent study, natural gas is the most preferred source of energy in Turkey with a rate of 63%, and it is followed by solar power with 21% and wind power with 6%9. Natural gas also accounts for 36.5% of the total electrical power generation10.

TurkStream Gas Pipeline provides a wide range of important benefits to Turkey. These are:

- **Increased Security of Energy Supply of Turkey:** TurkStream Gas Pipeline is an alternative proposed to Trans-Balkan pipeline which currently transports 14 billion cubic meters of

[4]Gazprom, Annual Reports 2006 – 2015. Converted from Ruble into Euro in accordance with annual average exchange rates.

[5]Budget and Cost Reduction Program approved by the Gazprom's Board of Directors, 2016, 28.12.2015

[6]Ibid.

[7]BP Statistical Review of World Energy 2016

[8] Natural Gas Distribution Companies Association of Turkey (GAZBİR), 2016 Natural Gas Distribution Sector Assessment Report, 13.03.2017

[9]Kadir Has University, Energy Preferences of Turkish People 09.02.2017

[10]Energy Market Regulatory Authority,Electricity Market Sector Report, October 2016

natural gas to Turkey per year. Trans-Balkan pipeline which is 40 years old with a low possibility of emergency power supply in case of an energy cut follows a route of 1,400 kilometers running through Ukraine, Moldova, Romania and Bulgaria before connecting to Turkey's natural gas network. TurkStream Gas Pipeline will put an end to the dependency on a single system and bring Turkey -which is placed at the end of a long natural gas supply chain- to forefront in natural gas import. This will not only strengthen the position of Turkey as a direct natural gas buyer from Russia and bring Turkey to a highly important position in more gas transmission to European countries but also make a great contribution to the security of energy of Turkey by substantially eliminating any transportation risks. In addition to diversifying the natural gas supply routes of Turkey and strengthening the security of supply, TurkStream Gas Pipeline will also contribute to the safety of energy transportation in compliance with national energy strategy by lightening the tanker traffic in Turkish straits[11].

The natural gas network of Turkey will considerably benefit from the increased import capacity that will allow for extra supply for unpredictable cuts. Despite all efforts, energy transmission networks break down sometimes which puts the operations of establishments at risk and reduces the level of welfare of households. In this context, Turkey has intervened in natural gas market for a couple of times in order to avoid the natural gas problem caused by the cuts in natural gas transmission carried out through Russia, Iran and Azerbaijan. The elimination of transportation risks will ensure the continuity of the performance of natural gas trade between Turkey and Russia. Increase in the supply routes running to the market and the number of pipelines makes transmissions more reliable to a considerable extent.

- **Response to increased energy demands caused by a growing economy:** Economy which has been growing for the last ten years has also increased the energy demands of the country and brought Turkey to the second place in the world following China in terms of increase in natural gas demand. Today, more than 50 billion cubic meters of natural gas is consumed in Turkish market[12] and it is expected that this consumption amount will exceed 80 billion cubic meters by 2030[13]. TurkStream Gas Pipeline will increase the capacity of gas transmission from Russia to Turkey by 12.5% by renewing Trans-Balkan pipeline of 14 billion cubic meters with a capacity of 15.75 billion cubic meters allocated to Turkey and this will contribute to strengthening the amount of gas flow for the natural gas demand which increased as a result of the economic growth.

  Another point is that TurkStream Gas Pipeline will supply gas to the most important industrial region of Turkey, as it is not possible to supply similar amount of natural gas from another source due to the limited capacity of local natural gas network (causing trouble in gas supply from east to west of the country). Therefore, TurkStream Gas Pipeline will directly supply natural gas to the cities such as Istanbul, Kocaeli, Bursa, İzmir and Manisa which can be considered as the locomotive of the economic growth in Turkey in a way to have a crucial importance in sustaining economic vitality.

- **Providing assistance to "energy trilemma" solution of Turkey:** Natural gas is one of the best fuels which respond to three highly important problems defined as "energy trilemma (sustainability, security and energy access)" by the World Energy Council. Turkey, as one of the parties signing to the Paris Climate Accord, is liable to use cleaner energy sources. And,

[11] Ministry of Foreign Affairs, Republic of Turkey, Energy Profile and Strategy of Turkey, 2015

[12] Energy Market Regulatory Authority, Natural Gas Market Sector Report 2015, 2016

[13] Gulmira Rzayeva, Domestic Energy Market of Turkey: Policies andChallenges, The Oxford Institute for Energy Studies, February 2014

this requires reducing the coal consumption and using natural gas more which generates less than half of the carbon emissions caused by coal and provides a faster, efficient and affordable alternative. The Turkish Government also plans to increase the share of renewable energy sources in national energy sources[14]. In addition to not jeopardizing the sustainability benefits, this means more extensive area of use for natural gas which is defined by sectoral experts as the "natural" component that will balance the security and efficiency problems surrounding the renewable energy sources.

- **Increased geostrategic importance of Turkey:** Turkey took a key role in regional energy trade as it is located at the junction point of energy transportation from some energy-rich countries in the region. TurkStream Gas Pipeline will make Turkey -which is in the last buyer position- the first entry point to Southern and Southeastern Europe in gas transport by changing the gas flow route from Russia. This important change will improve the role and status of Turkey in international and national energy equation. TurkStream Gas Pipeline will contribute to the improvement of the strategic importance of the country and will be a significant turning point in the long-term energy cooperation between Turkey and Russia.

The Project will also provide various important benefits to Europe including the following:

- **Improvement of access to natural gas:** Natural gas became a preferred option -along with renewable sources- in energy production after the termination of nuclear energy use in counties such as Germany following Fukushima nuclear plant accident. Offshore pipelines are considered to be one of the best ways to bring gas to the market. Offshore pipelines are safer, cheaper and more efficient than the transportation of liquefied natural gas (LNG) which requires liquefaction, transportation and re-gasification of natural gas. Besides, thanks to high industrial standards, large offshore pipelines have been running in a safe manner since 1950s and have a perfect safety record. TurkStream Gas Pipeline will also be constructed in accordance with high international standards.
- **Providing additional volume to replace decreasing local production in Europe:** The increase in gas demand of the European Union (EU) steadily progresses. According to Eurogas group in the sector, the gas demand increased around 6% and reached up to 447 billion cubic meters in 2016 while it was 4% in 2015[15]. Meanwhile, the gas rate imported in all EU-28 group increased to 69.3% in 2015 while it was 67.4% in 2014[16]. The import demand will continue increasing in a way to balance the decreasing production amounts. The natural gas production in the EU was decreased by 9% in 2015, and this production will keep decreasing as the natural gas reserves in the Netherlands and England are consumed away[17]. In addition to the extinction of 80% of the gas reserves in the Netherlands in September 2016, a decrease of 38% was observed in the production[18]. IEA (International Energy Agency) envisages that annual gas import to Europe will increase more than 100 billion cubic meters

[14]Ministry of Foreign Affairs, Republic of Turkey, Energy Profile and Strategy of Turkey, 2015

[15] Platts, Outlook 2017: European gas supply, demand to remain robust, 04.01.2017

[16] Eurostat, Natural gas consumption statistics, July 2016

[17] IEA, Medium-Term Gas Market Report 2016-2021

[18] Bloomberg, Netherlands literally running out of gas, 17.09.2016

by 2040 as a result of the decreased production amount provided that the demand remains stable[19].

- **Facilitation of clean energy transmission to the Southern and Southeastern Europe:** Coal dominates the energy market in the Southern and Eastern Europe with a market share of 38.7% as opposed to oil with a market share of 8.2% and natural gas with a market share of 5.2%. [20]. Only 10% of housing in Greece, 6% of housing in Serbia and 2% of housing in Bulgaria are connected to a natural gas network, and there is not any natural gas use in housing in Macedonia yet[21]. As a result, these countries rely substantially on solid fuels, and almost half of the energy consumed in Serbia, Kosava and Bosnia is met by coal and this rate is 35% in Bulgaria[22]. Burning coal causes more CO_2 emissions and brings higher costs due to the productivity losses in the production and transmission of the electric power which is generally used for the heating of the housings. Experts are of the same opinion that the natural gas will be the main factor in supplementing and completing renewable energy sources in energy production necessary for achieving the goals related to the climate change.
- **Improvement in energy shortage dominant in Europe and especially in the Balkans:** Natural gas meets more than one-third of the total energy demand in countries such as the Netherlands and England while this rate is just 9% in the Balkans where the supply networks are inadequate[23]. It is estimated that 50 to 125 million people in the EU are poor in natural gas and cannot meet their basic energy requirements. This is more intense in the Southern and Southeastern Europe and at least 30% of the households struggle with energy shortage[24]. The solution of this crucial problems is hindered due to the weak infrastructure for natural gas access and the people are forced to use less economic and less environment-friendly fuels.
- **Being a building block for a large number of new energy transport projects in Europe:** Various countries submit their proposals for other infrastructure projects that will supply gas from Turkey to Europe through TurkStream Gas Pipeline. TurkStream Gas Pipeline is a building block for these projects as a component of the energy supply network that will increase the security of energy in this region by supplying gas from the natural gas network of Russia.
- **Development of international solidarity by investing in the long-term energy partnership:** Pipelines are long-term commitments which are developed for specific market supply and allow for investing in new gas networks in the countries to where the natural gas will be transmitted, in energy production with natural gas and in other technologies. TurkStream Gas Pipeline requires Gazprom to make a substantial investment so as to supply the committed natural gas amounts. When putting this initiative into practice and bearing the cost, Gazprom takes into consideration that the supply cuts may have severe impacts both

[19] IEA, Outlook 2015 – New Policies Scenario. Figures are meant for European OECD countries (Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Turkey and England. EIA also discusses Israel for statistical reasons).

[20]See Change Network, Southeast Europe: An Energy Roadmap for 2050 (The EU Road or the Road to Nowhere?): Geleceğe bir Kılavuz, June 2016

[21] Ministry of Energy of Serbia, Presentation on Serbian Gas Sector, 2015
EurActiv, Bulgaria's Energy Sector Reform, April 2015

[22] 2014 data, Eurostat, National shares of fuels in gross inland energy consumption, 2016

[23] 2014 data, Eurostat, National shares of fuels in gross inland energy consumption , 2016

[24]Climate Action Network Europe, Energy Poverty in South-East Europe, 18.12.2016

on suppliers and consumers. TurkStream Gas Pipeline which is supported by various incentives to transport Russian natural gas to the markets in the Southern and Southeastern Europe will be an important factor in enhancing the energy solidarity between Turkey, Europe and Russia.

- Determination of a new industrial reference through the technical achievement having high standards for safety, security and environmental sustainability: The Project Owner brought together more than 200 experts from over 20 countries in order to construct the Project in a safe manner for the environment and the local community. This Project (TurkStream Gas Pipeline - Offshore Section) is implemented by experts in compliance with high international standards by attaching necessary importance to security, environment and people living around. The mission of South Stream Transport in charge of the Project is to transport the gas in a safe and reliable manner.

9.16.1 Cost-Benefit Analysis for Socio-Economic Dimensions

TurkStream Gas Pipeline - Offshore Section (Project) will create a positive macro-economic impact as a result of being a direct foreign investment. The total economic investment value of the Offshore Section of the Project in Turkey is 2.3 billion Euro and the entire financing will be provided by Gazprom PAO. A substantial part of the financing will be used in the construction of the shore crossing, onshore pipelines and Receiving Terminal in Kıyıköy.

Though it is difficult to put positive economic contributions into numbers at this point, there will be direct and indirect economic benefits due to the creation of employment and the procurements in the construction phase of the Project. It is anticipated that a total of 600 workers will work during the construction in landfall and a majority of these workers will be a citizen of the Republic of Turkey.

The Project will also require the procurement of some materials and equipment from Turkey, and it is probable that large-scale goods and services contracts will be made with the national firms active in Turkey. The fields of work of the Project likely to show an increase in goods and service demand at national, regional or local level are as follows:

- Construction contractors (road construction, land cleaning, etc.), construction materials and equipment suppliers;
- Local accommodation service providers, restaurants, stores; and
- Auxiliary services such as transportation, supplies, cleaning and security services.

In addition to the employment opportunities directly provided by the Project for the construction activities, there may be a limited increase in local employments due to indirect and triggering impacts of the construction activities. Indirect employment includes the employment opportunities that may be created in local firms in association with the procurement of goods and services from these local firms.

At this point, it is expected that the investment in the construction phase will mainly bring benefits at national level and that regional and local economic benefits will be more limited. **Section 9.13** provides detailed information on expected income growth, employment opportunities to be created and population movements which will result from the Project. It is anticipated that the Project will lead to more limited economic benefits during the operation phase. In the operation phase, about 20 full-time employees will be recruited; however, the procurement requirement will be substantially limited to office supplies, small hardware and relevant materials as well as services such as cleaning, catering, security and transportation.

The Project may cause some adverse socio-economic impacts during the construction and operation phases. These will be mainly local and temporary impacts in the region where the Project activities are carried out. The impact mitigation and management measures presented in this section are developed for the purposes of avoiding or minimizing any negative socio-economic impacts on the means of livelihood of the local community or, where this is not possible, balancing these impacts with remedial measures.

In addition to impact mitigation measures, the Project will develop a Community Investment Program for the local community in order to strengthen the socio-economic benefits or create such benefits.

9.17 Other Issues

9.17.1 General Impact Mitigation Measures

9.17.1.1 Complaint Procedure

A Complaint[25] Procedure that will provide guidance for the management of the complaints during the Project has been developed and is being implemented by the Project Owner.

The Complaint Procedure will be implemented by the Project Owner in cooperation with the contractors and ensure that the complaints are conveyed to the suitable Project staff and answered in time by following a standard investigation, analysis and solution procedure. Besides, the Complaint Procedure will ensure that the solutions are documented and conveyed to the relevant stakeholders.

The Complaint Procedure will take a Framework for Compensation Management and Reinstatement of Livelihood Conditions as a reference in order to ensure that the incidents requiring compensation somewhat are evaluated in a consistent and equal manner.

9.17.1.2 Framework for Compensation Management and Reinstatement of Livelihood Conditions

In particular conditions where an important negative impact cannot be mitigated through avoiding or minimizing the impact, it may be appropriate to compensate this situation. New or different impacts may occur during the course of the Project as a result of the changes in current circumstances, third party activities out of the control of the Project and/or the changes in the assumptions for which this assessment is taken into account. The Project Owner may face situations requiring compensation as a result of the impacts occurred during the monitoring of environmental and socio-economic conditions (Section 9.17.2) or during the regulation or implementation of impact mitigation measures as required.

Compensation also includes the measures necessary for the reinstatement of the livelihood conditions in case of the possibility of causing impacts on livelihood conditions. The Project Owner will develop a Framework for Compensation Management and Reinstatement of Livelihood Conditions which provides guidance for the compensation and the improvement of livelihood conditions.

The compensation management component of the Framework for Compensation Management and Reinstatement of Livelihood Conditions will define the process and requirements for the evaluation of compensation claims and the implementation of compensation measures. Compensation measures may be financial and in-kind contribution.

[25]Complaint refers to the notification of a problem by an individual (or group) -who feels that she/he is negatively impacted by the Project-related activities- through an official channel.

Compensation for economic losses will cover the conditions where the financial impacts caused by the decreased incomes or increased costs of an establishment or an individual in a way to be reasonably associated with the construction activities of the Project. The Framework will make sure that the individuals or establishments likely to be affected by the Project are appropriately compensated after they lose their assets or access to their assets. The Framework will provide certain criteria for the payment of the compensation through a consistent and fair approach.

The reinstatement of livelihood conditions component of the Framework for Compensation Management and Reinstatement of Livelihood Conditions will define the process to be carried out to identify the need for measures for the reinstatement of livelihood conditions, and the development of these measures through negotiations with the stakeholders exposed to the impact and the relevant local intermediaries. The overall goal is to reinstate the livelihood conditions which are exposed to the impact or to at least bring them to the levels before the impact.

The Framework for Compensation Management and Reinstatement of Livelihood Conditions will be closely associated with the Complaint Procedure. Additionally, the issue of compensation will be discussed in accordance with a specific component of the Construction Management Plans, the Framework for Compensation Management and Reinstatement of Livelihood Conditions and other appropriate plans and frameworks. As part of the implementation of the framework, the Project Owner will work together with the stakeholders -who are exposed to the impact- in order to identify the appropriate compensation and reinstatement measures.

9.17.1.3 Ongoing Stakeholder Engagement

The Project Owner will continue implementing a program that contains information provision, stakeholder engagement and consultations during the Construction and Pre-Commissioning Phases. These engagement activities will be designed so as to facilitate the dialog with all stakeholders including those who have a potential to be affected from the Project or those who have concerns about the Project or those who are interested in the Project. These activities will allow for early detection and solution, with an appropriate approach, of the potential impacts, problems and concerns. Also during the stakeholder engagement activities, the relevant stakeholders will be informed on the forthcoming construction activities and the completed Project activities and the notice regarding the foreseen changes will be given in advance.

The ongoing stakeholder engagement will serve as an instrument to monitor the impacts on the stakeholders who have a potential to be affected in order to ensure that the actual impact is not greater than expected. If additional important impacts are detected and confirmed, it will be a priority to come to an agreement on a solution by having meetings with the affected stakeholders. The solution including the development of additional impact mitigation measures will be developed in consultation with the affected stakeholders.

9.17.1.4 Community Investment Program

The Project Owner will develop a Community Investment Program which will provide guidance for community investment initiatives and opportunities. Though not having an objective of impact mitigation or compensation, the community investment may be beneficial both for the Project and the local communities and stakeholders by strengthening the socio-economic benefits and creating such benefits.

In this context, the community investment is seen as a key mechanism which supports the development of the community and ensures the establishment of a relationship based on mutual enjoyment of benefits with the local communities. Under the Community Investment Program, the Project Owner will be in cooperation with the local stakeholders to identify the potential investment opportunities and initiatives. Local stakeholders will also be an integral part of the design and implementation of such programs.

9.17.2 Monitoring

The socio-economic (and biophysical) environment will be monitored to ensure the proper management of the impacts. The monitoring activities which will be carried out as a part of the Project are summarized in the relevant sections of the EIA Report and focus on the topics below:

- Air Quality;
- Noise;
- Landscape and Panorama; and
- Marine Ecology and Sedimentation.

The ongoing stakeholder engagement will serve as an instrument to monitor the impacts on the potentially affected stakeholders and to ensure that the actual impact level is not greater than expected. If additional important impacts are detected and confirmed, it will be a priority to come to an agreement on a solution by having meetings with the affected stakeholders.

Regular social and economic monitoring activities will be carried out in the Construction and Pre-Commissioning Phases of the Project. The main objective of monitoring is to find out whether or not the Project leads to unforeseen social and economic changes through the monitoring of social and economic conditions in the local communities and if it does, to early-detect these changes.

Specific socio-economic monitoring measures and relevant physical monitoring measures consist of the following:

- Monitoring of the efficiency of the impact mitigation measures to be taken in addition to the monitoring of potential impacts on fishery activities, through ongoing meetings with the Kıyıköy Fishery Cooperative;
- Monitoring of the efficiency of the impact mitigation measures to be taken in addition to the potential impacts on the forestry activities as a result of the Project activities, through ongoing meetings with the Forestry Operation Directorate of Kıyıköy;
- Monitoring of the efficiency of the impact mitigation measures to be taken in addition to the potential impacts on the livestock activities as a result of the Project activities, through ongoing negotiations with the livestock enterprises in Selves region and the Livestock Cooperative;
- Monitoring of the potential impacts on tourism and beach use, through ongoing meetings with the relevant stakeholders such as Kıyıköy Municipality, Culture and Tourism Association of Kıyıköy, accommodation facilities and other establishments serving in tourism in the region;
- Noise monitoring in sensitive areas such as housings adjacent to the access roads and rest areas close to the construction activities for socio-economic receptors and for sensitive receptors in the forest;

- Monitoring of the efficiency of the impact mitigation measures regarding the traffic, through ongoing meetings with the stakeholders and the community exposed to the impact all along the access roads and transportation routes; and
- Monitoring of the water demand and potential changes in the capacity by directly communicating with Kıyıköy Municipality and/or service providers if the municipal water or the local water resources are used for the construction activities of the Project.

More general socio-economic monitoring activities regarding the ongoing stakeholder engagement will include the following issues:

- Worker recruitment from the local community;
- Goods and service procurement from the local enterprises;
- Request for using local service and facilities (e.g. healthcare facilities) for the non-local Project employees; and
- All kinds of problems regarding the wrong behaviors of the labour force of the Project (including contractors and subcontractors).

If necessary, some of the data above will be requested to be able to support the stakeholder meetings and/or find a solution for potential complaints. Additionally, the complaint procedure and the ongoing stakeholder engagement will help monitor the impacts and the perception created by the Project on the stakeholders.

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10 Assessment of the Activities in the Scope of the Project

This chapter focuses on the impacts of the construction and operation activities including preparation for the constructionphase and pre-operation phase and covers the following topics:

- Water utilization and disposal;
- Energy and fuel supply;
- Possible source and infrastructure use;
- Land and marine traffic (land preparation, construction, operation and post-operation);
- Assessment of air quality;
- Noise and vibration;
- Waste production and waste management;
- The maintenance phases of the pipeline;
- Contingencies (loss insemination in case of accidents);
- Health Protection Strip distance;
- Visual impacts;
- Lightning impacts;
- Odour;
- Land rehabilitation work;
- Risk analysis (Precautions to be taken against risk situations in the scope of project work and processes (land preparation, Construction, operation and post operation); and
- Other issues.

In this chapter you can find a assessment of the project activities in line with the existing national and international standards and provisions of the legislation, also when possible the legal requirements and project standards are stated in quantitative terms. The project will be developed and operated in line with the project standards that include the national and international legal requirements stated in **Chapter 3** (Legal, Political and Administrative Framework). In addition the project will adopt the Good International Industrial Practices (GIIP). Detailed information on the project phases is conveyed in **Chapter**General Characteristics of the Project).

Information in regards to the vessel fleets that will be used in the construction of offshore and shore crossing sections are given in Table10.1 and

Table10.2. Similarly the details regarding the equipment to be used in the construction of the projects' landfall section is provided in Table10.3. In this chapter the impact of the project activities at each stage is reviewed in the scope of the subject matters that are listed above.

Table10.1Offshore Construction Vessel Spread and Their Technical Specifications

Construction Activity	Type of Vessel	Task	Number of Vessels	Indicative Duration (Days) Per Vessel and per Pipeline unless stated otherwise	Indicative Vessels	Power Rating (kW)	Persons on Board	Utilisation (%)
Pre-Lay Seabed Intervention Works (for cable crossings)	Rock dumping vessel	Cable crossings	1	8 days	Rockpiper	15.192	60	60
	Survey vessel	Surveying the seafloor during intervention works	1	8 days	Normand Poseidon	8.400	50	60
	Multi service vessel (MSV)	ROV support, Diving support, Consumables supply, Bunker supply, Provisions supply, Water supply	1	8 days	Highland Navigator	7.160	50	60
	Fast supply vessels	Crew changes	1	1 day (2 half day trips)	GSP Lyra	2.520	70	60
	Maintenance Vessel	Provisions delivery, delivery of spare parts	1	1 day	Normand Flipper	7.160	16	60
	Fuel/wastewater collector vessel	Bilge and wastewater collection	1	1 day	Bryansk	610	5	60
	Rescue Vessel	Safety and rescue operations	1	Only required in case of emergency	GSP Vega	9.548	23	60
Offshore Pipe-laying >30 m water depth	Offshore pipe-lay vessel	Deepwater pipe-laying	1	76 days Plus 38 days running at 25% capacity for mobilisation/demobilisation	Pioneering Spirit	95.000	571	40
	Tugs	General support	1	76 days Plus 38 days running at 25% capacity for mobilisation/demobilisation	Normand Neptun	13.880	40	60
	Pipe-lay supply vessel (PSV)	Supplying pipe to pipe-lay vessel	5	76 days Plus 38 days running at 25% capacity for mobilisation/demobilisation	Spliethoff E-type	5.430	16	60

Construction Activity	Type of Vessel	Task	Number of Vessels	Indicative Duration (Days) Per Vessel and per Pipeline unless stated otherwise	Indicative Vessels	Power Rating (kW)	Persons on Board	Utilisation (%)
	Survey vessel	Surveying the sea floor in front and behind the pipelay vessel	2	76 days Plus 38 days running at 25% capacity for mobilisation/demobilisation	Normand Poseidon	8,400	50	60
	Multi service vessel (MSV)	ROV support, Diving support, Consumables supply, Bunker supply, Provisions supply, Water supply	2	76 days Plus 38 days running at 25% capacity for mobilisation/demobilisation	Highland Navigator	7,160	50	60
	Helicopter	Crew changes	1	4 days (8 half day trips)	Super Puma	1,200	10	60
	Crew boats, fast cats (back-up option)	Crew changes	1	2 days (4 half day trips)	GSP Lyra	2,520	70	60
	Maintenance vessel	Delivery of spare parts / equipment	1	4 days	Normand Flipper	7,160	16	60
	Fuel/wastewater collector vessel	Bilge and wastewater collection	1	4 days	Bryansk	610	5	60
	Rescue vessel	Safety and rescue operations	1	Only required in case of emergency	GSP Vega	9,548	23	60
Post-lay Seabed Intervention Works (for free span correction*)*	Post-lay trenching support vessel	Post-lay trenching for free-span correction (if required)	1	15 days	Calamity Jane	15,086	72	60
	Survey vessel	Surveying during intervention works	1	15 days	Normand Poseidon	8,400	50	60
	Fast supply vessel	Crew changes	1	1 day (2 half day trips)	GSP Lyra	2,520	70	60
	Maintenance vessel	Provisions delivery, delivery of spare parts	1	1 day	Normand Flipper	7,160	16	60
	Fuel/wastewater collector vessel	Bilge and wastewater collection	1	1 day	Bryansk	610	5	60

Construction Activity	Type of Vessel	Task	Number of Vessels	Indicative Duration (Days) Per Vessel and per Pipeline unless stated otherwise	Indicative Vessels	Power Rating (kW)	Persons on Board	Utilisation (%)
	Rescue vessel	Safety and rescue operations	1	Only required in case of emergency	GSP Vega	9,548	23	60

Table10.2Shore Crossing Construction Vessel Spread and Their Technical Specifications

Construction Activity	Type of Vessel	Task	Number of Vessels	Duration (days) per vessel	Indicative Vessels	Power Rating (kW)	Persons on Board	Utilisation (%)
Shallow Water Pipe-lay Activities (10-30 m water depth) and Pipeline Installation	Shallow water pipe-lay vessel	Preparing pipelines and pipeline trains for shore pull in the shore crossing	1	7 days (2 days of pipe laying, 5 days for shore pull) In addition, for mobilization and demobilization, at 25% capacity for 3 days	Tog Mor	3,750	140	40
	Anchor Handling Tugs	Anchoring of the pipe laying vessel	3	As above	Normand Neptun	13,880	15	60
	Pipe-lay supply vessel (PSV)	Supplying pipe to pipe-lay vessel	2	As above	Spliethoff E-type	5,430	15	60
	Survey vessel	Pre-lay, as-built and post-lay surveys of seabed / pipeline	2	As above	Normand Poseidon	8,400	50	60
	Multi service vessel (MSV)	ROV support Diving support Consumables supply Bunker supply Provisions supply Water supply	2	As above	Highland Navigator	7,160	50	60
	Crew boats, fast cats	Crew changes	1	1 day (2 half day trips)	GSP Lyra	2,520	70	60

Construction Activity	Type of Vessel	Task	Number of Vessels	Duration (days) per vessel	Indicative Vessels	Power Rating (kW)	Persons on Board	Utilisation (%)
	Fuel/wastewater collector vessel	Bilge and wastewater collection	1	1 day	Bryansk	610	5	60
	Rescue vessel	Safety and Rescue Operations	1	Only required in case of emergency	GSP Vega	9,548	50	60
	Fuel/wastewater collector vessel	Bilge and wastewater collection	1	1 day	Bryansk	610	5	60
Excavation of the Open-cut Section and Trenches through Dredging (till about 2km offshore)	Cutter Suction Dredger (CSD) (alternative option for dredging the rock)	Dredging of the trenches in the Nearshore Section The use of CSD depends on seabed conditions (it will be used in areas where the seabed is hard). May be used in combination with TSHD.	1	35-140 days	Taurus II	24,610	30	60
	Back-hoe dredging equipment (BHD)	Potentially, excavation of the rocky section in the outlet section by dredging	1	35-40 days	Nordic Giant	2,085	20	60
	Trailer Suction Hopper Dredger (TSHD)	Dredging of the trenches in the Nearshore Section The use of TSHD will depend on seabed conditions (only used in areas with soft sediments). Can be used together with CSD or BHD.	1	7 days	Shoalway	6,666	17	60
	Small survey vessel	Examination of the seabed before, during and after the dredging process	1	7 days	Dunai	500	10	60
	Tug	Transporting the CSD and split hopper barge, and	1	7 days	Mustang	4,536	8	60

Construction Activity	Type of Vessel	Task	Number of Vessels	Duration (days) per vessel	Indicative Vessels	Power Rating (kW)	Persons on Board	Utilisation (%)
		transport of water and fuel, etc.						
	Crew boats, fast cats	Crew changes	1	2 days (4 half day trips)	GSP Lyra	2,520	70	60
	Maintenance vessel	Delivery of spare parts / equipment	1	2 days	Normand Flipper	7,160	16	60
	Fuel/wastewater collector vessel	Bilge and wastewater collection	1	2 days	Bryansk	610	5	60
	Rescue vessel	Safety and Rescue Operations	1	Only required in case of emergency	GSP Vega	9,548	50	60
Backfilling of the Trenches	TSHD	Transportation of stored sandy / soft excavation material from temporary storage areas and backfilling of trenches with excavation mud	1	50 days	Shoalway	6,666	17	60
	CSD (CSD or Back-hoe Dredging equipment)	Removal of passages and backfilling of trenches	1	50 days	Taurus II	24,610	30	60
	BHD (BHD or CSD)	Removal of passages and backfilling of trenches	1	50 days	Nordic Giant	2,085	20	60
	Small survey vessel	Inspection of trenches before, during and after backfill	1	50 days	Duna	500	10	60
	Crew boats, fast cats	Crew changes	1	1 day (2 half day trips)	GSP Lyra	2,520	70	60
	Maintenance vessel	Delivery of spare parts / equipment	1	1 day	Normand Flipper	7,160	16	60
	Fuel/wastewater collector vessel	Bilge and wastewater collection	1	1 day	Bryansk	610	5	60

Construction Activity	Type of Vessel	Task	Number of Vessels	Duration (days) per vessel	Indicative Vessels	Power Rating (kW)	Persons on Board	Utilisation (%)
	Rescue vessel	Safety and Rescue operations	1	Only required in case of emergency	GSP Vega	9,548	50	60

Table10.3Equipment to be used in the construction of the Landfall Section

Construction Equipment			Number of Plant / Equipment per Phase				
Equipment	Power Rating / Weight	Activity dB LAeq, T @10m	Site Preparation (Inc. access roads and equipment mobilisation)	RT (2 pipelines)	Trench Excavation (2 pipelines)	Pipeline Installation (2 pipelines)	Demobilisation / Reinstatement
Bulldozer	250 kW - 35 t	86	4	2	1	1	1
Grader	87 kW - 22 t	77	2	2	1	1	1
Tracked Excavator	102 kW - 22 t	78	6	2	4	2	2
Tipper Lorry	75 kW - 25 t	85	4	4	2	1	2
Shovel	74 kW -19 t	76	2	4	2	1	2
Tracked Side Boom	230 kW - 50 t	77	0	2	0	6	0
Tracked Crawler Crane	250 kW - 120 t	75	1	4	0	1	0
Small Mobile Crane	370kW – 60 t		0	2	0	0	0
Large Mobile Crane	450kW – 72 t		0	1	0	0	0
Welding Machines	20 kW – 0,6 t	65	0	6	0	10	0
Pipe Bending Machine	129 kW - 25 t	66	0	0	0	1	0
Generators	250 kW	98	2	10	2	4	2

Construction Equipment			Number of Plant / Equipment per Phase				
Equipment	**Power Rating / Weight**	**Activity dB LAeq, T @10m**	**Site Preparation (Inc. access roads and equipment mobilisation)**	**RT (2 pipelines)**	**Trench Excavation (2 pipelines)**	**Pipeline Installation (2 pipelines)**	**Demobilisation / Reinstatement**
Mobile Stone Crusher	460 kW		1 to 3	0	0	0	0
Concrete Preparation Plant			0	1	0	0	0
Linear Crane (shore crossing only)			0	0	0	1	0

The number of workers that are to be employed in the construction phase of the project will be certain after the detailed design of the project is finalised. However the maximum number of employees (estimation in the existing conditions) foreseen during the most intensive period of construction activities is given in Table10.4 below.

Table10.4EstimatedLabour Force for the Construction Phase

Project Section	Maximum number of workers (approximate)
Offshore	950
Shore Crossing	250
Landfall	600

10.1 Water utilization and disposal (sources during preparation, construction, operation and post-operation, quantity of water, quantity of potable water and utility water and other utilization purposes, the quantity of wastewater post utilization and its disposal)

10.1.1 Offshore and Shore Crossing Section

10.1.1.1 Construction Phase

During the construction activities in the Offshore and Shore Crossing sections water will be required forgeneral domestic use for purposes such as drinking, washing, cooking, laundry, general cleaning. Even though certain vessels named in Table10.1 and

Table10.2 are equipped with a desalination system (distillation or reverse osmosis), it is foreseen that utility water will be supplied through tankers. The estimated domestic water consumption during the heavy construction activities of the Project's Shore Crossing and Offshore section is presented in Table10.5. It is anticipated that the daily water requirement per person will be 0,20 m^3 (The current average water consumption in Europe and many other countries has been taken as bases(Ref. 10.1).

Table10.5 Estimated Water Consumption during the Heavy Construction period in the Offshore and Shore Crossing Sections

Type of Water	Details	Daily Consumption (m^3)	
		Offshore	Shore Crossing
Kullanma Suyu	0,2 m^3/person- day	950 person x 0,2 m^3/person-day = 190	250 personx 0,2 m^3/person-day = 50

There are no national regulations or international standards that set the water consumption amount or scope on the vessels operating in the Turkish EEZ, the offshore section of the Project.

Table10.6 and Table10.7 indicates the estimated total water consumption during the construction and post operation phase of the project in the Offshore and Shore Crossing sections depending on the type of the vessels, their numbers, service capacity and personnel.

Table10.6Estimated Total Domestic Water Consumption During Construction and Pre-Commissioning Preparation Phase

Construction Activity	Type of Vessel	Number of Vessel	Duration of Operation (day)	Persons on board	Per Capita Consumption of Water (m^3/person-day)	Total Water Consumption (m^3) (For a single pipeline)
Pre-Lay Seabed Intervention Works (for cable crossings)	Rock dumping vessel	1	8	60	0,20	96,00
	Survey vessel	1	8	50	0,20	80,00
	Multi service vessel (MSV)	1	8	50	0,20	80,00
	Fast supply vessels	1	1	70	0,20	14,00
	Maintenance Vessel	1	1	16	0,20	3,20
	Fuel/wastewater collector vessel	1	1	5	0,20	1,00
	Rescue Vessel	1	Only required in case of emergency	23	0,20	Omited
Offshore Pipe laying >30 m Water depth	Offshore pipe-lay vessel	1	76 +38	571	0,20	13.018,80
	Tugs	1	76 +38	40	0,20	912,00
	Pipe-lay supply vessel (PSV)	5	76 +38	16	0,20	1.824,00
	Survey vessel	2	76 +38	50	0,20	2.280
	Multi service vessel (MSV)	2	76 +38	50	0,20	2.280
	Helicopter	1	4	10	0,20	8,00
	Crew boats, fast cats (back-up option)	1	2	70	0,20	28,00
	Maintenance vessel	1	4	16	0,20	12,80
	Fuel/wastewater collector vessel	1	4	5	0,20	4,00
	Rescue vessel	1	Only required in case of emergency	23	0,20	Omited
Post-lay Seabed	Post-lay trenching support vessel	1	15	72	0,20	216,00
	Survey vessel	1	15	50	0,20	150,00

Construction Activity	Type of Vessel	Number of Vessel	Duration of Operation (day)	Persons on board	Per Capita Consumption of Water (m^3/person-day)	Total Water Consumption (m^3) (For a single pipeline)
Intervention Works (for free span correction)	Fast supply vessel	1	1	70	0,20	14,00
	Maintenance vessel	1	1	16	0,20	3,20
	Fuel/wastewater collector vessel	1	1	5	0,20	1,00
	Rescue vessel	1	Only required in case of emergency	23	0,20	Omited
Total domestic water consumption for single pipe line: 21.026,00 m^3						
Total domestic water consumption for two pipe lines: 42.052,00 m^3						

Table10.7Estimated Total Domestic Water Consumption in the Construction and Pre-Operation Preparation Phase – Shore Crossing Section

Construction Activity	Type of Vessel	Number of Vessel	Duration of Operation (day)	Persons on board	Per Capita Consumption of Water (m^3/person-day)	Total Water Consumption (m^3) (For a single pipeline)
Shallow Water Pipe-lay Activities (10-30 m water depth) and Pipeline installation	Shallow water pipe-lay vessel	1	7 + 3	140	0,20	280,00
	Anchor Handling Tugs	3	7 + 3	15	0,20	90,00
	Pipe-lay supply vessel (PSV)	2	7 + 3	15	0,20	60,00
	Survey vessel	2	7 + 3	50	0,20	200,00
	Multi service vessel (MSV)	2	7 + 3	50	0,20	200,00
	Crew boats, fast cats	1	1	70	0,20	14,00
	Maintenance vessel	1	1	16	0,20	3,20
	Fuel/wastewater collector vessel	1	1	5	0,20	1,00
	Rescue vessel	1	Only required in case of emergency	50	0,20	Omited

Construction Activity	Type of Vessel	Number of Vessel	Duration of Operation (day)	Persons on board	Per Capita Consumption of Water (m^3/person-day)	Total Water Consumption (m^3) (For a single pipeline)
Excavation of the Open-cut Section and Trenches through Dredging (till about 2km offshore)	Cutter Suction Dredger (CSD)	1	35 – 140	30	0,20	840,00
	Backhoe dredging equipment (BHD) (alternative option for dredging the rock - this equipment was not modeled)	1	35 - 40	20	0,20	160,00
	Trailer Suction Hopper Dredger (TSHD)	1	7	17	0,20	23,80
	Small survey vessel	1	7	10	0,20	14,00
	Tug	1	7	8	0,20	11,20
	Crew boats, fast cats	1	2	70	0,20	28,00
	Maintenance vessel	1	2	16	0,20	6,40
	Fuel/wastewater collector vessel	1	2	5	0,20	2,00
	Rescue vessel	1	Only required in case of emergency	50	0,20	Omited
Backfilling of the Trenches	TSHD	1	50	17	0,20	170
	CSD (or backhoe dredging equipment)	1	50	30	0,20	300
	BHD (or CSD)	1	50	20	0,20	200
	Small survey vessel	1	50	10	0,20	100
	Crew boats, fast cats	1	1	70	0,20	14
	Maintenance vessel	1	1	16	0,20	3,20
	Fuel/wastewater collector vessel	1	1	5	0,20	1,00
	Rescue vessel	1	Only required in case of emergency	50	0,20	Omited

Construction Activity	Type of Vessel	Number of Vessel	Duration of Operation (day)	Persons on board	Per Capita Consumption of Water (m^3/person-day)	Total Water Consumption (m^3) (For a single pipeline)
Total domestic water consumption for single pipe line: 2.721,80 m^3						
Total domestic water consumption for two pipe lines: 5.443,60 m^3						

The disposal of the domestic wastewater –that will be generated in the vessels in the Offshore Section of the Project- in the Turkish EEZ will be in line with the provisions of the Water Pollution Control Regulation (SKKY) and according to Annex IV of "The International Convention for the Prevention of Pollution from Ships" (MARPOL 73/78) where applicable.

The domestic wastewatergenerated in the Offshore and Shore Crossing sections willcomprise of sewage water (As defined in MARPOL Annex IV sewage from toilet sourced wastewater) and dish, showers, laundry, bath and sink wastewater. In addition, in the international literature sewage water is defined as "black water" and other domestic wastewater as stated above is defined as "grey water" (Ref. 10.2). Accordingly, Table10.8 provides the estimated daily black water and grey water generation during the heavy construction period in the Shore Crossing and Offshore Sections of the Project. Daily sewage water (black water) generation per capita is considered to be 12lt and other domestic wastewater (grey water) generation amount is considered to be 180 lt (90% of domestic water consumption).

Table10.8Daily Estimated Black Water and Grey Water Generation in the Heavy Construction Period on the Offshore and Shore Crossing Sections

Wastewater	Details	Daily Maximum Generation Amount (m^3)	
		Offshore	Shore Crossing
Black Water	0,012m^3/Per capita - day	11,4	3
Grey Water	0,18 m^3/ Per capita - day	171	45

Sewage water (black water) and other domestic wastewater (grey water) generated in the shore crossing section of the project will be managed and if needed treated according to Water Pollution Control Regulation, Reception of Wastes from Ships and Waste Control Regulation and other related national legislation provisions.

With the assumption that the pipe laying operation in the offshore section will be carried out by Pioneering Spirit and in the Shore Crossing Section by Tog Mor the total amount of cooling water used is foreseen to be 9.620 m^3/hour. Accordingly, the conditions in relation to the cooling water is stated bellow:

- When discharged the temperature range of the cooling water shall be utmost 5-10 degrees above the sea water temperature; and
- Since the cooling water does not contain chemical/dangerous materials it will be considered as domestic wastewater and will be discharged accordingly.

Table10.9 and Table10.10 illustrates foreseen domestic wastewater (black water + grey water) generation amount in relation to the type of vessel, number of vessel, duration of operation and persons on board during the construction and pre-operation phase of the Offshore and Shore Crossing sections of the Project.

Table10.9Estimated Domestic Wastewater Generation in the Construction and Pre-operation Phase – Offshore Section

Construction Activity	Type of Vessel	Number of Vessel	Duration of Operation (day)	Persons on board	Per Capita Domestic Wastewater Generation (m^3/person-day)	Total Domestic WastewaterGeneration (m^3) (For a single pipeline)
Pre-Lay Seabed Intervention Works (for cable crossings)	Rock dumping vessel	1	8	60	0,192	92,16
	Survey vessel	1	8	50	0,192	76,80
	Multi service vessel (MSV)	1	8	50	0,192	76,80
	Fast supply vessels	1	1	70	0,192	13,44
	Maintenance vessel	1	1	16	0,192	3,07
	Fuel/wastewater collector vessel	1	1	5	0,192	0,96
	Rescue vessel	1	Only required in case of emergency	23	0,192	Omited
Offshore Pipe-laying >30 m water depth	Offshore pipe-lay vessel	1	76 +38	571	0,192	12.498,05
	Tugs	1	76 +38	40	0,192	875,52
	Pipe-lay supply vessel (PSV)	5	76 +38	16	0,192	1.751,04
	Survey vessel	2	76 +38	50	0,192	2.188,80
	Multi service vessel (MSV)	2	76 +38	50	0,192	2.188,80
	Helicopter	1	4	10	0,192	7,68
	Crew boats, fast cats (back-up option)	1	2	70	0,192	26,88
	Maintenance vessel	1	4	16	0,192	12,29
	Fuel/wastewater collector vessel	1	4	5	0,192	3,84
	Rescue vessel	1	Only required in case of emergency	23	0,192	Omited
	Post-lay trenching support vessel	1	15	72	0,192	207,36

Construction Activity	Type of Vessel	Number of Vessel	Duration of Operation (day)	Persons on board	Per Capita Domestic Wastewater Generation (m^3/person-day)	Total Domestic WastewaterGeneration (m^3) (For a single pipeline)
Post-lay Seabed Intervention Works (for free span correction*)*	Survey vessel	1	15	50	0,192	144,00
	Fast supply vessel	1	1	70	0,192	13,44
	Maintenance vessel	1	1	16	0,192	3,07
	Fuel/wastewater collector vessel	1	1	5	0,192	0,96
	Rescue vessel	1	Only required in case of emergency	23	0,192	Omited
Total domestic wastewater generation for single pipe line: 20.184,96 m^3						
Total domestic wastewater generation for two pipe lines: 40.369,92 m^3						

Table10.10 Estimated Domestic Wastewater Generation in the Construction and Pre-operation Phase – Shore Crossing Section

Construction Activity	Type of Vessel	Number of Vessel	Duration of Operation (day)	Persons on board	Per Capita Domestic Wastewater Generation (m^3/person-day)	Total Domestic Wastewater Generation (m^3) (For a single pipeline)
Shallow Water Pipe-lay Activities (10-30 m water depth) and Pipeline installation	Shallow water pipe-lay vessel	1	7 + 3	140	0,192	268,80
	Anchor Handling Tugs	3	7 + 3	15	0,192	86,40
	Pipe-lay supply vessel (PSV)	2	7 + 3	15	0,192	57,60
	Survey vessel	2	7 + 3	50	0,192	192,00
	Multi service vessel (MSV)	2	7 + 3	50	0,192	192,00
	Crew boats, fast cats	1	1	70	0,192	13,44
	Maintenance vessel	1	1	16	0,192	3,07
	Fuel/wastewater collector vessel	1	1	5	0,192	0,96
	Rescue vessel	1	Only required in case of emergency	50	0,192	Omited
Excavation of the Open-cut Section and Trenches through Dredging (till about 2km offshore)	Cutter Suction Dredger (CSD)	1	35 – 140	30	0,192	806,40
	Backhoe dredging equipment (BHD) (alternative option for dredging the rock - this equipment was not modeled)	1	35 - 40	20	0,192	153,60
	Trailer Suction Hopper Dredger (TSHD)	1	7	17	0,192	22,85
	Small survey vessel	1	7	10	0,192	13,44
	Tug	1	7	8	0,192	10,75
	Crew boats, fast cats	1	2	70	0,192	26,88
	Maintenance vessel	1	2	16	0,192	6,14
	Fuel/wastewater collector vessel	1	2	5	0,192	1,92

Construction Activity	Type of Vessel	Number of Vessel	Duration of Operation (day)	Persons on board	Per Capita Domestic Wastewater Generation (m^3/person-day)	Total Domestic Wastewater Generation (m^3) (For a single pipeline)
	Rescue vessel	1	Only required in case of emergency	50	0,192	Omited
Backfilling of the Trenches	TSHD	1	50	17	0,192	163,20
	CSD (or backhoe dredging equipment)	1	50	30	0,192	288,00
	BHD (or CSD)	1	50	20	0,192	192,00
	Small survey vessel	1	50	10	0,192	96,00
	Crew boats, fast cats	1	1	70	0,192	13,44
	Maintenance vessel	1	1	16	0,192	3,07
	Fuel/wastewater collector vessel	1	1	5	0,192	0,96
	Rescue vessel	1	Only required in case of emergency	50	0,192	Omited
Total domestic water consumption for single pipe line: 2.612,92 m^3						
Total domestic water consumption for two pipe lines: 5.225,84 m^3						

10.1.1.2 Operation Phase

Normand Poseidon will be used as the survey vessel in operation phase at the Offshore and Shore Crossing sections. The activities within the operation phase are provided in detail in section 1.13.4. It is foreseen that on average 50 persons will be on the survey vessel and that the survey will continue 30 days. The estimatedwater consumption amount in the Offshore and Shore Crossing sections at the operation phase is indicated in Table10.11.

Table10.11Estimated Domestic Water Consumption in the Operation Phase- Offshore and Shore Crossing Sections

Type of Vessel	Task	Number	Duration (days)	Persons on board	Per Capita Domestic Water Consumption (m^3/person-day)	Daily Water Consumption (m^3)	Total water consumption for a single pipeline operation (m^3)	Total water consumption for two pipeline operation (m^3)
Survey Vessel	Surveying the sea floor	1	30	50	0,20	10,00	300,00	600,00

The estimated domestic wastewater generation amount in the Offshore and Shore Crossing sections at the operation phase is indicated in Table10.12.

Table10.12 Estimated Domestic Wastewater Generation at the Operation Phase – Offshore and Shore Crossing Sections

Type of Vessel	Task	Number	Duration (days)	Persons on board	Per Capita Domestic Wastewater Generation (m^3/person-day)	Daily Total Wastewater Generation (m^3)	Total Wastewater Generation For Single Pipeline operation(m^3)	Total Wastewater Generation for Two Pipeline operation (m^3)
Survey Vessel	Surveying the sea floor	1	30	50	0,192	9,6	288,00	576,00

The domestic water disposal method during the Operation Phase will be similar to the disposal method applied in the construction phase.

10.1.1.3 Decommissioning Phase

The existing methods for pipeline decommissioningat the Offshore and Shore Crossing sections include either the removal of the pipeline or leaving in-situ on the seafloor after being cleaned and filled with water. Due to the fact thatin time (50 years) the pipelines commune with the sea floor the predominant opinion suggests that removing the pipeline would cause a disturbance in the sea floor habitat and therefore the option of cleaning and subsequently filling the pipeline with water to be left in-situ is preferred. The summary of the activities for both options is given below:

- Leaving the pipelines in-situ:
    - Filling the pipeline with water;
    - Cleaning the pipeline by washing with water, emptying the water used in cleaning, collection and disposal of the water;
    - Filling the ends of the pipeline; and

    - Conducting surveys after decommissioning for monitoring purposes.
- Removal of the pipelines:
    - Includes similar vessel activities to those carried out during pipe laying;
    - Intervention to the Seabed;
    - Removal of the seabed, storage on the shore, recycling and disposal;
    - Delivery of logistical support on land and sea.

In the leave in-situ option of the decommissioning, apart from the washing of the pipeline there is no other water utilization. The water will be brought from Russia or Turkey and will be removed by a hydro test valve present in these countries.

Considering the fact that decommissioning will take place in 50 years and advanced techniques will be used an estimated figure on water consumption cannot be given. However if the option of removing the pipelines is preferred, we can expect similar amount of water consumption to the construction phase as the activities carried out will be similar.

10.1.2 Landfall Section

10.1.2.1 Construction Phase

During the landfall construction activities there will be need for water for domestic consumption (such as drinking water, water utilized in workers' camps) and for process purposes and industrial consumption. Research on from where the water will be supplied is on going. It is foreseen that during the construction and operation phase of the project all the required water will be supplied through road tankers and when necessary with the required permission from Directorate General for State Hydraulic Works (DSİ) and other institutions groundwater wells can be used. The estimated water consumption during the heavy construction activities at the landfall section is indicated in Table10.13.

Table10.13 Estimated Water Consumption at the Landfall Section during Heavy Construction Period

Details	Maximum Water Consumption (m^3)
0,2 m^3 / person. Day	120 m^3/day (fduring the heavy construction period) x 720 day = 86.400
Other uses (dust suppression, tire washing ect.)	5 m^3/day x 720 day = 3.600
Total water consumption	90.000

It is foreseen that fire-extinguishing water will be supplied through tankers and will be stored on site in fire extinguishing water storage tanks. The amount of the fire-extinguishing water will be determined following the detailed technical evaluation after EIA phase within the scope of the national legislation and in line with the comments of the relevant official bodies.

The personnel who will be working at the pipe laying in the construction phase and the landfall facilities' construction activities will generate domestic wastewater. Daily estimated domestic water (grey water + black water) generation during the heavy construction activities at the On Shore section of the Project is provided in

Table10.14.

Table10.14Estimated daily Black Water and Grey Water Generation during the Heavy Construction Activity Period at the On Shore Section

Wastewater	Details	Maximum Daily Generation Amount (m^3)
Grey Water (Wastewater generated from dish water, shower, laundry, bath and sink)	180 l / person-day	108
Black Water (Sewage Water)	12 l / person-day	7,2

All the wastewater generated during the On Shore construction activities will be disposed according to the provisions of Water Pollution Control Regulation and other related legislation. When necessary portable treatment plant will be established.

10.1.2.2 Operation Phase

It is expected that 20 personnel members will work at the receivingterminal during operation. The personnel working at the receiving terminal will require domestic water. It is foreseen that water for consumption and sanitary purposes required during Operation Phase will be supplied with tankers. The source of the water has not been decided upon; however it is probable that the water will be supplied from one of the existing sources from the region. Groundwater use in the scope of the project is not foreseen, if necessary, groundwater will not be used without acquiring the necessary permits in line with the related legislation. Table10.15 indicates the foreseen total water consumption amount in the landfall section during the Operation Phase.

Table10.15Estimated Domestic Water Consumption in the Operation Phase – Landfall Section

Details	Average Consumption
Personel water consumption (200 l / person-day)	4 m^3/day
Other uses (Exterior washing of the equipment ect.)	2 m^3/day

Table10.16 indicates the estimated wastewater generation by the terminal where 20 personnelareforeseen to work.

Table10.16 Estimated Water Generation in the Operation Phase – Landfall Section

Wastewater	Duration (day)	Number of Personel	Daily Wastewater Generation	Total Wate Water Generation Amount (m^3)
Grey Water + Black Water	18.250	20	0,192 m^3/person-day	70.080
Other Uses(Exterior washing of the equipment ect.)	18.250	-	2 m^3/day	36.500

In the receiving central appropriate surface water drainage system will be installed. The design of the drainage system will be made in line with the national legislation in the projects detailed design stage. For the disposal of the wastewater in the receiving central a wastewater tank will be installed on the field, a sewage connection will not be required in the receiving central. If required, a portable treatment facility will be established. The disposal of the wastewater will be carried out upon receiving the necessary approval from the related institutions and the necessary analysis will be made.

The liquid fuel and chemicals used in systems and equipment (the emergency situation generator for example) will be equipped with a secondary protection as an integrated part of the design that will control any leakage/spill.

Any wastewater generated during the maintenance activities in the Operation Phase (inspection of the pipelines and measurement for example) will be collected in the tanks at the field and will be transported from the field with a licenced vehicle and will be disposed by a licenced facility according to the current waste management legislation.

All the wastewater generated at Operation Phase of the landfall section will be disposed according to the Water Pollution Control Regulation and according to the requirements of the other related legislations.

10.1.2.3 Decommissioning Phase

Detailed information in regards to the decommissioning of the landfall section of the project is given in detail at Section 1.13 (The Scope of the Project Process).

Considering the fact that the decommissioning will take place in 50 years time with the assumption that advanced techniques will be used in the future a figure on the water consumption amount has not been given at this stage.

10.1.3 Quantity of Other Wastewater (With The Exclusion of Domestic Wastewater) and Disposal Methods

10.1.3.1 Construction Phase

The discharge of the wastewater in the Turkish EEZ is regulated in line with the provisions of Water Pollution Control Regulation, Waste Collection from Vessels and Waste Management Regulation and MARPOL 73/78. The following content is expected withinthe liquid waste that is to be generated during the construction and operation phases:

- Bilge Water;
- Ballast Waster; and
- Other liquid waste (for example; sewage sludge).

The estimated bilge water generation is estimated to be between 50 to 500 tons during the project’s construction and operation phase.

The bilge water will be managed according to Waste Collection from Vessels and Waste Management Regulation and other related national regulation as well as international agreements in the Turkish EEZ.

After vessels unlade they usually take on ballast water and as they embark they take out ballast water. For this reason supply vessels will take on their ballast water generally from the Turkish EEZ. The pipe lay vessel can take in or take out ballast water according to the sea conditions. As a result it is not possible to calculate the amount of ballast water that will be taken out during the construction and operation phase.

The contaminated ballast water will not be discharged to the Black Sea. A Ballast Water and Sediment management plan will be developed and implemented according to International Maritime Organisation's (IOM) International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) and also when appropriate Ballast procedures and Quality standards for ballast discharges as well as Protection and Management Guideline for İnvasive Species and Oil and Gas Industry requirements will be taken into consideration.

10.1.3.2 Pre-Commissioning and Operation Phase

10.1.3.2.1 Hydro test

In the pipelines at the Shore Crossing and Landfall sections at the pre-commissioning activities seawater will be used. The pre-commissioning approach for the Project involves hydro testing of the landfall facilities and shore crossing and landfall sections of the pipelines only. Hydro testing (a hydrostatic test) involves filling each pipeline with water and pressurizing it in excess of the design pressure of the pipelines to test the strength of the pipeline and confirm that there are no leaks. For the use of the seawater the required approvals will be received from the relative authorities.

For this purpose at the pre-commissioning phase assigned vessels will deliver the water supply to the pipeline, water filtration, filling the pipeline with water andhydro test will be carried out. PIG's (Pipeline control and measurement equipment) will also be launched from the subsea test head towards the test head towards the PIG launcher/receiver located in the Landfall Section.

Diesel-powered filling pumps for filling pipelines will draw water from the sea with a capacity of 25 m^3 / min with temporary water intake hoses of appropriate dimensions. These hoses will be connected to buoys suspended approximately 3-5 m below the below sea surface in a suitable offshore location near the tie-in location. Suction hoses will be equipped with filtering equipment to prevent the entry of coarse wastes and sea creatures (such as fish and plankton). In case the dewatering of the pipeline will be delayed for any reason, oxygen scavenger (sodium bisulphite) [1]shall be injected into the test water to prevent internal corrosion of the pipeline prior to dewatering at an injection rate of 250 parts per million (ppm). It is anticipated that approximately 500 litres of oxygen scavenger will be injected per pipeline. While flooding the pipeline, cleaning and gauging PIGs shall also be pushed towards shore.

A valve will be open on the landfall test head during the flooding operation, which will be connected to vents to vent air from the pipeline as it is filled with seawater. During the flooding operation, approximately 100 m^3 of seawater will initially be pumped into the pipeline followed by a cleaning and gauging PIG train. A further 1.900 m^3 (approximately) of seawater will then be pumped into the pipeline. The first 100 m^3 of water and debris (consisting of rust, coating and weld debris) in front and in-between the PIGs, will be captured in temporary landfall water storage (break) tanks or in temporary ponds, which will later during hydro testing be pumped back into the pipeline

After a successful hydrostatic test, the pipeline will be dewatered and dried (by air), optionally filled with nitrogen (N2) or chemically conditioned (by using MEG –mono ethylene glycol). Dewatering and drying/conditioning will be undertaken from the temporary PIG launcher/receiver at the RT

[1]Sodium Bisulphite is listed in OSPAR's PLONOR list of additives.

towards the temporary subsea PIG receiver. The PIG train will be propelled by oil free, dry, compressed air provided by a landfall based compressor spread. In case of chemical conditioning of the pipeline, in order to remove and treat residue seawater from the pipeline wall during dewatering, a pre-calculated amount of MEG will be sent through the pipeline. MEG volume is estimated to be 30 m^3 in the worst-case conditions.

During the dewatering process, the amount of treated seawater to the sea from the subsea PIG receiver will be 12,5 m^3 / min. Seawater will be discharged to the sea at a height of about 1 meter above sea level, through a four or six-inch diffuser placed to reduce blur, seabed rubbing and sediment clouds. MEG will not be disposed into the sea but will be pumped from the subsea test head to the support vessel via a down line. MEG will be received and stored in suitable secure tanks on-board the vessel and will be shipped to shore to be disposed or recycled by a licensed waste handling company. Water Pollution Control Regulation, Bathing Water Quality Regulation, Surface Water Quality Regulation requirements, of which the details have been given in **Chapter 3** (Legal, Political and Administrative Framework), will be taken into consideration For the discharge of the treated seawater back to the sea

The duration of the pre-commissioning activities is summarized in Table10.. Detailed information on the pre-commissioning stage is given in Chapter 1.13.3.

Table10.17 Duration of Pre-commissioning Activities

Activity	Duration (days)
Pre-packing of pipeline with compressed air	20
Cleaning, gauging and drying (using MEG) of pipeline	24
Venting of air from pipelines (undertaken in Turkey)	6
Purging of pipeline with nitrogen	3
Total	**53**

Table 10.18 provides a summary of the liquid waste (with the exception of domestic wastewater) that will be generated/discharged during the pre-commissioning activities

Table 10.18 Estimated Liquid Waste Amount Generated During the Pre-commissioning Phase

The Section Where the Precommissioning Activity will take Place	Waste/Discharge Type	Total Amount (two pipelines)	Disposal Method
Shore Crossing and Landfall section	Hyrdotest water (sea water and oxygen scavenger)	4.000m^3 (1.000 l oxygen scavenger sodium bisulphite included)	will be discharged approximately 30 m water depth at Shore Crossing pipeline tie-in location
	Pipeline cleaning waste (rust, coating and weld debris)	0,4 tons	The waste will be stored in tanks at the receiving terminal and will be transported to a licensed waste disposal facility.
	MEG	60 m^3	Will be stored in sutible and safe tanks on support vessels and will be sent to a licensed landfall faciliry to be disposed by a licensed disposal facility or to be recycled.

The Section Where the Precommissioning Activity will take Place	Waste/Discharge Type	Total Amount (two pipelines)	Disposal Method
Receiving Terminal	Hydrotest water	2.000 m^3	Will be collected in cesspools or will be transported away from the field to a licensed wastewater treatment facility
	Pipeline cleaning waste (rust, coating and weld debris)	200 kg	Those that will be broken or moldered at the receiving terminal will be collected in tanks or directly at mobile tankers and will be transported to a licensed waste disposal facility.
The Turkstream offshore pipline not limited to the scope of the project (From the landfall facility from Russia to the receiving terminal in Turkey)	MEG for cleaning and drying	1.600 m^3	MEG will be stored in safe tanks on support vessels and will be sent to a licensed landfall faciliry to be disposed by a licensed disposal facility or to be recycled.
	Pipeline cleaning waste (rust, coating and weld debris)	32 - 36 tons	Broken or moldered at the receiving terminal will be collected in tanks and will be transported to a licensed waste disposal facility.

10.2 Energy and Fuel Supply

10.2.1 Construction Phase

Since the need for power supply for construction activities, lay of the mechanical structure, workers camp(s) etc. will be limited with the construction phase, the electricity energy is planned to be supplied through temporary power generator (working with diesel fuel). If the generator is used the provisions of the regulation on industry sourced air pollution control will be followed. If necessary, by receiving the necessary permits connection can be established with the national electrical grid.

Table Table10.19 provides information in regards to the daily average fuel consumption during the heavy construction period in the Offshore and Shore Crossing sections. This information is average data and it is foreseen that the subcontractor can clarify it before the construction phase.

Table10.19 Estimated fuel consumption during the heavy construction activities period

Fuel	Usage	Daily Average amount (tons)	
		Offshore	Shore crossing
Diesel	Equipment on the vessel	MDO (Marine Diesel Fuel) calculations are added	
MDO	vessel	1.800	500

The diesel fuel that is required for the construction activities on the landfall section will be transported to the construction sites with licenced fuel tankers. There will be special areas that will be used for refuelling for facilities and vehicles in the construction sites; when the spot of these special areasare assigned, surface water, groundwater and surface water drainage channels will be taken into consideration. Secondary protection measures fit to retain at least 110% of the stored fuel volume at the fuel tankers will be installed.

Strict procedures to minimise the fuel spill risk during refuelling will be applied. All the refuelling activates will take place as a part of the Environmental and Social Management Plan of the Project and in line with the requirements set in the framework of the Turkish Landfall Construction Management Plan.Both the project owner and its contractors (and subcontractors) will act according to the requirements of the construction management plan. Other fuel, oil and chemicals will be stored in containers in a closed area that is clearly marked to prevent pollution. Also spill kits containing cleaning materials/ absorbent materials and other similar materials will be kept at the refuelling areas and mobile fuel tankers and areas close to them.

In emergency situations in order to prevent the liquids from contaminate groundwater and surface water, spill kits will be present in the areas where there are liquid materials, the drainage system of these areas will be designed in a way that will prevent spills and leakages to reach the rainwater system of the site.

The chemicals and materials will be labelled in a comprehensible way and safety forms will be hung on the storage areas. The chemical and material store will be well protected, kept clean and in order and sufficient inventory controls will be made. The storage areas of the chemicals leak-proof thus will not be affected by the rainfall and adverse weather conditions and will have secondary protection. The secondary protection will be waterproof and resistant against the material it contains.

10.2.2 Operation Phase

Connection to the national electricity grid will be established as of the initial phase of the operation. The total energy need of the receiving terminal once it is completed and in operation will be around 5 MW. If connection of the terminal to the national electrical grid is not possible, a small power plant for electricity supply can be established. This is considered as a worst-casescenario. The power plant with the planned capacity of 5 MW will have 3 gas burners. Energy will be needed for valves, lighting, acclimatization and various parts of other smaller components. Heaters will work with natural gas.

An emergency situation generator to provide energy to the sensitive systems when there is a cut in normal energy supply will be installed at the receiving terminal located at the landfall section during the operation phase. To store the diesel fuel required for the emergency situation generator a fuel storage tankerwith the volume of 20 m^3 will be placed at the receiving terminal.

On all the systems and equipment that use liquid fuel and chemicals at the landfall section (for instance the emergency situation generator) will be equipped with a secondary protection as a integral part of to design in order to control any leakage/spill.

Fuel consumption during the project’s operation phase will be through the survey vessels that will operate during the offshore surveys.

10.2.3 Decommissioning Phase

Considering the fact that decommissioning will take place within 50 years, with the assumption that advanced techniques will be used, figures in relation to energy or fuel supply has not been provided at this stage.

10.3 Possible source and infrastructure utilization

10.3.1 Construction Phase

During the construction of the Offshore and Shore Crossing sections there will be need for various materials. The estimated amount of the main materials that will be used is provided in Table10.20. Quantities shown are approximate and subject to final optimisation during the detailed design process.

Table10.20Materials to be used and Estimated Amount

Material	Amount for each pipeline	Total amount (For two pipelines)
Steel (pipe sections)	199.525 tons	399.050 tons
Concrete Coating	28.340 tons	56.680 tons
Coating (3LLP*)	2.636 tons	5.272 tons
Joint Coating	1.081 tons	2.162 tons
Weld Material	196 tons	392 tons
Rocks/Stones (For the protection of pipeline joints)	11.040 m^3	22.080 m^3

* Three Layer Polypropylene

During the construction of pipelines at the landfall section and receiving terminal various materials will be required. Table10.21 indicates the estimated amount of main materials that will be used in the construction of the two pipelines in the Landfall Section and the receiving terminal. Quantities shown are approximate and subject to final optimisation during the detailed design process.

Table10.21Materials to be used during Construction of the Landfall Section

Material	Quantity (two pipelines)
Landfall Section Pipelines	
Steel (pipe sections)	14.000 tonnes
Imported Backfill Material (sand or soft earth)	15.000 tonnes
Field Joint Coating (HSS)	1.550 sleeves
Weld Material	35 tonnes
Pre-cast Concrete Jacking Pipes	950 jacking pipes
RT	
Steel (piping and equipment)	9.000 tonnes
Concrete (foundations of piping, equipment and containers)	12.000 tonnes
Imported fill material for site preparation (stone/rock)	30,000m^3 (tonnes)[1]
Field Joint Coating (HSS)	100 sleeves
Weld Material	1 tonnes
Paving Blocks /Slabs (to form areas of hardstanding)	9.000 tonnes
Crushed Rock (paving foundations)	4.800 tonnes

Material	Quantity (two pipelines)
Gravel (surfacing of areas outside paved areas)	9.000 tonnes
Access Roads and Temporary Facilities	
Rocks/stones for access roads	22,000 m^3 (13,000 m^3, of this amount will be used for temporary roads while 9,000 m^3 will be used for permanent roads.)
Asphalt concrete for access roads	1.320 m^3
Rock for temporary facilities' hardstanding areas	33.000 m^3

1. Assuming a bulk density of 1,5 tonnes/m^3.

Since the need for power supply for construction activities, lay of the mechanical structure, workers camp(s) etc. will be limited with the construction phase, the electricity energy is planned to be supplied through temporary power generator (working with diesel fuel). If the generator is used the provisions of the regulation on industry sourced air pollution control will be followed. If necessary, by receiving the necessary permits connection can be established with the national electrical grid.

Should there be any potential effects on the existing sources and infrastructure of Kıyıköy during the Construction Phase of the Project, these effects will be minimised as much as possible with the measures that are listed below:

- The existing situation of the infrastructure services will be surveyed and meeting with the service providers, owners of infrastructure and operators will be held in coordination; and
- The placement, labelling and securing the existing service that is provided by third parties (e.g. energy lines, telephone lines etc.) according to agreements made with the owners and related permits. In order to avoid any unexpected effects and damages on the services and infrastructure extended to the public the work will be done according to the Good International Industry Practices (GIIP) construction technique.

10.3.2 Operation Phase

No use of material apart from those used for maintenance (and when necessary repair) is expected during the operation phase.

Connection to the national electricity grid will be established as of the initial phase of the operation. The total energy need of the receiving terminal once it is completed and in operation will be around 5 MW. If connection of the terminal to the national electrical grid is not possible, a small power plant for electricity supply can be established. This is considered as a worst-casescenario. The power plant with the planned capacity of 5 MW will have 3 gas burners. Energy will be needed for valves, lighting, acclimatization and various parts of other smaller components. Heaters will work with natural gas.

Also emergency situation energy sources to provide energy to the sensitive systems at the receiving terminal when there is a cut in normal energy supply will be established. In such cases electricity will be supplied through emergency situation generators and accumulators (uninterruptible power supplies).

10.3.3 Decommissioning Phase

Considering the fact that decommissioning will take place within 50 years, with the assumption that advanced techniques will be used, an assessment about the source and infrastructure use has not been provided at this stage.

10.4 Land and Marine Traffic (Land preparation, Construction, Operation and Post-Operation)

10.4.1 Marine Traffic

Identifying the effect of the vessel traffic at the Offshore and Shore Crossing section construction corridor is related to the traffic density in the region.Figure10.1 demonstrates the port authorities and coastal structures in the offshore section and close surroundings. In this scope Table10.22 - Table10.27 provides the statistics for the vessels that have touched to the port authorities over the years.

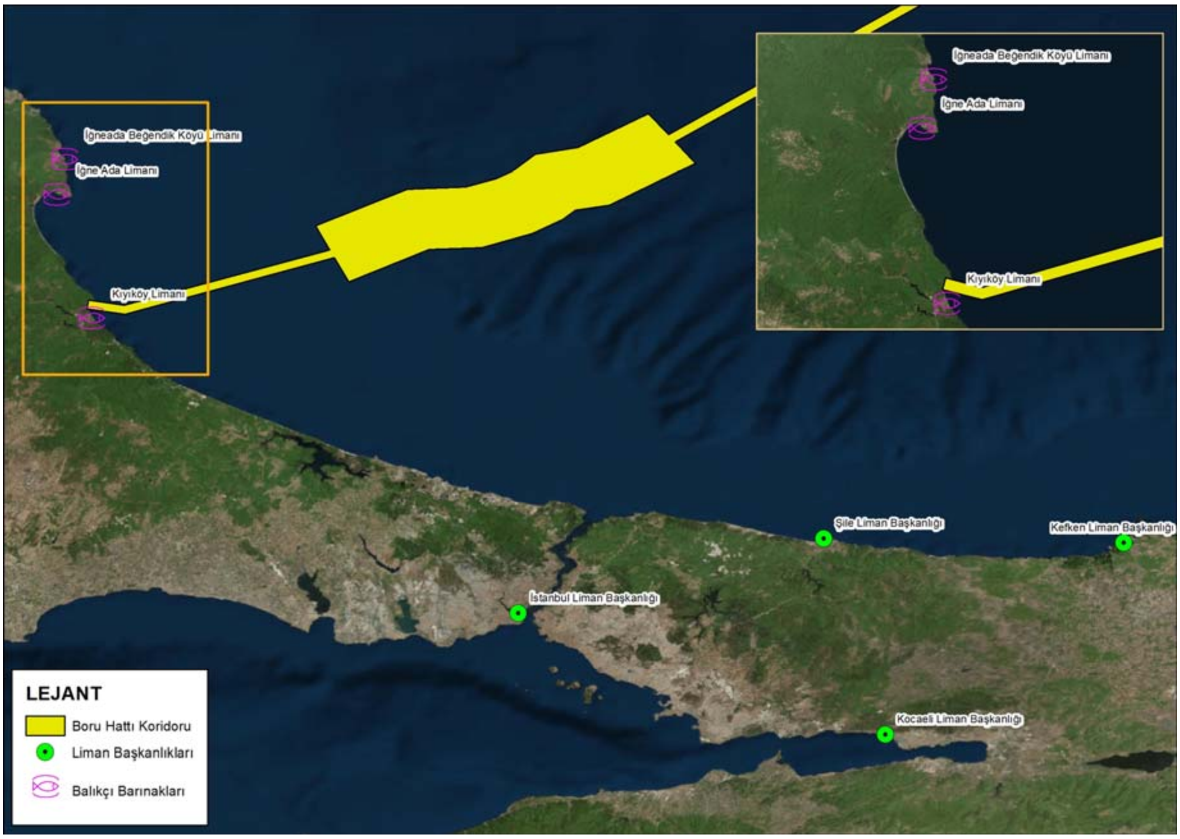


Figure10.1: Port authorities and fishing ports in the close surroundings of the project landfall

The closest port authority to the Project's landfall section is İğneada port authority. When we look into the statistics of İğneada port authority between the years 2011-2016 the highest number of vessels that have touched the port in one year is 405 (Ref. 10.3).Apart from the vessels that touch the post the fishing vessels in the surroundings also bring an additional load to the marine traffic. The fishing port's characteristics at Kıyıköy and İğneada are explained in detail at chapter 9 (assessment of the socio-economic environment).

Table10.22: The Statistics of Vessels that have Touched the Ports on the Bases of Port Authorities (2016 year end) (Ref. 10.3)

Port Authority	Number of Various Vessels						Total Number of Touched Vessels					
	Turkish Flagged		Foreign Flagged		Total		Turkish Flagged		Foreign Flagged		Total	
	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton
İĞNEADA	12	852	0	0	12	852	45	4.206	0	0	45	4.206
KARASU	16	799	0	0	16	799	70	5.484	1	2.597	71	8.081
KEFKEN	41	2.392	0	0	41	2.392	124	6.964	0	0	124	6.964
ŞİLE	35	2.648	0	0	35	2.648	114	9.419	1	2.506	115	11.925
İSTANBUL	318	238.900	125	1.174.503	443	1.413.403	2.182	9.179.448	803	11.257.823	2.985	20.437.271

Table10.23: The Statistics of Vessels that have Touched the Ports on the Bases of Port Authorities (2015 year end) (Ref. 10.3)

Port Authority	Number of Various Vessels						Total Number of Touched Vessels					
	Turkish Flagged		Foreign Flagged		Total		Turkish Flagged		Foreign Flagged		Total	
	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton
İĞNEADA	7	337	0	0	7	337	9	381	0	0	9	381
KARASU	29	1.737	0	0	29	1.737	68	4.240	0	0	68	4.240
KEFKEN	32	1.637	0	0	32	1.637	92	5.263	0	0	92	5.263
ŞİLE	40	3.458	0	0	40	3.458	90	8.482	0	0	90	8.482
İSTANBUL	270	211.555	170	2.074.993	440	2.286.548	2.087	8.427.799	1.339	31.097.482	3.426	39.525.281

Table10.24: The Statistics of Vessels that have Touched the Ports on the Bases of Port Authorities (2014 year end) (Ref. 10.3)

Port Authority	Number of Various Vessels						Total Number of Touched Vessels					
	Turkish Flagged		Foreign Flagged		Total		Turkish Flagged		Foreign Flagged		Total	
	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton
İĞNEADA	4	294	0	0	4	294	7	502	0	0	7	502
KARASU	24	1.502	0	0	24	1.502	45	2.926	0	0	45	2.926
KEFKEN	38	2.947	0	0	38	2.947	77	7.519	0	0	77	7.519
ŞİLE	60	5.608	0	0	60	5.608	99	10.130	0	0	99	10.130
İSTANBUL	282	156.333	142	1.807.913	424	1.964.247	1.815	3.429.484	1.341	34.980.681	3.156	38.410.165

Tabl310.25: The Statistics of Vessels that have Touched the Ports on the Bases of Port Authorities (2013 year end) (Ref. 10.3)

Port Authority	Number of Various Vessels						Total Number of Touched Vessels					
	Turkish Flagged		Foreign Flagged		Total		Turkish Flagged		Foreign Flagged		Total	
	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton
İĞNEADA	95	1.791	1	1.408	96	3.199	210	4.474	1	1.408	211	5.882
KARASU	8	329	0	0	8	329	37	2.241	0	0	37	2.241
KEFKEN	19	998	0	0	19	998	61	3.899	0	0	61	3.899
ŞİLE	19	1.894	0	0	19	1.894	84	7.923	0	0	84	7.923
İSTANBUL	248	106.662	147	1.936.377	395	2.043.039	2.292	3.513.555	1.391	36.540.536	3.683	40.054.091

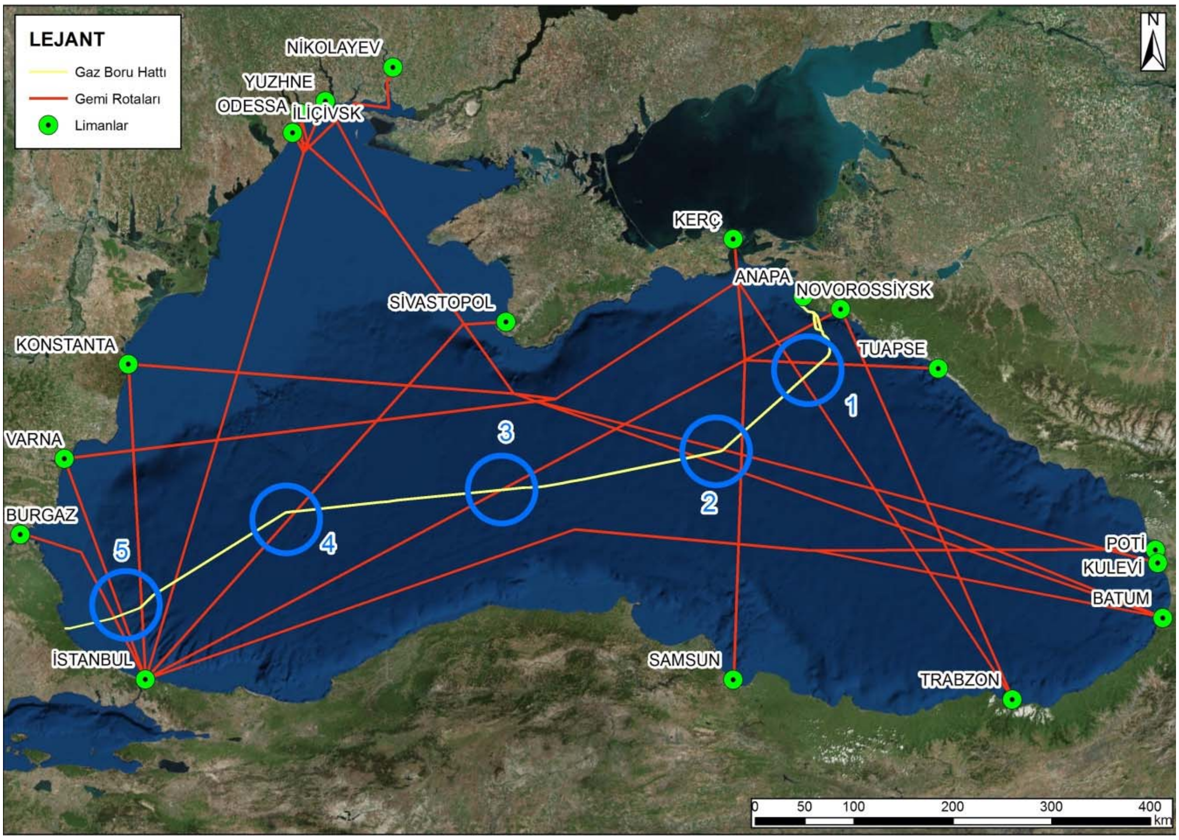
Table10.26: The Statistics of Vessels that have Touched the Ports on the Bases of Port Authorities (2012 year end) (Ref. 10.3)

Port Authority	Number of Various Vessels						Total Number of Touched Vessels					
	Turkish Flagged		Foreign Flagged		Total		Turkish Flagged		Foreign Flagged		Total	
	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton
İĞNEADA	114	2.040	0	0	114	2.040	405	8.395	0	0	405	8.395
KARASU	30	2.154	0	0	30	2.154	96	7.069	0	0	96	7.069
KEFKEN	38	3.024	0	0	38	3.024	109	9.454	0	0	109	9.454
ŞİLE	62	6.142	0	0	62	6.142	140	19.453	2	11.802	142	31.255
İSTANBUL	280	130.415	151	1.775.619	431	1.906.034	1.710	2.801.018	1.370	31.772.623	3.080	34.573.641

Table10.27: The Statistics of Vessels that have Touched the Ports on the Bases of Port Authorities (2011 year end) (Ref. 10.3)

Port Authority	Number of Various Vessels						Total Number of Touched Vessels					
	Foreign Flagged		Total		Foreign Flagged		Total		Foreign Flagged		Toplam	
	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton	Number of Vessels	Gross Ton
İĞNEADA	91	1.732	1	496	92	2.228	214	4.759	1	496	215	5.255
KARASU	18	1.002	0	0	18	1.002	62	3.936	0	0	62	3.936
KEFKEN	34	2.251	0	0	34	2.251	118	9.882	0	0	118	9.882
ŞİLE	63	6.710	0	0	63	6.710	157	19.000	0	0	157	19.000
İSTANBUL	264	217.339	152	1.629.070	416	1.846.409	1.954	2.360.930	1.631	30.929.777	3.585	33.290.707

Black Sea is an important transportation route for the shoring countries. The navigation routes at the Black Sea and the intersecteion points of these routes with the Project pipeline are indicated in Şekil 10.2 (Ref. 10.4).



Şekil 10.2: Navigation routes on the Black Sea

The working hours and project coordinates of the ship's routes and vessels set to be used during construction and operation phases of the Project shall be notified to the relevant Port Authorities, Coast Guard Commands and the Directorate General of Coastal Safety.

Unless the Republic of Turkey Ministry of Foreign Affairs decide otherwise, all the necessary permits for the vessels that will be operating in the Turkish EEZ will be received six months in advance. Unless the Republic of Turkey Ministry of Foreign Affairs decide otherwise vessel operators will receive all their relevantactivity permits six months prior to the construction.

10.4.2 Land Traffic

This section has been prepared according to the data that has been provided in April 2017 in scope of the traffic management current situation analysis that the project owner conducted. The Landfall section of the project can be accessed over Vize and Saray districts. This route has been demonstrated in

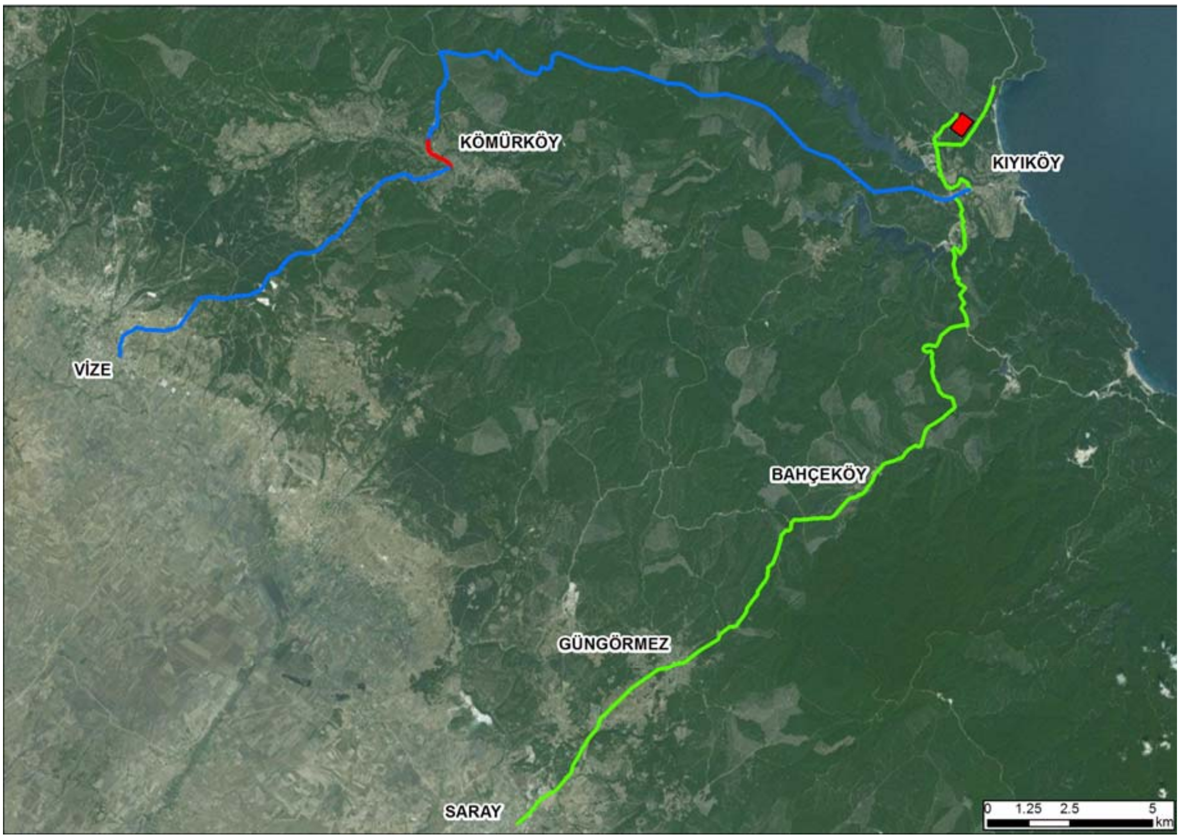


Figure10.3.

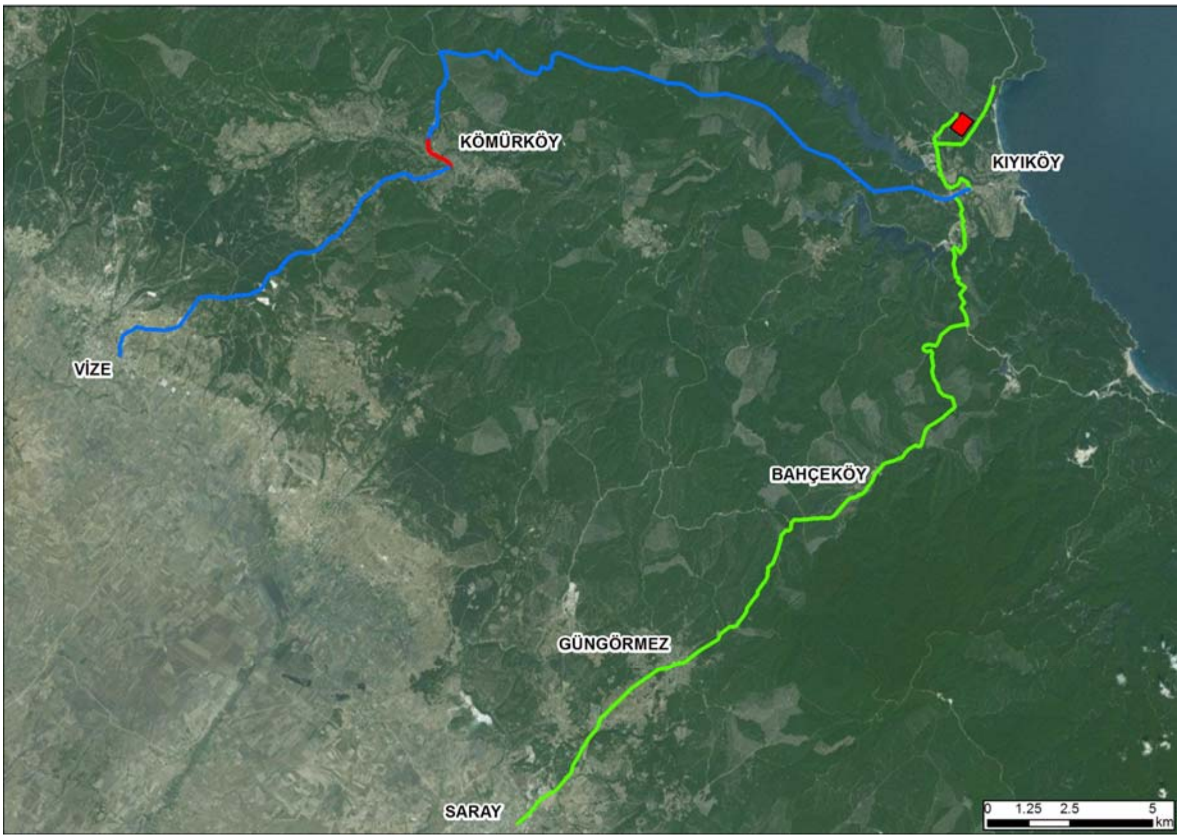


Figure10.3: Access route to the Project's Landfall Section

The route on the south (marked with green) connects to the highway from Saray and passes through the Güngörmez, Bahçeköy villages towards the Project's Landfall Section.

The route on the north (marked with blue) connects to the Vize highway and passes through Kömürköy towards the Project's Landfall Section. The road passing through Kömürköy can be optionally bypassed through a new road at its west.

Both of the routes that are referred to above have been designed in a way that will prevent the traffic load caused by the project in the Kıyıköy town centre. Therefore as can be seen on

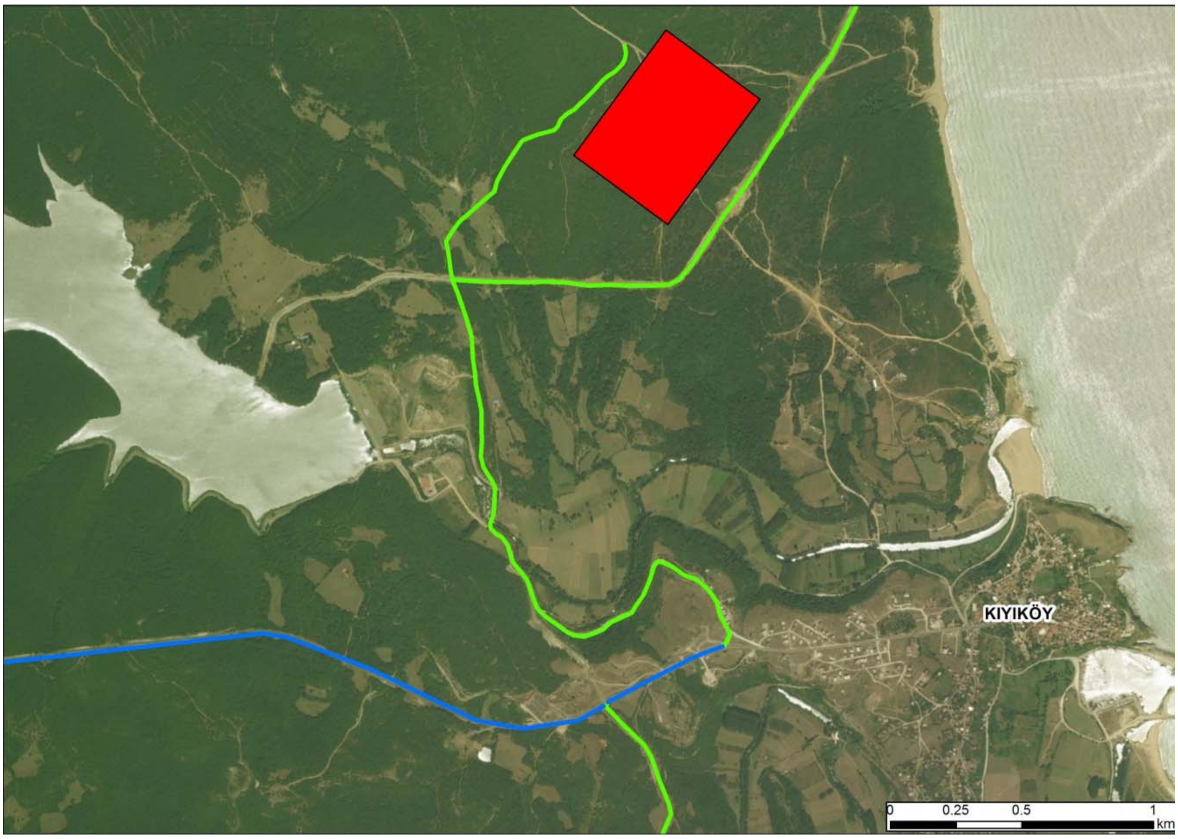


Figure10.4 the access routes to the landfall section do not pass through the Kıyıköy town centre.

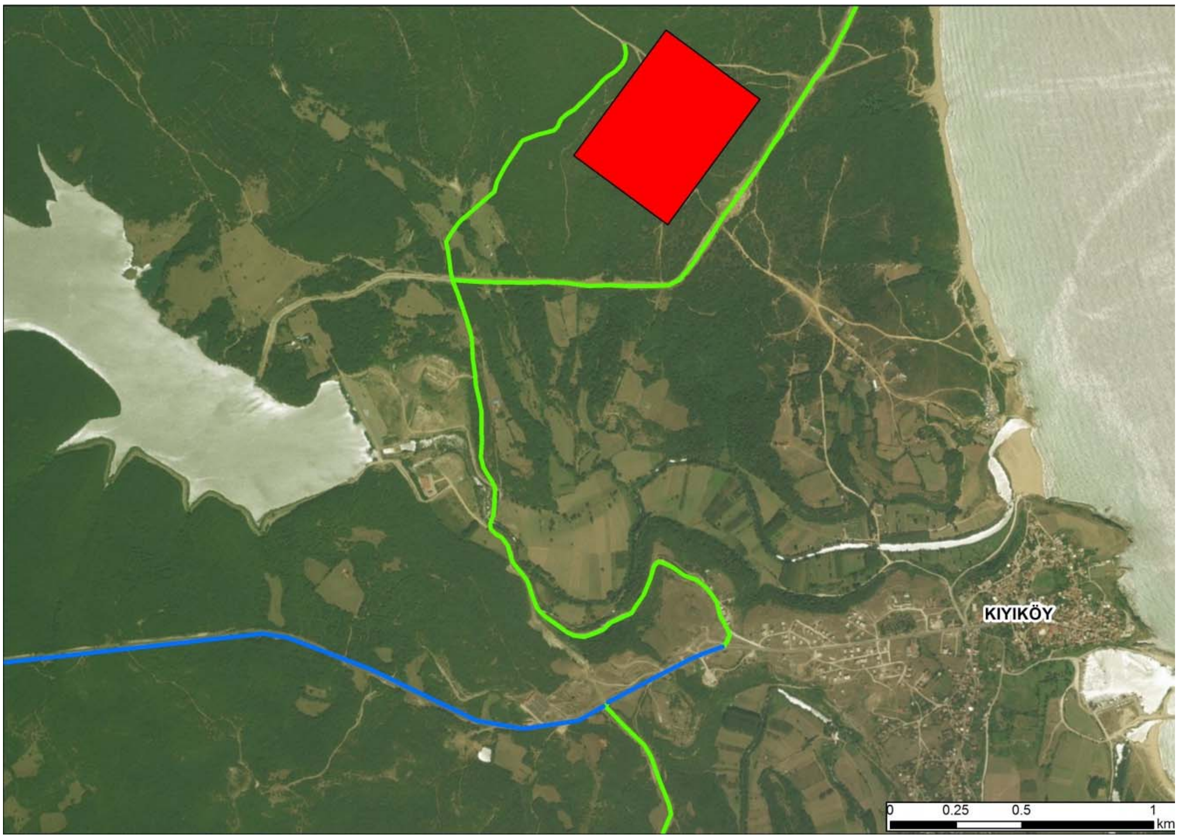


Figure10.4: Access routes to the landfall section

At the following section an assessment of the suitability of the routes in the north and south, the section from the point that they intersect to the landfall section and the roads that are in the close surroundings of the landfall section is made.

10.4.2.1 The Route on the South

at

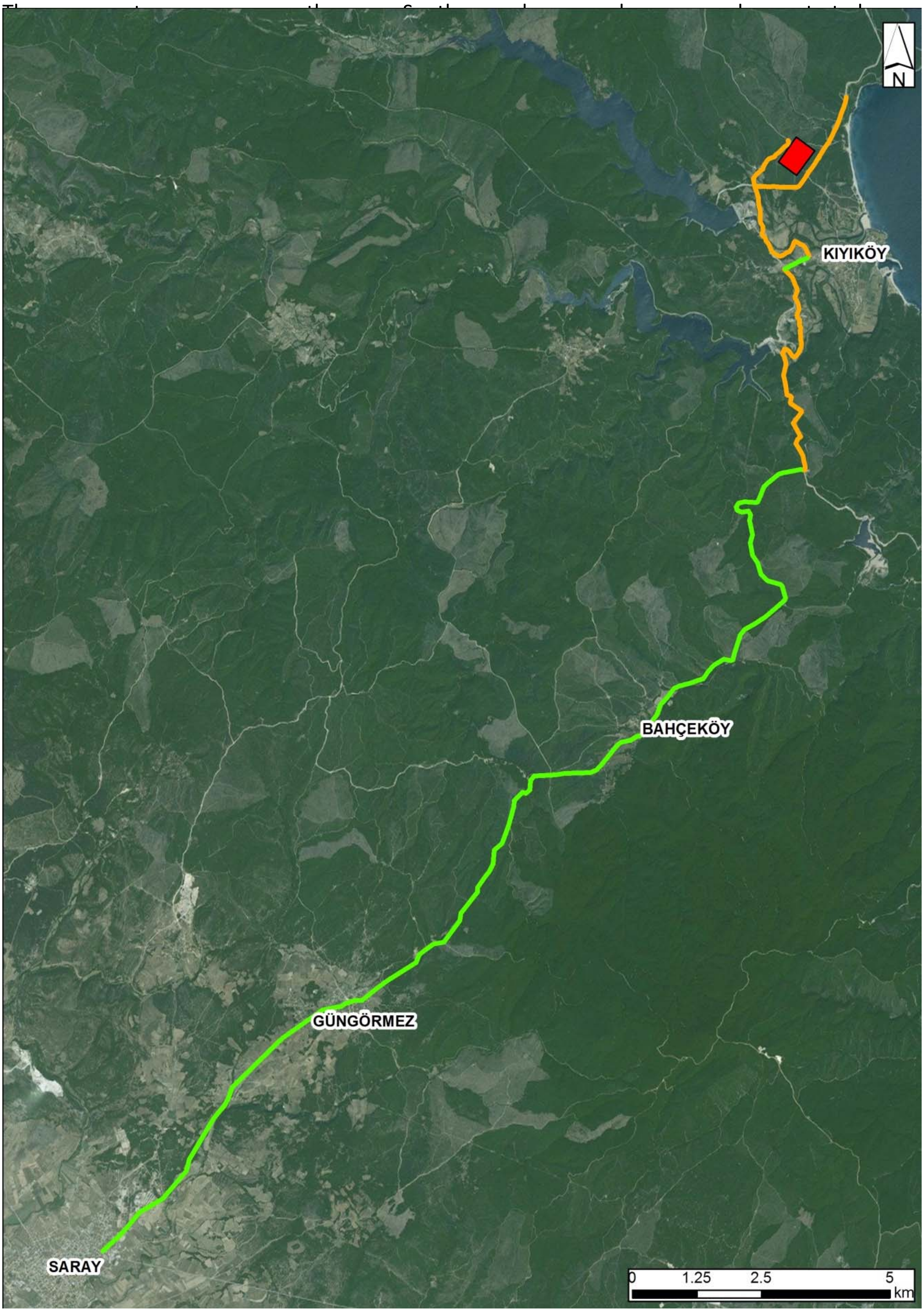


Figure10.5. The roads that are marked in green show the asphalt roads and those marked in yellow show the unpaved roads.

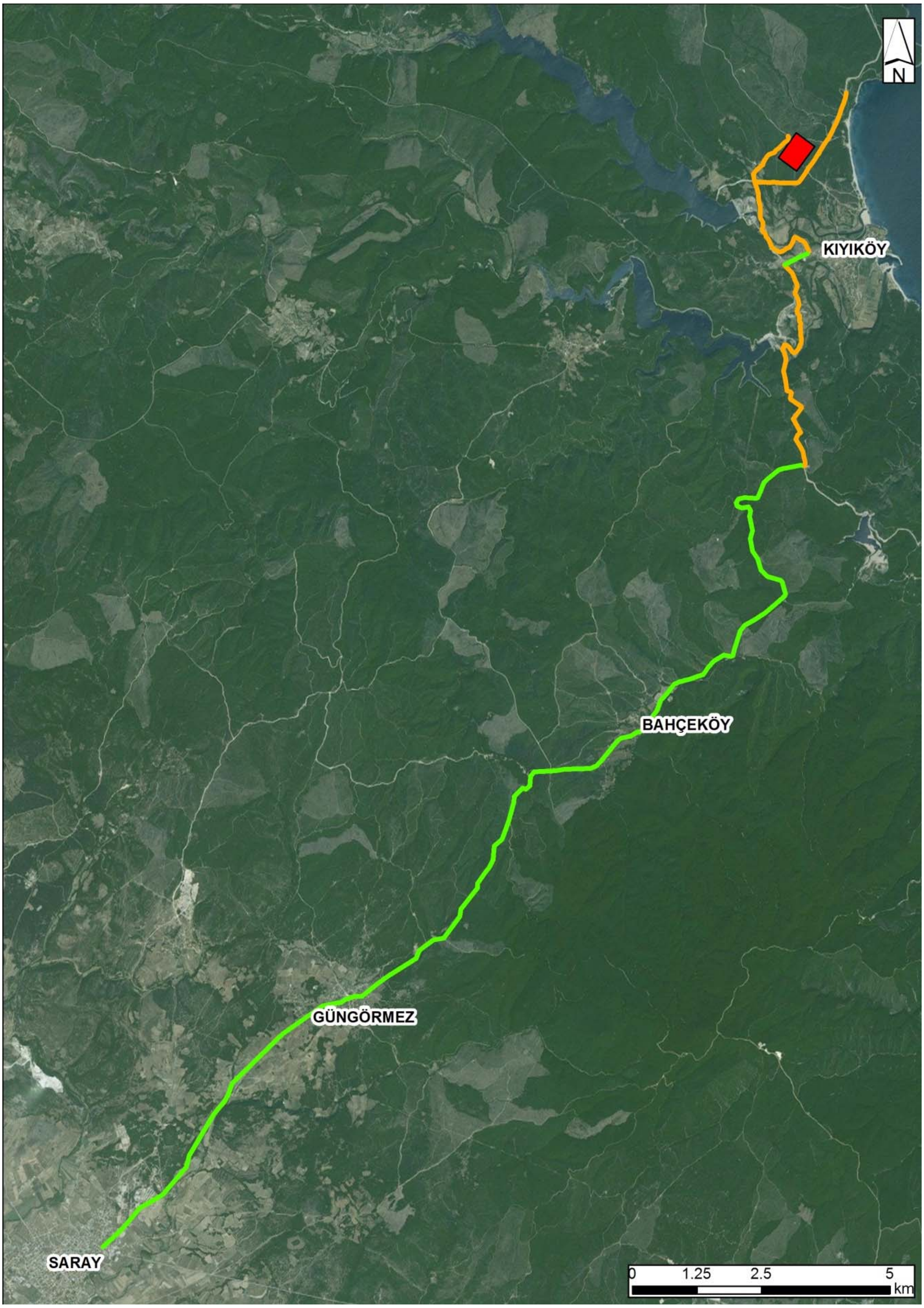


Figure10.5: Route on the South

A general assessment about the suitability of access roads on the route at the south (until the intersection point with the route at the north) has been given bellow.

The initial 24km starting from Saray is paved. This road in general terms is sufficiently wide for construction traffic in motion and it is deemed that if this road is used improvement and maintenance work on its own would be sufficient.

The road passing through Güngörmez village is wide enough for two-way traffic and it passes through the village in almost a straight route (Figure 10.6).

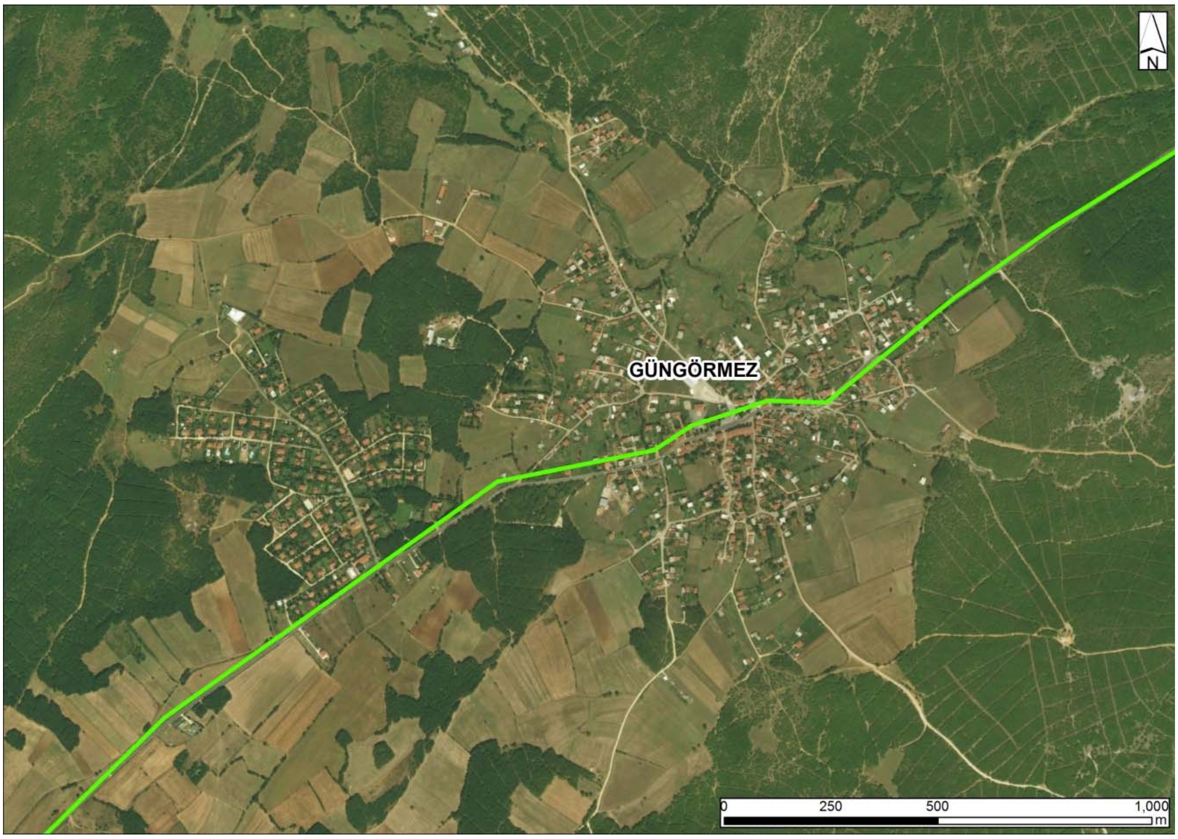


Figure 10.6: The existing asphalt road that passes through Güngörmez Village.

The road that passes through Bahçeköy village is generally straight apart from some soft bends and also wide enough for two-way traffic. In the section where the road narrows for two-way traffic there are dwellings on both sides of the road and it is also a narrow path for other highway users (Figure 10.7).

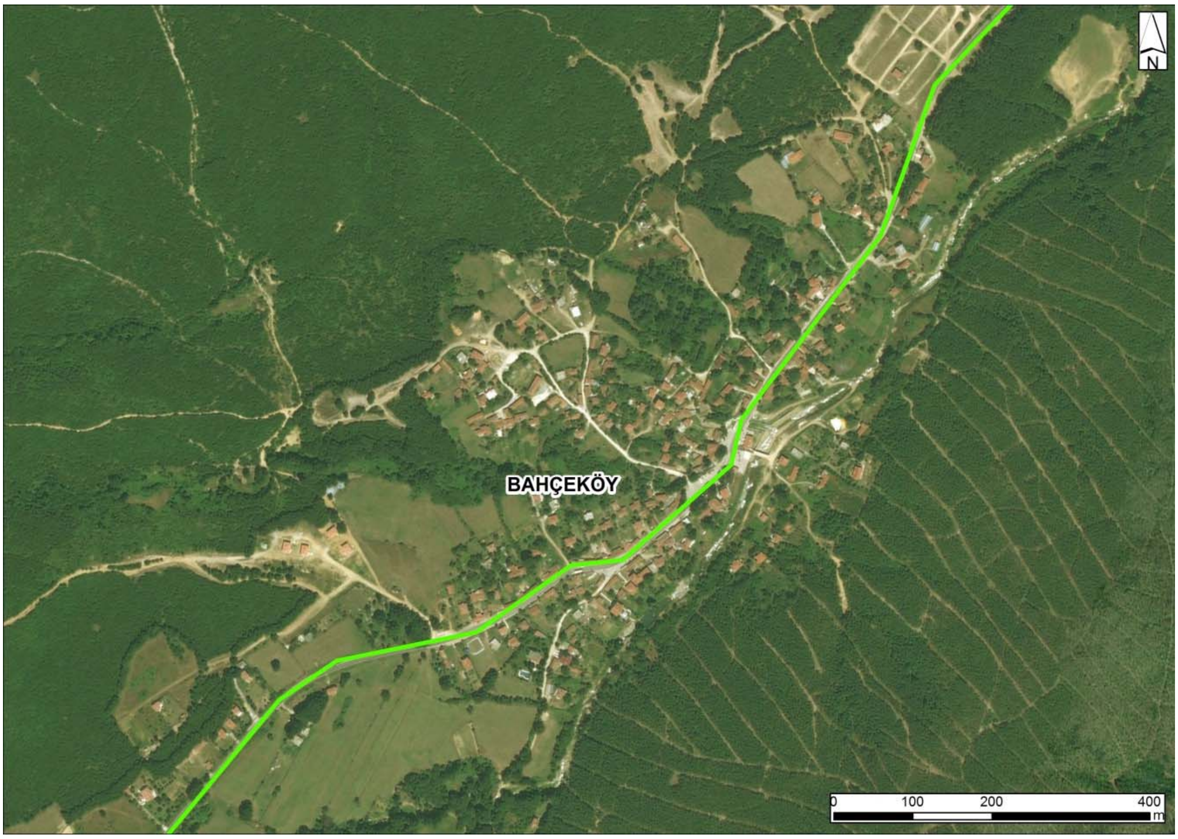


Figure 10.7: Existing Asphalt Road passing through Bahçeköy Village

The unpaved/earth road of approximately 500 m passing from the east side of the Kazandere Dam is spotted to have insufficient width for the construction traffic at its current situation. (Figure10.8). In order for it to be used fortransportation the entire road or a section of it might need to be enlarged. The bridge on the ISKI Kazandere Dam will be one way only for construction traffic.

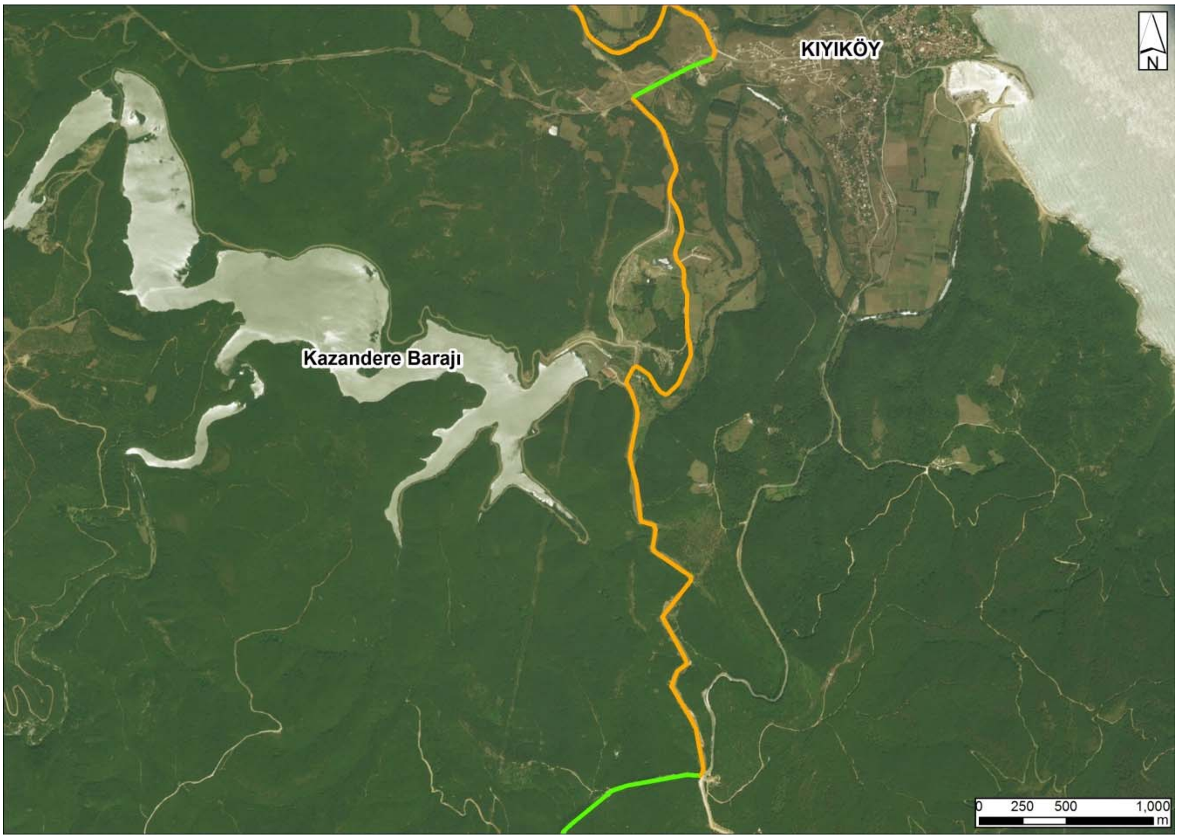


Figure10.8: The unpaved/earth road passing from the east of the Kazandere Dam

10.4.2.2 Route on the North

The route on the north is shown at Figure 10.9. The road marked in green indicates the asphalt roads and the one marked in yellow shows the unpaved/earth roads.

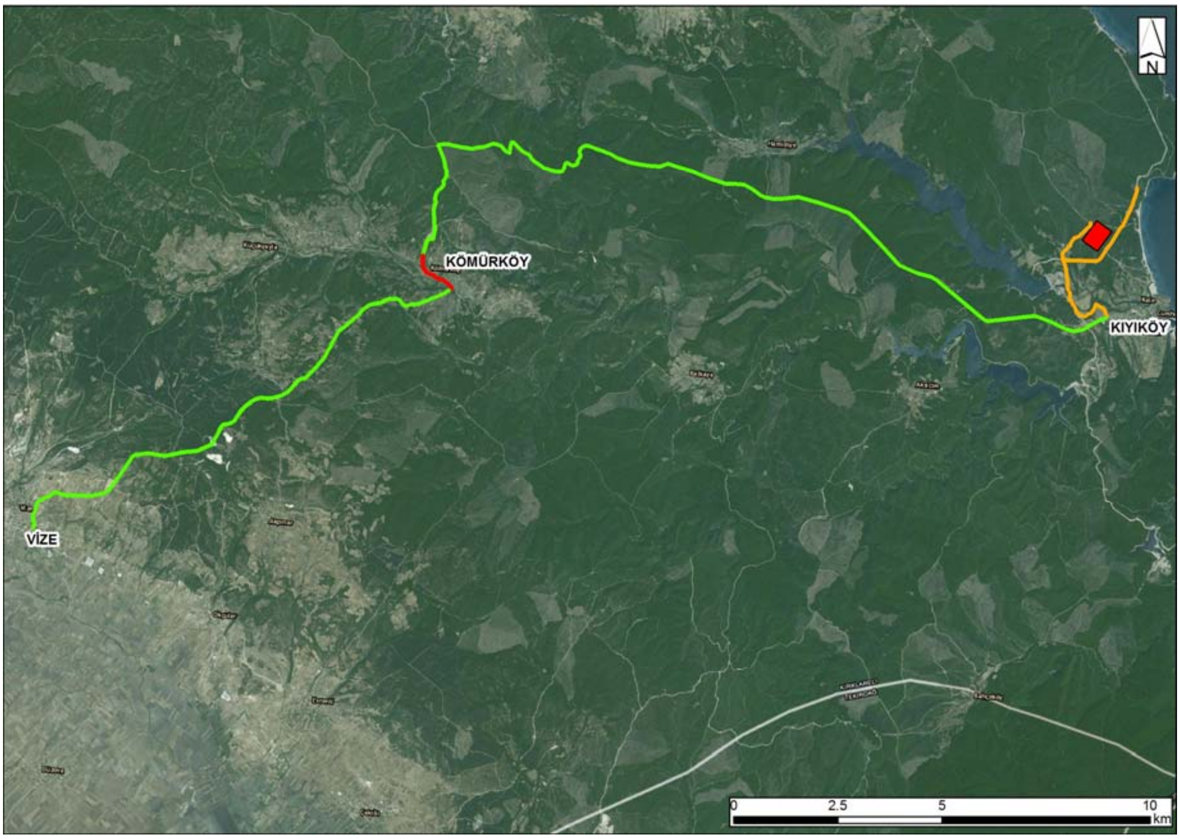


Figure 10.9: The Route on the North

A general assessment about the suitability of access roads on the route on the north (until the intersection point with the route at the south) has been given below.

As a result of the suitability assessment it has been revealed that section of the access road that passes through Kömürköy is a narrow road that goes through dwellings and the bends are particularly not suitable for long trunks to pass. If this route is used instead of using the road that passes through Kömürköy, a new alternative paved double road of 2.5 km (which will also include a bridge with the width of 20-30 m that passes over the river)passing by west side might be needed as a bypass.

Considering the fact that the access road is of 1 km to the Hamidiye village, the Hamidiye village is foreseen not to be not in direct interaction with the construction traffic.

10.4.2.3 The route that continues to the Landfall Section from the intersection point of the North and South Routes

A general assessment of the roads on the route that continues to the Landfall Section from the intersection point of the North and South Routes is given below.

If the route on the south is used, the 1 and 2 numbered unpaved roads indicated in Figure10.10 might need to be improved.

If the route on the north is used, the unpaved road numbered 1 might need to be improved.

Between the unpaved roads 1 and 2 there is a paved/asphalt road that connects Kıyıköy and Vize. If the route on the south is used only 500m of this road towards Kıyıköy will be used.

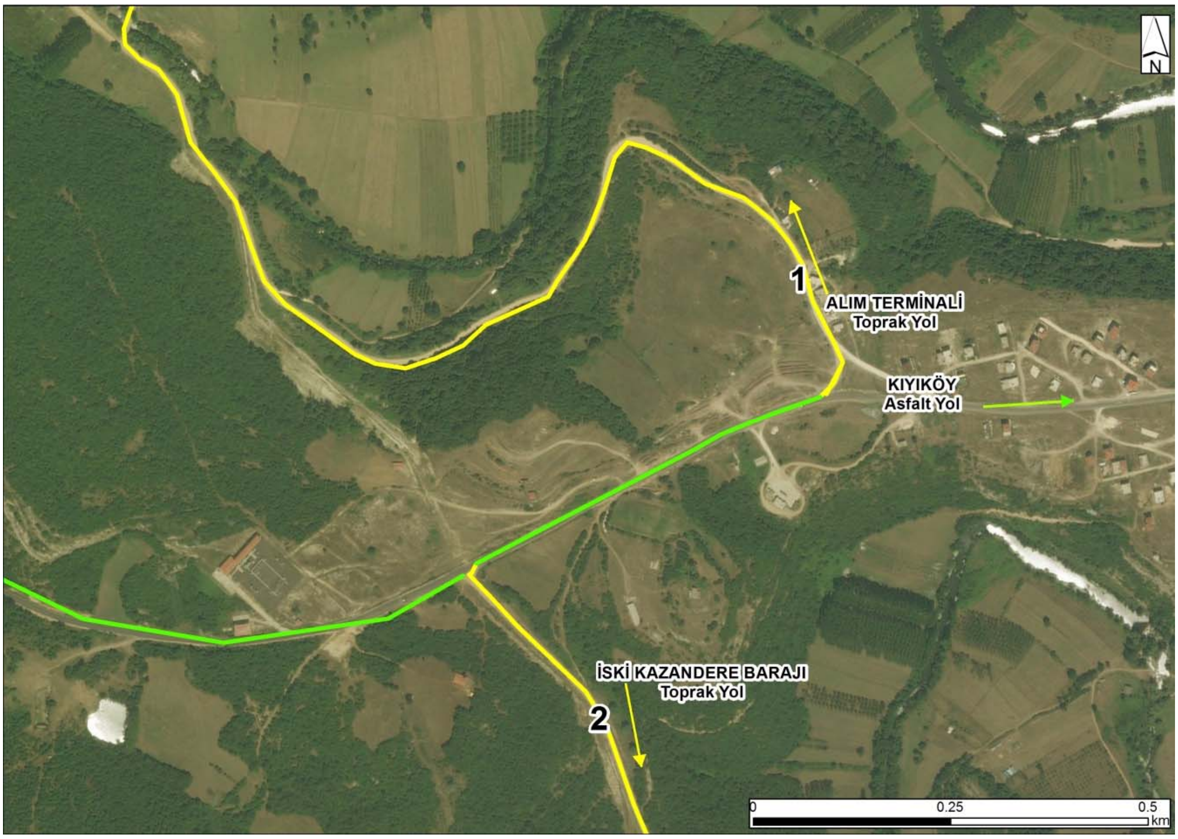


Figure10.10: The Unpaved Roads At The West Of Kıyıköy Town And The Paved Road That Continues To Kıyıköy

10.4.2.4 The Routes Close Surroundings of the Landfall Section

The permanent and temporary access roads near the Landfall Section are illustrated below.

In the current settlement plan (Figure10.11) there are two permanent (number 1 and 2) roads planned to be used for accessing the Receiving Terminal and one temporary road (number 3) planned to be used during the construction phase. The total length of the permanent access roads to the Receiving terminal at the current planned situation is approximately 450-500 meters.

4 temporary roads (numbered 4a-4b-4c-4d) that continue over the ISKI pipeline and is planned to be used to access the Receiving Terminals and the pipe laying construction site is shown in the current settlement plan (Figure10.11)

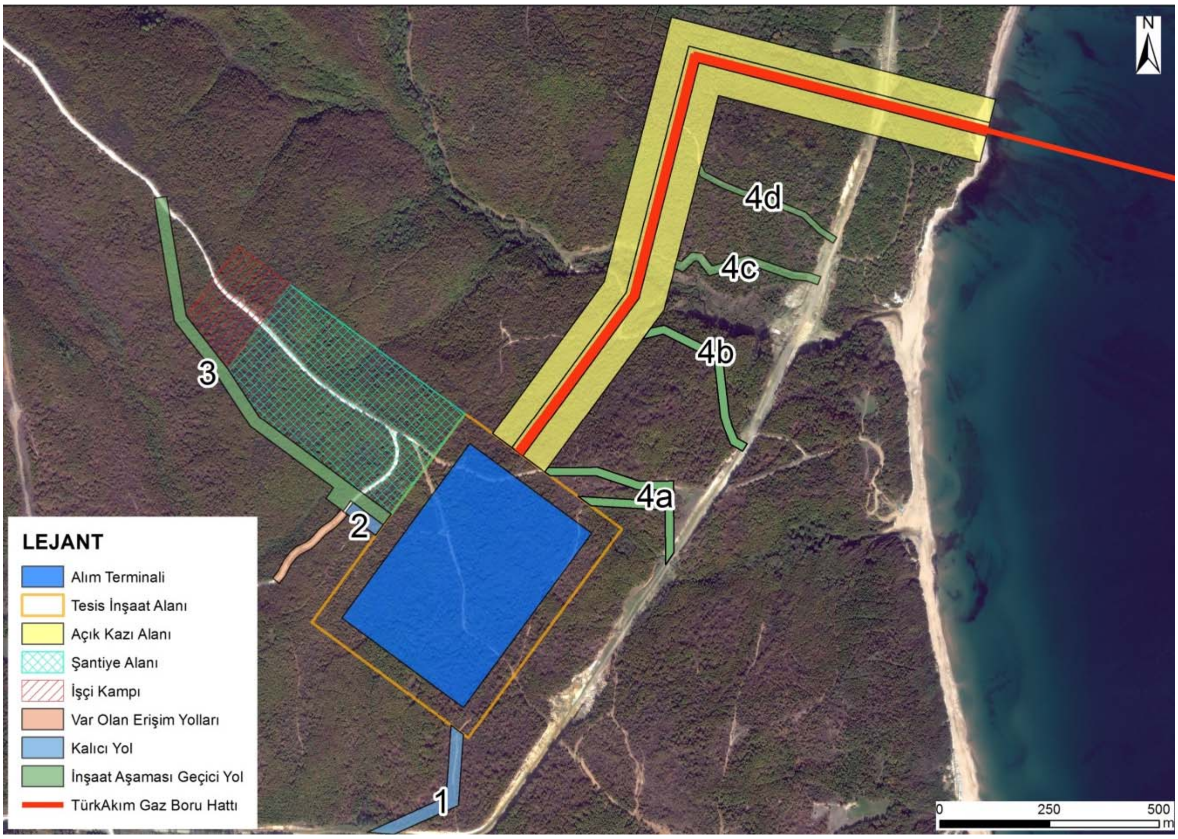


Figure10.11: Current Settelment Plan

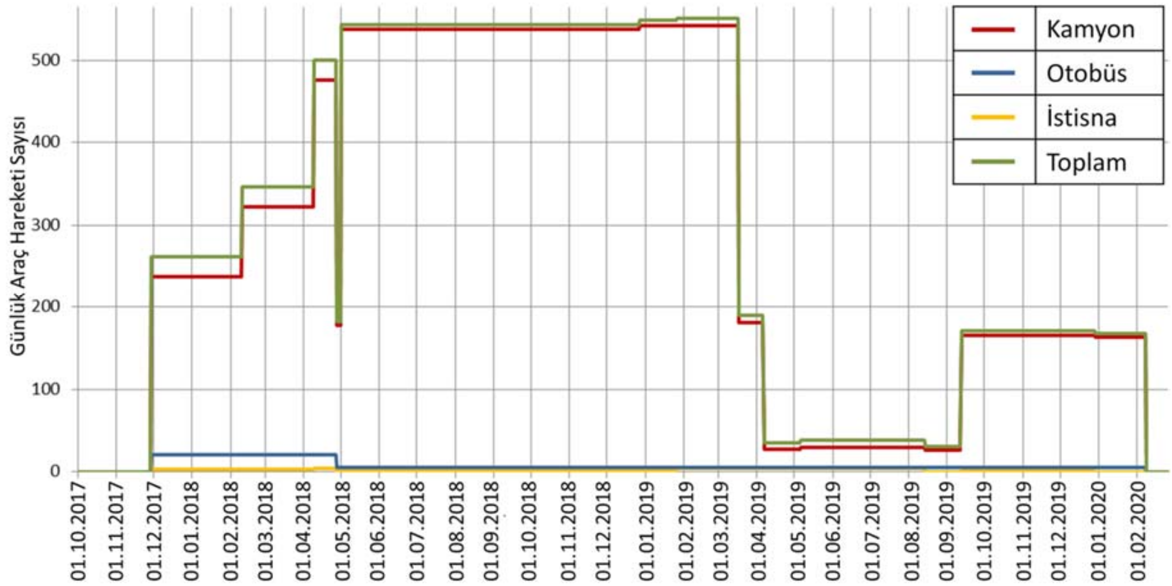
10.4.2.5 Traffic Volume

The traffic volume study is based on the estimated amount of material and equipment that is planned to be used in the construction of the Receiving Terminal and the pipelines in the Shore Crossing and Landfall sections as well as the Project calendar. The site work will continue for 24 hours after receiving the necessary permits during the big part of the construction phase. Bringing the materials to the site with trucks will require two-way (to the site and from the site) truck transportation.

In this context the number of trips on both ways have been calculated. In the calculations the movement of the trucks within the construction site have been disregarded. The study on the traffic volume mainly focuses on determining the traffic volume between districts/villages and the landfall section.

The study on the traffic volume has been made for the route on the North (coming from Vize). When the data from the South route is taken as bases, the traffic volume here is expected to be similar to the North route. South route is preferred, different from the North route, a part of the unpaved road numbered 2 on, Figure10.10 might need improvement and the road that passes through Kömürköy might need to be bypassed with a new paved road.

Figure Figure10.12 and Figure10.13 presents the foreseen traffic volume data during the construction of the Receiving Terminal and open cut shore crossing.



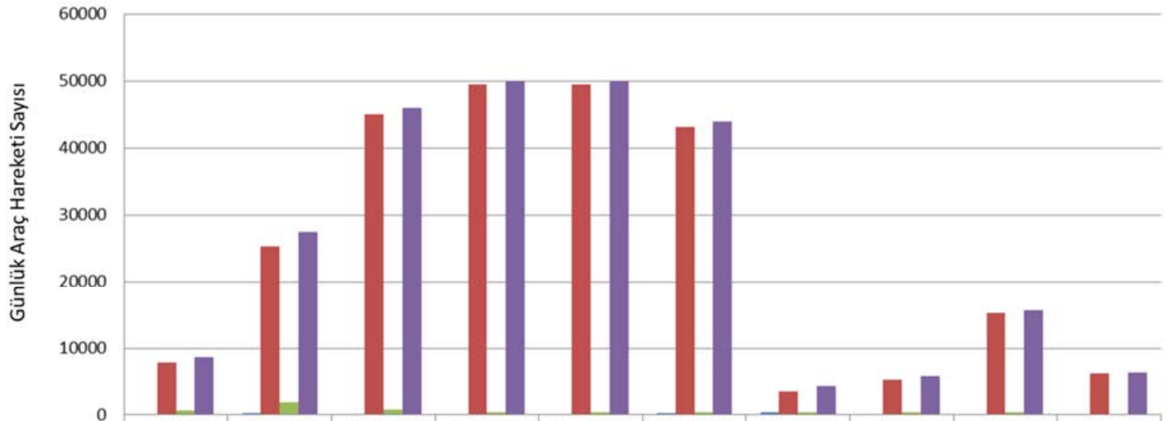
*Red line: Truck

*Blue line: Bus

*Yellow line: exceptions

*Green line: Total

Figure10.12: Estimated Construction Traffic Volume – Daily Vehicle Motion Assessment with Cautious Approach



	2017 4.Çeyrek	2018 1.Çeyrek	2018 2.Çeyrek	2018 3.Çeyrek	2018 4.Çeyrek	2019 1.Çeyrek	2019 2.Çeyrek	2019 3.Çeyrek	2019 4.Çeyrek	2020 1.Çeyrek
İstisna	110	305	132	46	55	323	349	180	30	6
Kamyon	7843	25293	45004	49511	49531	43184	3572	5211	15218	6188
Otobüs	693	1869	870	429	429	415	429	429	429	177
Toplam	8646	27467	46007	49987	50015	43922	4350	5820	15678	6371

Figure10.13:The total number of double way trips calculated for 3-month periods – With a cautious approach

In the light of the information that is provided above, due to the vehicle traffic during the construction phase of the project, it is foreseen that an additional traffic load can occur in the route that will be chosen. With the measures that are listed below the potential effects of the extra traffic volume that will be caused by the project activities and the potentially required road improvement work in the preferred access route(s), will be attempted to be minimised.

If there is a need of improvement on the roads that are on the route close to dwellings:

- A calendar that will prevent or minimize the negativeimpact that the activities that cause noise might have on the sensitive receptor during the night will be set;
- Good International Industrial Practices (GIIP) will be taken as a bases in the management of the effect of dust settlement, noise and lighting;
- Temporary security fences to ensure the security during construction and prevent public access to the workings sites (including temporary areas) will be built and warning signs to increase the awareness against the dangers will be hung;
- Once the roadwork is completed all the equipment and materials (including the construction soil) will be removed from the site in line with the requirements; and
- When applicable secure access to the housings close to the roads where there is work will be ensured.

The effects that might occur due to the land traffic at Kıyıköy and access routes due to the project:

- The use of the access roads during construction will be maintained and if possible alternative access roads will be provided;
- Before the construction traffic starts the current situation analysis and the identification of sensitive receptors will be identified by conducting detailed traffic and transportation surveys when necessary on the road routes where there are heavy settlements, and when necessary the effects of the potential traffic will be better evaluated and additional mitigation measures about the effects of the traffic will be developed. When the mitigation measures are being developed after the study effects of dust and noise and measures for pedestrian safety (speed limits, pedestrian access, noise reduction in road pavement, visual monitoring) will be taken into consideration;
- A Construction Traffic Management Plan that will include the following will be developed and implemented:
    - The traffic will be directed in a way that avoids the residential/urban areas and particularly Kıyıköy town centre. The traffic will also be managed and directed in a way that will avoid the sensitive receptors and time (official holidays, bayrams etc.);
    - During working hours and outside of working hours speed limits will be strictly applied and driving in line with the health and safety standards will be maintained;
    - The driving performance will be evaluated, if necessary additional trainings will be delivered; and
    - Necessary warning signs and signals about traffic will be installed.
- An awareness program for highway users and pedestrians on the traffic safety will be developed;
- The current situation of the access routs and access roads before the construction activities will be set. All the access roads that have been adversely impacted by the will be restored to at least its previous conditions. None of the access roads will be left in worse condition than before the construction period.

10.5 Air Quality Assessment

In 2015 in the scope of the project ENNOTES engineering owning Ministry of Environment and Urbanization accreditation document, has made background air quality measurements to study the air pollution distribution caused by the activities conducted in the construction and operation phases.

By using the results of the background air quality measurements an air quality model to identify the effects that the Project's Offshore, Shore Crossing and Landfall sections might have on the air quality of the Project activity area has been developed. In 2017 the air quality model has been updated according to the changes that the Project Owner made on the Project settlement.

With the air quality model the Contribution Value to Air Pollution (HKKD) and air quality values have been calculated and the results have been assessed according to the Regulation on Industry Sourced Air Pollution Control (SKHKKY).

This section offers a general assessment with regard to the performed measurement and modeling. The details of the air quality measurements and modeling work are given in the Air Quality Modeling Report contained in **ANNEX-10.A**.

10.5.1 Emission Calculations and Emission Management

10.5.1.1 Background Measurement

In order to assess the background air quality NO_2, SO_2 and VOC measurements with passive sampling, PM_{10} with active sampling and settled dust measurements have been carried out. In evaluating the current air quality of the Project area the results of these measurements have been taken into consideration. The results of the background measurements have been given in Table10.28 - Table10.32

Table10.28 Background NO_2 Measurement Results (µg/m^3).

Parametre	Sample Point	Coordinates		Results (µg/m^3)		
				03.07.2015 02.08.2015	02.08.2015 01.09.2015	Average
NO_2 (µg/m^3)	1	589628	4610798	0,78	0,35	0,57
	2	589210	4610739	0,76	0,42	0,59
	3	588984	4611006	0,72	0,37	0,55
	4	589617	4611109	0,81	0,49	0,65
	5	590827	4609798	0,92	0,46	0,69
	6	588787	4612631	0,80	0,75	0,78
	7	589658	4612017	0,81	0,29	0,55
	8	590082	4611726	0,69	0,61	0,65
	9	588811	4612315	0,84	5,34	3,09
	10	590164	4609751	0,73	0,45	0,59

Table10.29 SO_2 Measurement Results (µg/m^3).

Parametre	Sample Point	Coordinates		Results (µg/m3) 03.07.2015 02.08.2015	02.08.2015 01.09.2015	Average
SO_2 (µg/m^3)	1	589628	4610798	<0,76	<0,61	<0,68
	2	589210	4610739	<0,76	<0,61	<0,68
	3	588984	4611006	<0,76	<0,61	<0,68
	4	589617	4611109	<0,76	<0,61	<0,68
	5	590827	4609798	<0,76	<0,61	<0,68
	6	588787	4612631	<0,76	<0,61	<0,68
	7	589658	4612017	<0,76	<0,61	<0,68
	8	590082	4611726	<0,76	<0,61	<0,68
	9	588811	4612315	<0,76	<0,61	<0,68
	10	590164	4609751	<0,76	<0,61	<0,68

Table10.30: VOC Measurement Results (µg/m^3)

Parametre	Sample Point	Coordinates		Results (µg/m^3) 03.07.2015 02.08.2015	02.08.2015 01.09.2015	Ortalama
VOC (µg/m^3)	1	589628	4610798	40,08	98,84	69,46
	2	589210	4610739	104,08	40,81	72,445
	3	588984	4611006	45,45	40,66	43,055
	4	589617	4611109	67,95	122,73	95,34
	5	590827	4609798	1.192,77	56,7	624,735
	6	588787	4612631	42,79	48,8	45,795
	7	589658	4612017	120,26	81,48	100,87
	8	590082	4611726	215,12	26,65	120,885
	9	588811	4612315	216,75	143,51	180,13
	10	590164	4609751	37,65	177,59	107,62

Table10.31: PM_{10}Measurement Results

Parameter	Day	Results (µg/m³) Sampling Point 1 Coordinates: 588270, 4612911	Results (µg/m³) Sampling Point 2 Coordinates: 588419, 4613198
PM_{10} (µg/m³)	1	0,54	0,91
	2	0,71	0,36
	3	0,36	0,53
	4	0,36	1,44
	5	0,89	0,90
	6	0,54	0,36
	7	0,72	0,92
	8	0,90	0,54
	9	0,90	0,36
	10	0,72	0,72
	11	0,36	0,74
	12	0,73	0,55
	13	0,91	0,90
	14	1,09	1,06
	15	0,54	0,54
	16	0,72	0,72
	17	0,90	0,72
	18	0,54	0,90
	19	0,90	1,45
	20	1,26	0,72
	21	0,89	0,54
	22	0,54	0,91
	23	1,08	1,09
	24	0,36	0,72
	25	0,90	0,54
	26	0,72	0,72
	27	1,08	1,24
	28	0,37	0,72
	29	0,54	0,73
	30	0,72	0,36
	Short Term Value	1,26	1,45
	Long Term Value	0,73	0,75

Table10.32: Settled Dust Measurement Results

Parametre	Sample Point	Coordinates	Results (µg/m³)	
			Short Term Results	Long Term Results
Settled Dust (mg/m²-day)	1	588270, 4612911	24	22,125
	2	588419, 4613198	24	23,75

10.5.1.2 Construction Phase Emission Values

10.5.1.2.1 Offshore and Shore Crossing Section

The emissions to be caused by the construction activities in the Offshore and Shore Crossing sections of the Project will be sourced from the vessels operating in these sections. The majority of the emissions will be sourced from the fuels that the vessel engines combust. The main pollutants will be nitrogen oxide (NO_x), carbon monoxide (CO), sulphur oxides (SO_x), particulate matter (PM_{10}) and volatile organic compounds (VOC).

The calculations of the vessel emissions, the emission factors given in EMEP/EEA 2016 have been used. Detailed information in relation to the fuel consumption has been collected from this document. Details on emission factors and fuel consumption values according to EMEP/EEA 2016 have been provided in the Air Quality Modeling Report presented in Annex-10.A.

The calculated emission values of the vessels that will be in operation during pipe laying construction activities in the Offshore Section are given in Table10.33 below.

Table10.33: The Emission Value Sourced from the Vessels Operating in the Pipe laying Activities at the Offshore Section

Construction Activity	Vessel Type	Emission Value (kg/hour)				
		NO_x	CO	SOx	PM_{10}	VOC
Pre-Lay Seabed Intervention Works (for cable crossings)	Rock dumping vessel	132,38	12,48	56,21	2,53	4,72
	Survey vessel	73,19	6,90	31,08	1,40	2,61
	Fast supply vessels	21,96	2,07	9,32	0,42	0,78
	Maintenance vessel	62,39	5,88	26,49	1,19	2,23
	Fuel/wastewater collector vessel	5,32	0,50	2,26	0,10	0,19
	Rescue vessel	83,20	7,84	35,33	1,59	2,97
Offshore Pipe-laying >30 m water depth	Offshore pipe-lay vessel	551,86	52,02	1.230,25*	10,55	19,68
	Tugs	120,94	11,40	51,36	2,31	4,31
	Pipe-lay supply vessel (PSV)	236,57	22,30	20,09	4,52	8,44
	Survey vessel	146,39	13,80	31,08	2,80	5,22
	Multi service vessel (MSV)	124,78	11,76	26,49	2,38	4,45
	Crew boats, fast cats	21,96	2,07	9,32	0,42	0,78
	Maintenance vessel	62,39	5,88	26,49	1,19	2,23
	Fuel/wastewater collector vessel	5,32	0,50	2,26	0,10	0,19

Construction Activity	Vessel Type	Emission Value (kg/hour)				
		NO_x	CO	SOx	PM_{10}	VOC
	Rescue vessel	83,20	7,84	35,33	1,59	2,97
Post-lay Seabed Intervention Works (for free span correction)	Post-lay trenching support vessel	131,45	12,39	55,82	2,51	4,69
	Survey vessel	73,19	6,90	31,08	1,40	2,61
	Fast supply vessel	21,96	2,07	9,32	0,42	0,78
	Maintenance vessel	62,39	5,88	26,49	1,19	2,23
	Fuel/wastewater collector vessel	5,32	0,50	2,26	0,10	0,19
	Rescue vessel	83,20	7,84	35,33	1,59	2,97

* When calculating SOx emissions, the sulphur rate in fuel is taken as 3.5% for offsore pipe-laying vessel while it is taken as 1% for other vessels.

In order to reflect the worst case, it is assumed that all the vessels indicated in Table10.33 above will operate at the same time period.

In addition to the vessel emissions in one of the vessels there will be a waste combustion unit. The emissioncalculations for the waste combustion unit have been made separately and have not been included to the modeling work. The emission values for the waste emission unit are given in Table10.34.

Table10.34: The Emission Values Sourced From the Waste Combustion Unit

Equipment	Capacity (kg/hour)	Emission Value (kg/hour)				
		NO_x	CO	SO_x	PM_{10}	VOC
Waste Combustion Unit	300	0,61	0,021	0,0141	0,0021	2,22

In addition to the main pollutants whose emission values are given in Table10.34, th emission values of Pb, Cd, Hg, As, Ni, PCDD/F, PAHs and HCB to be caused by the waste combustion unit have also been calculated and these values are given in the Air Quality Modeling Report contained in **ANNEX-10.A**.

The calculated emission values of the vessels that will be in operation during the pipe laying construction activities in the Shore Crossing Section are given in Table10.35.

Table10.35:The Emission Value Sourced from the Vessels Operating in the Pipe laying Activities at the Shore Crossing Section

Construction Activity	Vessel Type	Emission Value (kg/hour)				
		NO_x	CO	SO_x	NO_x	VOC
Shallow Water Pipe-lay Activities (10-30 m water depth) and Pipeline Installation	Shallow water pipe-lay vessel	21,78	2,05	13,88	0,42	0,78
	Anchor Handling Tugs	362,83	34,20	51,36	6,93	12,94
	Pipe-lay supply vessel (PSV)	94,63	8,92	20,09	1,81	3,38

Construction Activity	Vessel Type	Emission Value (kg/hour)				
		NO_x	CO	SO_x	NO_x	VOC
	Survey vessel	146,39	13,80	31,08	2,80	5,22
	Multi service vessel (MSV)	124,78	11,76	26,49	2,38	4,45
	Crew boats, fast cats	21,96	2,07	9,32	0,42	0,78
	Maintenance vessel	62,39	5,88	26,49	1,19	2,23
	Fuel/wastewater collector vessel	5,32	0,50	2,26	0,10	0,19
	Rescue vessel	83,20	7,84	35,33	1,59	2,97

*When calculating SOx emissions, the sulphur rate in fuel is taken as 1% for vessels.

The calculated emission values of the vessels that will be in operation during the dredging activities in the Shore Crossing Section are given in Table10.36.

Table10.36: The Emission Value Sourced from the Vessels Operating in the Dredging Activities at the Shore Crossing Section

Activity	Vessel Type	Emission Value (kg/hour)				
		NO_x	CO	SO_x	NO_x	VOC
Excavation of the Open-cut Section and Trenches through Dredging (till about 2km offshore)	Cutter Suction Dredger (CSD)	214,44	20,21	91,06	4,10	7,65
	Backhoe dredging equipment (BHD) (excavation of the rock by dredging)	18,17	1,71	7,71	0,35	0,65
	Trailer Suction Hopper Dredger (TSHD)	58,08	5,48	24,66	1,11	2,07
	Small survey vessel	4,36	0,41	1,85	0,08	0,16
	Tug	39,52	3,73	16,78	0,76	1,41
	Crew boats, fast cats	21,96	2,07	9,32	0,42	0,78
	Maintenance vessel	66,31	6,25	28,16	1,27	2,37
	Fuel/wastewater collector vessel	5,32	0,50	2,26	0,10	0,19
	Rescue vessel	83,20	7,84	35,33	1,59	2,97
Backfilling of the Trenches	TSHD	58,08	5,48	24,66	1,11	2,07
	BHD	18,17	1,71	7,71	0,35	0,65
	Small survey vessel	4,36	0,41	1,85	0,08	0,16
	Crew boats, fast cats	21,96	2,07	9,32	0,42	0,78
	Maintenance vessel	66,31	6,25	28,16	1,27	2,37

Activity	Vessel Type	Emission Value (kg/hour)				
		NO_x	CO	SO_x	NO_x	VOC
	Fuel/wastewater collector vessel	5,32	0,50	2,26	0,10	0,19
	Rescue vessel	83,20	7,84	35,33	1,59	2,97

*When calculating SOx emissions, the sulphur rate in fuel is taken as 1% for vessels.

10.5.1.2.2 Landfall Section

In the Construction Phase of the Landfall Section there will be excavation activities. The emission values caused by the excavation activities have been calculated according to the estimations given below:

- Total excavation volume: approximately 440.180 m^3
- Soil density: 1,6 ton/m^3
- Total excavation amount: 440.180 m3 x 1,6 ton/m^3 = 704.288 tons
- Total fill volume: 445.000 m^3
- Soil density: 1,6 ton/m^3
- Total fill amount: 445.000 m3 x 1,6 ton/m^3 = 712.000 ton
- Operation period: 5 ay
- Daily operation duration: 24 hours
- Hourly excavation (approximate): (704.288 ton / 5 month) / 30 day / 24 hours = 195,6 tons / hour
- Daily fill (approximate): (712.000 ton / 5 month) / 30 day / 24 hours = 197,8 tons / hour

The mass flow rate of the emissions caused by the excavation activities has been calculated according to the emission factors as stated by the provision stated in Annex 2 of SKHKKY “the hourly flow rate emissions released to the atmosphere by the operations; shall be identified by measurements from the stacks for existing facilities, and with emission factor for off-stack sources and facilities that will be newly built.” Table 12.6: Emission Factors for the Calculation of Mass Flow Rate of the Dust Emissions at Annex 12 of SKHKKY is used for emission factors. The dust emissions caused by the excavation activities has been given in Table10.37.

Table10.37: Dust Emissions Caused by the Excavation Activities

Activity	Emission Value (kg/hour)
Excavation	2,44
Truck loading	0,98
Transportation	1,73
Unload	0,99
Total	6,14

10.5.1.3 Emission Values for Operation Phase

10.5.1.3.1 Offshore and Shore Crossing Section

The emissions caused during the operation phase will only be caused by the vessel operation during periodic controls and pipe maintenance and will therefore be much less than the emissions during the construction phase. In the operation phase NO_2, CO, SO_2 and PM_{10} emissions at the Offshore and Shore Crossing sections of the Project will be significantly below what is calculated for the construction phase.

10.5.1.3.2 Landfall Section

The emissions in the Operation Phase of the Project will be sourced from the heating systems and energy production activities.

For the heating of the gas, in the operation phase there will be 12 heating systems each with 8,5 MW power (6 for each pipeline, 102 MW thermal capacity in total) and the heaters will work with the gas received from the system. It is planned that in the operation phase the Receiving Terminal will be connected to the national electrical grid by ensuring an adequately safe connection and that the electricity need of the terminal will be supplied through this connection. In case that it is not possible to connect the Receiving Terminal to the national electrical grid (or it is not adequately safe), a small power plant will be installed for power supply. This is considered as hydraulic equipment scenario. The power plant planned to have a 5 MW capacity will contain 3 gas engines.

As natural gas will be used in the trigeneration and boiler system the main pollutant in the combustion process will be NO_x pollutant. In order to calculate the gas emissions the document titled internal combustion engines that combust gas fuel as stated in EMEP/EEA Air Pollutant Emission Inventory Guidance Document 2013- Small combustion plants off domestic use- Table 3-36 Level 2 – emission factors has been used, as for the boiler systems the document titled EMEP/EEA Air Pollutant Emission Inventory Guidance Document 2013- Small combustion plants off domestic use- Table 3-33 Level 2 – emission factors, middle size (>1MWth to ≤50 MWth) boiler systems that combust natural gas has been used. Detailed information regarding the emission factors can be found in Air Quality Modeling Report presented in Annex – 10.A. The emission values calculated for the operation phase is given in Table10.38.

Table10.38: The Emission Values that will be Sourced from the Equipment Used in the Operation Phase

Parameter	Emission Value(kg/hour)	
	Gas Engine	Heater
NO_x	0,81	1,22
CO	0,3	0,92
SO_x	0,003	0,009
PM_{10}	0,012	0,01

10.5.1.4 Modeling Study

10.5.1.4.1 The Method Used in The Modeling Study

In the air quality modeling study, “Lakes Environmental AERMOD View” program that is used with a licence by Ennotes Environment Engineering Consultancy Electricity Project Ind. Trade. Co. Ltd. Is used. In the program the latest version *AERMOD 15181* that has been launched on 24.07.2015 by AERMOD US EPA has been used.

The model is one of the most advanced computer models that can estimate the daily and annual Air Pollution Estimated Value by using the real time data that changes in time. The model incorporates many different dispersion models (point, volume, area) from isolated funnels to fugitive emissions, it also takes into consideration the aerodynamic waves, turbulences and any other similar events that pollutants from any industrial zone source can encounter.

The AERMOD model works in a network that is defined by the user, the calculations are made for the corner points of each receiving body element that establish the net. The network system that the AERMOD model utilises can be defined as polar or cartesian,also discrete receiving points apart from the network are set and at these points more detailed calculations can be made. In the model there is also an option to select rugged terrain. The AERMOD model used the four different data types that are listed below:

- Hourly meteorological data set that includes wind direction, wind speed, temperature, Pasquill stability class, mixing height, (depending on the users choice) the wind profile exponent and potential vertical temperature difference;
- The coordinates and height of each element within the network system that is defined as receiving environment;
- The data of the source that has been identified as a start point by the user, which includes the source coordinates, source height, diameter, pollutant speed, temperature and flow; and
- Also the model includes many program control parameters depending on the user options.

For the modeling study to be conducted there is a need for long-termmeteorological data. The meteorological data in the region have been collected from the meteorology stations. The Kıyıköy-Midye station located close to the Project area conducts microclimate type measurements, the station has been closed in 1997 and sufficient data cannot be received from this station. Because of this, a research to identify a station that will represent the region has been made. As a result it has been found that as the stations near the project area are of continentalcharacteristics they cannot represent the region; and the most probable station that could identify the region has been found to be the Kumköy-Kilyos station. In the modeling study the data from this station has been used. Air-conditioning, synoptic or hourly-surface station data measured in automated stations and meteorological sounding data measured in rawinsonde stations are needed for AERMOD model. There is a station near the study field which belongs to the Turkish State Meteorological Service and makes up-to-date observation. Meteorological sounding data have been supplied from the closest Istanbul Meteorological Station to the Project Site among 8 rawinsonde stations in Turkey.

The Air Quality Standards Used

In Annex -2 Table 2.2 of SKHKKY the short time and long time limit values that the industrial facilities need to seek in their affect area has been provided. In the regulation the limit values have been given in the reduction table and in this study in order to demonstrate the most binding situation the limit values of 2024 and later has been used. The limit values defined in SKHKKY is shown at Table10.39.

Table10.39: Air Quality Limit Values

Parameter	Time Period	Unit	Year						
			2014	2015	2016	2017	2018	2019-2023	2024 and later
SO_2	Hourly (Cannot be transgressed more than 24 times in one year)	µg/m³	500	470	440	410	380	350	350
	24 hours		250	225	200	175	150	125	125
	UVS		60	60	60	60	60	60	60
	**Annual and winter period (1 October-31 March)		20	20	20	20	20	20	20
NO_2	Hourly (Cannot be transgressedmore than 18 times in one year)	µg/m³	300	290	280	270	260	250	200*
	Annual		60	56	52	48	44	40*	40
Suspended Particulated Material(PM_{10})	24 hours (Cannot be transgressed more than 35 times in one year)	µg/m³	100	90	80	70	60	50	50
	annual		60	56	52	48	44	40	40
CO	Maximum daily 8 hours average	mg/m³	16	14	12	10	10	10	10
Total Organic Compounds (in carbons)	Hourly	µg/m³	280	280	280	280	280	280	280
	KVS		70	70	70	70	70	70	70
Settled dust	KVS	mg/m²day	390	390	390	390	390	390	390
	UVS		210	210	210	210	210	210	210

There are also limit values set by the European Union and The World Health Organisation (WHO) to prevent air pollution. (European Union Directive on Health Based Standards2008/50/EC) the limit values of the world health organisation can be found in "PM, O_3, NO_2 and SO_2For air quality guideline". These limit values are as given in Table10.40.

Table10.40: International limit Values

Parameter	Average Time Period	EU Limit Values (µg/m³)[1]	WHO Limit Values (µg/m³)[2]
NO_2	1 hour (To protect human health)	200(Cannot be transgressed more than 18 times in one year)	200
	Calendar year (To protect human health)	40	40

PM_{10}	24 hour (To protect human health)	50(Cannot be trangressed more than 35 times in one year)	50
	Calendar year (To protect human health)	40	20
CO	Maximum 8 – hourly average (To protect human health)	10.000	-

1 2008/50/EC limit values in the EU directive

2 World Health Organisation limit value for PM, O3, NO2 and SO2 in the air quality guideline

10.5.1.4.2 Modeling Scenarios

The model outputs are structured in a way that gives the possibility to prepare dispersion maps in the region of the Project area. By this means, it was possible to assess the air quality of the region for different scenarios. Modeling scenarios are as given below:

Scenario 1: The assessment of the offshore section vessel emissions during the construction phase,

Scenario 2: The assessment of the vessel emissions at the shore crossing dredging activities during the construction phase,

Scenario 3: The assessment of the vessel emissions at the shore-crossing pipe laying activities during the construction phase,

Scenario 4: The assessment of the dust emissions at the excavation activities on the landfall section during the construction phase,

Scenario 5: The assessment of the emissions for the operation phase.

10.5.1.4.3 Modeling results

For each scenario air pollution contribution value has been calculated by using the NO_2, SO_2, CO, VOC and PM_{10}measurement results and they are presented in the following section.

Scenario 1

The air pollution contribution values for scenario 1 is given in Table10.41 below.

Table10.41: Scenario 1 Air Pollution Contribution Values

Parameter	Period	APCV (µg/m^3) and Coordinates	Limit Values (µg/m^3)
SO_2	Hourly (maximum)	114,46 (664545, 4635580)	350
	Transgression number	0	(Cannot be transgressed more than 24 times in one year)
	Daily (maximum)	19,12 (666810, 4636646)	125
	Transgression number	0	(Cannot be transgressed more than 3 times in one year)
	Annual	4,87	20

Parameter	Period	APCV (µg/m^3) and Coordinates	Limit Values (µg/m^3)
		(668810, 4638906)	
NO_2	Hourly (maximum)	269,25 (664545, 4635580)	200
	Hourly transgression number	6	(Cannot be transgressed more than 18 times in one year)
	Annual	11,46 (668810, 4638906)	40
CO	Daily 8 hour average	42,33 (664545, 4635580)	10.000
VOC	Hourly (maximum)	16,20 (664545, 4635580)	280
	KVS	2,70 (666810, 4636646)	70
PM_{10}	Daily (maximum)	1,43 (666810, 4636646)	50 (Can transgress 35 times)
	Transgression number	0	35 times in a year
	Annual	0,36 (668810, 4638906)	40

NO_2 emissions sourced from the vessels working in the offshore section during the construction phase according to scenario 1 are provided in Table10.41. In addition NO_2 dispersion is shown in Figure10.14 and Şekil 10.15.

Table10.41 indicates that the hourly and annual NO_2 air pollution contribution values sourced from the offshore construction activities will be 269,25 µg/m^3 and 11,46 µg/m^3 in order at the worst affected areas in the offshore. These values are below the limit values indicated in SKHKKY. With this in mind, NO_2 emissions sourced from the Project activities according to the Scenario 1 are not expected to create a significant impact.

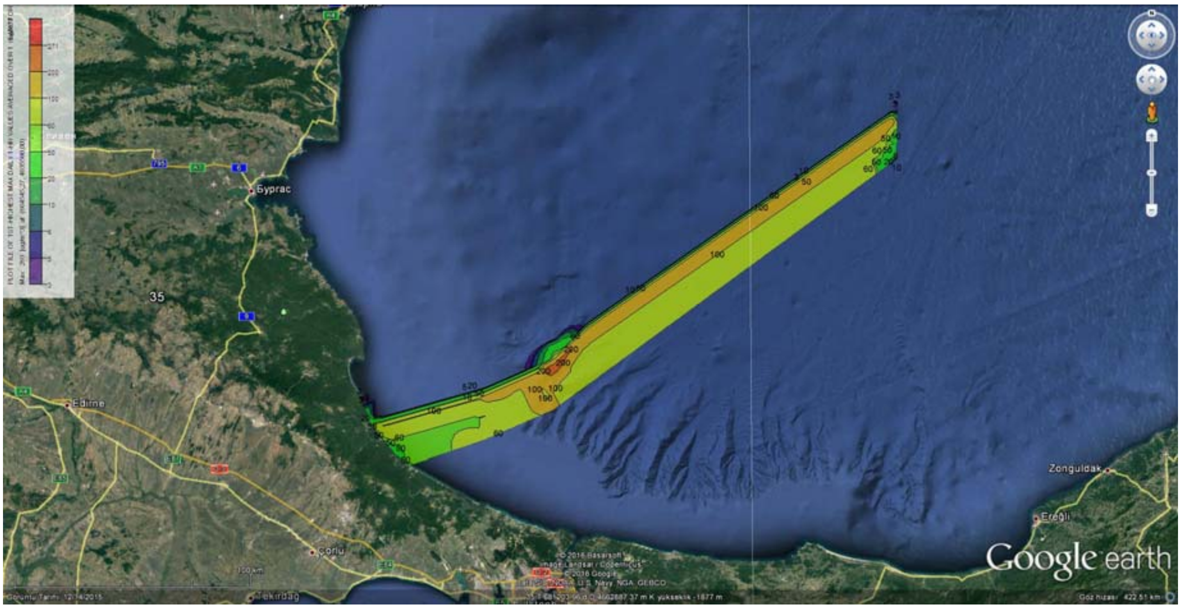
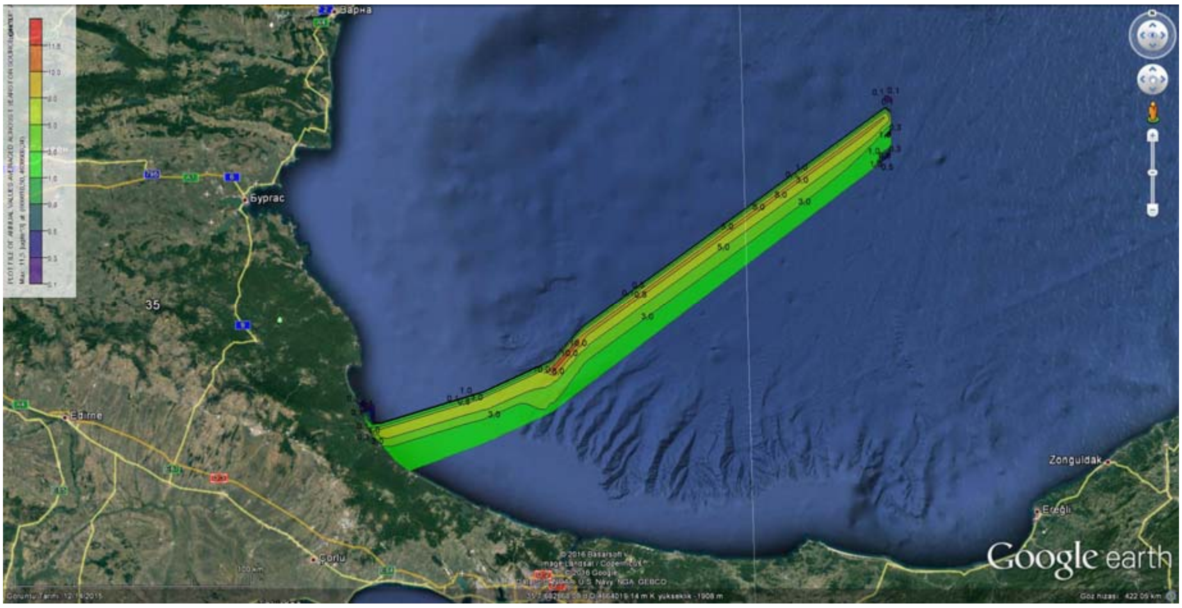


Figure10.14: Scenario-1 Hourly NO_2 Dispersion



Şekil 10.15: Scenario-1 Annual NO_2 Dispersion

SO_2 emissions sourced from the vessels working in the offshore section during the construction phase according to scenario 1 are provided in Table10.41. In addition SO_2 dispersion is shown in Figure10.16, Figure10.17 and Figure10.18.

Table10.41 indicates that the hourly, daily and annual SO_2air pollution contribution values sourced from the offshore construction activities will be respectively 114,46 µg/m^3, 19,12 µg/m^3 and 4,87 µg/m^3 at the worst affected areas in the offshore. These values are below the limit values indicated in SKHKKY. With this in mind, SO_2 emissions sourced from the project activities according the scenario 1 are not expected to create a significant impact.

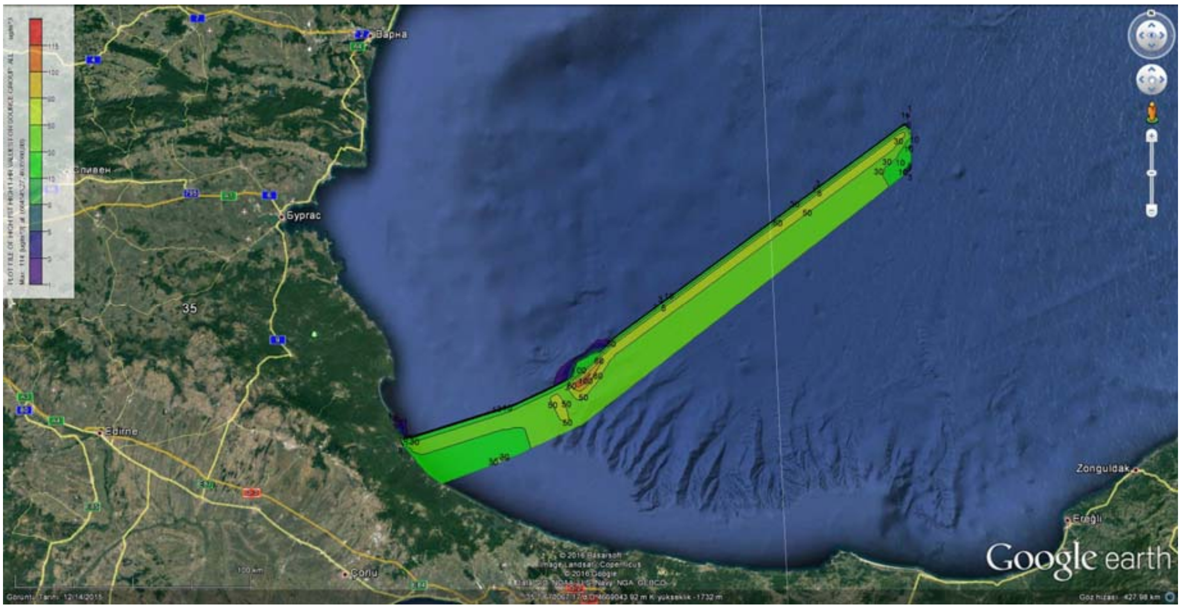


Figure10.16: Scenario-1 Hourly SO_2 Dispersion

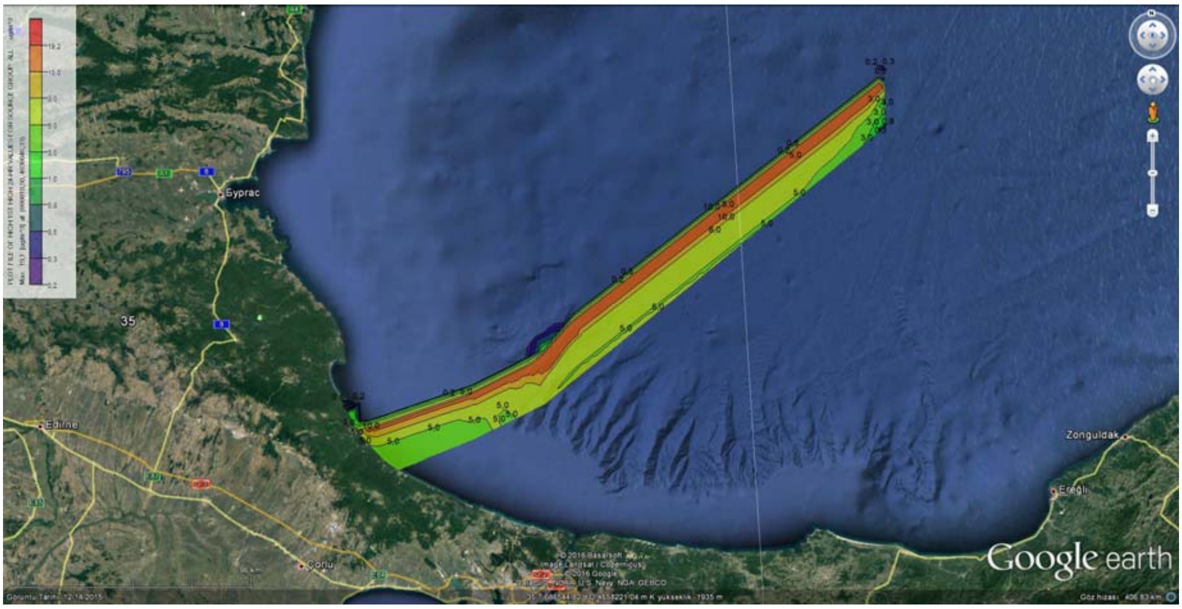


Figure10.17: Scenario-1 Daily SO_2 Dispersion

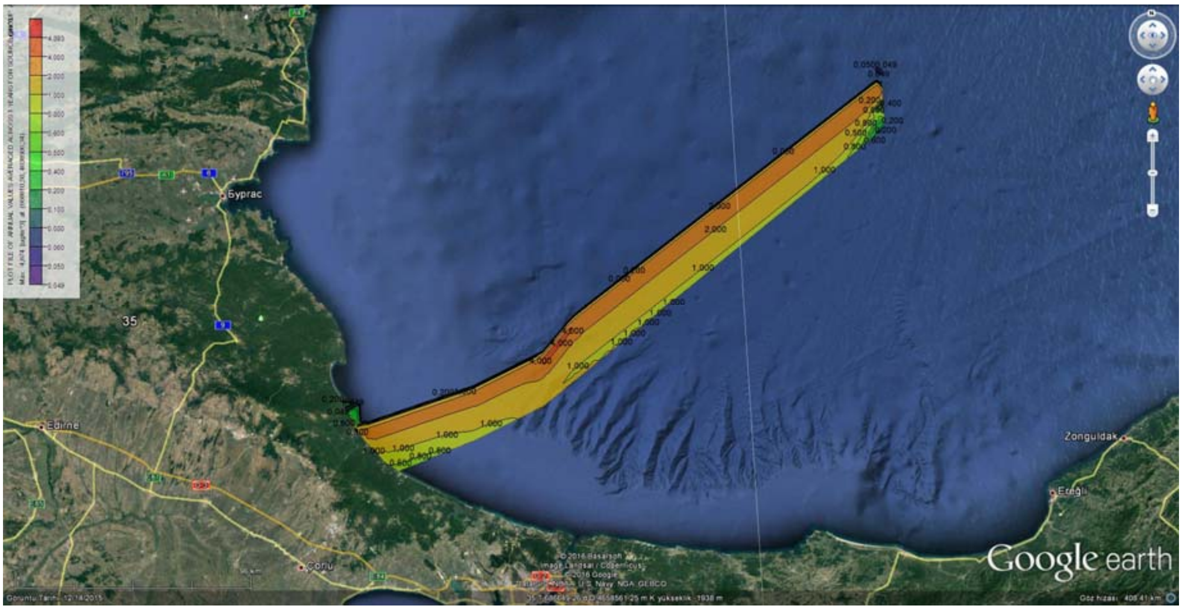


Figure10.18: Scenario-1 Annual SO_2 Dispersion

COemissions sourced from the vessels working in the offshore section during the construction phase are provided in Table10.41. In addition COdispersion is shown in Figure10.19.

Table10.41 indicates that the 8 hour CO air pollution contribution values sourced from the offshore construction activities will be respectively 42,33 µg/m^3 at the worst affected areas in the offshore. This value is below the limit value indicated in SKHKKY. With this in mind CO emissions sourced from the project activities according the scenario 1 are not expected to create a significant impact.

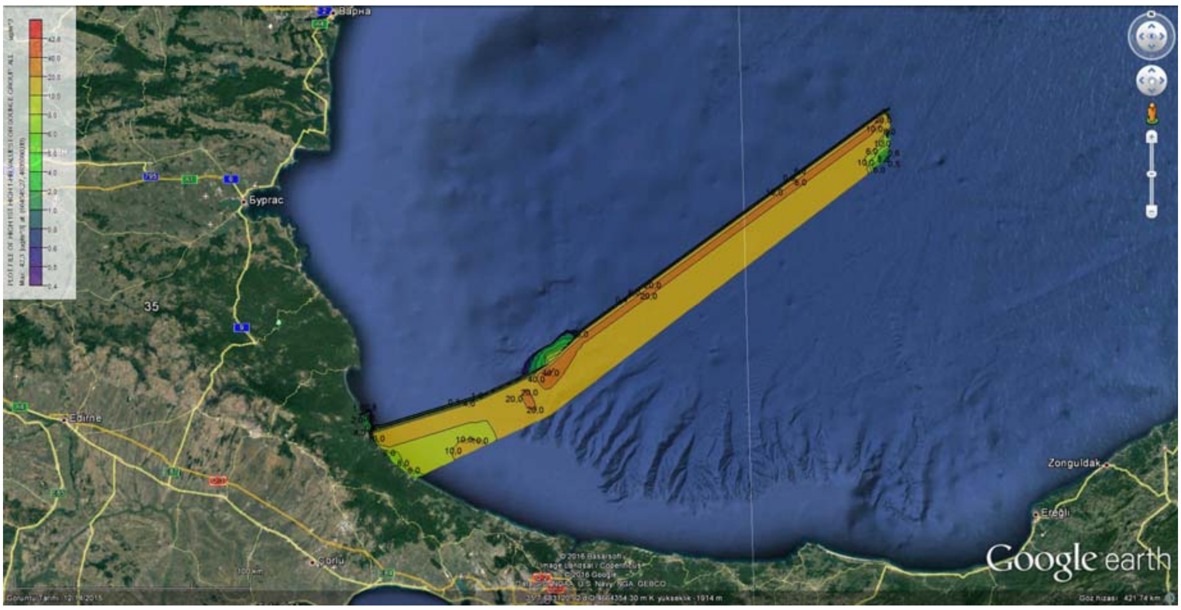


Figure10.19: Senaryo-1 Maximum daily 8 hour average CO dispersion

PM_{10} emissions sourced from the vessels working in the offshore section during the construction phase according to scenario 1 are provided in Table10.41. In addition PM_{10} dispersion is shown in Figure10.20 and Figure 10.21.

Table10.41 indicates that the daily and annual PM_{10} air pollution contribution values sourced from the offshore construction activities will be respectively 1,43 µg/m^3 and 0,36 µg/m^3 at the worst affected areas in the offshore. These are below the limit values stated in SKHKKY. With this in mind PM_{10} emissions sourced from the project activities according the scenario 1 are not expected to create a significant impact.

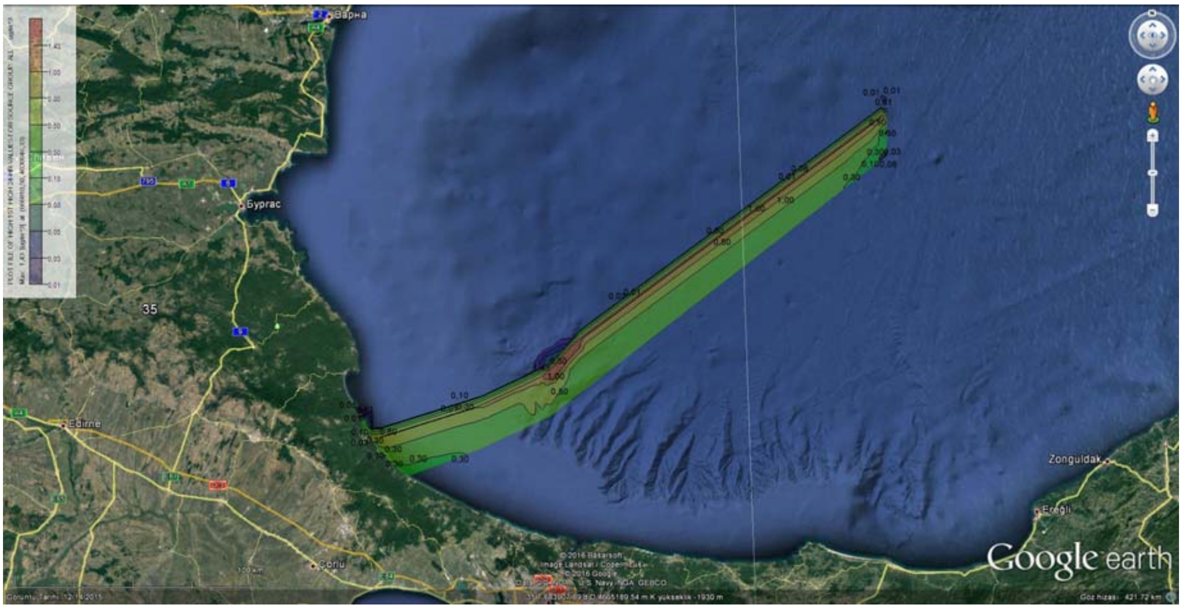


Figure10.20: Scenario-1 Daily PM_{10} Dispersion

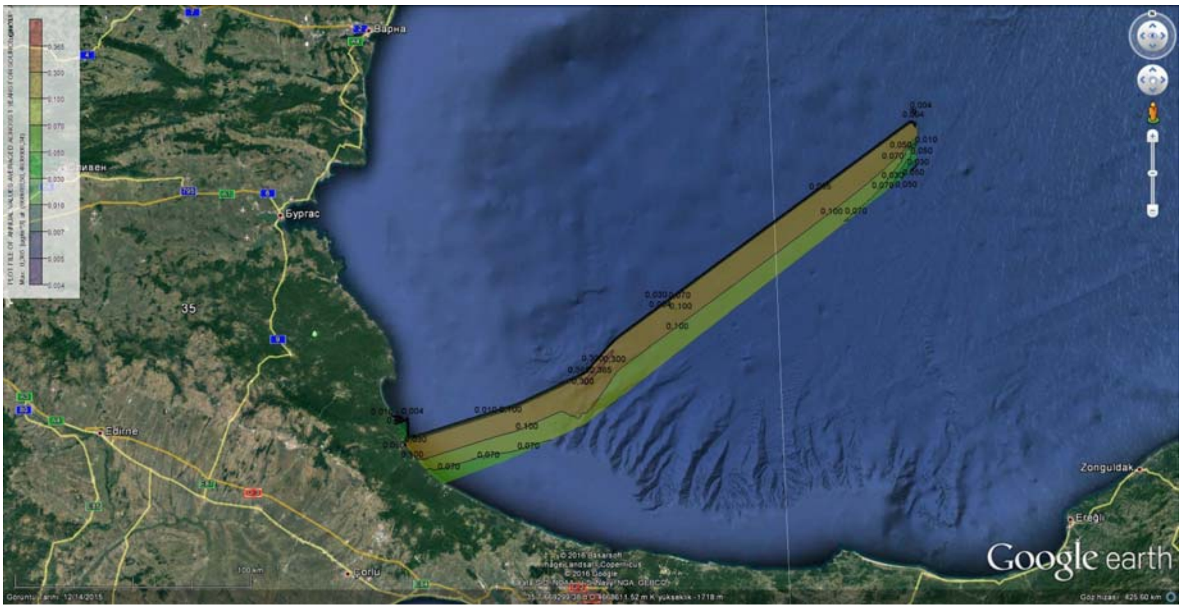


Figure 10.21: Scenario-1 Annual PM_{10} Dispersion

VOC emissions sourced from the vessels working in the offshore section during the construction phase according to scenario 1 are provided in Table10.41. In addition VOC dispersion is shown in Figure10.22 and Figure10.23.

Table10.41 indicates that the hourly and short term VOC air pollution contribution values sourced from the offshore construction activities will be respectively 16,20 µg/m³ and 2,70 µg/m³ at the worst affected areas in the offshore. These are below the limit values stated in SKHKKY. With this in mind VOC emissions sourced from the project activities according the scenario 1 are not expected to create a significant impact.

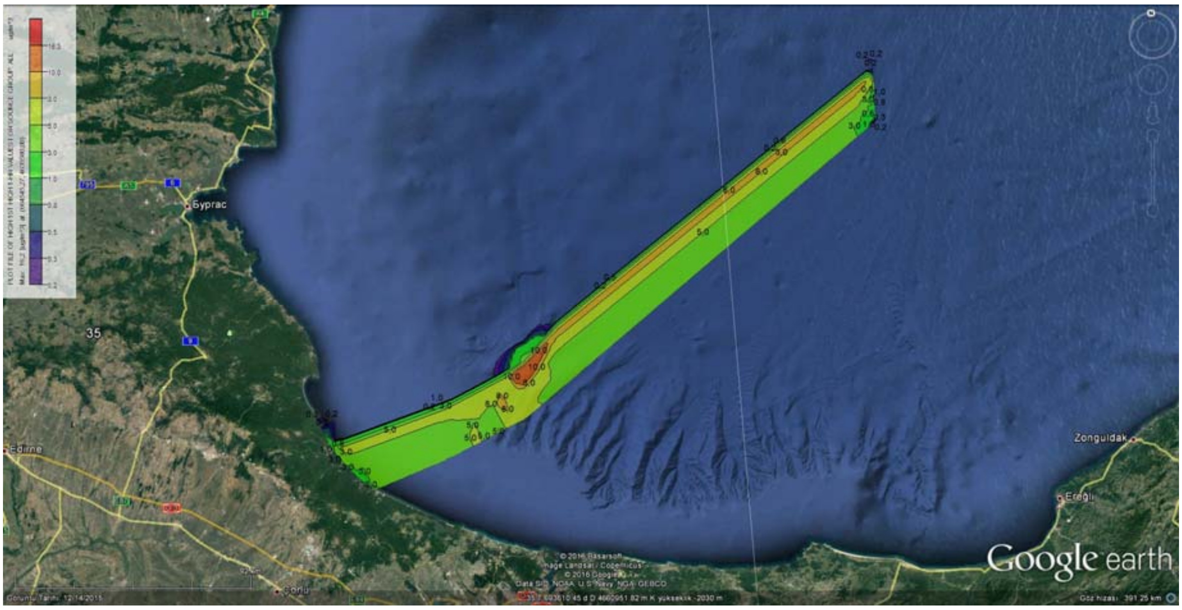


Figure10.22: Scenario-1 Hourly VOC Dispersion

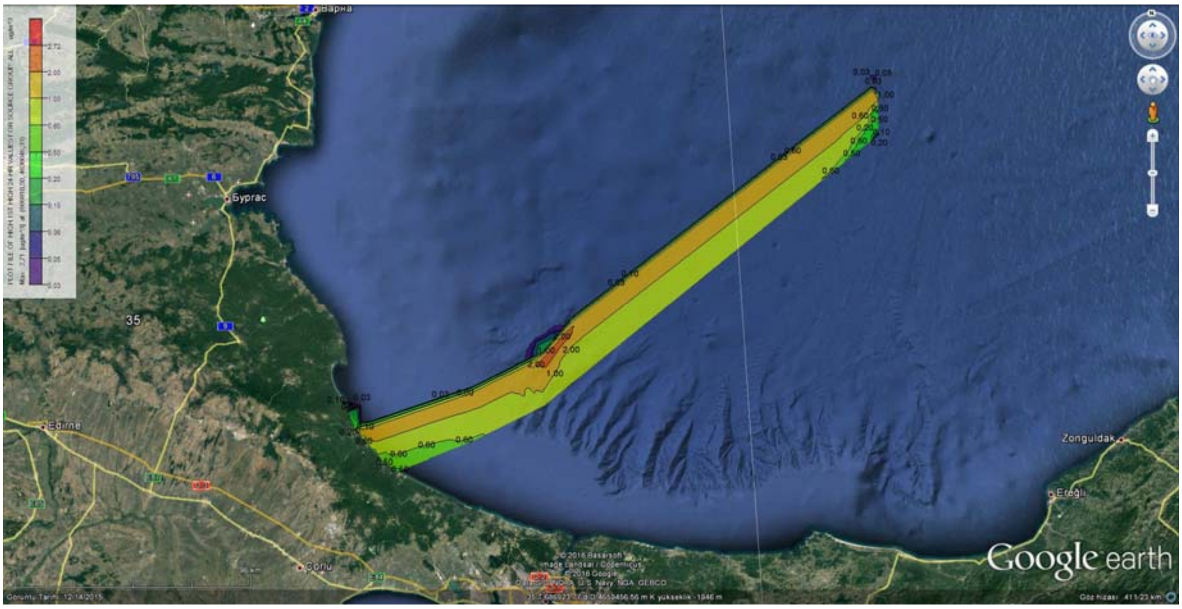


Figure10.23: Scenario-1 Daily VOC Dispersion

Scenario 2

The air pollution contribution values for scenario 2 are given in Table 10.42 below.

Table 10.42: Scenario 2 Air Pollution Contribution Values

Parameter	Period	APCV (µg/m³) and Coordinates	Limit Values (µg/m³)
SO_2	Hourly (maximum)	67,20 (589700, 4609941)	350
	Transgression amount	0	(Cannot be transgressed more than 24 times in one year)
	Daily (maximum)	6,37 (590200, 4607941)	125
	Transgression amount	0	(Cannot be transgressed more than 3 times in one year)
	Annual	1,20 (591700, 4611941)	20
NO_2	Hourly (maximum)	152,72 (589700, 4609941)	200
	Transgression amount	0	(Cannot be trangressed more than 18 times in one year)
	Annual	1,20 (591700, 4611941)	40
CO	Daily 8 hours average	6,54 (590200, 4607941)	10.000
VOC	Hourly (maximum)	9,16 (589700, 4609941)	280
	KVS	0,8 (590200, 4607941)	70
PM_{10}	Daily (maximum)	0,48 (590200, 4607941)	50 (can transgress 35 times)
	Transgression amount	0	35 times a year
	Annual	0,02 (591700, 4611941)	40

NO_2 emissions sourced from vessels operating in the dredging activities at the construction phase in the shore crossing section according to scenario 2 is provided in Table 10.42. In addition NO_2 dispersion is shown in Figure10.24 and Figure10.25.

Table 10.42 indicates that the hourly and annual NO_2 air pollution contribution values sourced from the offshore construction activities will be respectively 152,72 µg/^{m3} and 1,20 µg/m^3 at the worst affected areas in the offshore. These are below the limit values stated in SKHKKY. With this in mind NO_2 emissions sourced from the project activities according the scenario 2 are not expected to create a significant impact.

Figure10.24: Scenario-2 Hourly NO_2 Dispersion

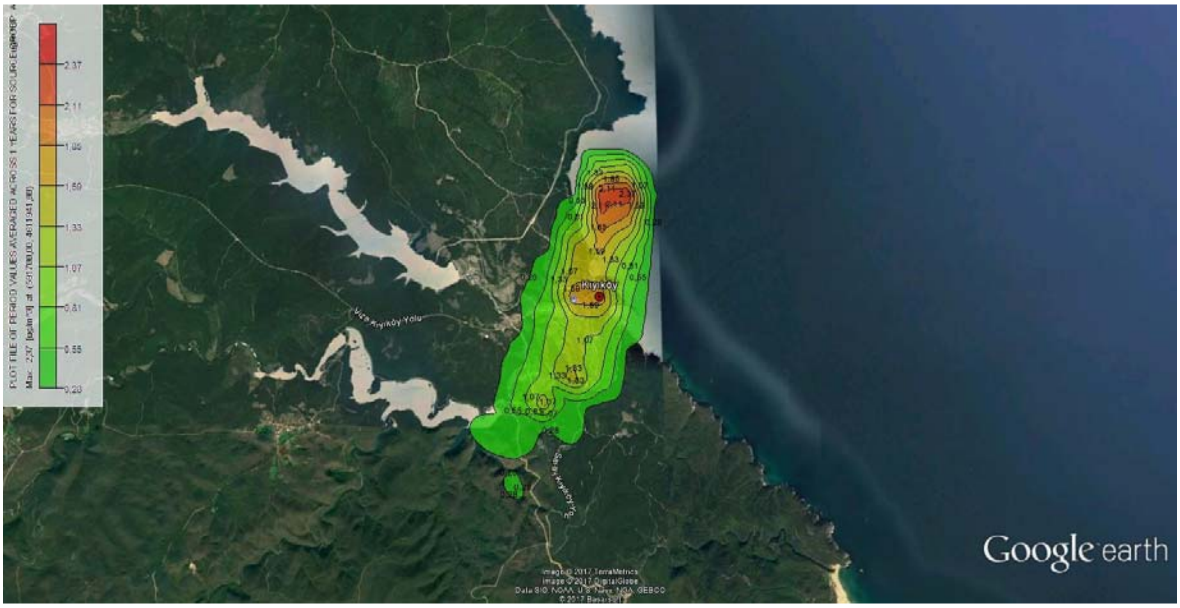


Figure10.25: Scenario-2 Annual NO_2 Dispersion

SO_2 emissions sourced from vessels operating in the dredging activities at the construction phase in the shore crossing section according to scenario 2 is provided in Table 10.42. In addition SO_2 dispersion is shown in Figure10.26, Figure10.27 and Figure10.28.

Table 10.42 indicates that the hourly and annual SO_2 air pollution contribution values sourced from the offshore construction activities will be respectively 67,20 µg/m^3, 6,37 µg/m^3 and 1,20 µg/m^3 at the worst effected areas in the offshore. These are below the limit values stated in t SKHKKY. With this in mind SO_2 emissions sourced from the project activities according the scenario 2 are not expected to create a significant impact.

Figure10.26: Scenario-2 Hourly SO_2 Dispersion

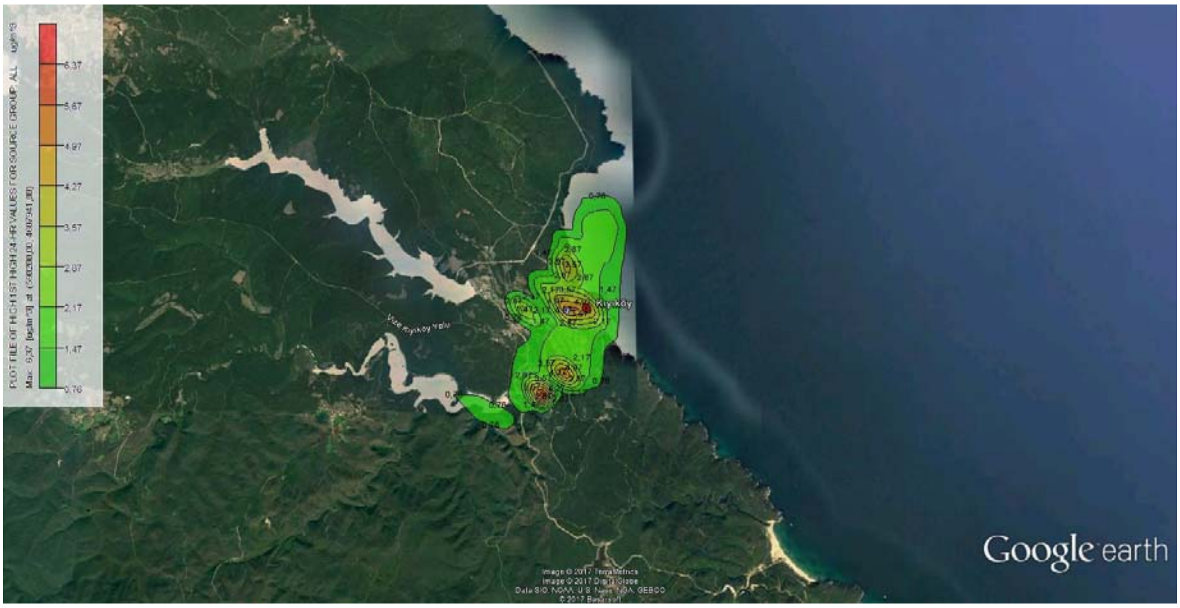


Figure10.27: Scenario-2 Daily SO_2 Dispersion

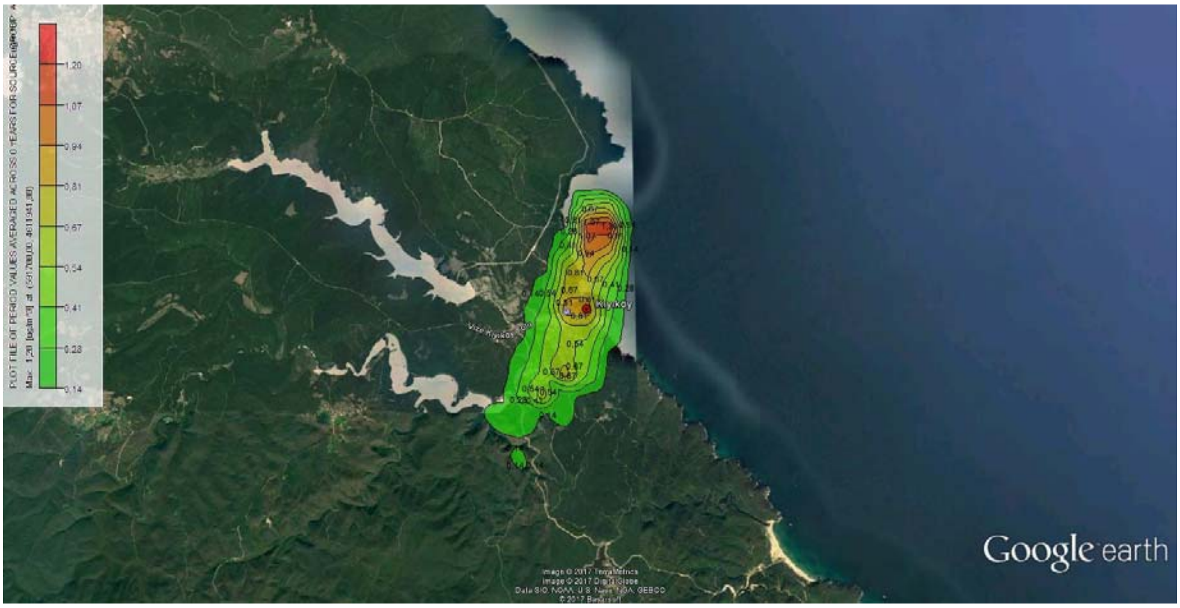


Figure10.28: Scenario-2 Annual SO_2 Dispersion

COemissions sourced from vessels operating in the dredging activities at the construction phase in the shore crossing section according to scenario 2 is provided in Table 10.42. In addition CO dispersion is shown in Figure10.29.

Table 10.42 indicates that the 8 hour CO air pollution contribution values sourced from the offshore construction activities will be respectively 6,54 µg/m^{3}at the worst affected areas in the offshore. These are below the limit values stated in SKHKKY. With this in mind CO emissions sourced from the project activities according the scenario 2 are not expected to create a significant impact.

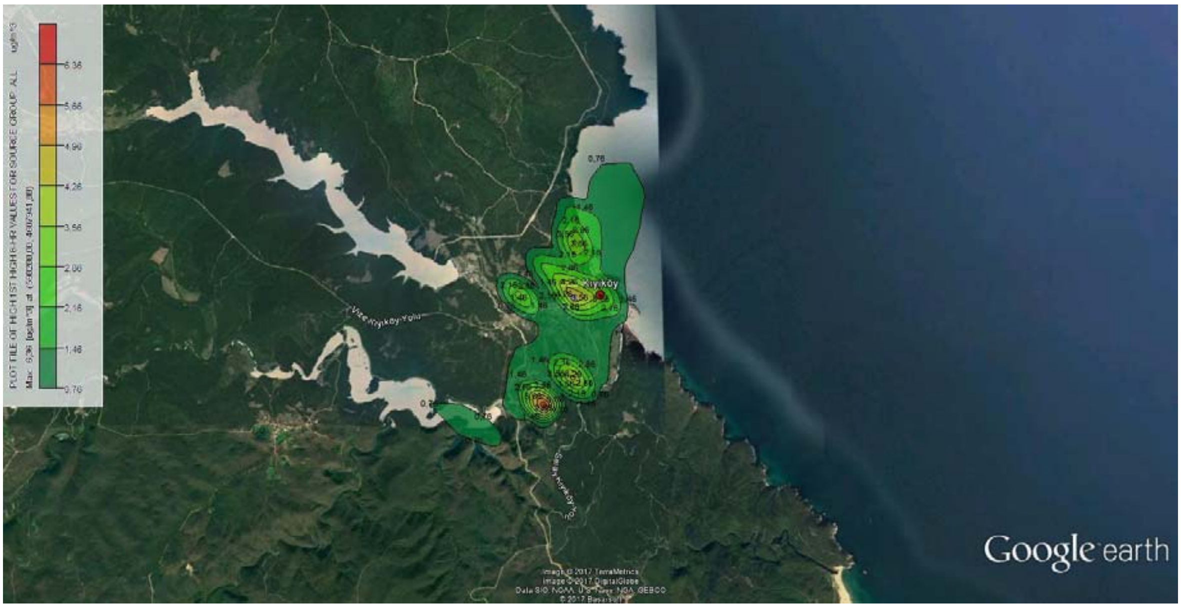


Figure10.29: Scenario-2 Maximum Daily 8 Hour Average CO Dispersion

PM_{10} emissions sourced from vessels operating in the dredging activities at the construction phase in the shore crossing section according to scenario 2 is provided in Table 10.42. In addition PM_{10} dispersion is shown in Figure10.30 and Figure10.31.

Table 10.42 indicates that the daily and annual PM_{10} air pollution contribution values sourced from the offshore construction activities will be respectively 0,48 µg/m^3 and 0,02 µg/m^3 at the worst affected areas in the offshore. These are below the limit values stated in SKHKKY. With this in mind PM_{10} emissions sourced from the project activities according the scenario 2 are not expected to create a significant impact.

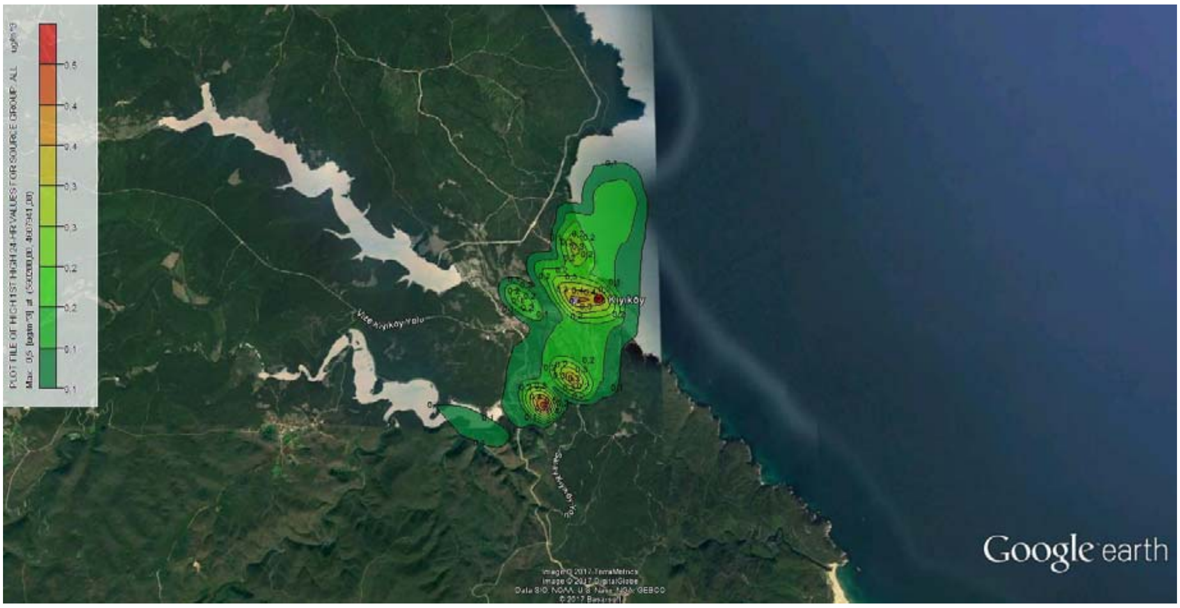


Figure10.30: Scenario-2 Daily PM_{10} Dispersion

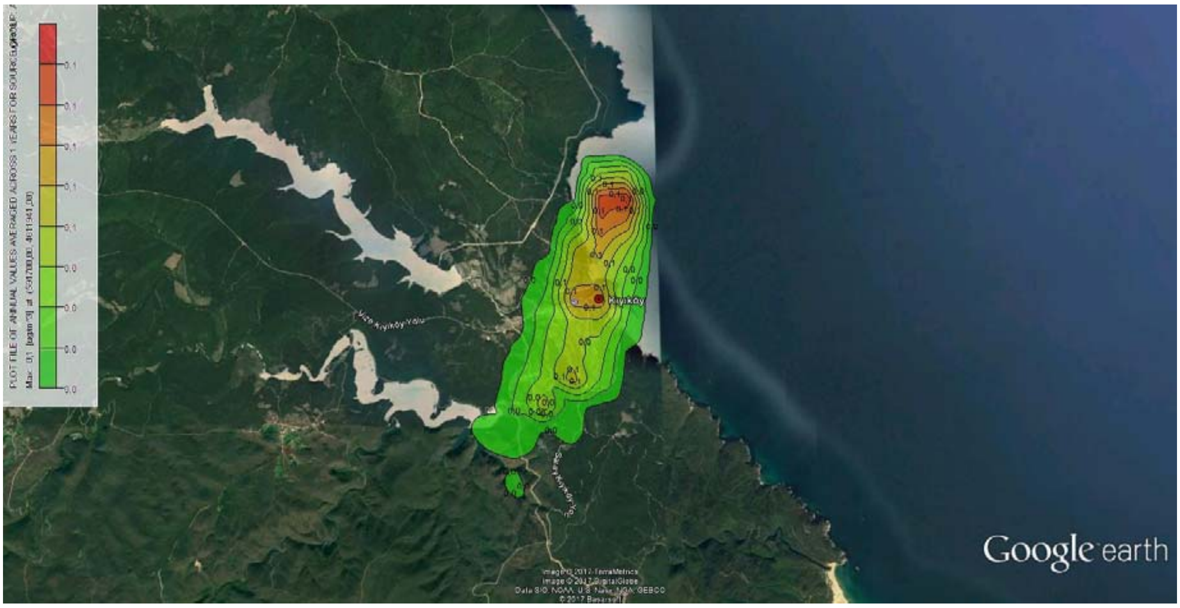


Figure10.31: Scenario-2 Annual PM_{10} Dispersion

VOC emissions sourced from vessels operating in the dredging activities at the construction phase in the shore crossing section according to scenario 2 is provided in Table 10.42. In addition VOC dispersion is shown in Figure10.32 and Figure10.33.

Table 10.42 indicates that the hourly and short term VOC air pollution contribution values sourced from the offshore construction activities will be respectively 9,16 µg/m^3 and 0,8 µg/m^3 at the worst affected areas in the offshore. These are below the limit values stated in SKHKKY. With this in mind

VOC emissions sourced from the project activities according the scenario 2 are not expected to create a significant impact.

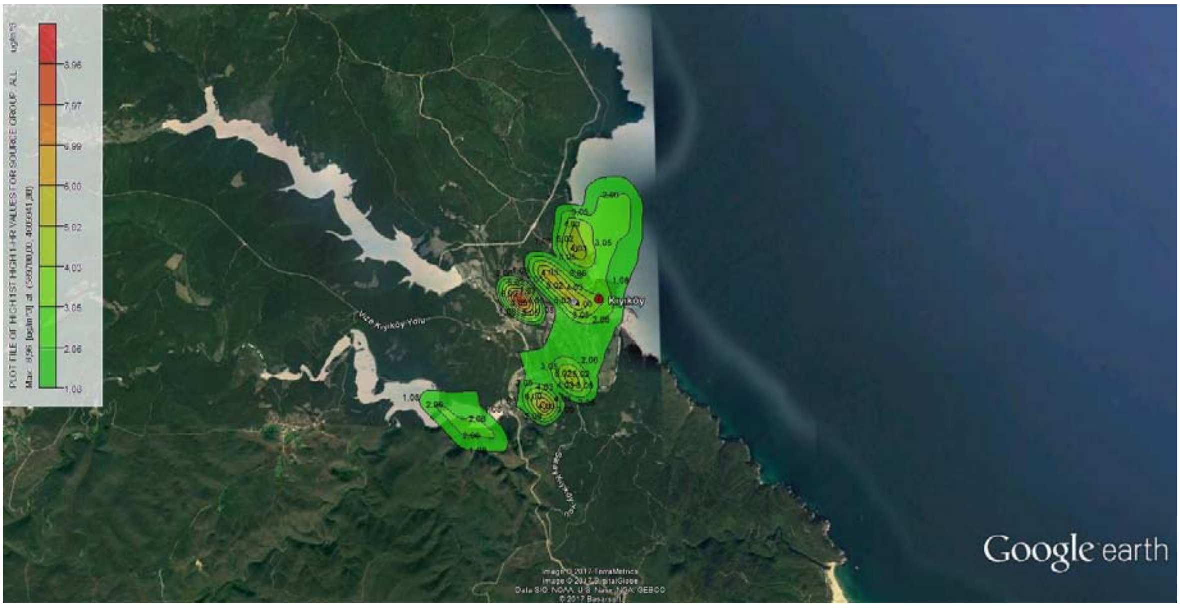


Figure10.32: Scenario-2 Hourly VOC Dispersion

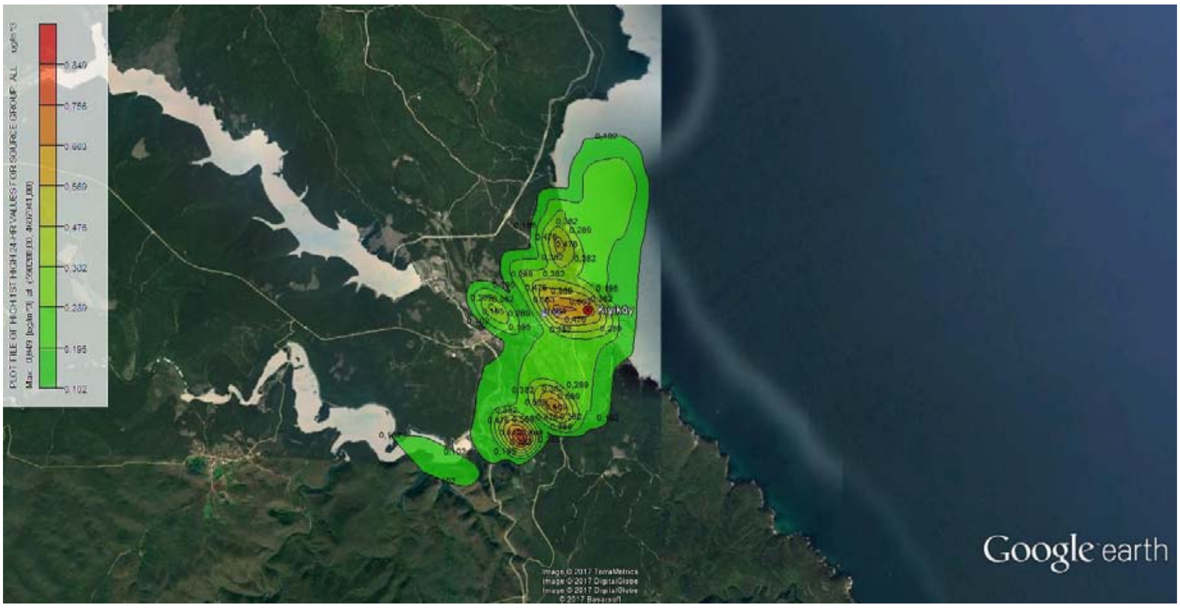


Figure10.33: Scenario-2 Daily VOC Dispersion

Scenario 3

The air pollution contribution values for scenario 3 are given in Table10.43 below.

Table10.43: Scenario 3 Air Pollution Contribution Values

Parameter	Period	APCV (µg/m³) and Coordinates	Limit Values (µg/m³)
SO_2	Hourly (maximum)	61,09 (589700, 4609941)	350

Parameter	Period	APCV (µg/m³) and Coordinates	Limit Values (µg/m³)
	Transgression amount	0	(Cannot be transgressed more than 24 times in one year)
	Daily (maximum)	5,79 (590200, 4607941)	125
	Transgression amount	0	(Cannot be transgressed more than 3 times in one year)
	Annual	1,09 (591700, 4611941)	20
NO_2	Hourly (maximum)	132,36 (589700, 4609941)	200
	Transgression amount	0	(Cannot be trangressed more than 18 times in one year)
	Annual	2,36 (591700, 4611941)	40
CO	Daily 8 hours average	5,56 (590200, 4607941)	10.000
VOC	Hourly (maximum)	8,96 (589700, 4609941)	280
	KVS	0,8 (590200, 4607941)	70
PM_{10}	Daily (maximum)	0,48 (590200, 4607941)	50 (can transgress 35 times)
	Transgression amount	0	35 times in a year
	Annual	0,09 (591700, 4611941)	40

NO_2 emissions sourced from vessels operating in the pipe laying activities at the construction phase in the shore crossing section according to scenario 2 is provided in Table10.43. In addition NO_2 dispersion is shown in Figure10.34 and Figure10.35.

Table10.43 indicates that the hourly and annual NO_2 air pollution contribution values sourced from the offshore construction activities will be respectively 132,36 µg/m³ and 2,36 µg/m³at the worst affected areas in the offshore. These are below the limit values stated in SKHKKY. With this in mind NO_2 emissions sourced from the project activities according the scenario 3 are not expected to create a significant impact.

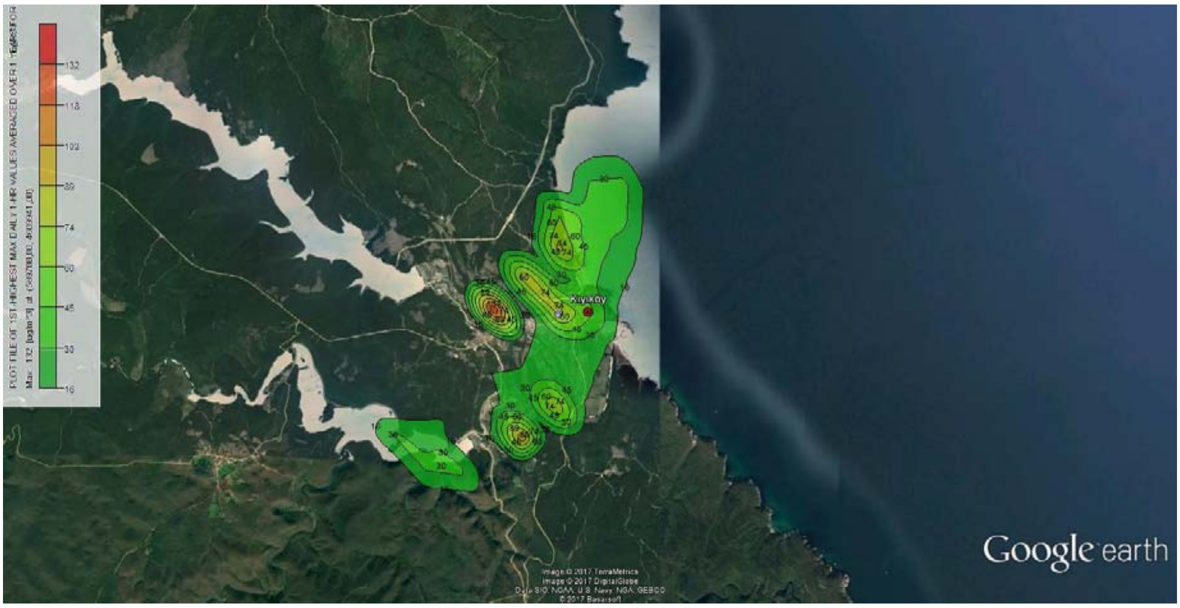


Figure10.34: Scenario-3 Hourly NO_2 Dispersion

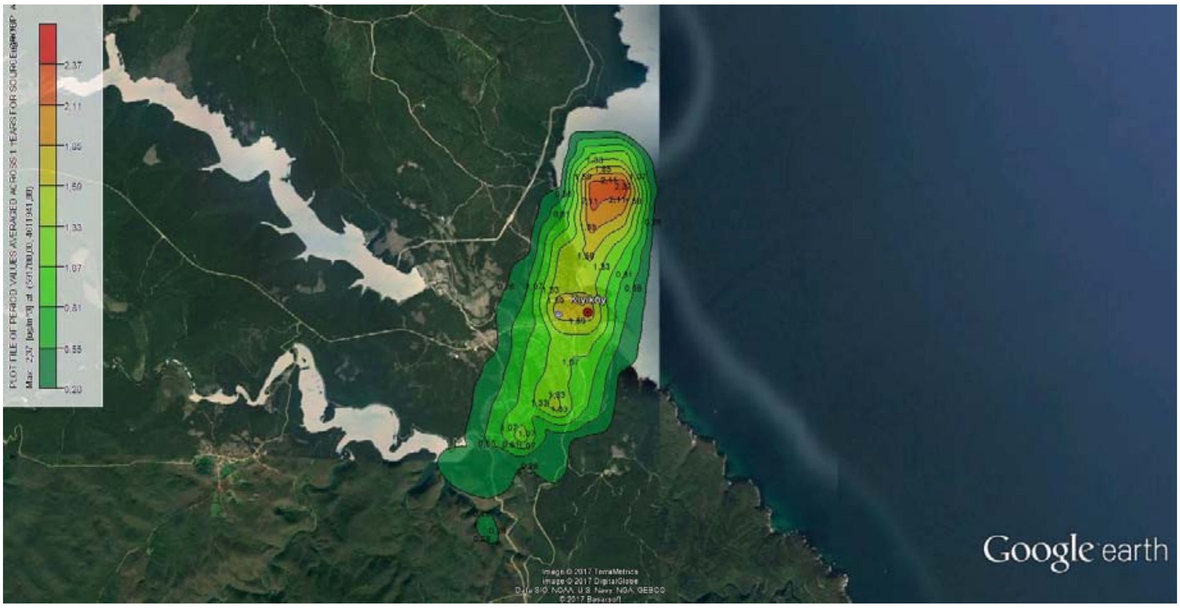


Figure10.35: Scenario-3 Annual NO_2 Dispersion

SO_2 emissions sourced from vessels operating in the pipe laying activities at the construction phase in the shore crossing section according to scenario 2 is provided in Table10.43. In addition NO_2 dispersion is shown in Figure10.36, Figure10.37 and Figure10.38.

Table10.43 indicates that the hourly, daily and annual term SO_2 air pollution contribution values sourced from the offshore construction activities will be respectively 61,09 µg/m^3, 5,79 µg/m^3 and 1,09 µg/m^3 at the worst affected areas in the offshore. These are below the limit values stated in SKHKKY. With this in mind SO_2 emissions sourced from the project activities according the scenario 3 are not expected to create a significant impact.

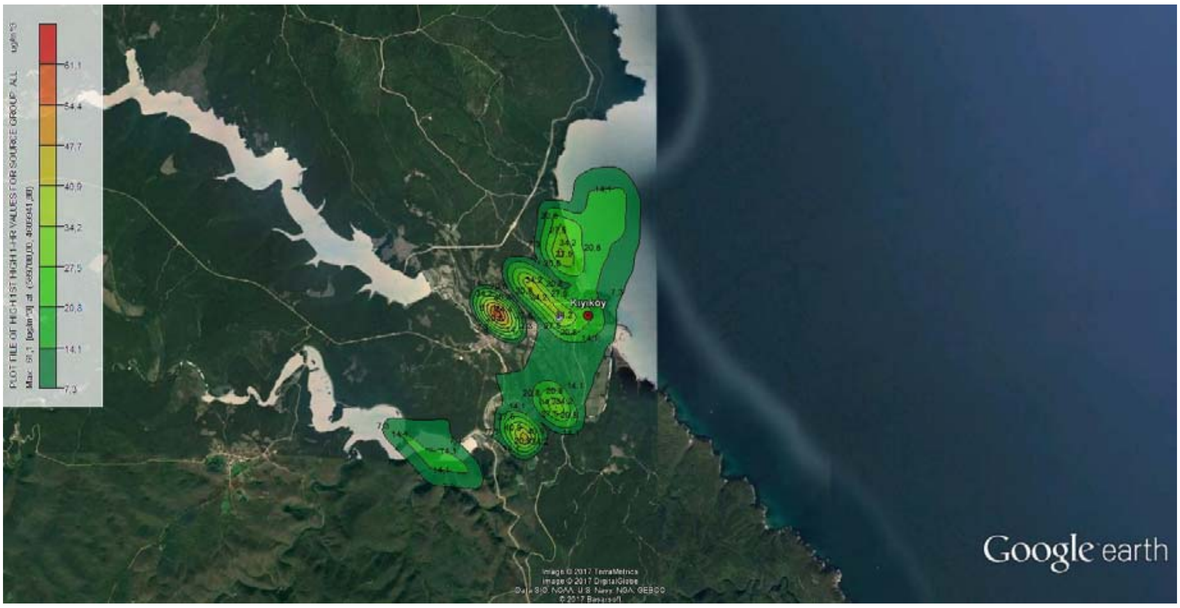


Figure10.36: Scenario-3 Hourly SO_2 Dispersion

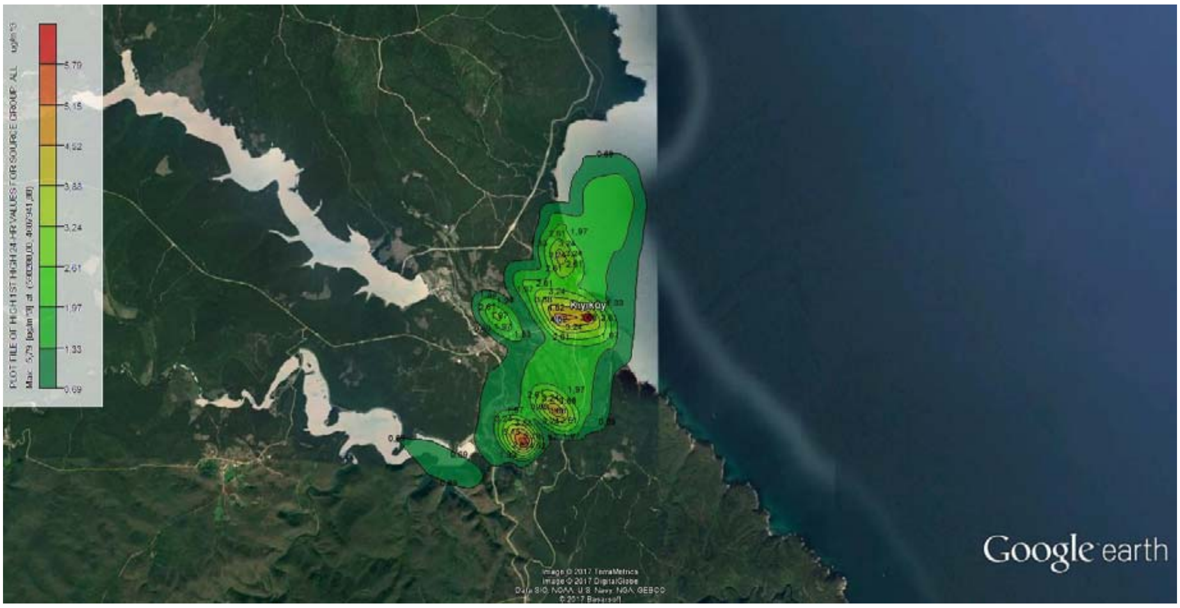


Figure10.37: Scenario-3 Daily SO_2 Dispersion

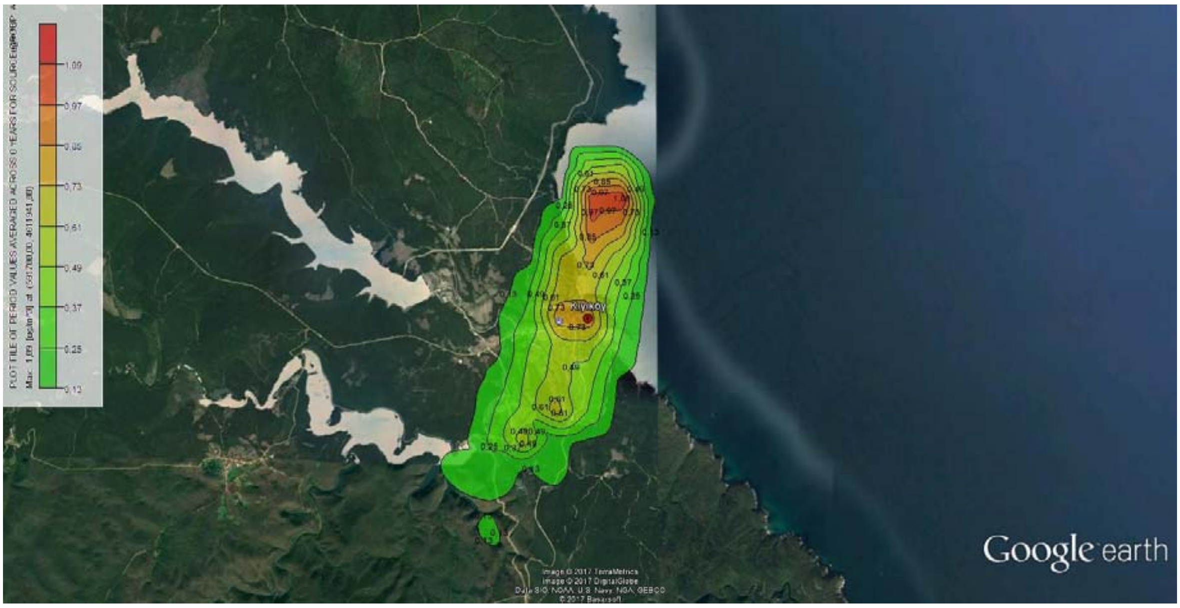


Figure10.38: Scenario-3 Annual SO_2Dispersion

CO emissions sourced from vessels operating in the pipe laying activities at the construction phase in the shore crossing section according to scenario 2 is provided in Table10.43. In addition CO dispersion is shown in Figure10.36, Figure10.37 and Figure10.38.

Table10.43 indicates that the 8-hour CO air pollution contribution values sourced from the offshore construction activities will be 5,56 µg/m3 at the worst affected areas in the offshore. These are below the limit values stated in SKHKKY. With this in mind CO emissions sourced from the project activities according the scenario 3 are not expected to create a significant impact.

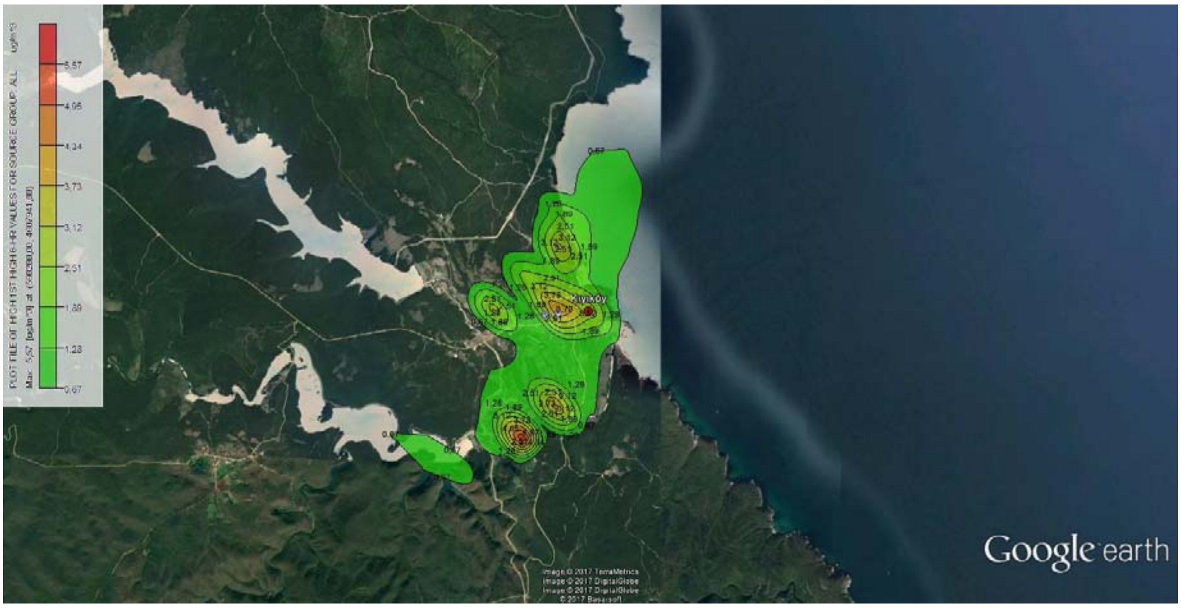


Figure10.39: Scenario-3 Maximum daily 8 hour average CO dispersion

PM_{10} emissions sourced from vessels operating in the pipe laying activities at the construction phase in the shore crossing section according to scenario 2 is provided in Table10.43. In addition CO dispersion is shown in Figure10.40 and Figure10.41.

Table10.43 indicates that the daily and annual PM_{10} air pollution contribution values sourced from the offshore construction activities will be 0,48 µg/m^3 at the worst affected areas in the offshore. These are below the limit values stated in SKHKKY. With this in mind PM_{10} emissions sourced from the project activities according the scenario 3 are not expected to create a significant impact.

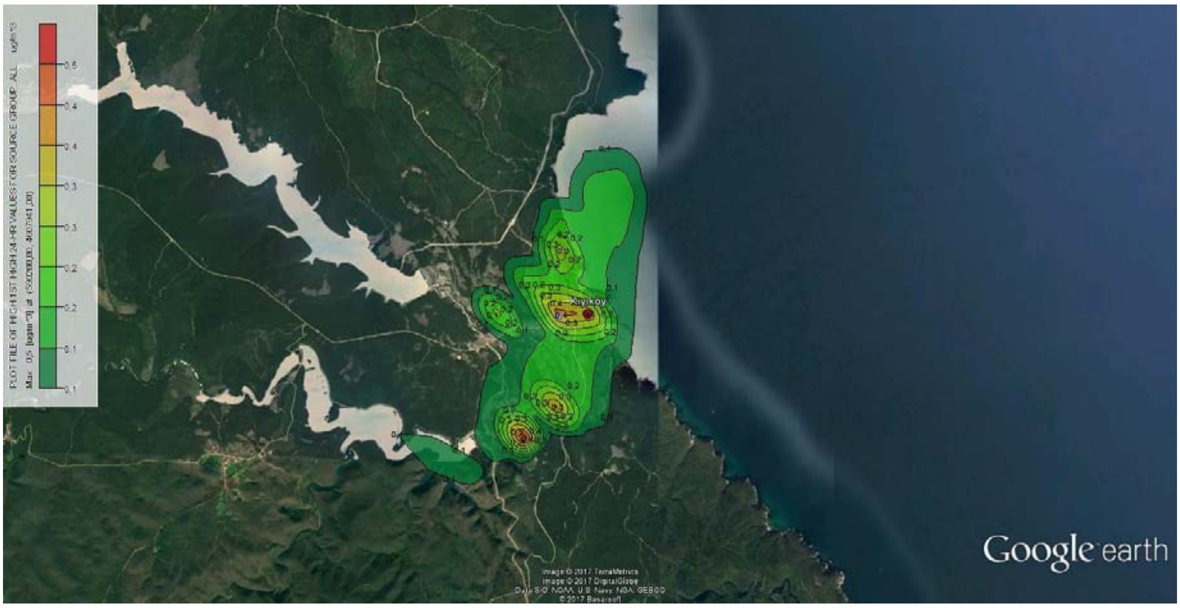


Figure10.40: Scenario-3 Daily PM_{10} Dispersion

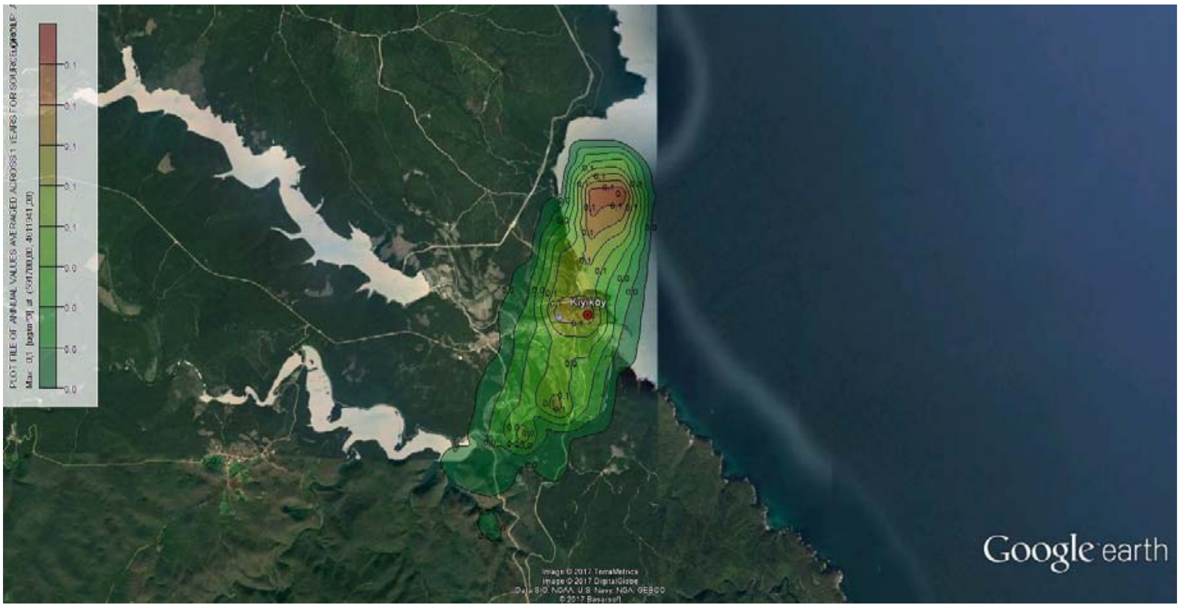


Figure10.41: Scenario-3 Annual PM_{10} Dispersion

VOC emissions sourced from vessels operating in the pipe laying activities at the construction phase in the shore crossing section according to scenario 3 is provided in Table10.43. In addition CO dispersion is shown in Figure10.42 and Figure10.43.

Table10.43 indicates that the hourly and short term VOC air pollution contribution values sourced from the offshore construction activities will be 9,16 µg/m^3 and 0,8 µg/m^3 at the worst affected areas in the offshore. These are below the limit values stated in SKHKKY. With this in mind VOC emissions sourced from the project activities according the scenario 3 are not expected to create a significant impact.

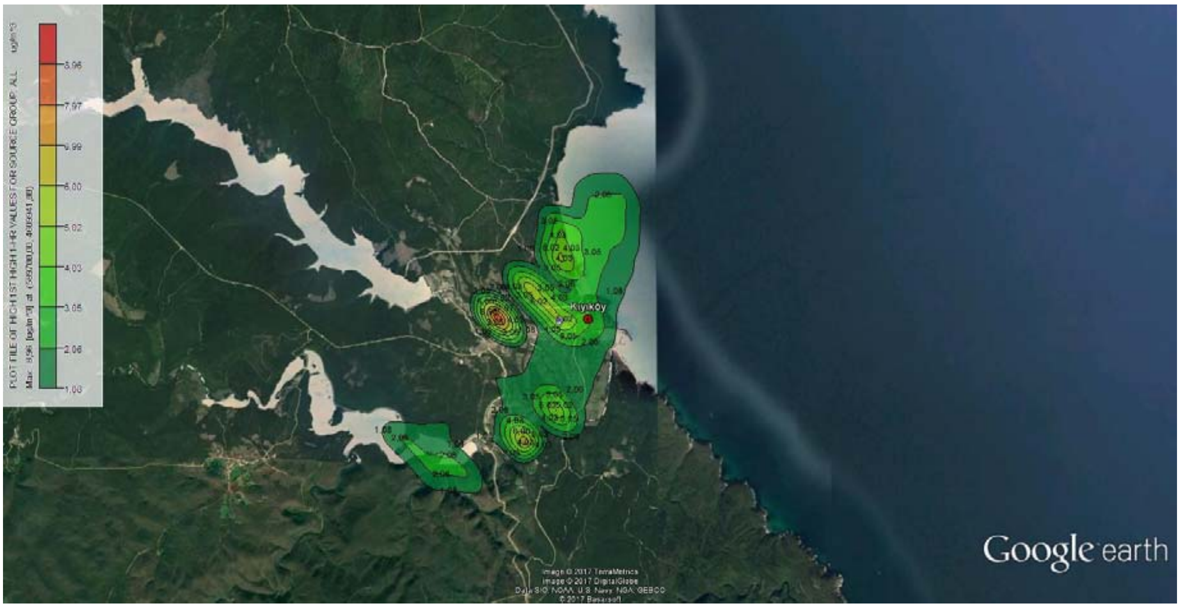


Figure10.42: Scenario – 3 Hourly VOC Dispersion

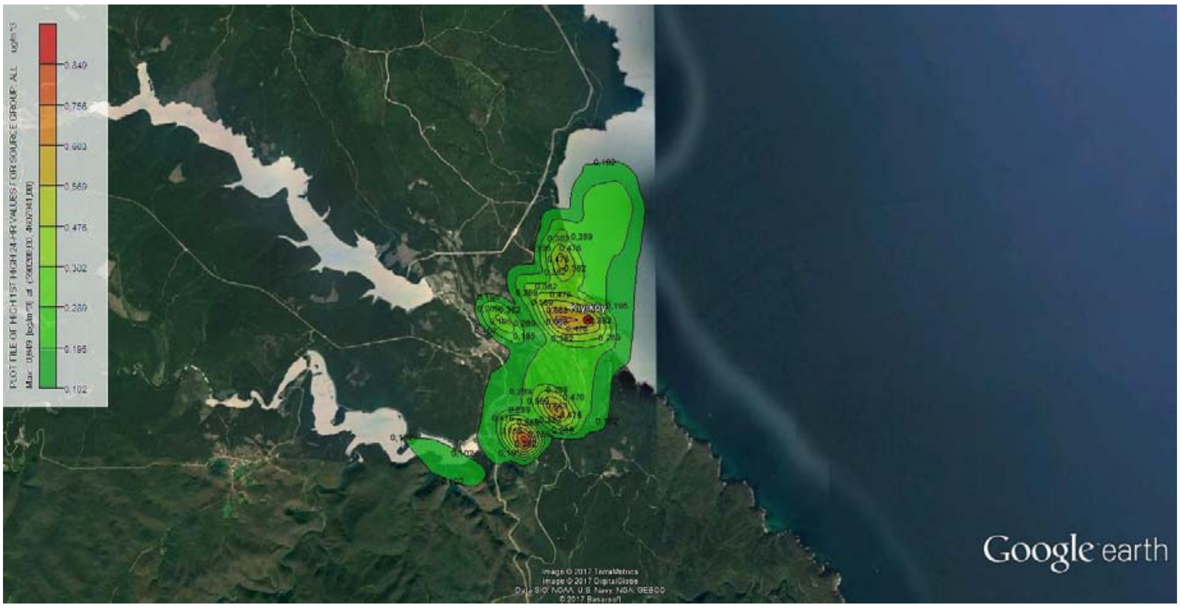


Figure10.43: Scenario – 3 Daily VOC Dispersion

Scenario 4

The air pollution contribution values for Scenario 4 are presented in Table10.44.

Table10.44: Air pollution contribution values for scenario 4

Parameter	Period	APCV (µg/m^3) and Coordinates	Limit Values (µg/m^3)
PM_{10}	Daily (maximum)	27,12 (589500, 4610895)	50 (Cannot be transgressed more than 35 times in one year)
	Transgression number	-	35 times in a year
	Annual	5,42	40

Parameter	Period	APCV (µg/m^3) and Coordinates	Limit Values (µg/m^3)
		(589500, 4610895)	
Settled Dust	Monthly	10,32 (589500, 4610895)	390
	Annual	7,92 (589500, 4610895)	210

PM_{10} emissions to be sourced from excavation activities during the construction phase in the Landfall Section according to scenario 4 is provided in Table10.44. In addition PM_{10} dispersion is shown in Figure10.44 and Figure10.45.

Table10.44 indicates that the daily and annual term PM_{10} air pollution contribution values sourced from the excavation activities during the construction phase in the Landfall Section will be 27,12 µg/m^3 and 5,42 µg/m^3 at the worst affected areas in the offshore. These are below the limit values stated in SKHKKY. With this in mind the PM_{10} emissions sourced from the project activities according to scenario 4 are not expected to create a significant effect.

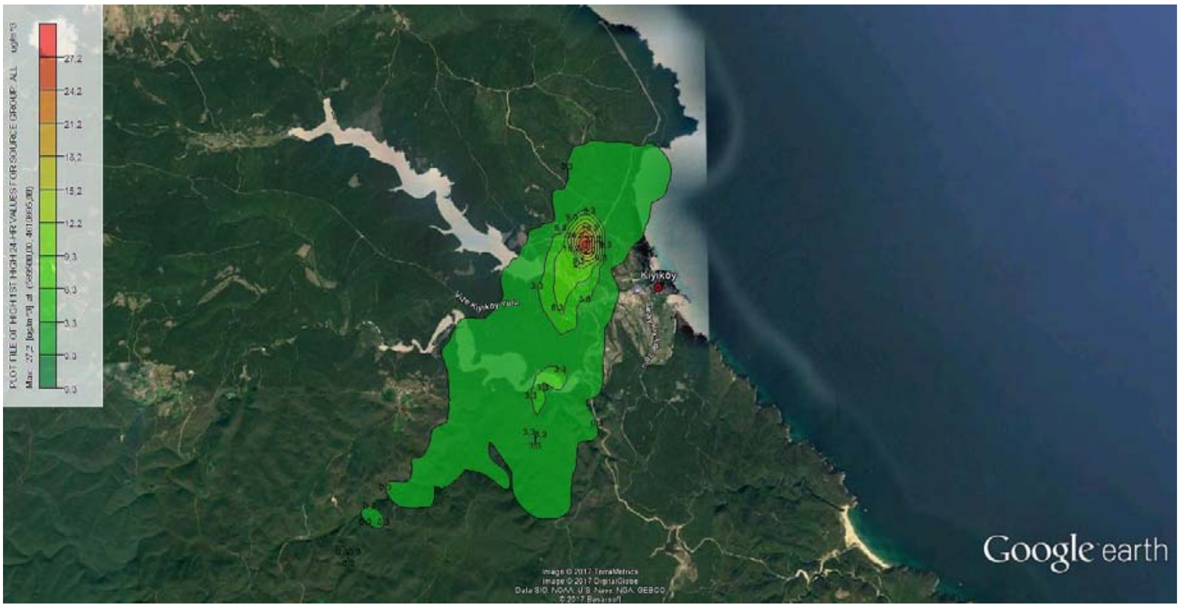


Figure10.44: Scenario-4 Daily PM_{10} Dispersion

Figure10.45: Scenario-4 Annual PM_{10} Dispersion

Scenario 5

The air pollution contribution values for Scenario 5 are presented in Table10.45.

Table10.45: Air pollution contribution values for scenario 5

Parameter	Period	APCV (µg/m³) and Coordinates	Limit Values (µg/m³)
NO_2	Hourly (maximum)	6,63 (587325, 4605312)	200
	Hourly Transgression Number	0	(Cannot be transgressed more than 18 times in one year)
	Annual	0,40 (587553, 4606584)	40

NO_2emissions sourced from vessels operating in the activities at the construction phase in the shore crossing section according to scenario 5 is provided in Table10.45. In addition NO_2dispersion is shown in Figure10.46 and Figure10.47.

Table10.45, indicates that the hourly and annual term NO_2 air pollution contribution values sourced from the offshore construction activities will be 6,63 µg/m³ and 0,40 µg/m³ at the worst affected areas in the offshore. These values are below the limit values defined in SKHKKY. For this reason the NO_2emissions sourced from the project activities according to scenario 5 is not expected to create a significant impact.

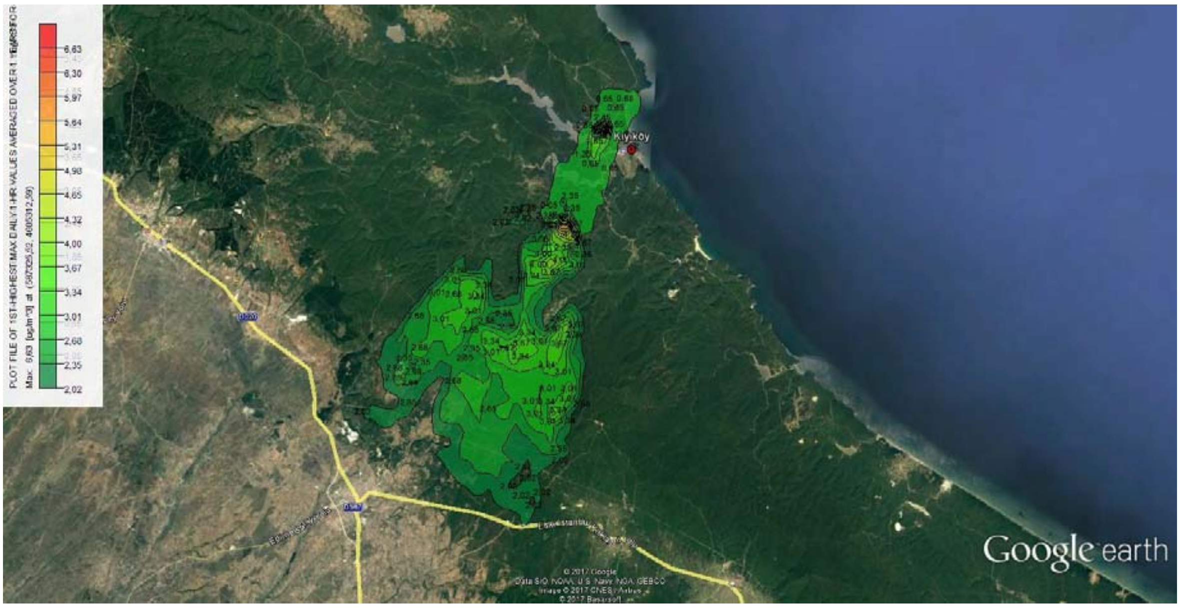


Figure10.46: Scenario-5 Hourly NO_2 Dispersion

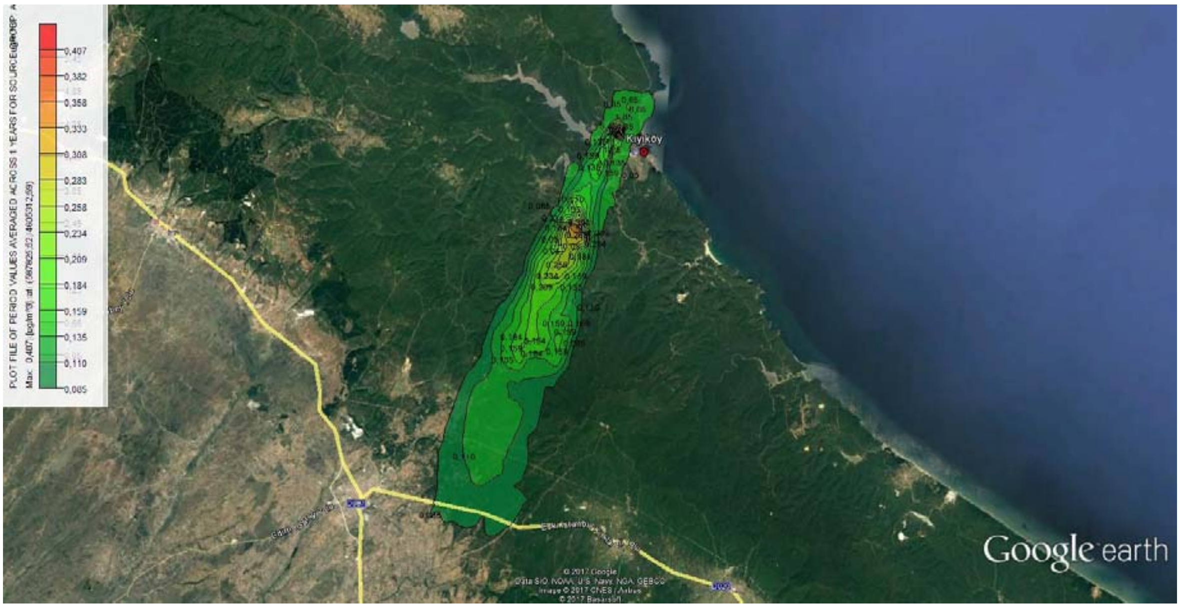


Figure10.47: Scenario-5 Annual NO_2 Dispersion

10.5.2 Mitigation Measures

Specified points in SKHKKY and HKDYY will be taken into consideration during construction and operation phases of the Project.

Also, design controls (mitigation measures) for the construction phase of the Project are shown in Table 10.46 below.

Table 10.46 Construction Phase Air Quality Design Controls

Phase	Activity	Impact	Mitigation Measure / Design Control

Construction	Emissions resulting from vessels operating with research and construction purposes in Shore Crossing	• Human health and ecologically vulnerable habitats are affected by deteriorating local air quality conditions with NOx, SOx, CO, VOC ve PM_{10} emissions • Greenhouse gas emissions	• Vessel will be operated in accordance with MARPOL emission requirements and relevant national legislation and emission standards. • Vessel fleet will be subject to regular maintenance.
	Emissions resulting from vehicle and construction equipment engins	• Human health and ecologically vulnerable habitats are affected by deteriorating local air quality conditions with NOx, SOx, CO, VOC ve PM_{10} emissions • Greenhouse gas emissions	• Following relevant national legislation and emission standards; • Suitable construction and traffic management for minimizing equipment and vehicle emissions; • Regular maintenance of vehicle fleet and equipment.
	Dust generation resulting from onshore construction activities	• Deteriorating local air quality conditions, disease problems	• Good construction site management practices: - Suppressing dust with water if needed. - Improving impacted road surfaces where needed.

Design controls (mitigation measures) for operation phase of Offshore and Shore Crossing sections of the Project are shown in Table 10.47 below.

Table 10.47: Air Quality Design Controls in Operation Phase of Offshore and Shore Crossing Sections

Phase	Activity	Impact	Mitigation Measure / Design Control
Operation	Emissions resulting from vessels carrying out maintenance works in nearshore	• Human health and ecologically vulnerable habitats are affected by deteriorating local air quality conditions with NOx, SOx, CO, VOC ve PM_{10} emissions • Greenhouse gas emissions	• Vessel will be operated in accordance with MARPOL emission requirements and relevant national legislation and emission standards.

Design controls (mitigation measures) for operation phase of landfall section of the Project are shown in Table 10. below.

Table 10.48: Air Quality Design Controls in Operation Phase of Landfall Section

Phase	Activity	Impact	Mitigation Measure / Design Control
Operation	Emission sources resulting from operation and maintenance activities: - heaters - diesel generators - emergency diesel generator	• Human health and ecologically vulnerable habitats are affected by deteriorating local air quality conditions with NOx, SOx, CO, VOC ve PM_{10} emissions • Greenhouse gas emissions	• Following relevant national legislation and emission standards, regular equipment maintenance

Phase	Activity	Impact	Mitigation Measure / Design Control
	Leaking emissions resulting from equipments during operation and maintenance activities (including pig examination and measurement process) - emission of incombustible gases - air conditioning situations	• Deteriorating local air quality	• Following relevant national legislation and emission standards; • Reducing leaks as much as possible with regular maintenance

10.6 Noise and Vibration

Background noise measurements was carried out in 6 (six) points in 2005 by Frequency Environment Laboratory in the scope of the Project in order to do research about the impacts of the noise resulting from activities to be conducted during construction and operation phases of the Landfall Section. Results of this measurement have been reviewed in accordance with Regulation on Environmental Noise Assessment and Management (ÇGDYY).

Noise modeling was carried out for construction, pre-commissioning (hydro test) and post-operation phases of the Landfall Section of the Project. Modeling work was carried out for three separate periods of time; daytime, evening and night. Noise modeling was updated in 2017 according to changes madeby Project Owner in the Project settlement.

A noise emission modeling for Offshore and Shore Crossing sections of the Project covering the construction and operation phases has been carried out by taking into consideration the vessel fleet and equipment to be used. Detailed information about activities to be carried out in construction, pre-commissioning, operation and decommissioning phases of the Project is given in **Chapter** 1 (General Characteristics of the Project).

Noise levels of each equipment evaluated in the modeling study have been tailored using the "Roadway Construction Noise Model User's Guide" of January 2006 -published by the U.S. Department of Transportation and prepared for roadway constructions- and the documents of the "American Society of Safety Engineers" (Ref 10.5).

Within the scope of the noise emission modeling studies, the sound emission in the outdoor environment has been calculated according to ISO 9613-2 standards and the humidity, temperature and land structure have been taken into account in the calculations. In addition, ground absorption coefficient has been detected as 0,8 in the field and as 0 for the sea.

An overview of completed environmental noise measurement and modeling works is given in this Section. Details of environmental noise measurements and modeling works are included in Environmental Noise Analysis and Acoustic Report given in ANNEX-10.B.

Conformity with national legislation and provisions of Regulation on Environmental Permit and License will be ensured for environmental noise management under Project activities.

10.6.1 Background Measurement

6 (six) background noise measurement points (MP) are specified in residential areas where receiver locations closest to the Landfall Section are located, considering sensitive receiver locations in order to identify current noise levels in the impact zone of the Project. Background noise measurement points are shown in Figure 10.48.

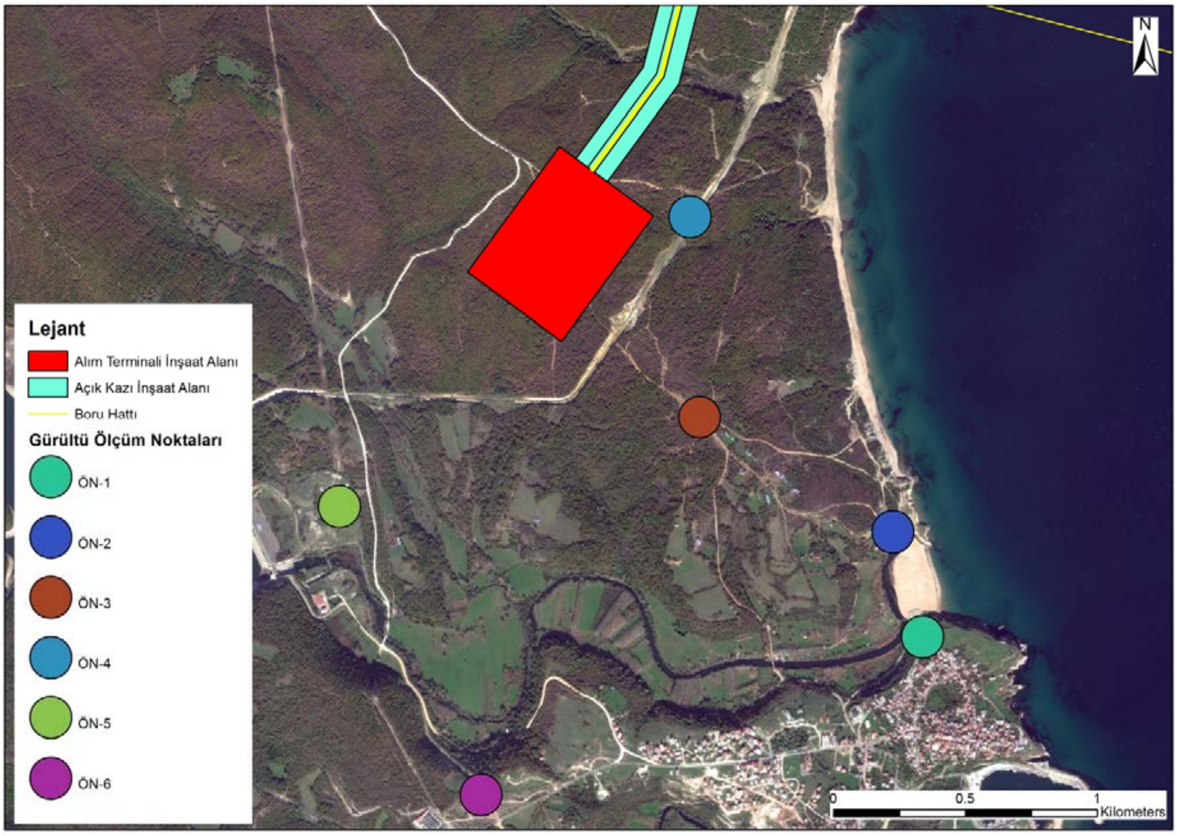


Figure 10.48: Background Noise Measurement Points

It is considered that the measurement point (MP-2) in the closest receiver location and other measuring points will generally represent the whole area. Distance between background measurement points and Landfall Section is shown in Table 10.46 accordingly.

Table 10.46: Distance between Background Measurement Points and Landfall Section

Measurement Point (MP)	Distance to Landfall Section (meter)
Mesurement Point 1	1.800
Mesurement Point 2	1.450
Mesurement Point 3	600
Mesurement Point 4	140
Mesurement Point 5	1.000
Mesurement Point 6	1.750

As the measurement point in the closest receiver location and other measurement points will generally represent the whole area, measurements have been carried out for long term considering probable changes to occur in background noise in area where Landfall Section is planned to be established. Table

10.50 below indicates the dates, periods and durations of the measurement by background noise measurement points.

Table 10.5047: Measurement Durations by Background Noise Measurement Points

Measurement Point (MP)	Date of Measurement	Period of Measurement	Duration of Measurement
Mesurement Point 1	11/07/2015	Daytime, Evening, Night	43 hours
Mesurement Point 2	11/07/2015	Daytime, Evening, Night	65 hours
Mesurement Point 3	11/07/2015	Daytime, Evening, Night	58 hours
Mesurement Point 4	11/07/2015	Daytime, Evening, Night	64 hours
Mesurement Point 5	11/07/2015	Daytime, Evening, Night	63 hours
Mesurement Point 6	11/07/2015	Daytime, Evening, Night	14 hours

The summary of measurement results is given in Table 10.51 below, and the detailed information on the detailed noise measurement results and frequency analysis is provided in the Environmental Noise Analysis and Acoustic Report in **ANNEX-10.B**.

Table 10.51: Background Noise Measurement Results

Measurement Point (MP)	L_{day} (dBA)	$L_{evening}$ (dBA)	L_{night} (dBA)
Mesurement Point 1	51,4	52,6	51,7
Mesurement Point 2	51,5	46,9	40,9
Mesurement Point 3	49,3	53,2	42,9
Mesurement Point 4	45,7	38,5	56,5
Mesurement Point 5	49,3	51,3	38,1
Mesurement Point 6	57,1	40,7	32,0

Long-term background noise measurements were carried out with devices that had 1 second step intervals (records 1 data per second). Measurements were carried out in the framework of TS ISO 9315, TS ISO 1996-2 standards.

SVANTEK brand devices - type 1 SVAN 971 with serial no of 34907 and 44474, type 1 SVAN 958 with serial no of 20702, type 1 SVAN 957 with serial number of 14563, type 1 SVAN 949 with serial number of 12263 and 6061 - were used in the measurements. Verification with measurement was carried out before device was used. Calibration certificates of device and verification devise are given in Environmental Noise Analysis and Acoustic Report provided in ANNEX – 10.B.

Zones in relation to background noise levels are categorized according to Article 27 of ÇGDYY as follows:

- Category A (Lday type <55 dBA) Zone: Highest level of noise in this category is not irritating. Noise is not taken into consideration as determiner when planning decision is made.
- Category B (Lday type 55 - 64 dBA) Zone: Noise level is taken into consideration when planning decisions are made. Planning decisions are made by taking necessary measures against noise.

- Category C (Lday type 65 -74 dBA) Zone: Planning decision is not generally made. However in cases where public benefit is in question, and permit has to be given, as there are no other locations with lower noise levels, measures against noise are taken considering background noise level.
- Category D (Lday type >74 dBA) Zone: Planning decision cannot be taken.

According to the gathered results; the background noise levels and the categories specified in accordance with ÇGDYY Article 27 are indicated in Table 10.48 below.

Table 10.48: Categories of Background Noise Measurement Results - ÇGDYY Article 27

Measurement Point (MP)	Background Noise Level Day Time (dBA)	Background Noise Level Evening (dBA)	Background Noise Level Night (dBA)	Category (According to ÇGDYY Regulation Article 27)
Measurement Point1	51,40	52,60	51,70	Category A
Measurement Point2	51,50	46,90	40,90	Category A
Measurement Point3	49,30	53,20	42,90	Category A
Measurement Point4	45,70	38,50	56,50	Category A
Measurement Point5	49,30	51,30	38,10	Category A
Measurement Point6	57,10	40,70	32,00	Category B

When background noise measurement results are reviewed in accordance with the framework of ÇGDYY Article 27, it was revealed that the categories are A and B.

10.6.2 Offshore and Shore Crossing Section

10.6.2.1 Construction Phase

It is foreseen that construction works for Offshore and Shore Crossing Sections of the Project will continue for 24 hours a day without any interruption. Although there are limitations set by the provisions of ÇGDYY, construction activities are planned to continue for a 24-hour basis with special permit.

Basic noise sources in the Offshore and Shore Crossing Sections are composed of vessels and other ships that will be used for construction activities.

Within the scope of the modeling study conducted for the construction phase of the Offshore Section, the vessels which are listed in Table 10.1 and will be in operation in the Offshore Section are assessed and it is deemed more appropriate to model these vessels as an areal noise source scattered in the area as a vessel fleet instead of integrating them into the model separately.

Noise level per unit area is designated within the said areal source. The noise level of this areal noise source is taken as Lw"=85 dBA/m^2. The value of 85 dBA determined is defined as "The Highest Exposure Action Value" under the " Regulation about Protection of Workers from Risks associated with the Noise" published by the Ministry of Labour and Social Security. It is aimed to assess the noise levels in the receiver location in the event that the highest noise level that might be caused by the vessel fleet is reached.

Within the scope of the modeling study for the construction phase of the Shore Crossing Section, the vessels which are listed in Table 10.2 and will be in operation in the Shore Crossing Section are assessed; and as the maximum number of vessels will be reached during the pipe-laying activities in shallow waters, 10 vessels anticipated to be used at this stage are modelled as areal source by taking into consideration that each vessel will have an engine, crane, compressor and generator components. Personnel vessel, maintenance/repair vessel and fuel vessel are on the other hand integrated into the model as point source. The rescue vessel is not included in the model supposing that it will only be in operation in case of emergencies.

In addition to this equipment, a deck area will be established for each vessel and noise sources such as probable personnel activities in the vessels and deck activities have been included in the model as well. In this context, the sound power levels calculated for the construction phase of the Shore Crossing Section are given in the Environmental Noise Analysis and Acoustic Report in **ANNEX-10.B**.

As a result of modeling works, the impacts of noise emissions in the measurement points selected in the onshore, resulting from construction activities in Offshore and Shore Crossing sections have been calculated and indicated in Table 10.49.

Article 23 Paragraph ç of ÇGDYY states that *"Construction activities of such projects as dam, bridge, tunnel, highway, urban main road, and cluster housing which seek for public interest and construction activities that will interrupt the local traffic in the city during daytime can be carried out with the Provincial Local Environment Board Decision to be made within this scope and by adhering to the limit values obtained by subtracting 5 dBA for evening and 10 dBA for night from the daytime values given in Table – 5 of Annex-VII on condition that no activities are carried out during daytime."*

As also stated above, though restricted by the provisions of ÇGDYY, it is planned to carry out the Project's construction activities for 24 hours with an exceptional permission.

Accordingly, the results have been compared with limit values of L_{day}= 70 dBA, $L_{evening}$= 65 dBA, L_{night}= 60 dBA given in Environmental Noise Limit Values for ÇGDYY Annex VII Table 5: Construction Site.

Table 10.49: Modeling Results of Construction Activities for Offshore and Shore Crossing Sections

	Measurement Point (MP)	Source Impact Calculated with Model			ÇGDYY Annex VII Table 5 Limit Values		
		L_{Day}	$L_{Evening}$	L_{Gece}	L_{Day}	$L_{Evening}$	L_{Gece}
Offshore Section Construction	Measurement Point1	55,26	56,05	56,73	70	65	60
	Measurement Point2	55,67	57,44	58,13	70	65	60
	Measurement Point3	55,68	56,46	57,15	70	65	60

	Measurement Point (MP)	Source Impact Calculated with Model			ÇGDYY Annex VII Table 5 Limit Values		
		L_{Day}	$L_{Evening}$	L_{Gece}	L_{Day}	$L_{Evening}$	L_{Gece}
	Measurement Point4	57,61	58,39	59,07	70	65	60
	Measurement Point5	48,38	49,17	49,86	70	65	60
	Measurement Point6	47,65	48,43	49,12	70	65	60
Shore Crossing Section Construction	Measurement Point1	31,78	32,56	33,24	70	65	60
	Measurement Point2	34,16	34,93	35,61	70	65	60
	Measurement Point3	35,20	35,97	36,64	70	65	60
	Measurement Point4	39,13	39,89	40,55	70	65	60
	Measurement Point5	27,39	28,17	28,86	70	65	60
	Measurement Point6	25,38	26,17	26,85	70	65	60

The table above indicates that there is no point where a limit value is exceeded. Offshore and Shore Crossing ÇGDYY provisions are ensured for all time periods.

Figures 10.49 to 10.54 demonstrate the noise maps prepared for the Construction Phase of the Offshore and Shore Crossing sections as a result of the modeling.

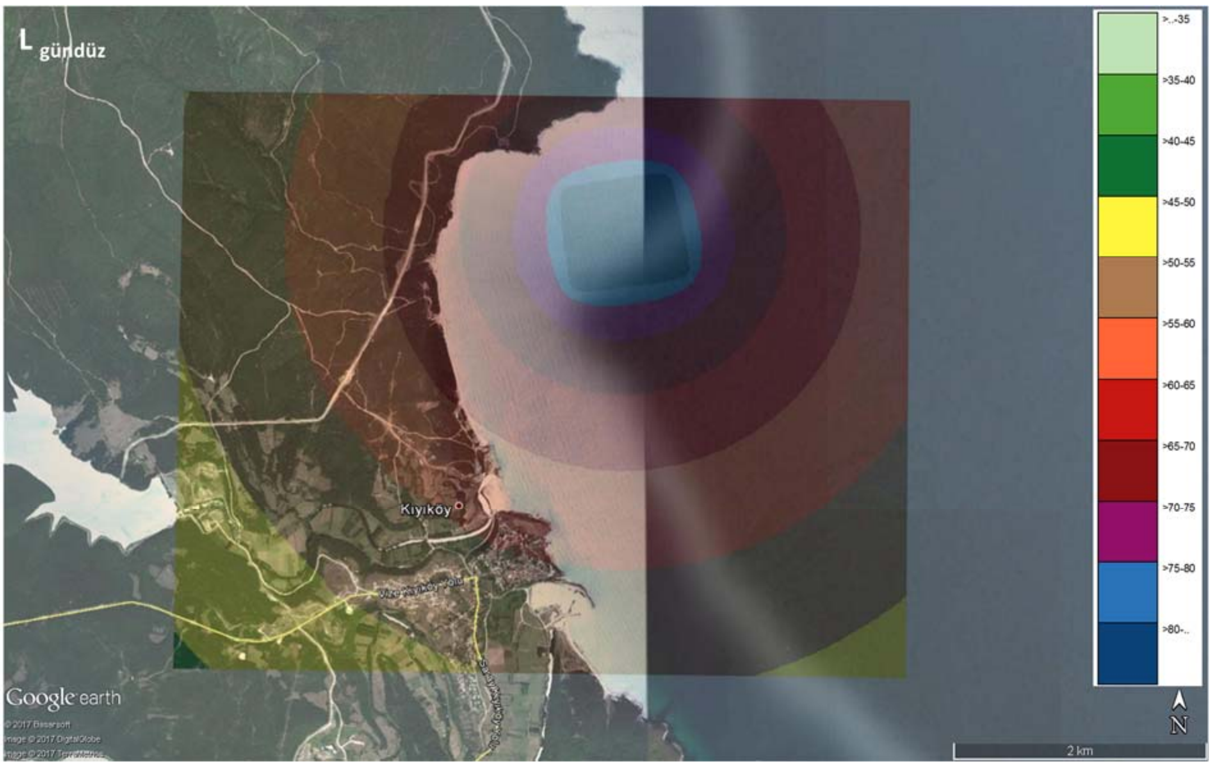


Figure 10.49: Noise Map (Offshore Section Construction $L_{daytime}$ with Satellite Image)

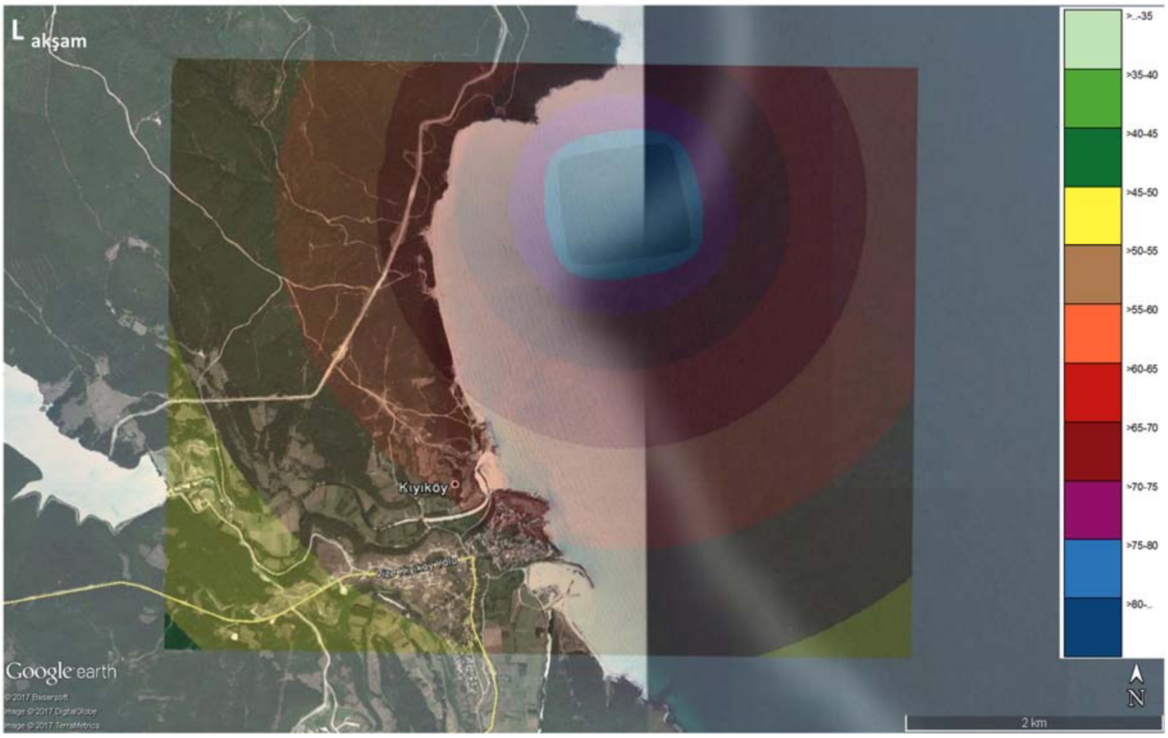


Figure 10.50: Noise Map (Offshore Section Construction $L_{evening}$ with Satellite Image)

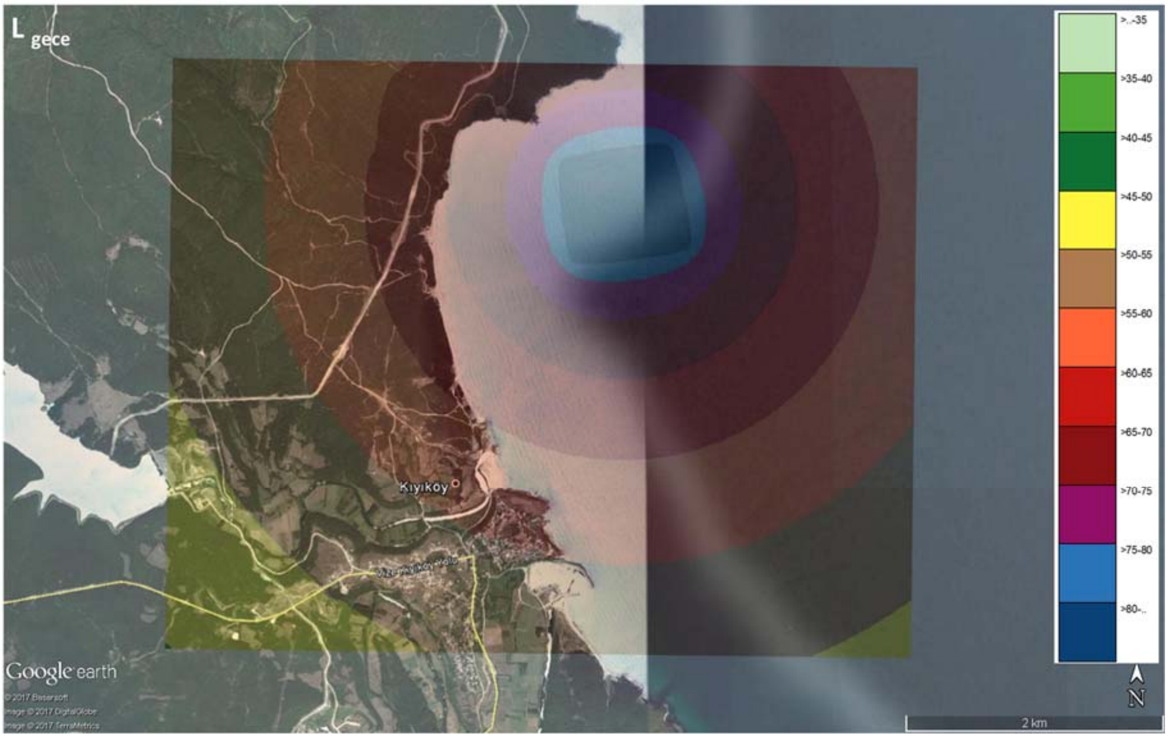


Figure 10.51: Noise Map (Offshore Section Construction L_{night} with Satellite Image)

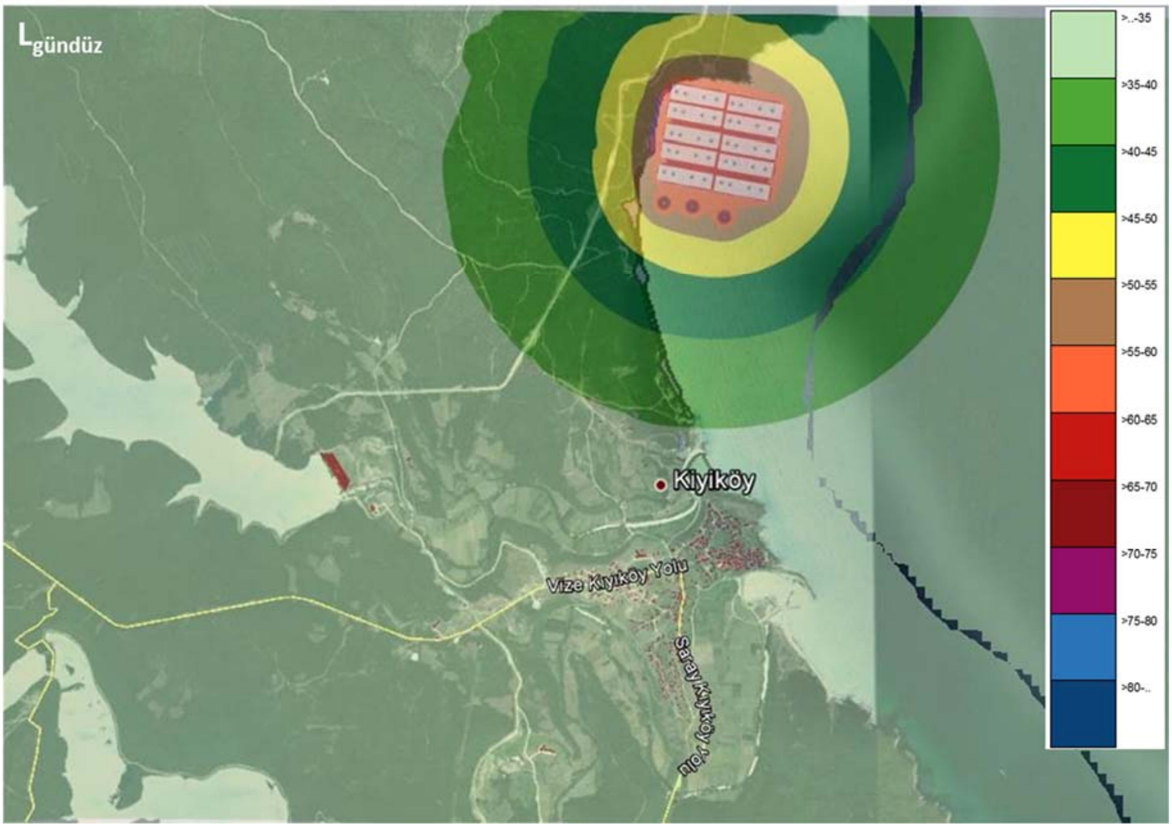


Figure 10.52: Noise Map (Shore Crossing Section Construction $L_{daytime}$ with Satellite Image)

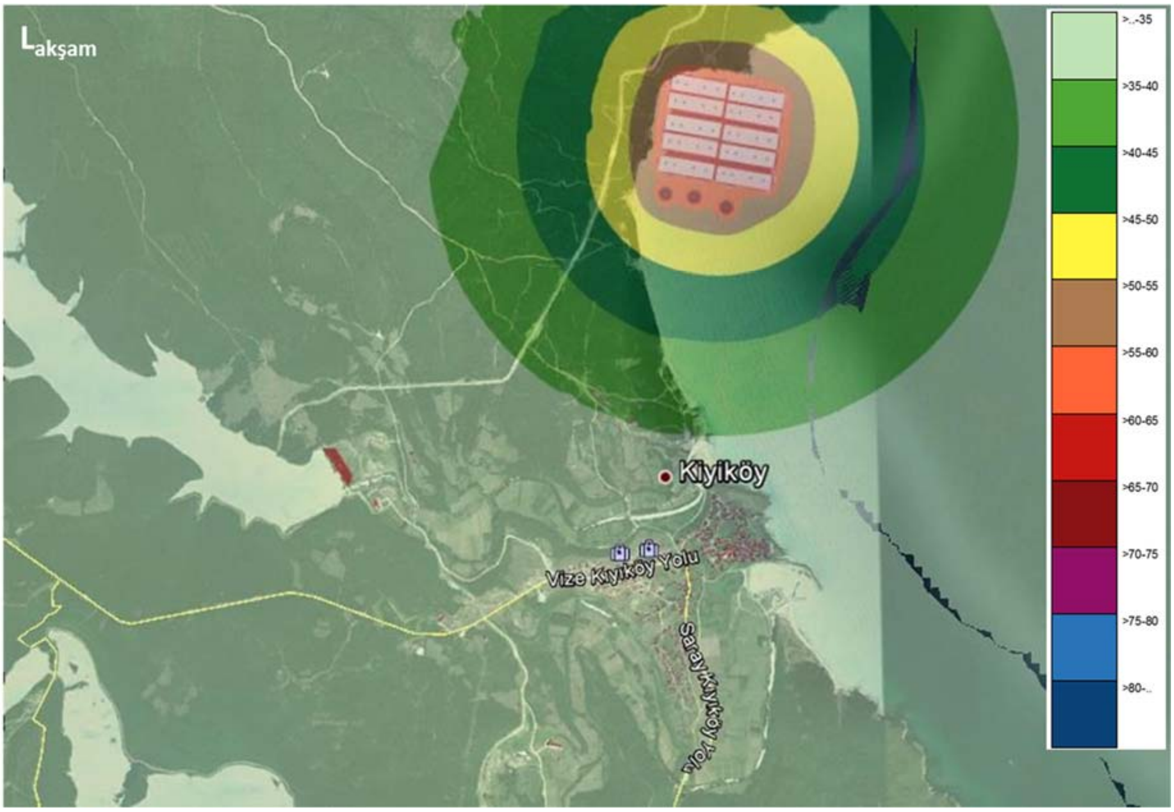


Figure 10.53: Noise Map (Shore Crossing Section Construction $L_{evening}$ with Satellite Image)

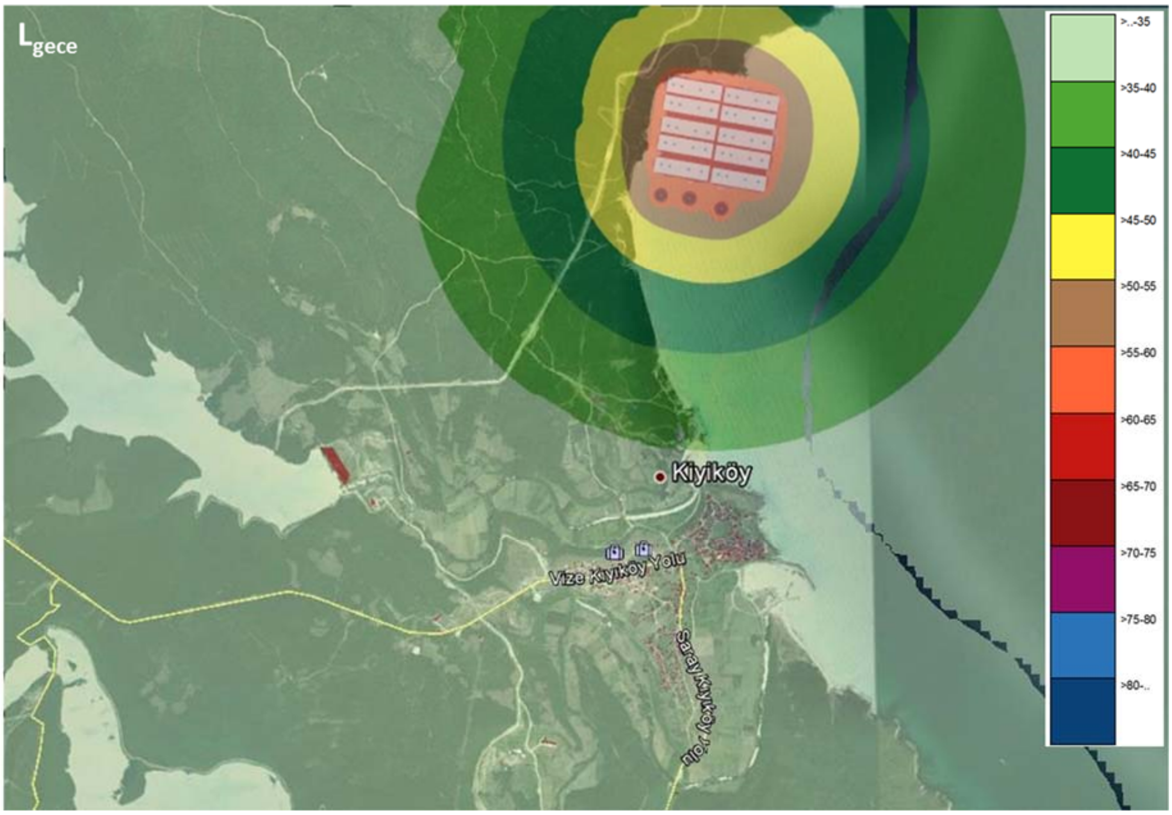


Figure 10.54: Noise Map (Shore Crossing Section Construction L_{night} with Satellite Image)

10.6.2.2 Operation Phase

There will not be a constant source of noise in Offshore and Shore Crossing sections in the operation phase of the Project. Noise emmissions will be limited only to the noise emissions resulting from vessel movements required during periodic inspections and maintenance of pipes. Therefore, it will be lower than noise emissions of the construction activities and will be temporary.

10.6.2.3 Decommissioning Phase

Considering that decommissioning will be carried out in 50 years with the assumption that advanced techniques will be used at that period there hasn't been any assessment made about noise at this stage.

10.6.3 Landfall Section

The closest residential area (Figure 10.55) to the Landfall Section is Kıyıköy town located nearly 1,800 m away at the southeast direction. Apart from this, camping sites and beaches are located 600 m away from the Onshore Section at the southeast.

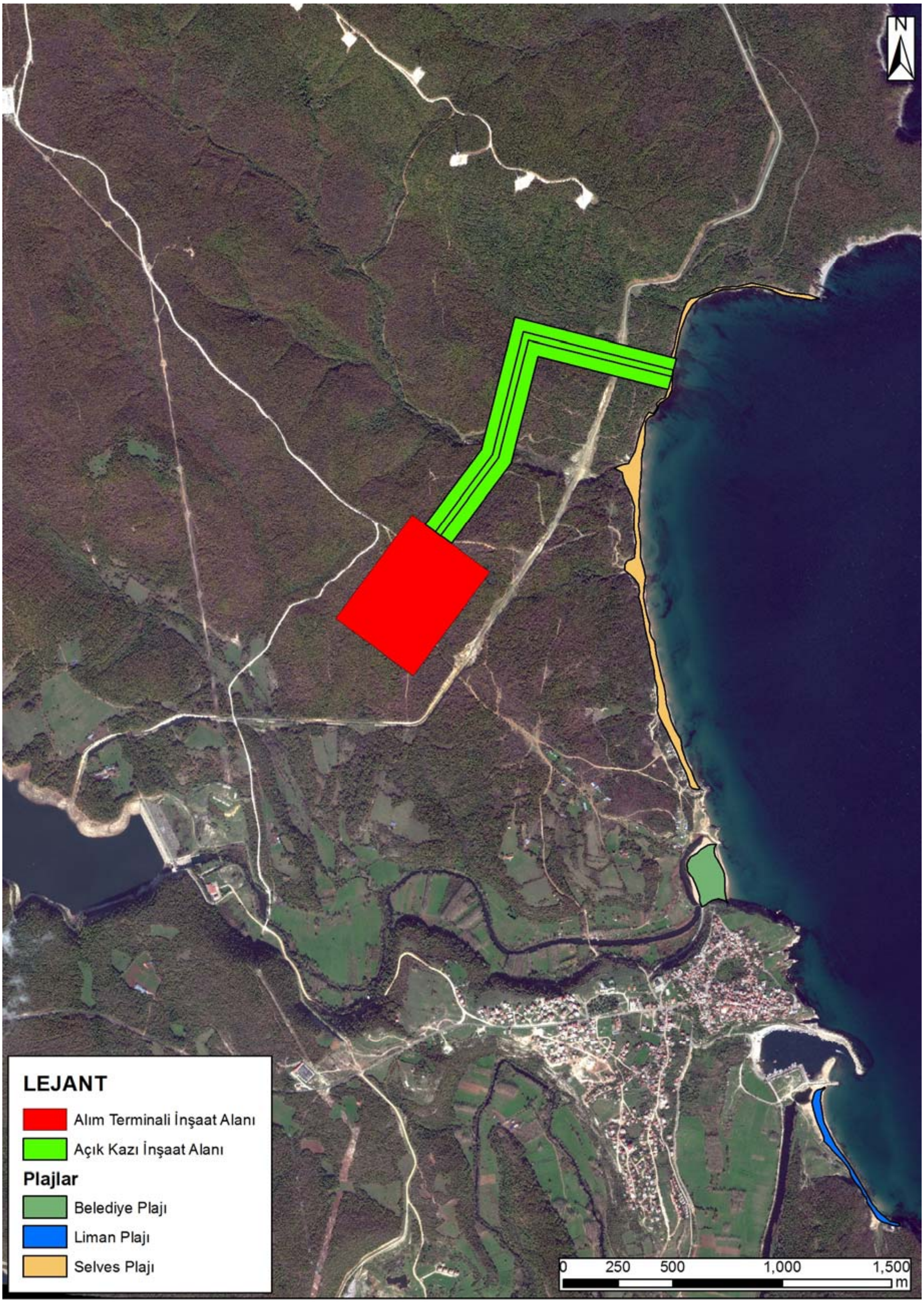


Figure 10.55: Areas of Utilization Located Closest to Landfall Section

A list of equipment used in modeling is given in Environmental Noise Analysis and Acoustic Report given in Annex – 8.B. Highest number of each individual equipment has been designated into the model and modeling has been completed assuming that the equipment will work simultaneously and construction activities will continue for 24 hours in order to observe the worst-case scenario. Although it is limited by the provisions of Regulation on Environmental Noise Assessment and Management, construction activities are planned to continue in a 24-hour basis with a special permit.

Noise levels are tailored by utilizing "Roadway Construction Noise Model User's Guide" dated January 2016, prepared for roadway construction and published by United States Department of Transportation and documents of the "American Society of Safety Engineers" (Ref 10.5).

Calculations of sonic propagation in the open field was done in accordance with ISO 9613-2 standard and humidity, temperature, land structure were taken into account in the calculations. Moreover, ground absorption coefficient was detected as 0.8 in the field.

10.6.3.1.1 Construction Phase

Pipelines to be constructed in the Landfall Section of the Project and construction sites of Receiving Terminal; and construction site routes of earth-moving trucks are defined in noise emission model as areal source and roadway noise source respectively.

Within the scope of the modeling study for the Construction Phase of the Landfall Section, all equipment which are listed in Table 10.3 and will be used in the Construction Phase of the Landfall Section are assessed, and the sound power levels which are detailed in the Environmental Noise Analysis and Acoustic Report in **ANNEX-10.B** are calculated for each equipment.

In order to represent the worst case scenario, the highest possible number of each equipment are assigned into the model and the modeling is done supposing that all equipment run at the same time and the construction activities continue for 24 hours.

The sound power levels calculated are assigned into the model as two different areal sources for Receiving Terminal and pipeline construction areas. Table 10.54 presents the noise emissions to be caused by the construction activities in the Landfall Section as a result of the modeling study.

Article 23 Paragraph ç of ÇGDYY states that *"Construction activities of such projects as dam, bridge, tunnel, highway, urban main road, and cluster housing which seek for public interest and construction activities that will interrupt the local traffic in the city during daytime can be carried out with the Provincial Local Environment Board Decision to be made within this scope and by adhering to the limit values obtained by subtracting 5 dBA for evening and 10 dBA for night from the daytime values given in Table – 5 of Annex-VII on condition that no activities are carried out during daytime."*

As also stated above, though restricted by the provisions of the Regulation on Environmental Noise Assessment and Management, it is planned to carry out the Project's construction activities for 24 hours with an exceptional permission.

Accordingly, noise emissions that will result from equipment used in construction phase after modeling works are shown in Table 10.50 below. The results have been compared with limit values of L_{day}= 70 dBA, $L_{evening}$= 65 dBA, L_{night}= 60 dBA given in Environmental Noise Limit Values for ÇGDYY Annex VII Table 5: Construction Site.

Table 10.50: Modeling Results of Landfall Section Construction Activities

	Measurement Point (MP)	Source Impact Calculated with Model			ÇGDYY Annex VII Table 5 Limit Values		
		L_{Day}	$L_{Evening}$	L_{Gece}	L_{Day}	$L_{Evening}$	L_{Gece}
Landfall Section Construction	Measurement Point1	41,07	42,07	42,65	70	65	60
	Measurement Point2	40,27	41,20	41,82	70	65	60
	Measurement Point3	52,27	53,08	53,61	70	65	60
	Measurement Point4	69,86	70,02	70,07	70	65	60
	Measurement Point5	40,92	43,23	43,36	70	65	60
	Measurement Point6	39,93	40,80	41,38	70	65	60

When construction activities for Landfall Section of the Project and background measurements are taken into consideration there is no limit value exceeded apart from measurement point 4. When the table above is reviewed, it is seen that the limit value is exceeded during evening and night periods of Measurement Point 4. The location where the limit value is exceeded in the specified measurement point and periods is around 1,800 m away from residential areas.

Noise maps prepared for the Construction Phase of the Landfall Section as a result of the modeling are shown in Figure 10. to Figure 10.8.

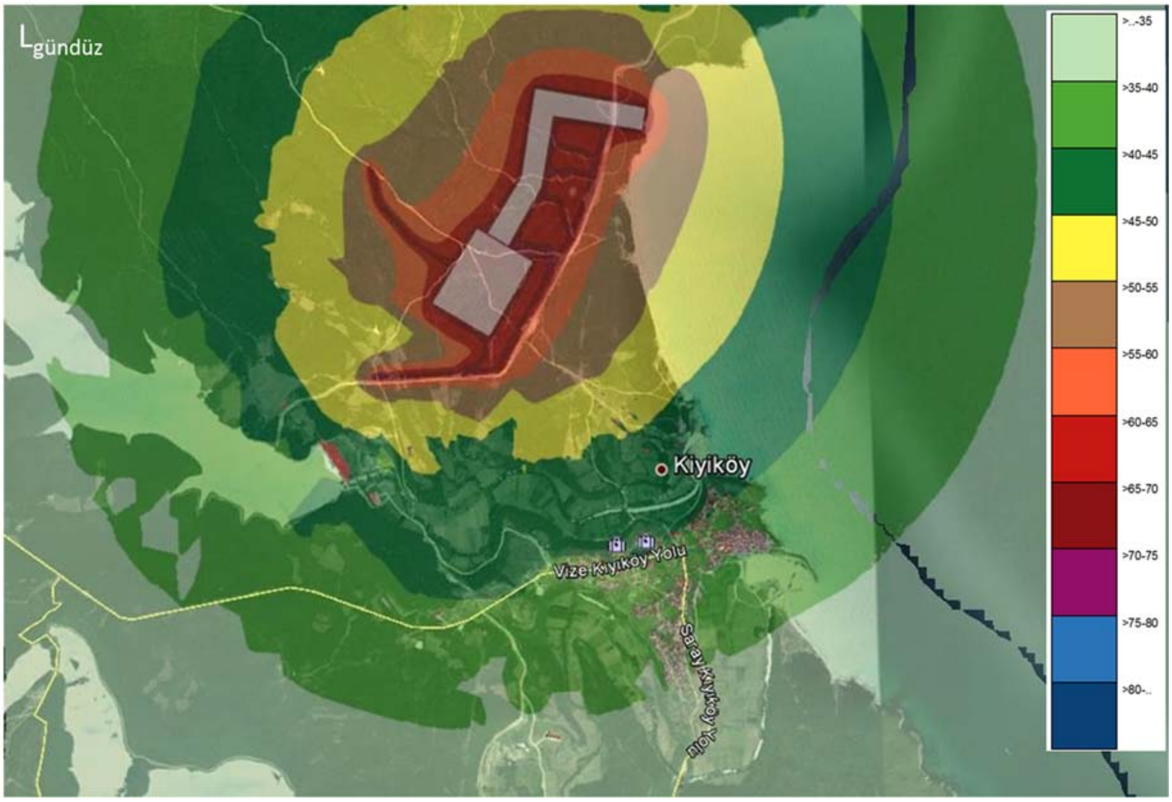


Figure 10.56: Noise Map (Landfall Section Construction L_{day}, with Satellite Image)

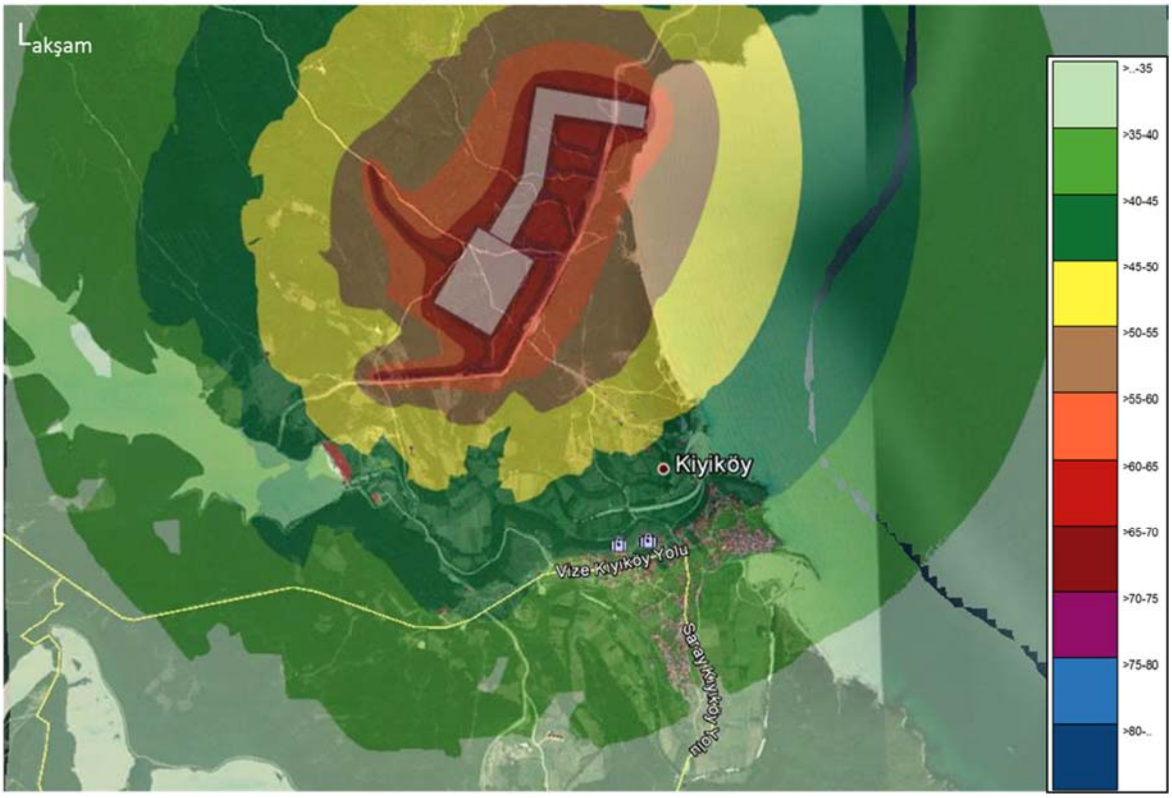


Figure 10.57: Noise Map (Landfall Section Construction $L_{evening}$, with Satellite Image)

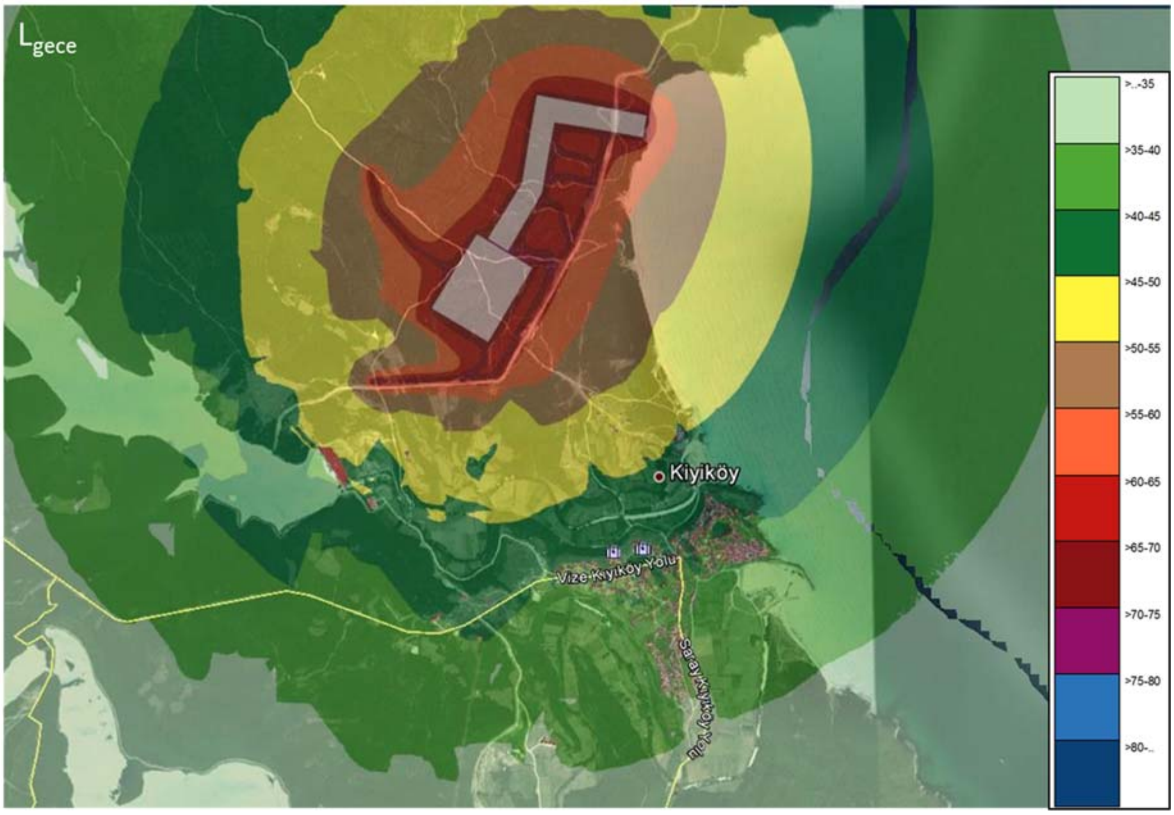


Figure 10.58: Noise Map (Landfall Section Construction L_{night}, with Satellite Image)

Controls and measurements will be carried out for vibrations resulting from construction activities, if deemednecessary.

Modeling of Noise Resulting from Excavation Trucks

Noise levels created by excavation trucks that will be used in construction activities of the Project in Kıyıköy town of Kırklareli province are also mapped in modeling work.

Modeling has been done with the assumption that there will be 550 daily truck movements and these movements will be on cross traffic asphalt or half-ruined asphalt and excavation trucks will be driven at fixed speed and with an average speed of 40 km/h during construction activities of the Project of Landfall Section.

Noise maps that will result from the movements of excavation trucks in Landfall Section after the modeling are demonstrated in Figure 10. to Figure 10..

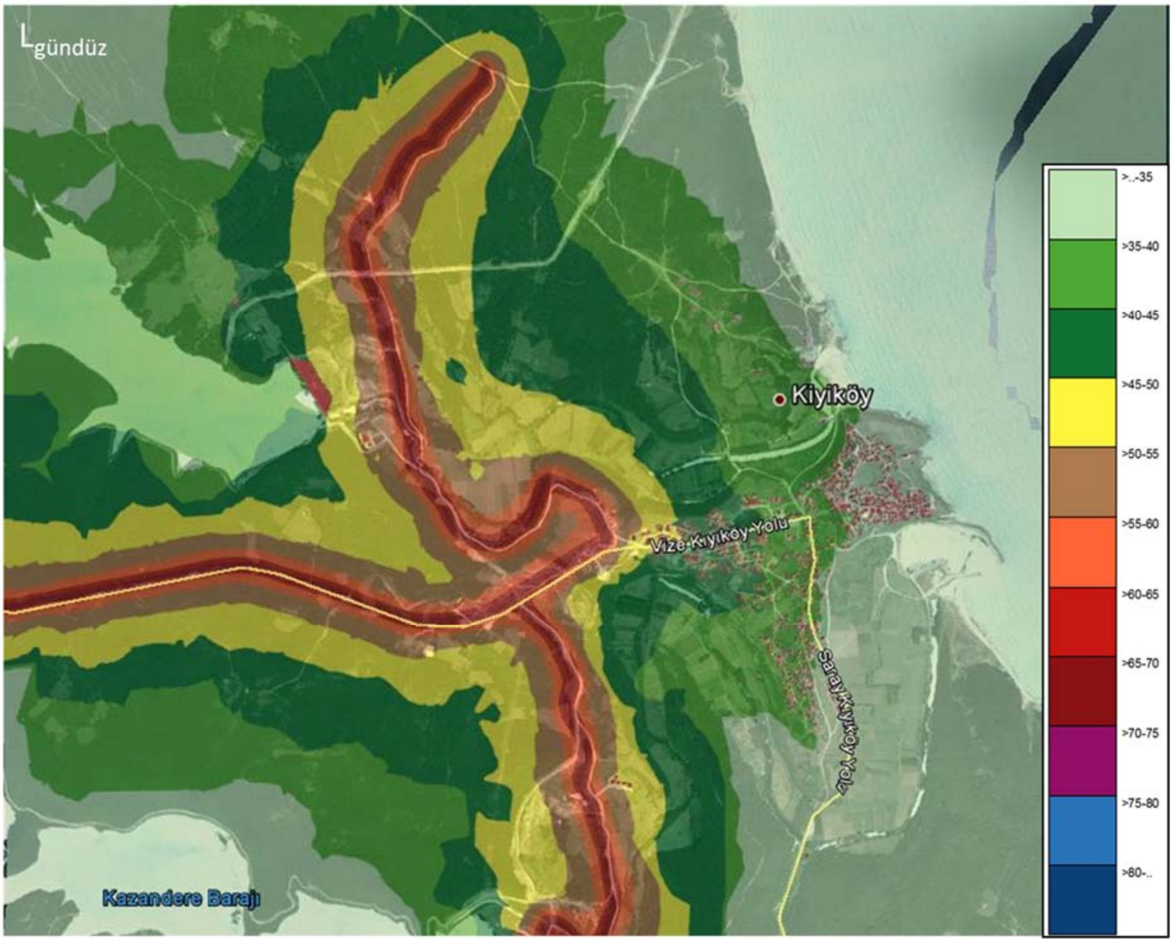


Figure 10.59: Noise Map (Excavation Trucks L_{day}, with Satellite Image)

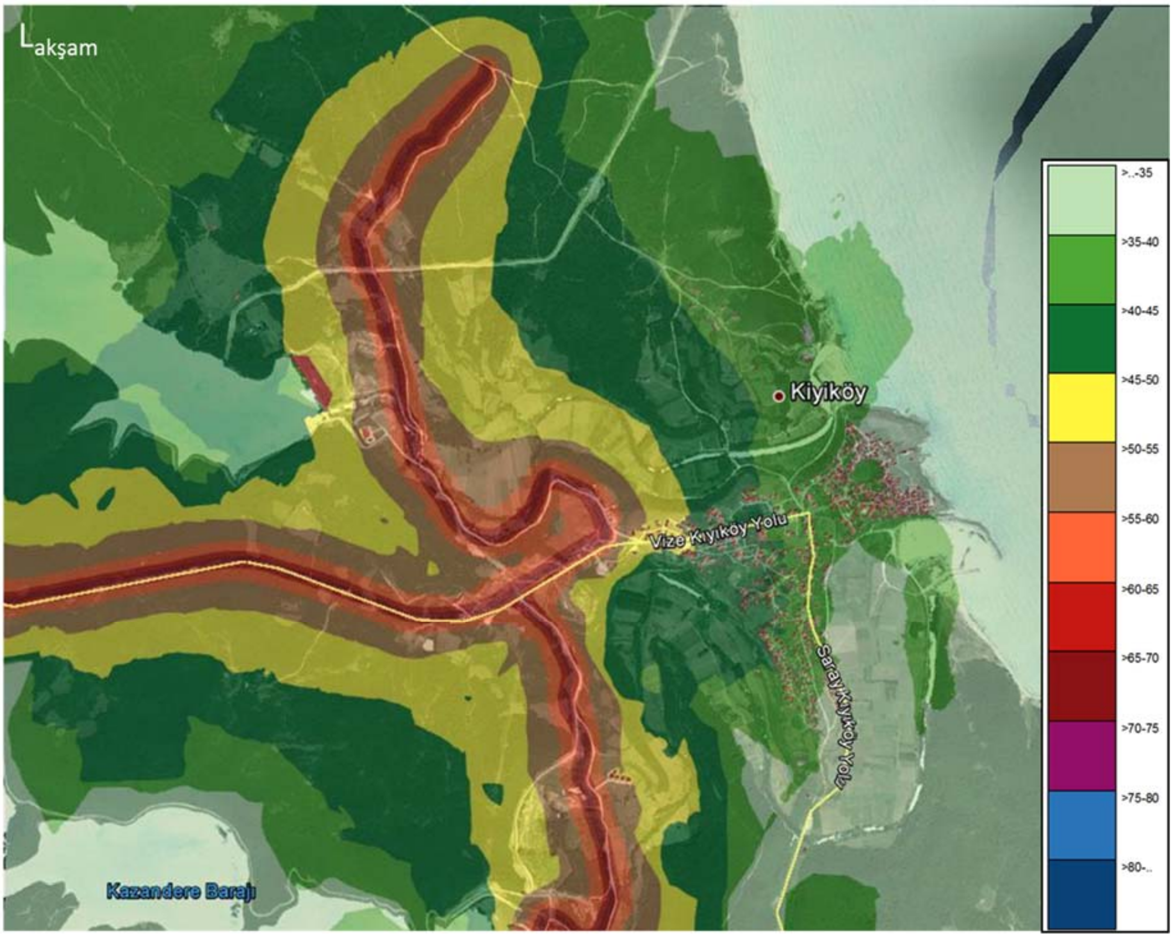


Figure 10.6050: Noise Map (ExcavationTrucks $L_{evening}$, with Satellite Image)

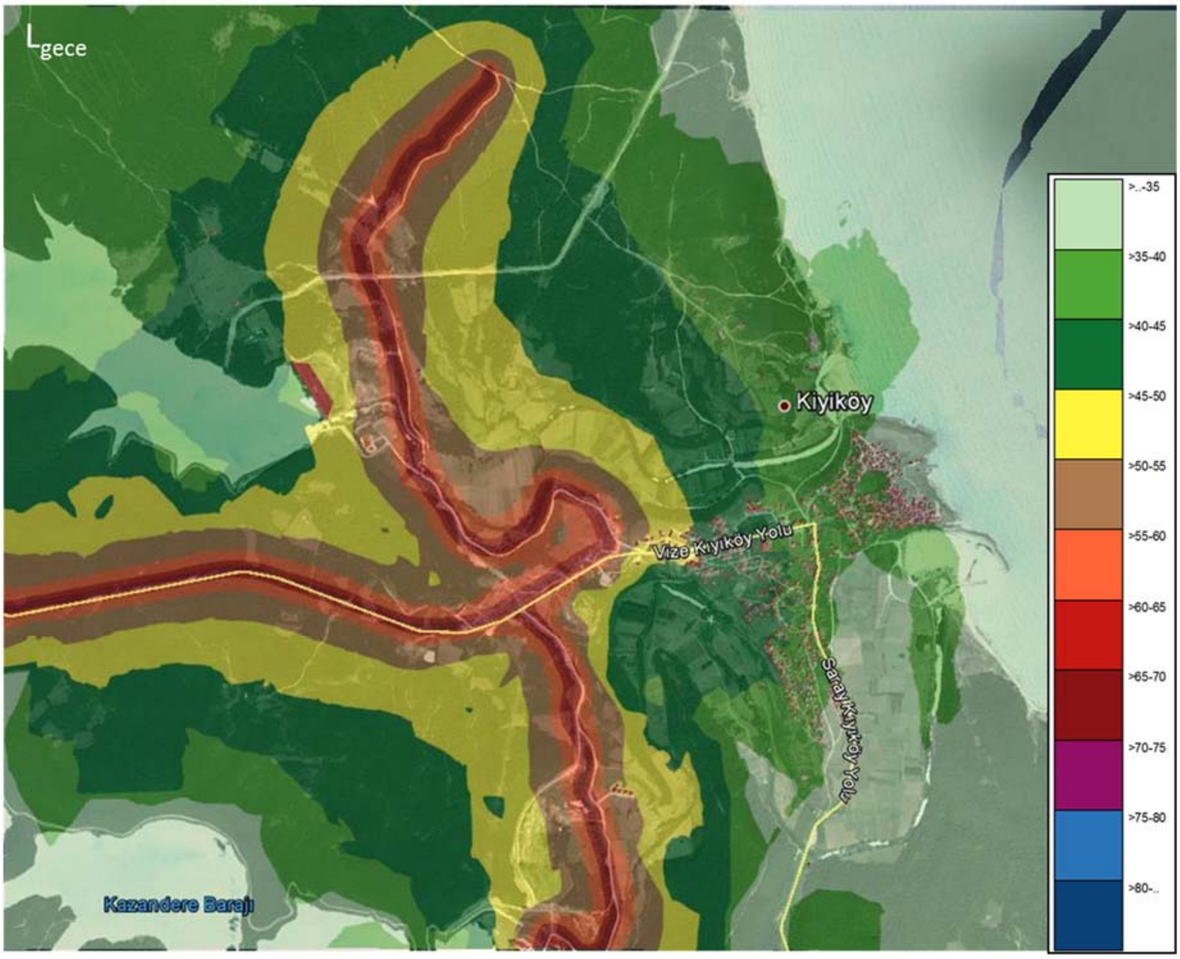


Figure10.61: Noise Map (ExcavationTrucks L_{night}, with Satellite Image)

10.6.3.1.2 Pre-Commissioning (Hydrotest) and Operation Phase

Noise emission resulting from hydrotest activities in Pre-Commissioning Phase of the Project is evaluated in this section. All equipment are assumed to be running at the same time in the modeling studies carried out in this scope.

Within the scope of the modeling study carried out for Pre-Commissioning Phase (Hydrotest), the list of the equipment assessed as noise source and the sound power levels of the said equipment are given in detail in the Environmental Noise Analysis and Acoustic Report in **ANNEX-10.B**.

Noise emissions that will result from hydrotest activities carried out in the Pre-Commissioning Phase according to the modeling work are given in Table 10.51.

Table 10.51: Modeling Results for Pre-Commissioning Phase (Hydrotest)

	Measurement Point (MP)	Source Impact Calculated with Model			ÇGDYY Annex VII Table 5 Limit Values		
		L_{Day}	$L_{Evening}$	L_{Gece}	L_{Day}	$L_{Evening}$	L_{Gece}
Pre-Commissioning (Hydrotest)	Measurement Point 1	24,57	25,36	26,05	70	65	60
	Measurement Point 2	27,06	27,85	28,54	70	65	60

Measurement Point (MP)	Source Impact Calculated with Model			ÇGDYY Annex VII Table 5 Limit Values		
	L_{Day}	$L_{Evening}$	L_{Gece}	L_{Day}	$L_{Evening}$	L_{Gece}
Measurement Point 3	30,79	31,57	32,25	70	65	60
Measurement Point 4	37,43	38,20	38,86	70	65	60
Measurement Point 5	24,41	25,20	25,89	70	65	60
Measurement Point 6	20,51	21,30	21,99	70	65	60

Considering the hydrotest activities and background measurements there are no limit values exceeded.

Noise maps prepared for Pre-Commissioning Phase (hydrotest) for Landfall Section as a result of the modeling are given in Figure 10.62 to Figure 10..

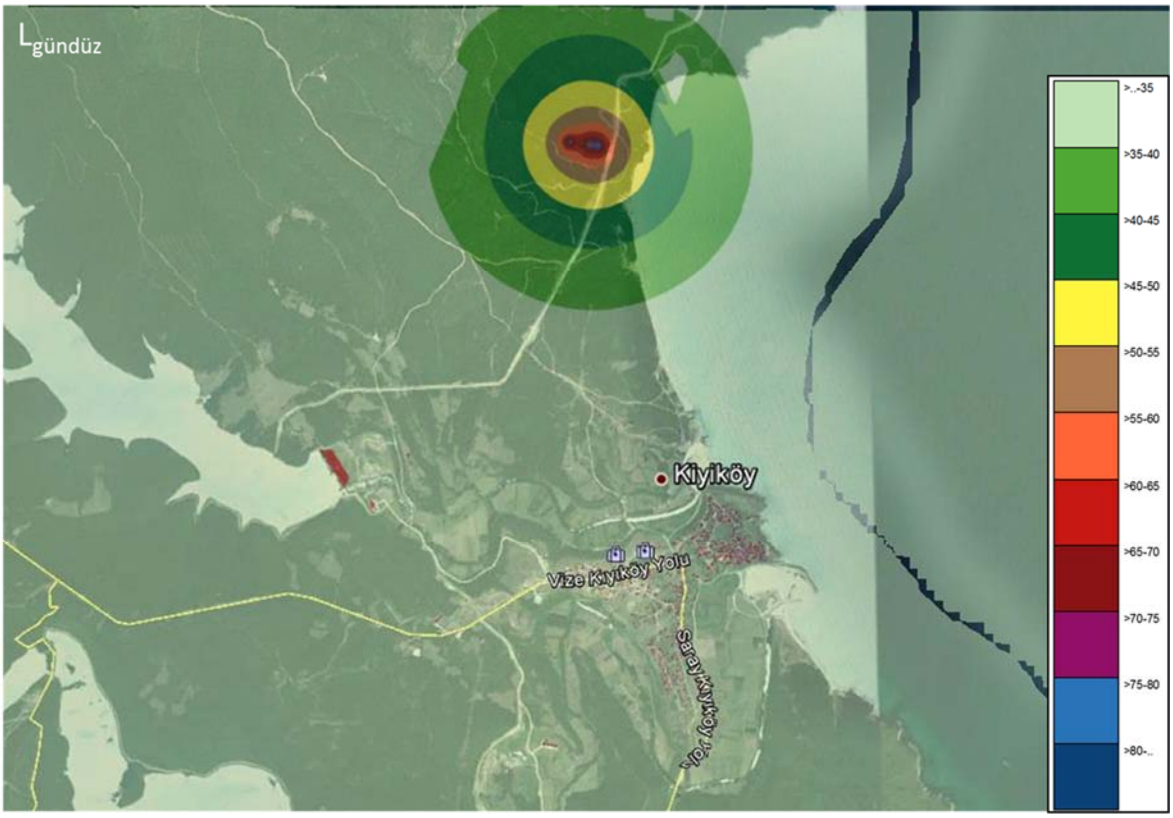


Figure 10.62: Noise Map (Decommissioning (Hydrotest) Phase for Landfall Section L_{day}, with Satellite Image)

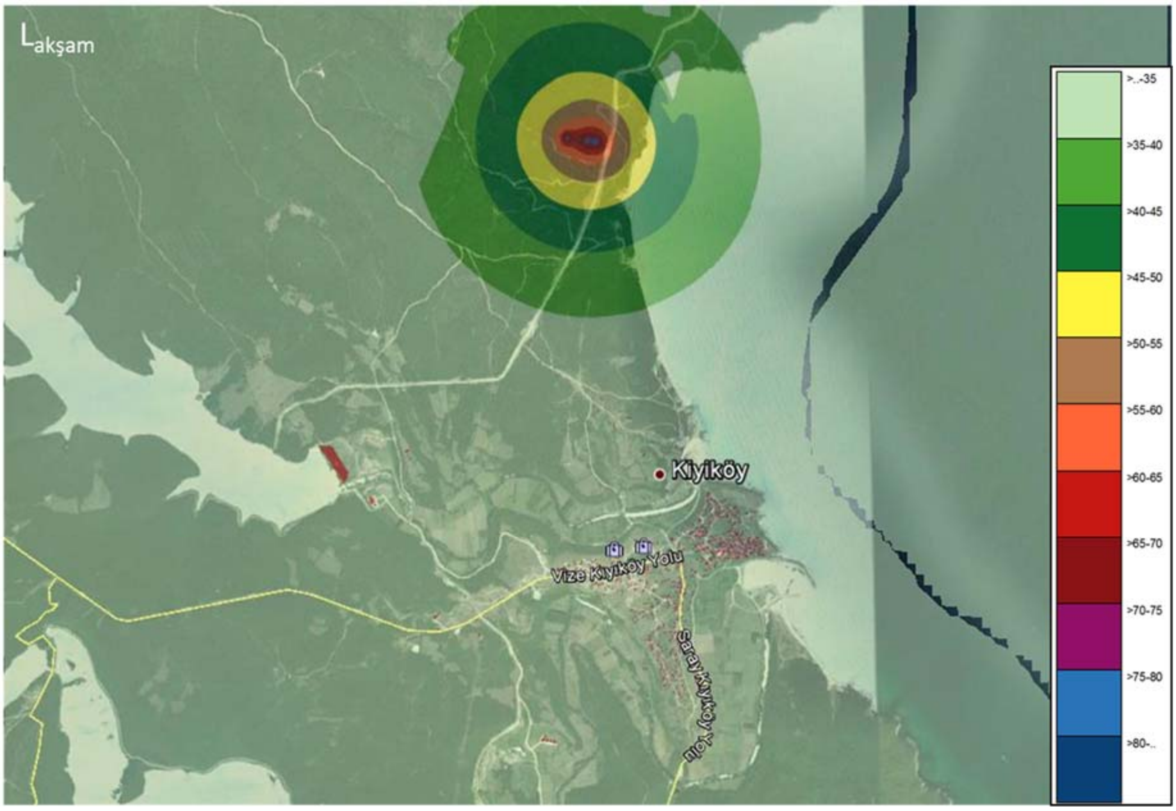


Figure 10.63: Noise Map (Decommissioning (Hydrotest) Phase for Landfall Section $L_{evening}$, with Satellite Image)

Figure 10.64: Noise Map (Decommissioning (Hydrotest) Phase for Landfall Section L_{night}, with Satellite Image)

Sound characteristics of the machine and equipment to be used within Receiving Terminal during Operation Phase will be undeterred. Noise concentrated in low frequencies will propagate from machines and equipment used in the Operation Phase.

Noise sources within Receiving Terminal are included in the modeling with the assumption that they will be used for the entire day. The list of the equipment that will cause noise in the Operation Phase and the sound power levels of the said equipment are given in detail in the Environmental Noise Analysis and Acoustic Report in **ANNEX-10.B**.Noise emissions resulting from operation activities according to the modeling work are given in Table 10.52 below.

According to ÇGDYY Annex-VII Table 4, Landfall Section is located close to the areas *"Where noise sensitive areas of utilization for education, culture and health care as well as summer holidays and camping are concentrated".* Therefore, modeling results have been compared with limit values of L_{day}= 60 dBA, $L_{evening}$= 55 dBA, L_{night}= 50 dBA specified in ÇGDYY Annex-VII Table 4.

Table 10.52: Modeling Results for Landfall Section Operation Phase

	Noise Level Calculated with Model (dBA)			Limit Value (dBA)			Eligibility		
	LDay	LEvening	LNight	LDay	LEvening	LNight	LDay	LEvening	LNight
Measurement Point 1	30,98	31,76	32,45	60	55	50	Eligible	Eligible	Eligible
Measurement Point 2	27,15	27,93	28,61	60	55	50	Eligible	Eligible	Eligible
Measurement Point 3	42,86	43,62	44,28	60	55	50	Eligible	Eligible	Eligible
Measurement Point 4	48,35	49,07	49,69	60	55	50	Eligible	Eligible	Eligible
Measurement Point 5	23,45	24,22	24,90	60	55	50	Eligible	Eligible	Eligible
Measurement Point 6	30,17	30,96	31,65	60	55	50	Eligible	Eligible	Eligible

The table above proves that there is no point where the limit values are exceeded.

However, as stated in ÇGDYY, in addition to the comparison in Table 4 of Annex-VII, the noise levels obtained as a result of the modeling study need to be assessed according to the background noise measurement results. This assessment is provided in Table 10.57 below.

Table 10.53: Assessment of Landfall Section Operation Phase Modeling Results according to Background Noise Measurement Results

	Noise Level Calculated with the Model (dBA)			Background Noise Measurement Results (dBA)			Difference		
	$L_{Daytime}$	$L_{evening}$	L_{night}	$L_{Daytime}$	$L_{evening}$	L_{night}	$L_{Daytime}$	$L_{evening}$	L_{night}
Measurement Point 1	30,98	31,76	32,45	51,4	52,6	51,7	- 20,42	-20,84	-19,25
Measurement Point 2	27,15	27,93	28,61	51,5	46,9	40,9	-24,35	-18,97	-12,29

Measurement Point 3	42,86	43,62	44,28	49,3	53,2	42,9	-6,44	-9,58	1,38
Measurement Point 4	48,35	49,07	49,69	45,7	38,5	56,5	2,65	10,57	-6,81
Measurement Point 5	23,45	24,22	24,90	49,3	51,3	38,1	-25,85	-27,08	-13,20
Measurement Point 6	30,17	30,96	31,65	57,1	40,7	32,0	-26,93	-9,74	-0,35

As also seen in the table above, it is found that the difference between the noise levels calculated with the model and the background noise levels in daytime, evening and night periods respectively in Measurement Point 3 and Measurement Point 4 has plus value and that the value calculated with the model is higher than the background noise. Measurement Point 3 and Measurement Point 4 are respectively 1,100 m and 1,800 m away from residential areas.

Noise maps prepared for the Operation Phase of the Landfall Section as a result of the modeling are given in Figure 10.65 to Figure 10.67.

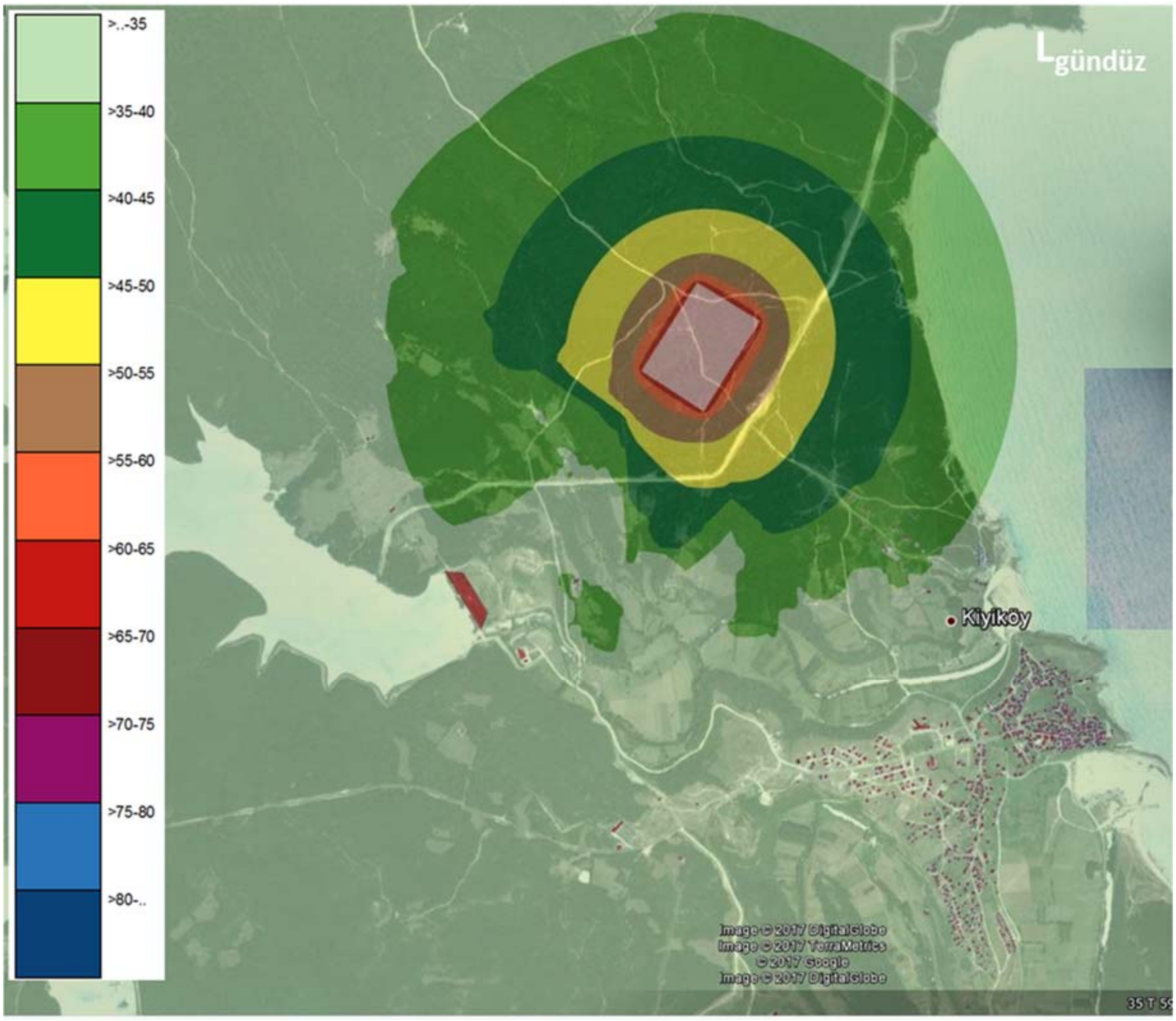


Figure 10.65: Noise Map (Landfall Section Operation Phase L_{day}, with Satellite Image)

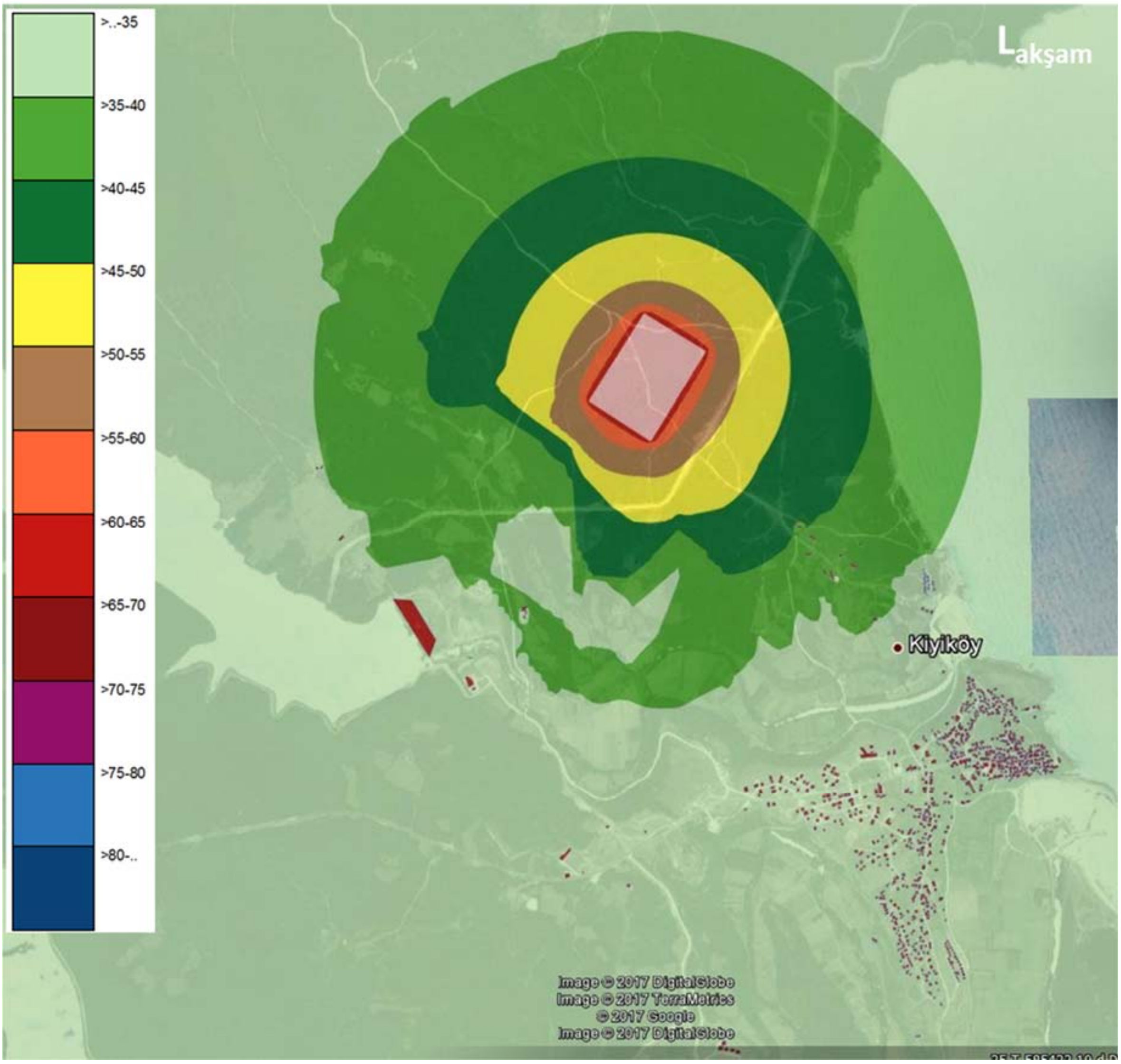


Figure 10.66: Noise Map (Landfall Section Operation Phase $L_{evening}$, with Satellite Image)

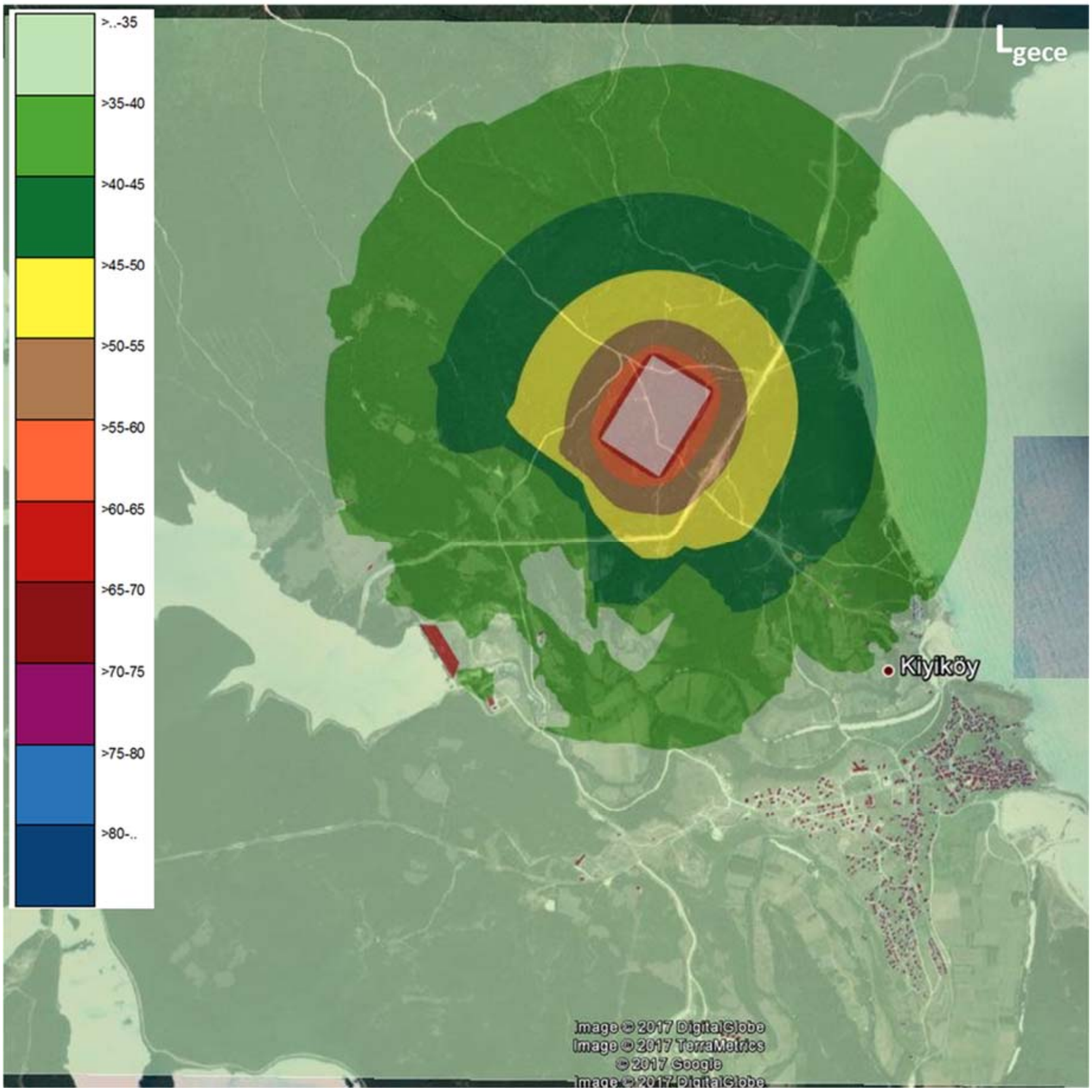


Figure10.67: Noise Map (Landfall Section Operation Phase L_{night}, with Satellite Image)

10.6.3.1.3 Decommissioning Phase

Bearing in mind that decommissioning will be carried out in 50 years, there are no assessments about noise in this stage, considering advanced techniques will be used.

10.7 Waste Production and Waste Management

Information on waste classes, descriptions, codes, amounts, recovery and disposal that are expected to be generated in Offshore, Shore Crossing and Landfall sections during Construction, Operation and Decommissioning phases of the Project is given in this section. Relevant Turkish Environmental Legislation was taken as reference and relevant regulations were followed when waste codes and classes were being determined.

As laid down in the opinion letter (**ANNEX-5.A**) dated July 2017 of Maritime and Coastal Management Department of Directorate General of Environmental Management of the Ministry of Environment and Urbanization, necessary measurements will be taken in order to prevent construction waste from falling into the sea during the construction processes. Waste management under the Project will be carried out in accordance the provisions of Turkish Environmental Law and International Legislation, where necessary (in the Turkish EEZ). Facilities licensed by Ministry of Environment and Urbanization and licensed devices in recovery of and disposal of wastes will be used.

In the event that unforeseen wastes are generated and / or waste disposal facilities other than those that are laid down in this section are required to be used, management and disposal of these wastes will also be carried out in accordance with provisions of Environmental Legislation and International Legislation, where necessary (in the Turkish EEZ).

10.7.1 Waste Types, Amounts and Disposal Methods (Construction, Operation andPost-Operation)

Black Sea has "Special Area" status in accordance with Annex I and V of the MARPOL 73/78 Convention regulating wastes sourced from vessels in the Offshore Section (in the Turkish EEZ) under the Project. MARPOL ANNEX IV includes measures for the prevention of pollution of sewage dumped by vessels.

Wastes to be generated by vessels under the Project (wastes falling within the scope of MARPOL 73/78) will be conveyed to the licensed waste reception facilities established in compliance with the Waste Reception from Vessels and Waste Control Regulation which entered into force after published in the Official Gazette No. 25682 of December 26, 2004.

Wastes that are expected to be generated in construction, pre-commissioning, operation and decommissioning phases of the Project are explained, according to the Project sections indicated below.

10.7.1.1 Offshore and Shore Crossing Sections

Information (waste code, waste description and estimated amount range) about wastes that are expected to be generated in Construction and Pre-Commissioning phases of Offshore and Shore Crossing sections of the Project is presented in Table 10.54.

Detailed information about amount and disposal of wastewater expected to be generated in Construction, Pre-Commissioning, Operation and Decommissioning phases of Offshore and Shore Crossing sections of the Project is given in Section 10.1.

Table 10.54 Waste Types and Estimated Amount Range Foreseen to be Generated During Construction and Pre-Commissioning Activities of Offshore and Shore Crossing Sections

Waste Code (EWC)	Waste Code Description	Estimated Amounts
12 01	Wastes Resulting from Physical and Mechanical Surface Treatments and Shaping of Metals and Plastics	70 tons – 700 tons
13 01*	Waste Hydraulic Oils	1 ton – 5 ton
13 02*	Waste Oils of Motor, Transmission and Greasing	1 ton – 50 tons
13 04*	Bilgewater	50 tons - 500 tons
13 07*	Fuel Oil Wastes	Foreseen as 600 tons annually.
15 01	Packing (including Packing Wastes of Municipality Collected Separately)	8 tons – 80 tons

Waste Code (EWC)	Waste Code Description	Estimated Amounts
15 02*	Suctions, Filter Materials, Cleaning Fabric and Protective Clothing	< 1 ton
16 01*	Vehicles for Different Transportation Types (including Construction Vehicles) and Wastes Resulting from Dismantling and Maintenance (excluding 13, 14, 16 06 and 16 08) of These Aforementioned Vehicles	500 tons
16 05	Gases in Pressure Tank and Discarted Chemicals	< 1 ton
17 02	Wood, Glass and Plastic	< 1 ton
17 09	Other Construction and Destruction Wastes	60 – 600 tons
18 01*	Wastes Resulting from Birth, Diagnosis, Treatment or Disease Prevention Works for Humans	< 1 ton
20 01*	Fractions Collected Separately (excluding 15 01)	100s – 180 tons
20 03	Other Municipality Wastes	100s – 180 tons

Wastes marked with (*) are dangerous wastes.

In the event that a vessel uses a desalination unit to produce fresh water, waste salty water will be managed in accordance with the paragraph b Pollution Prohibitions for Seas of Article 23 of the Water Pollution Control Regulation and the relevant legislation in force.

It is foreseen that the waste generation in the Operation Phase of the Project will be much less in comparison to the construction and pre-commissioning phases.

As laid down in the opinion letter **(ANNEX-5.A)** dated July 2017 of Maritime and Coastal Management Department of Directorate General of Environmental Management of the Ministry of Environment and Urbanization, wastes to be generated by vessels under the Project (wastes falling within the scope of MARPOL 73/78) shall be managed in accordance with the Waste Reception from Vessels and Waste Control Regulation in force.

The provisions of the Environmental Law and relevant legislation in force will be followed for other wastes to be caused by the Project. Furthermore, in the scope of the Project dumping of any liquid and solid material will not be allowed in construction and operation phases. Measures will be taken in order to prevent any construction waste falling into sea and leaking of oil and petroleum products. As details of the measures that will be taken are to be specified during detailed engineering studies, information about this issue will be submitted to the Ministry of Environment and Urbanization before Construction Phase, if demanded.

The required steps such as notifying the waste reception facilities 24 hours in advance and keeping a record will be fulfilled before the vessels deliver their wastes to the waste reception facilities.

Bearing in mind that decommissioning will be carried out in 50 years with the assumption of the use of advanced techniques, no information is given about wastes that are expected to be generated in this phase.

10.7.1.2 Landfall Section

Information (waste code, wasted description and estimated amount range) about wastes that are expected to be generated as a result of activities which will be carried out during the Construction and Pre-Commissioning phases of Landfall Section of the Project is indicated in Table 10.59. Moreover, wastes that are expected to be generated during pre-commissioning activities related to cleaning, measurements and drying of whole of TurkStream Gas Pipeline are taken into consideration as materials to be injected from Russian coastal facilities during this process will cleaned out from the system of Receiving Terminal in Turkey. The estimations based on experiences obtained by Project Owners in similar projects are given in the table below.

Detailed information about the amount and disposal of wastewater expected to be generated in Construction, Pre-Commissioning, Operation and Decommissioning phases of the Project Landfall Section is provided in Section 10.1.

Table 10.59 Waste Types and Estimated Amount Range Foreseen to be Generated During Construction and Pre-Commissioning Activities of Landfall Section

Waste Code (EWC)	Waste Code Description	Estimated Amounts
02 01	Tarım, Bahçıvanlık, Su Ürünleri Üretimi, Ormancılık, Avcılık ve Balıkçılıktan Kaynaklanan Atıklar	10 tons – 100 tons
12 01	Wastes Resulting from Physical and Mechanical Surface Treatments and Shaping of Metals and Plastics	22 tons – 220 tons
13 01	Waste Hydraulic Oils	1 ton – 10 tons
13 02*	Waste Oils of Motor, Transmission and Greasing	1 ton – 10 tons
15 01*	Packing (including Packing Wastes of Municipality Collected Separately)	10 ton - 100 tons
15 02*	Suctions, Filter Materials, Cleaning Fabric and Protective Clothing	< 1 ton
16 01*	Vehicles for Different Transportation Types (including Construction Vehicles) and Wastes Resulting from Dismantling and Maintenance (excluding 13, 14, 16 06 and 16 08) of These Aforementioned Vehicles	1 – 10 tons
16 05	Gases in Pressure Tank and Discarted Chemicals	< 1 ton 1.600 m^3 (maximum, if MEG – monoetlineglicol – is used for cleaning and drying of pipeline, instead of drying with air) or 530 m^3 (minimum, if MEG is only used for pipeline cleaning)
16 06*	Batteries and Storage Batteries	< 1 ton
17 01	Concrete, Brick, Roof Tile and Ceramic	10 tons – 100 tons
17 02	Wood, Glass and Plastic	< 1 ton
17 04	Metals (including Alloys)	10 tons – 100 tons
17 05	Soil (including Earth-Moving in Contaminated Areas), Stones and Dredging Muds	Field earth-moving wastes of excavation is nearly 500.000 m^3
17 09	Other Construction and Destruction Wastes	< 3.000 tons

Waste Code (EWC)	Waste Code Description	Estimated Amounts
18 01*	Wastes Resulting from Birth, Diagnosis, Treatment or Disease Prevention Works for Humans	< 1 ton
20 01*	Fractions Collected Separately (excluding 15 01)	10 tons - 100 tons
20 03	Other Municipality Wastes	10 tons - 100 tons

Wastes marked with (*) are dangerous wastes.

Domestic wastes of low amounts will be generated during the regular operation activities of the Receiving Terminal and some process waste will be generated during maintenance activities (e.g. examination and measurement of pipelines).

Wastes will be collected separately, stored and transferred into licensed disposal facilities via licensed waste transportation companies in accordance with the relevant national legislation. Disposal facilities where the wastes will be transferred have not been determined yet. Only licensed facilities will be used for transportation, recycling and disposal of wastes.

Considering that decommissioning will be carried out in 50 years, no information is given about wastes that are expected to be generated in this phase, assuming that advanced techniques will be used at that time.

10.8 Phases of Pipeline Maintenance

10.8.1 External Examination of the Pipeline

External conditions of underwater pipeline including exterior conditions of cathodic protection system will be monitored in regular intervals and time periods specified in Table10.60 below with Remotely Operated Vehicles (ROV) or Autonomous Underwater Vehicles (AUV) and sonar scanning by using visual (with camera) methods.

Sections of pipeline with critical importance will be subject to examination carried out annually at the initial stage and then, more or less frequently depending on actual findings (e.g. expansion of clear span.) Sections of the pipeline with critical importance may be composed of the following:

- Steep slopes;
- Continental shelf breaks;
- Sections of pipeline either buried or in the trench; or
- Areas where clear spans or other marine anomalies may occur (based on former research)

Table10.60: External Control Examinations Suggested for Offshore and Shore Crossing Pipelines

External Control	Control Method	Suggested Control Frequency	Examination Time per Pipeline (section within the jurisdiction of Turkey beginning from KP660)*
Examination in Sections with Critical Importance	ROV	Annually	Nearly 5 days**
Examination Throughout the Whole Pipeline Route	ROV	Before the commencing or within 1 year following commencing of operation	Nearly 30 days
	AUV	Then in every 5 years	Nearly 11 days

External Control	Control Method	Suggested Control Frequency	Examination Time per Pipeline (section within the jurisdiction of Turkey beginning from KP660)*
Cathodic Protection Examination	ROV	Before the commencing or within 1 year following commencing of operation; After 5 years of operation; Then in every 10 years.	Nearly 30 days

* Disruptions during operation phase and delays caused by weather are included but bringing and removing of equipment is not included in the time periods specified above.

** Time periods depend on an estimation based on critical areas; time periods may vary depending on the number of critical areas (less or more) according to results of final examination if critical areas.

Landfall cathodic protection examination will be manually carried out with intervals that are to be specified in Pre-Engineering and Design phase. Test stations will be located above the axis of each buried pipeline.

10.8.2 Internal Examination of the Pipeline

After completion of pipeline measurements for pre-commissioning phase, it is foreseen that examination that will be carried out later using PIG in pipeline is not necessary for the initial stage and following 5 years. Frequency of tests may be increased or decreased depending on results of former controls, examination information and regulation requirements. Internal examination frequency suggested for pipelines is shown in Table10.61.

Table10.61: Control Examinations Suggested for Pipeline

Internal Control	Control Method	Suggested Control Frequency
Wall thickness measurement	Smart PIG	Before the commencing or within 1 year of operation phase Then in every 5 years
Pipeline location	XYZ mapping PIG	Before the commencing or within 1 year of operation phase Then in every 5 years
Pipeline geometry	Measurement PIG	Before the commencing Before using thickness measurement equipment or smart PIGs
	Pipeline Thickness Measurement PIG	Before the commencing Then in every 5 years

Due to the compound of the dry gas to be transported in the pipelines, it is foreseen that interior cleaning of the pipeline won't be necessary during the operation phase. However, if it is needed, this will be carried out using cleaning PIGs carried with gas. Gas flow speed in the pipelines will be decreased to 60% of maximum gas flow speed during the examination and measurement processes. A Pipeline Integrity Management System (PIMS) focusing on especially corrosion control will also be developed for constant monitoring / maintenance while system works.

If required, necessary permits for major repairing works related to offshore pipeline will be obtained, specific management plans and procedures for the project will be implemented.

10.9 Contingency (Loss Indemination in Cases of Accidents)

As laid down in the opinion letter (**ANNEX-5.A**) dated July 2017 of Maritime and Coastal Management Department of Directorate General of Environmental Management of The Ministry of Environment and Urbanization, in compliance with the Law No. 5312 on Principles Concerning the Emergency Response in the Event of Pollution of Marine Environment with Petroleum and Other Hazardous Materials and Compensation of Damages, and as per the provision of regulations thereunder, a Risk Assessment and Emergency Response Plan is prepared by an authorized body in the name of the Project Owner and submitted to the Directorate General of Environmental Management of the Ministry of Environment and Urbanization for approval. Construction activities will be commenced after aforementioned plan requirements are fulfilled.

In addition to the permit requirements mentioned above, contractors of the construction in the Turkish EEZ will work in accordance with the provisions of MARPOL 73/78 and prepare an Prevention of Oil Spill in Offshore and Emergency Response Plan including following:

- The Shipboard Oil Pollution Emergency Plan (SOPEP including an oil registry book); and
- Shipboard Marine Pollution Emergency Plan (SMPEP).

Contractors will prepare an Onshore Emergency Response Plan including procedures for events such as fire, traffic accidents, etc. for the construction phase of the Project in accordance with national legislation and this plan will be evaluated by the Project Owner as a part of document evaluation process of the Project.

Emergency Shutdown and safety systems will be established for Operation Phase in the Receiving Terminal. In the event that an unexpected event takes place, Emergency Shutdown system will be initiated and isolation between pipelines and Receiving Terminal will be ensured. Gas in the pipelines will be isolated and gas amount in the offshore pipelines will be maintained at a fixed amount by closing the entry and exit Emergency Shutdown valves in the landfall facilities.

Core principle is to stop a gas outlet that may escalate the fire and maintain the gas amount in the pipeline at a fixed amount.

Necessary security measures such as access control, identification badges, CCTV, registration and monitoring of entry and exit of personnel and vehicles for duration of the contract for 24 hours a day and throughout 365 days including non-work days in work areas including also temporary areas will be taken.

There will be an emergency generator in the Receiving Terminal located in the Landfall Section in order to supply energy to the sensitive systems in the terminal in case of a power supply cut in the operation phase.

An Emergency Response Plan will be prepared for the operation phase of the Project in accordance with "Regulation on Emergencies in the Workplace" by the Operating Company.

Detailed information about Onshore and Offshore Emergency Response Plans is given in **Chapter 12** (Environmental and Social Management System).

Project Owner is responsible of the compensation of the damages that may occur as a result of accidents and other unexpected events that may be caused by construction and operation activities during Construction and Operation phases. Therefore, social insurances required by the labor legislation as well as the necessary insurances under General Conditions of Environmental Pollution Financial Responsibility Insurance will be covered.

Moreover, financial responsibility guarantees that will be demanded under the requirements of International and National legislation by The Turkish State will be provided by the Project Owner.

10.10 Health Protection Strip Distance

Turkstream Gas Pipeline and Surface Facilities are considered as level one non-sanitary enterprise in accordance with Article 5.3 “Transportation facilities carrying petroleum, natural gas and chemicals with pipes longer than 10 km and with a diameter of more than 600 mm” in Annex-2 of Regulation on Licenses to Start and Operate a Business. It is mandatory to establish a health protection strip around industrial zones and organized industrial zones and level one non-sanitary enterprise in accordance with Article 16 of aforementioned regulation. Dwellings or human settlement are not permitted within the Health Protection Strip.

Necessary measures and safety precautions will be taken in order to prevent any infringement of Health Protection Strip established under the Project as Health Protection Band distances will be processed into construction plan by relevant Construction Section and relevant institutions. Necessary liabilities under the “Regulation on Licenses to Start and Operate a Business.” will be fulfilled. Moreover, activities will not be indicated before Business Licenses are obtained in accordance with Article 6 of the Regulation. An application has been submitted to Ministry of Health for determination of distance for Health Protection Strip under the Project, as laid down in the opinion letter of Kırklareli Public Health Directorate, dated 03 July 2017, according to Regulation on Licenses to Start and Operate a Business, as the Receiving Terminal is under the scope of Non-Sanitary Enterprises, taking into consideration the negative impacts of the Receiving Terminal on environment and public health, in line with the Directive numbered 6359 and dated 17.02.2011 of the Ministry of Health, a 40 m ± %25 health safety line distance needs to be left inside of its own parcel border and protected by competent Authority authorized to license. Accordingly, a fire safety line and a Health Protection Strip with 50 m width are left within the boundaries of the Receiving Terminal.

10.11 Visual Impact

Visual impacts are the impacts resulting from changes in the current situation of the site by creating new units or changing the available factors with Project work. Stated impacts can be considered as impacts of construction and operation activities that are to be carried out on the landscape characteristics and impacts of probable changes on visual pleasantness (pleasantness of a receiver or a receiver group defined in a specific manner, on landscape or general view).

A modeling / imaging work initiated by Project Owner is carried out by XKP Company which is a Dutch company specialized in 3d visualization in order to lay out current visual value of the Project Site and evaluate the extent of the impacts of the Project on the visual pleasantness. Visual data obtained from pre-study is given in Figures 69 to Figure 10.775578 below.

In this study, extent of impacts in densely populated areas such as beaches, main roads, residential areas is imaged with the help of “Points of Sight” selected in field works.

A methodology addressing following was used by XKP Company which was present in Kıyıköy in order to prepare a modeling / imaging work in May2017 for the Project:

- 3d model is produced by processing photographs with 3d computer-generated imagery (CGI) technology;
- In the first phase of the photomontage process, “Points of Sight” suggested by placing virtual cameras to 3d landscape model are verified and examined;
- 3600 panoramic photographs are taken for all “Points of Sight”. All photographs are taken with DSLR cameras with full frame lenses and mounted into a tripod suitable for panoramic photograph shoots. Multiple photographs are combined with smooth transitions in a way that will create 3600 spherical panoramic images;
- Camera is installed with a GPS receiver in order to add location information (geo-tagging) of the images. Positions of “Points of Sight”, elevations and view directions are used to create virtual cameras in 3d landscape model, thanks to geo-tagging. Virtual cameras are adjusted by reflecting landscape models on each image in order to verify the accuracy of geo-tagging information;
- Receiving Terminal site, open cut and shore crossing road are modeled according to Project characteristics defined in Chapter 1 (General Characteristics of the Project). These models are included in landscape model and view from “Points of Sight” defined with Zone of Theoretical Visibility analysis can be verified; and
- Photomontage is done by adding computer-generated imagery into selected “Points of Sight”. Suggested design produced by combining photographs of each “point of sight” and processed images are adjusted to 3600 panoramic images.

Locations and sight directions of some Points of Sight (BN) presented with modeling / imaging work on probable visual impacts that may occur in the Construction and Operation phases of the Project are given in Figure 10..

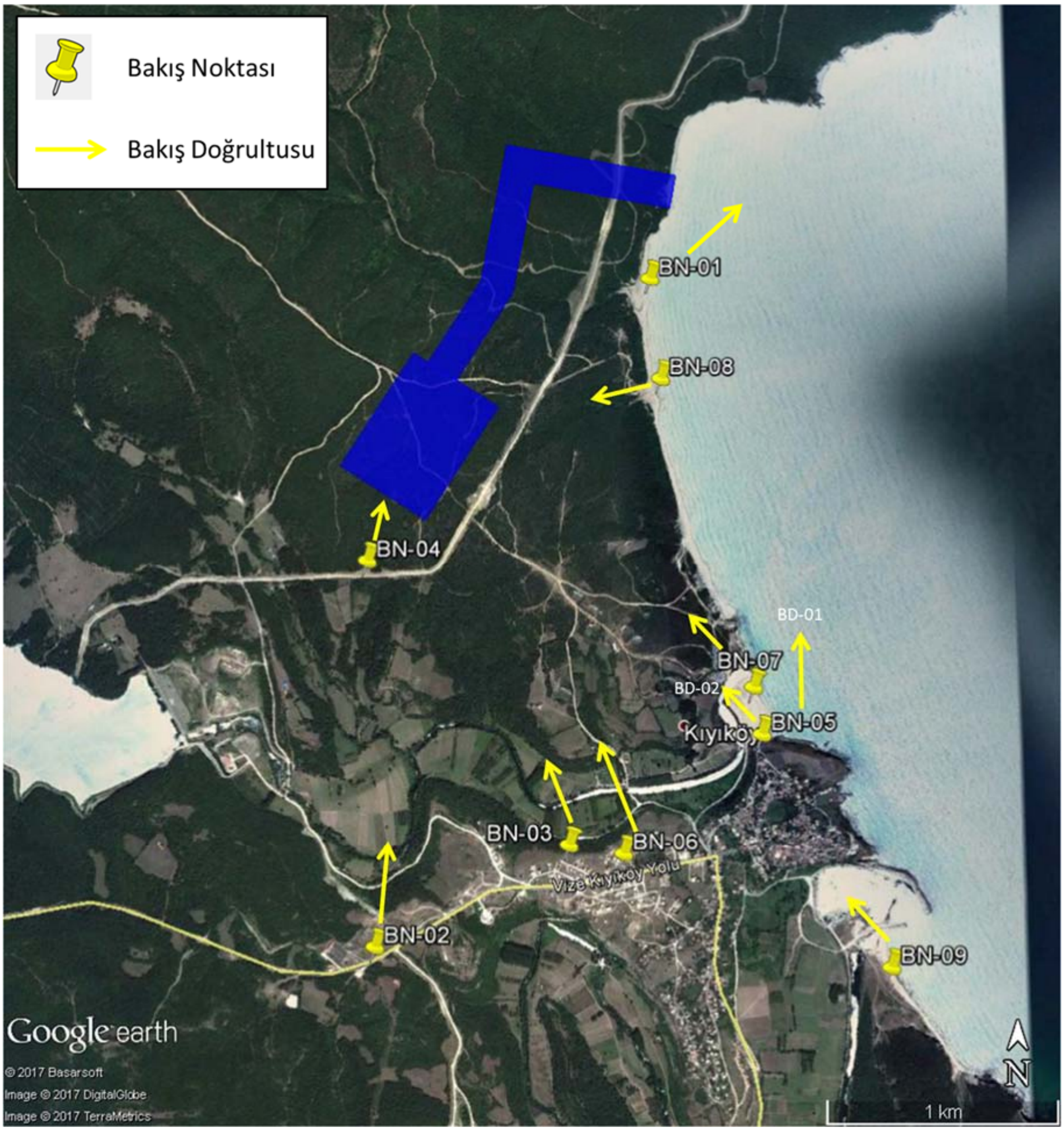


Figure 10.68: Points of Sight of Modeling / Imaging Work

Locations of Points of Sight (BN) in Figure 10. are as follows:

- **BN 01:** Selves Beach;
- **BN 02 and BN 03:** Main road from Vize to Kıyıköy;
- **BN 04:** İSKİ road;
- **BN 05 and BN 06:** North of Kıyıköy Town;
- **BN 07:** Municipal Beach;
- **BN 08:** Selves Beach; and
- **BN 09:** Port Beach.

Some temporary visual impacts may occur in the construction and operation phase because of the Project. It is expected that the most significant visual impacts will result from construction activities in the Shore Crossing Section in the Selves Beach (Figure 10.) and that theseimpacts will be temporary and for a short term as impacts are limited to duration of the construction. Construction activities in Shore Crossing Section are expected to be seen from Belediye Beach and Liman Beach.

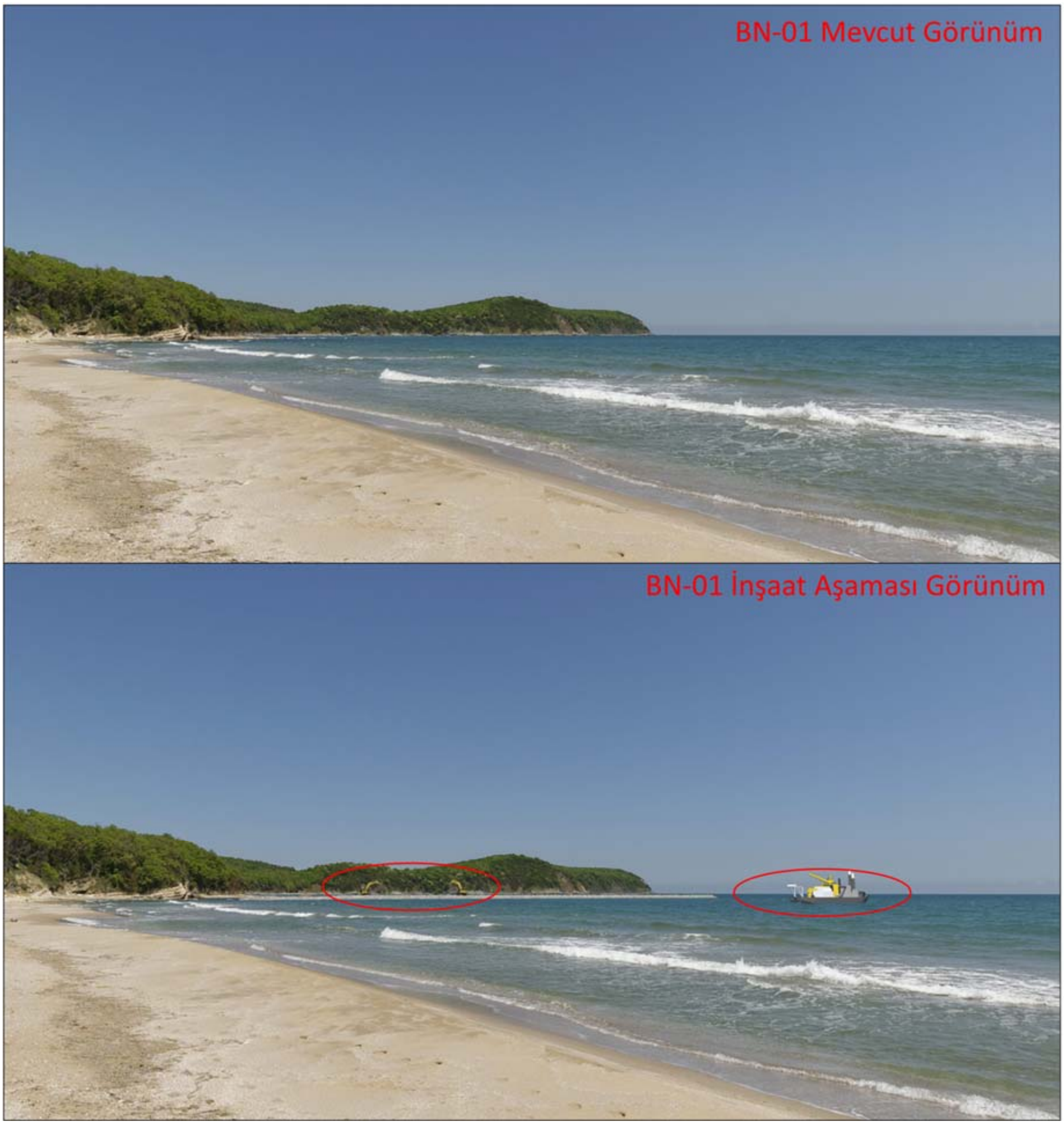


Figure 10.69: Point of Sight 01

Moreover, visitors coming to Selves Beach may be exposed to visual impacts related to onshore Project activities while they are travelling on İSKİ road used for access to Selves Beach or travelling to Kıyıköy on main road continuing from Vize (Figure 10.705170, Figure 10.71, and Figure 10.72).

Figure 10.7051: Point of Sight 02

Figure 10.71: Point of Sight 03

Şekil 10.52: Point of Sight 04

Construction activities of Shore Crossing Section in the north of Selves Beach won't be seen largely from the panoramic landscape in the highest point seeing Selves Beach and located in the north of the Kıyıköy town, except from several points located in the east part of Kale Neighborhood. Construction vessels will be seen from several high points located in the north of the town (**Error! Reference source not found.**73). However, these visual impacts will be temporary and for a short term as they are limited to Construction Phase.

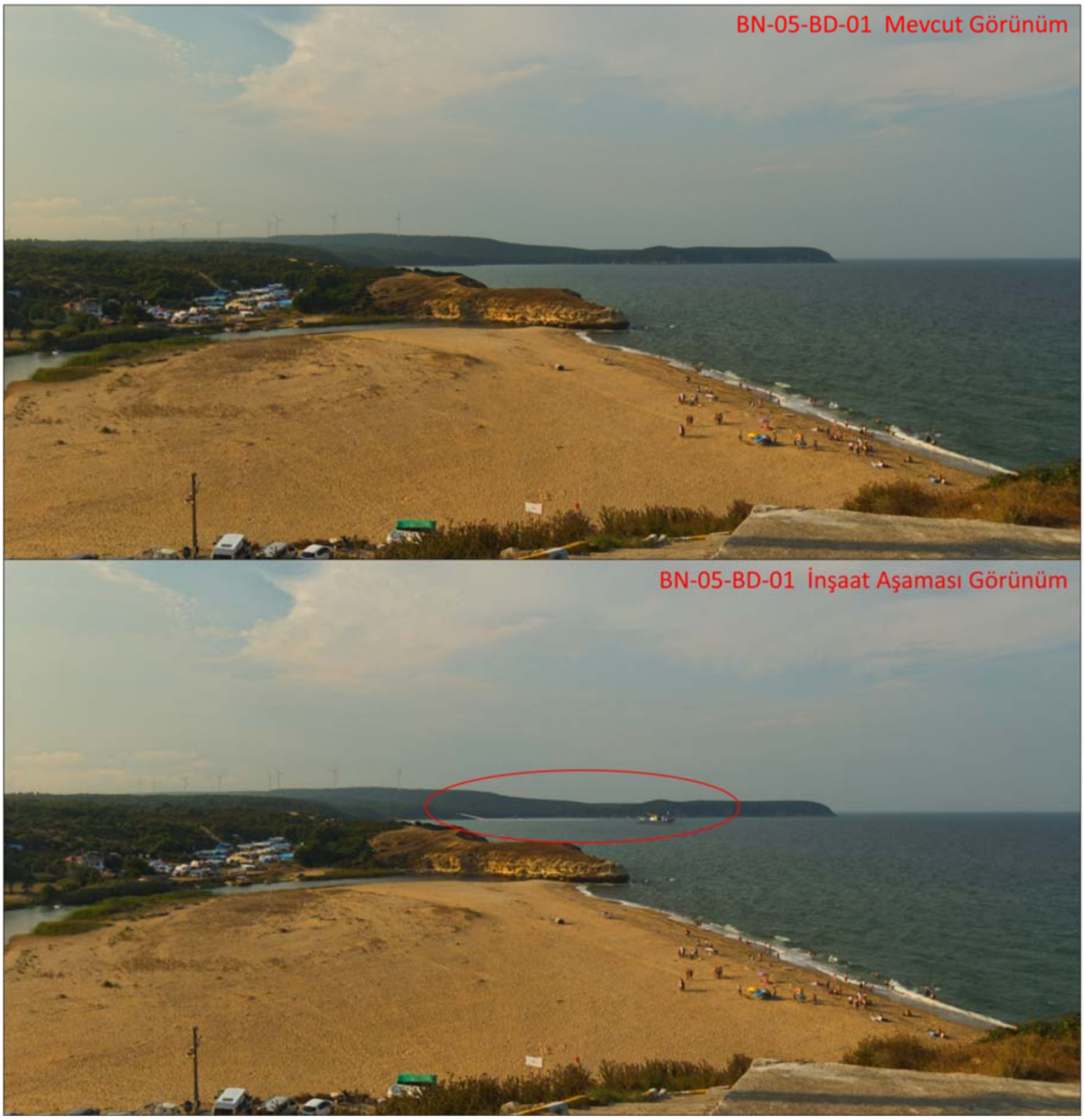


Figure 10.73: Point of Sight 05 Direction of Sight 01

“Points of Sight” that may include tourism businesses such as cafes, restaurants, accommodation service providers from where Receiving Terminal can be seen, are located in the north of the Kıyıköy Town Center (see Figure 10.74 and Figure 10.75).

Figure 10.74: Point of Sight 05 Direction of Sight 02

Figure 10.53: Point of Sight 06

Receiving Terminal will not have any visual impacts on beaches located in Kıyıköy (see Figure 10.76, Figure 10.765477 and Figure 10.7755) and there will not be any restrictions for beach usage in construction phase of the Project.

Figure 10.7654: Point of Sight 07

Figure 10.7755: Point of Sight 08

Figure 10.56: Point of Sight 09

Potential visual impacts specified in the assessments conducted under modeling / imaging work carried out in order to explain current visual impacts of the Project Site and evaluate the extent of the impacts of the Project on the visual pleasantness, will be minimized as much as possible with general measures laid down below:

- Green (plant) screening around Receiving Terminal;
- Carrying out of landscape arrangements of all permanent surface structures in accordance with drawing and specifications of the Project by taking into consideration the visual curtaining of the facilities;
- Curtaining of lights in Receiving Terminal by reflecting;
- Reinstatement of natural habitat and landscape after construction, where appropriate;
- Rehabilitation of Project pipeline easement band.

Moreover, issues on protection, assessment and management of landscape are addressed under “European Landscape Convention” of which Turkey is a party to by publishing it in its Official Gazette dated 27.07.2003 and no 25181. According to the convention; landscape harbors public interest in cultural, ecological, environmental and social fields and contributes to shaping of the local cultures and this is the most important part of the cultural and natural heritage, therefore issues on the protection and management of natural and cultural heritage are covered by being aware of the fact that it contributes to enhancing prosperity and country identity. In this framework provisions of relevant convention on land usage and necessary measures that are to be taken will be followed.

10.12 Lighting Impact

10.12.1 Offshore and Shore Crossing Section

Pipe-laying vessels and support vessels in the Offshore and Shore Crossing Sections will be viable with provisions of International Convention for the Safety of Life at Sea (SOLAS), International Regulations for Preventing Collisions at Sea (COLREG) and “Code of Safe Practice for the Carriage of Cargoes and Persons by Offshore Supply Vessels” and international technical practices.

Moreover, as required by Article 8 of Port Regulations on general principles, all vessels navigating in the administration site of port, located in landfall facility or anchored as well as those concerned with onshore facility and others concerned will follow the instructions of the port authority in order to ensure navigational, environmental, life and property safety and security. Furthermore, all vessels that will be used in the construction of the Project will be lightened in compliance with the maritime requirements in accordance with “Regulation for Preventing Collision at Sea” entered into force with decision no 7/14561 of Council of Ministers and also “International Code of Signals”.

An average of 3,5 km pipe laying activity will be carried out at normal marine and weather conditions, impacts of lights and signals of pipe-lay vessels and supply vessels, installed in order to ensure navigation, environment, life and property safety and security will be temporary as they are limited to duration of construction. Potential light impacts will be minimized by minimizing exterior lighting of vessels and reducing lighting density (except from navigational and safety lighting) (e.g. usage of timer where appropriate) during construction of pipelines in Offshore and Shore Crossing sections.

During operation phase of Offshore and Shore Crossing sections; control / maintenance of pipeline and vessel activities for emergencies can be carried out. Lighting impacts resulting from these activities are foreseen not to be more than the impacts of other ships and marine vessels.

Considering the fact that decommissioning will be carried out in 50 years, assuming that advanced techniques will be used at that time no information is given about lighting impacts in this phase.

10.12.2 Landfall Section

The entire construction site will be lightened for safety and security reasons except from the time periods where the construction is stopped in certain periods during the Construction Phase of Landfall Section. A Lighting system that will ensure the control and safety during operation phase of permanent components of the Project such as Receiving Terminal will be installed. Lighting during the operation phase will be maintained at a low level in order not to disturb people and other living creatures and unnecessary lighting will be avoided. The light impacts that may be caused by the lighting of the

Receiving Terminal will be minimized through impact mitigation measures such as curtaining of lights in the Receiving Terminal by reflecting as also stated above.

Bearing in mind that decommissioning will be carried out in 50 years, no information is given about lighting impacts in this phase, assuming that advanced techniques will be used at that time.

10.13 Odour

TurkStream Gas Pipeline System will be monitored with a leak detection system (a component of Pipeline Performance System) operating in the basis of real time flow, pressure and temperature tracking and detecting gas leaks automatically. These parameters are measured constantly and on a real-time basis by SCADA system. If the system detects a change in the parameters explained above, it will warn operators in Central Control Room (CCR) and Back Up Control Room (BUCR) automatically. However, the system may not initiate the automatic shutdown at this phase.

It may be necessary to shut pipelines down occasionally during the operation of the Project. Pipelines can be shut down in various ways. Detailed information about the shutdown of the pipelines is given in Chapter 1 (General Characteristics of the Project). Depending on the shutdown philosophy, ventilation will be carried out when gas emission is absolutely necessary.

Close located residential areas and relevant authorities will be notified during planned main air ventilation.

As no additives with scenting purposes will be added to the natural gas, a scent problem is not expected even in the probable malfunctions and emergencies and Regulation on Controlling Emissions Causing Odor will be implemented.

10.14 Land Rehabilitation Work

After pre-commissioning tests of pipelines in Shore Crossing and Landfall sections are completed, restoration work of the construction corridor will be initiated. All impacted areas across the construction corridor will be reinstated (to its original land form) to a reasonable extent. Stripped vegetation layer will be replaced into construction site. Topography of the land will be reinstated to its original form in the most appropriate way. Re-vegetation work will be carried out in order to ensure generation of vegetation by cleaning herbal soil layer from stones.

All temporary roads will be removed, if there is any damage in the forest roads used in order to accessthe Project Site during pre-construction and construction phases, it will be repaired. All temporary structures including foundation and tiling should be removable in order to reinstate all lands after the completion of the construction.

Stored herbal soil will be laid into the construction corridor. Herbal soil should be cleaned from stones and processed in order to regain the vegetation cover of the area. All impacted access roads will be reinstated at least to its form before the construction. Access roads and other areas will not be left in a condition worse than their former conditions before the construction.

Land drainage infrastructure tumbled / carried during the construction, access roads and other networks and facilities will be reinstated to at least its former condition. Access roads will not be left in a condition worse than their former condition before the construction. Special attention will be given to the reinstatement or replacement of the drainage infrastructure, access roads and other infrastructure and facilities that are damaged / replaced during the construction phase. Photographs will be taken before and after the work process in order to document any changes to be made where necessary.

Using topsoil layer (includes natural seed bank and natural soil materials) will support re-greening of natural vegetation cover and natural processes by using endemic species. Thus, structure of genetic biologic diversity and original plant association will be protected. The need to protectthe pipelinesfrom deep-rooted plant species will be taken into consideration.

After reinstatement work iscompleted, monitoring and necessary maintenance work will be carried out on the land until natural development cycles are re-established and environmental expert of the pipeline operator approves this.

Moreover, Contractor will be responsible for the preparation and implementation of an Erosion, Reinstatement and Landscape Plan to preserve bio-diversity. As a part of the document review process of the Project, Project Owners will examine plans of the contractors. Detailed information about Reinstatement and Landscape Plan is given in **Chapter12** (Environmental and Social Management System).

10.15 Risk Analysis(Precautions to be Taken Against Risk Situations in the Scope of Project Work and Processes Land Preparation, Construction, Operation and Post Operation)

10.15.1 Definition of Accidents Prior to Shore Crossings and Offshore Construction and Operation

There are events that may pose risks on environmental and socio-economic receivers in Construction and Operation phases of the Project. Main activities that may cause risks, definition of the events and receivers that may be affected are demonstrated in Table 10.62.

Table 10.62: Events that May Cause Risks (Construction and Pre-commissioning Phase)

No	Activity	Event	Receiver	
			Environmental	Socio-economic
1	Offshore construction activities and use of vessels related to these activities	Marine accidents and activities causing oil spill (including collisions and the ones during bunkering)	√	√
2	Shore Crossing construction activities and use of vessels related to these activities	Marine accidents and activities causing oil spill (including collisions and the ones during bunkering)	√	√
3	Vessel Traffic in Black Sea	Sinking of the ship above the pipeline and causing damage	√	√
4	Vessel Traffic in Black Sea	Objects (e.g. containers) falling from the vessels	√	√

Assome accidents are unlikely to cause significant impacts, they are excluded from the assessment addressed in this section. Excluded accidents are given below:

- **Pipeline repairing/rescue related to accidents:** There may be a need for pipeline rescue/repairing after the accident. It is deemed that these activities are similar to pipeline construction activities. In this situation, rescue activities will be carried out in accordance with Good International Industry Practice (GIIP) and significant environmental impact potential will be limited; and
- **Vessel collisions and generated oil spills after:** As there will be limited number of research / control vessels that are foreseen to be used in the Operation Phase and as the duration of usage will be short term, it is considered that collision and oil spill risks are very low and they are excluded from the assessment. Vessels that will be operated on behalf of the Project Owner will implement the Good International Industry Practice (GIIP) and significant environmental impact potential will be limited.
- **Grounding:** Grounding issue is not addressed for this area as Offshore pipe-lay activity will not be carried out in areas near the shores of Turkey. However, grounding is addressed in landfall section risk assessment; and
- **Spill and discharge of materials posing the risk of danger other than fuel / oil:** Relatively small amounts of potentially hazardous chemicals (spills from hydraulic power unit, grey / black wastewater, sewage, garbage, bilge water and oily wastewater discharges) generated from vessels can be easily managed by ensuring that they are operated in accordance with International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), and national regulations. All contractors and operators working on behalf of TurkStream Gas Pipeline are required to prepare Shipboard Marine Pollution Emergency Plan (SMPEP) appropriate for each vessel. Effective implementation of SMPEP will ensure that impacts of these kinds of events are limited enough not to be addressed in detail.

Events mentioned above will not create a direct environmental risk, environmental risks may be occur only due to leaks in the natural gas pipeline.

- **Sinking of the ship above the pipeline and damages:** The risk that grounding may damage the pipeline, may occur across the whole of pipeline route, but the risk occurs only when the vessel is big enough to damage the pipeline. Possibility of occurrence of this event is limited to the possibility of wrecking of a vessel navigating in Black Sea and sinking area of the vessel happens to be the pipeline, in other words the possibility is very low;
- **Objects (e.g. containers) falling from the vessels:** The risk of falling of objects may occur across the whole of pipeline route. A falling container on the pipeline may cause a dent in the unprotected steel pipeline. Possibility of occurrence of this event is limited to the possibility of a container falling from a vessel navigating in Black Sea and sinking area of the container happens to be the pipeline. This possibility is neglectable and low.

Potential of damaging of the pipeline due to the dangers resulting from the activities specified above is very low but the risk remains and this situation may result in gas leaks from the underwater pipeline. Engineering design standard and quality assurance during construction combined with high external pressure over the pipeline at 2,000 m water depth leads to a very low possibility of the occurrence of such an event in an offshore pipeline.

In the Shore Crossing Section; as exterior pressure over the pipeline is low, possibility of gas leak is relatively high. However, it is possible to respond in a short time in the Shore Crossing Section, it is foreseen that this risk is neglectable. A fire event may affect human receivers only if an ignition in the surface of the sea following pipeline malfunction and gas leak reaches to a passing vessel. The biggest possibility of occurrence of such an event is limited to a dent caused by an object such as a container or a vessel as explained above. It is neglectable as such an event hasn't occurred statistically in both offshore and shore crossing section. Potential impacts that may occur relating to environmental and receivers are given in sections below.

10.15.2 Oil Spill Risks, Results and Mitigation Measures

As specified in Table 10.61 above, some vessel accidents and collisions may result in oil spills that may cause impacts on both the environment and humans and other socioeconomic receivers. Therefore, mitigation measures that will be implemented in order to minimize the possibility of occurrence of an oil spill / leak and minimize the probable negative impacts on marine species and habitats that may be affected potentially, are given below:

- In compliance with the Law No. 5312 on Principles Concerning the Emergency Response in the Event of Pollution of Marine Environment with Petroleum and Other Hazardous Materials and Compensation of Damages, and as per the provision of regulations thereunder a Risk Analysis and Emergency Response Plan covering Offshore and Shore Crossing sections of the Project is prepared by an authorized body in the name of the Project Owner and the approval of the relevant authorities are obtained;
- Contractors will work in accordance with provisions of MARPOL 73/78 and prepare an Prevention of Oil Spill in Offshore and Emergency Response Plan including The Shipboard Oil Pollution Emergency Plan (SOPEP including an oil registry book) and Shipboard Marine Pollution Emergency Plan (SMPEP); and
- All vessel crew will have proper trainings, qualifications and documentations to carry out their tasks during pipeline construction.

Mitigation measures specified above minimize the possibility of occurrence of an oil spill / leak and reduce the probable negative impacts on marine habitat in the event of a spill / leak.

As a result of the assessment, it has been agreed that the Project does not have a significant risk of an oil spill / leak as there will not be any other source of a potential spill / leak event other than fuel tanks of vessels.

10.15.3 Vessel Collision Risk

Forvessel collision possibility; possibility of collision between a vessel of the pipe-lay fleet and a vessel belonging a third person during construction phase may be evaluated. Measures for preventing collision accidents will be implemented regularly. Additional measures foreseen are as follows:

- A mutualunderstanding will be set by meeting with relevant authorities in order to establish a navigational safety zone with a diameter of nearly 2 km (1.1 nautical mile) for a vessel with dynamic positioning and with a diameter of 1.5 km (0,8 nautical mile) for an anchored vessel to prevent delays and accidents that may occur in marine traffic;
- Vessel routes and operating hours of vessels will be determined in the construction and operation phases of the Project and will be notified to the relevant Harbor Master's Offices, Coast Guard Command and Directorate General of Coastal Safety; and

- Pipe-lay vessel will have proper marking and lighting. This vessel wil also broadcast suitable navigation information and information on the limitation of its maneuverability on AIS.

10.15.3.1 Vessel Accident Risks

Collision accidents including vessels that will be used during the construction Phase of the Project are as follows:

- Sinking;
- Grounding; and
- Fire and explosions.

Oil spill is not the inevitable result of the marine accidents which vessels of the Project are involved. Damages in the impacted vessel should be significant in order for the oil to spill. In most cases, rescue actions can be carried out in the damaged vessel and these actions may include extraction of fuel in order to prevent oil from spilling during the rescue activities.

It has been found out in the conducted literature research that there is no specific information about history of oil spills resulting from accidents that may occur during construction of offshore natural gas pipelines. Most of the information regarding oil spills is related to oil and gas exploration activities or oil tanker operations.

10.15.4 Landfall Section quantitative risk analysis

Final safety zones will be determined as a part of the Pre-Engineering and Design Studies according to Quantitative Risk Analysis for the Landfall Section and requirements of relevant legislationQuantitative Risk Analysiscovering safety zones has been prepared as a separate document by the Project Owner.

Two pipelines will be laid in parallel in a way that generally minimizes the onshore easement band. Width of “permanent pipeline easement band” to be established above onshore pipeline is determined as 31 m according to BOTAŞ Technical Safety and Environment Regulation. There will be 10 m distance between two pipelines.

In addition to “Permanent Easement Strip”, some safety zones will be established for protection of public health and infrastructure. These safety zones are defined in quantitative risk analysis and summarized in Figure10.79 below. Safety zones given below are proposed for the Project under the Quantitative Risk Analysis. Safety zones for pipelines will be measured starting from the center of the pipeline and safety zones for the Receiving Terminal will be measured starting from the edge of the Receiving Terminal.

Individual Risk (IR) criteria for local population have been accepted as follows;

For residential areas IR = $1X10^{-5}$ annually

For sensitive uses (schools, hospitals, areas for sports, etc.) IR = $1X10^{-6}$ annually

There are no restrictions for areas located 600 m away from Receiving Terminal or 400 m away from pipelines.

As a result of the Quantitative Risk Analysis, risk map (areas where possibility of loss of life is 10^{-5}/year and 10^{-6}/year) obtained for Receiving Terminal during the operation phase of the Landfall Section is given in Figure 10.79 below.

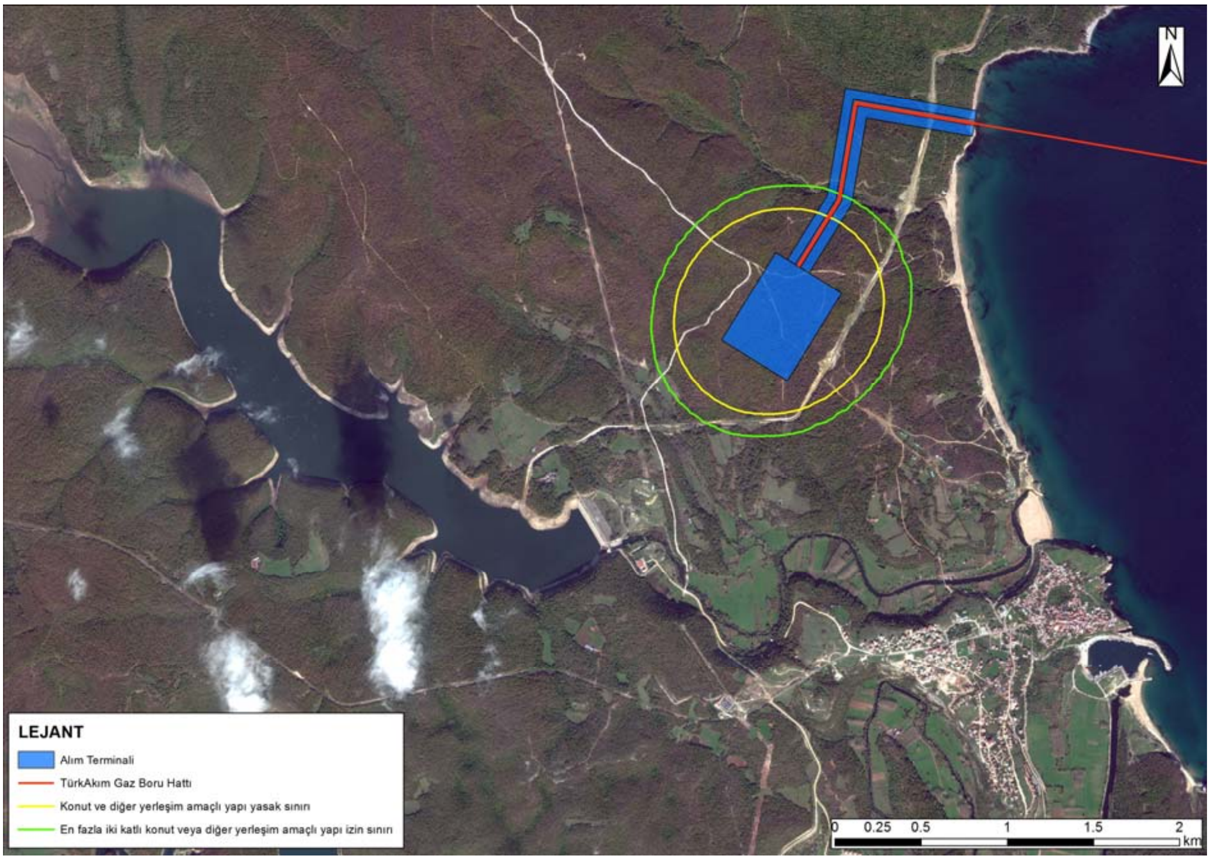


Figure 10.79: Quantitative Risk Analysis – Risk Map (areas where possibility of loss of life is 10^{-5}/year and 10^{-6}/year)

A 50-m fire safety line where trees are removed and a health protection strip are defined around the edge of the Receiving Terminal with respect to the letters of comment received from the relevant institutions.

Final width of easement band and Receiving Terminal safety zones will be determined in accordance with relevant legislation and opinions of the public institutions.

10.16 Other Matters

There are no other matters to be addressed in this section.

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11 CUMULATIVE IMPACT ASSESSMENT

The impacts of the Project need to be assessed together with the potential impacts that may stem from other current or future projects and activities located, planned and defined as reasonable in the same geographic area, in a way that may create more (or less) important impacts with the Project.

In this chapter, Cumulative Impact Assessment of the Project is presented and details regarding the methodology of Cumulative Impact Assessment implemented, the scope of Cumulative Impact Assessment and the impact assessment are given. In the assessment, the outcomes and findings of the plans, studies and assessments in force drafted by the relevant official bodies or other parties in direct relation with the Project and its impact area are also taken into consideration.

In the study for Cumulative Impact Assessment, “Important Environmental and Social Factors” concept deemed important in risk assessment and covering the environmental and social factors given below has been employed:

- Physical features;
- Environmental features;
- Ecosystem conditions (biodiversity);
- Social conditions (such as settlement, health care, economy); and
- Cultural features.

Cumulative Impact Assessment methodology has been designated considering a 5-phase process containing those below:

- **Scope Determination Phase:** In this phase, it is specified which important environmental and social factors should be included in the scope of Cumulative Impact Assessment by taking into consideration the social and environmental conditions predominant in the regions with a potential of being impacted by the Project and the features of the Project. Then, other projects or human activities with a potential of having cumulative impact on important environmental and social factors defined are identified.
- **Assessing Cumulative Impacts on Important Environmental and Social Factors:** An assessment (taking into consideration the expected Project impacts on important environmental and social factors) has been carried out, with the aim to determine the interaction force of other investment activities to result in cumulative impact (where the temporal and spatial impacts coincides)–together with the Project- that are planned for the same geographic area or defined as reasonable.
- **Assessing the Importance of Anticipated Cumulative Impacts:** Important cumulative impacts have been assessed as much as possible only when the impact magnitude is numerically definable through accessible documents. When the necessary information to define impact magnitude is missing, the magnitude is based on expert opinion and has qualitative characteristics.
- **Cumulative Impacts Management–Design and Implementation:** Necessary impact mitigation or impact management (or monitoring) activities (beyond those for impacts stemming from the Project which are addressed in this EIA Report) have been designated.

Temporal constraints of Cumulative Impact Assessment cover Construction, Pre-Commissioning and Operation Phases of the Project. In this Cumulative Impact Assessment, important environmental and social factors to be exposed to an impact in any level and stemming from the Project are addressed. Therefore, important environmental and social factors to be exposed to an impact with low importance level may be excluded from the scope of Cumulative Impact Assessment. In cases where the Project impact is defined as moderate or important, the relevant important environmental and social factors have been assessed within the framework of Cumulative Impact Assessment. Impacts that have been determined to have low impotence level have been analyzed with scrutiny in order to identify whether they have the potential to create cumulative impacts. Important environmental and social factors addressed with the scope of the assessment are as follow:

- Important Environmental and Social Factors (Offshore and Shore Crossing Section)
    - Air quality;
    - Underwater noise and vibration;
    - Waste generation/sea water quality;
    - Marine ecology;
    - Marine traffic; and
    - Socioeconomics.
- Important Environmental and Social Factors (Landfall Section)
    - Air quality;
    - Noise and vibration;
    - Visual and landscape elements;
    - Terrestrial ecology;
    - Soil, underground water and surface water quality;
    - Land traffic; and
    - Socioeconomics.

11.1 Interaction with other components of the Project

The Project will create a new route that will increase the long-term credibility of gas supply from Russia to Turkey and Southeast European Countries through Black Sea with two pipelines with a length of nearly 270 km and a diameter of 813 mm (32 inches) which will be laid side-by-side from the Kilometer Point 660 (KP660) near the Exclusive Economic Zone (EEZ) border between Turkey and Bulgaria to the Receiving Terminal to be built in Kıyıköy town in Vize district of Kırklareli province in Turkey’s mainland.

The Project calendar of the Project components (Offshore, Shore Crossing and Landfall Sections) whose definitions are given in **Chapter 1** (General Features of the Project) is given in Table 11.1 below.

Table 11.1: Project Calendar

Sections	Activities	2017				2018				2019			
		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Offshore Section	Pipe-laying cable crossings				■								
	Pipeline route preliminary survey (14 days before pipe-laying)					■							
	Pipe-laying–from KP 660 in EEZ of Turkey to 30 meters deep					■	■		■				
	Welding at surface connection point at 30 meters depth										■		
	Post-laying interventions to seabed (including surveys)									■	■		
Shore Crossing Section	Access Roads			■	■								
	Site preparation for shore crossing						■						
	Construction of causeways/rock seawalls							■	■				
	Dredging for open cut (from shoreline to nearly 2 km offshore)								■	■			
	Pull-in of pipes and pipe-laying to a depth of 30 min shallow waters (nearly 5 days for each pipeline)									■			
	Reinstatement of Shore Crossing site, backfilling of trenches										■	■	
Landfall Section	Landfall Section pipelines – site construction, office and equipment placement					■	■						
	Landfall Section pipeline construction							■	■	■			
	Receiving Terminal - construction of sites, office and equipment placement						■						
	Early construction works, site preparation and leveling for Receiving Terminal installment					■	■	■	■				
	Receiving Terminal Construction							■	■	■	■	■	■
	Site arrangement and placement of pipeline markers											■	■
	Shore Crossing and Landfall Section Pre-Commissioning Phase										■		
	Receiving Terminal Pre-Commissioning Phase											■	■
	TurkStream Gas Pipeline System–Pre-Commissioning Phase											■	■
	TurkStream Gas Pipeline System –Commissioning Phase												■
	TurkStream Gas Pipeline System –Operation Phase												■

11.2 Interactions with Current or Other Planned Pipelines

11.2.1 BOTAŞ Gas Pipeline Section

TurkStream Gas Pipeline starts from the Russkaya Compressor Station in Anapa shores in Russian Federation and is linked to BOTAŞ Section at the exit of the Receiving Terminal planned to be constructed in Landfall Section which will be located in Kıyıköy town in Vize district of Kırklareli province in Turkish shores. Detailed information regarding 5 separate sections covering BOTAŞ Section of TurkStream Gas Pipeline System is presented in **Chapter 1** (General Features of the Project) and BOTAŞ Section is defined as follow:

"Onshore Section 1" refers to the section starting from the exit of the Receiving Terminal of Offshore Section 1 and reaching to where it will be linked with the current gas transfer system of the Republic of Turkey across the territory of the Republic of Turkey. This section is under BOTAŞ's responsibility and is out of the scope of the Project addressed in this EIA Report, and it will be referred to as "**BOTAŞ Section**" in this EIA Report.

BOTAŞ Section, which is a section of TurkStream Gas Pipeline and will be evaluated as a different pipeline project out of the scope the Project addressed in this EIA Report, is likely to create environmental and social cumulative impacts together with the Project.

At the writing date of this EIA Report, there is no detailed information available about BOTAŞ Section. According to the information obtained from the meetings held with BOTAŞ officials, it is foreseen that the construction phase of BOTAŞ Section will start at the 2nd Quarter of 2018 and commissioning phase will be commenced at the 4th Quarter of 2019. According to the construction schedule of the Offshore Section addressed in this EIA Report, as can also be seen in Table 11.1 above, it is foreseen that the construction of Landfall Section of the Project will start at the 1st Quarter of 2018 and be completed at the 4th Quarter of 2019. As construction schedules of these two projects will overlap in this case, it is expected that cumulative impacts will occur during the construction phase. The most important ones of these cumulative impacts can be listed as follows: increase in road traffic because of construction traffic, noise, dust emissions and ecological impacts resulting from logging.

According to the information received from BOTAŞ officials, BOTAŞ plans to use the current roads and pipeline easement lane during the construction phase. The main measurement station will be established as close as possible to the Receiving Terminal and in the most eligible part of the site. According to the information obtained in preliminary examination made by BOTAŞ for the first 10 km of BOTAŞ pipeline and conveyed to us, environmental impacts are as follows;

- Domestic wastewater generation(as a result of water demand of workers and infrastructure water requirements);
- Wastewater resulting from hydro test;
- Dust emission resulting from excavation works;
- Construction debris (waste remaining from pipes and other materials);
- Waste generation such as domestic solid waste, medical waste, hazardous wastes;
- Noise resulting from construction equipment; and
- Socioeconomic impacts: in the event that the workforce is from local people, employment creation and positive effects on the country's economy.

However, along with the impacts listed above, impacts such as cultural heritage and traffic are also expected. Information that BOTAŞ's works about this issue continue was received from BOTAŞ officials.

As it is inevitable that construction schedules of these two projects which are two separate components of TurkStream Gas Pipeline will overlap, it will be needed -with the aim of preventing or mitigating possible cumulative impacts- to build a coordination plan with BOTAŞ officials by working in coordination with BOTAŞ and getting detailed information about the activities that will be carried out under BOTAŞ Section.

The work plan to be developed should be carried out, agreeing with BOTAŞ, in a way that also includes an evaluation of cumulative impacts to be created by the two projects together based on their priority and an evaluation of cumulative impact mitigating methods through the negotiations to be conducted with stakeholders, especially with local people. In the letter of BOTAŞ dated 08.09.2017 it is laid down that letter dated 10.07.2015 is in force and there is no inconvenience regarding Project implementation.

11.2.2 ISKI (İstanbul Water and Sewerage Administration) Canal, Water Pipeline and Water Conservation Area

Pabuçdere Dam and Kazandere Dam whose relative locations to the Landfall Section are given in Figure 11.1 were built by ISKI to meet the drinking water demand of İstanbul. Also, there is a water pipeline, which belongs to ISKI, in the east of Pabuçdere Dam and Kazandere Dam and the relative location of this water pipeline to the Landfall Section is presented in Figure 11.1.

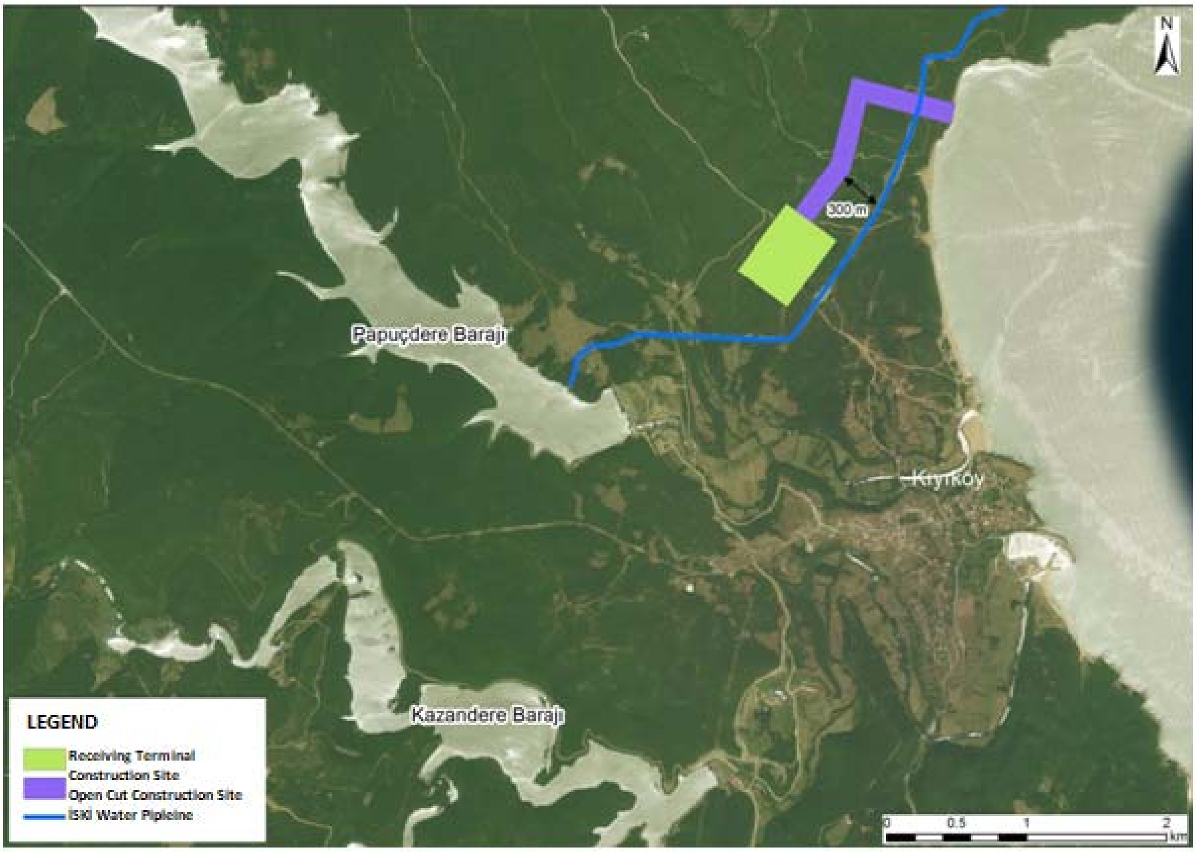

Figure 11.1: Relative location of Pabuçdere Dam, Kazandere Dams and ISKI Water Pipeline to the Landfall Section of the Project

Detailed information regarding Pabuçdere Dam and Kazandere Dam is presented in Table 11.2.

Table 11.2: Information Regarding the Dams in the Project Site

Dam	Type	Commissioning Year	Lake Volume (Million m^3)	Annual Drinking Water (hm^3)	Basin Area (km^2)	Capacity (Million m3/year)
Kazandere	Zoned Earthfill	1997	17.60	19.4	313	100
Papuçdere	Zoned Rockfill	2000	62	11.5	178.5	60

According to the Water Pollution Control Regulation and ISKI Regulation on the Drinking Water Basins (2011), basin conservation border distances of dams are as follow:

- 0 – 300 m: Strict conservation area;
- 300 – 1.000 m: Short-distance conservation area;
- 1.000 – 2.000 m: Medium-distance conservation area; and
- 2.000 m – Catchment basin border: Long-distance conservation area.

According to 1/100.000 scaled Thrace Sub-Region Environmental Plan, the Landfall Section of the Project is out of the borders of Pabuçdere and Kazandere reservoirs providing drinking water for İstanbul and the borders of basin conservation. Project site is 1.2 km away from Pabuçdere Dam Drinking and Tap Water Short-Distance Conservation Area Border (Figure 11.2).

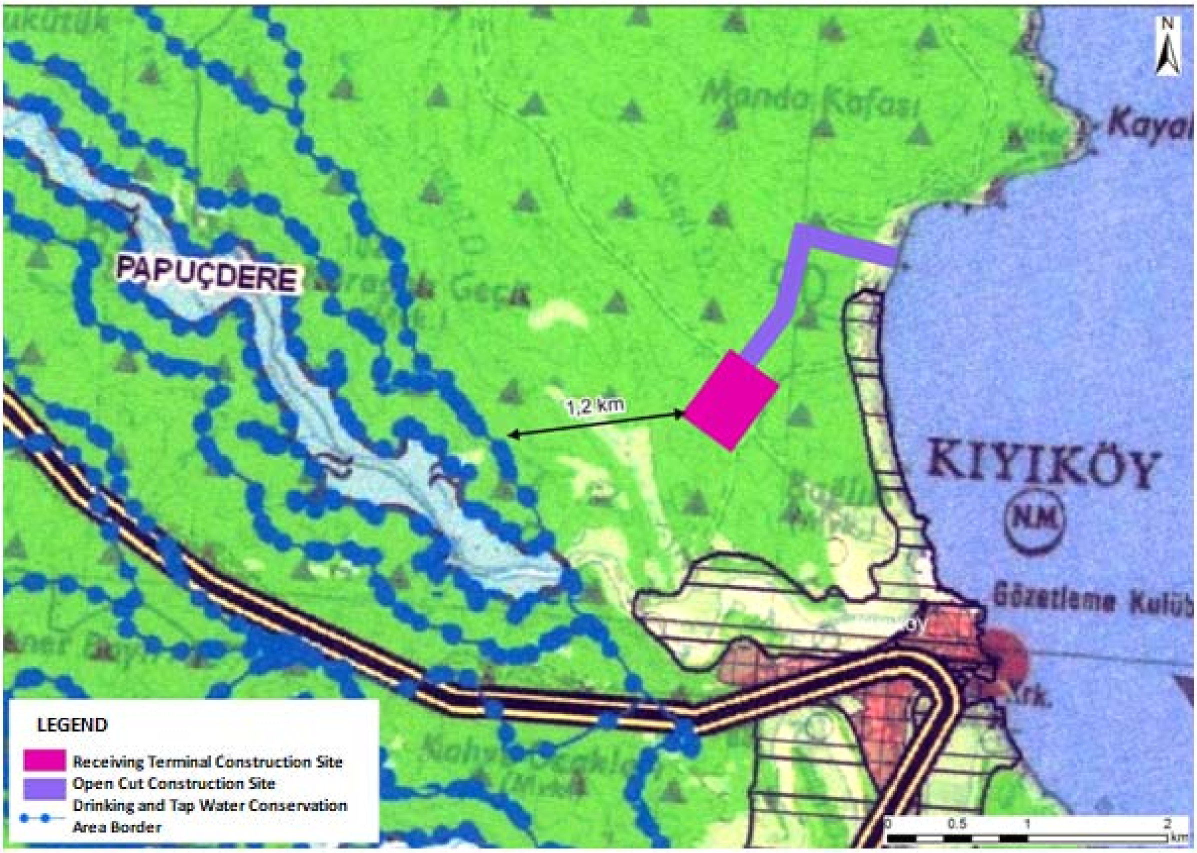

Figure 11.2: Distance between Pabuçdere Dam Drinking and Tap Water Conservation Area Borders and Landfall Section of the Project

In addition to Pabuçdere and Kazandere Dams in service in the region, Kömürköy and Kızılağaç Dams are in project phase.

Another project that is planned near the Onshore Section is İğneada Dam of ISKI. İğneada Dam is planned to be constructed over Bulanıkdere located in the north of Pabuçedere Dam in service. Water conserved in İğneada Dam is planned to be transferred to Pabuçdere Dam through the transmission line.

Cumulative impacts that may result from the Project, activities and planned projects of ISKI are foreseen as follows:

- Air quality/climate changes;
- Noise and vibration;
- Terrestrial ecology;
- Visual and landscape impacts;
- Cultural heritage and archeology; and
- Socioeconomics.

The scale of impacts depends on the size of the planned dam, the activities to be carried out and the work program. A cooperation with ISKI will be assured in order to prevent or mitigate possible cumulative impacts.

Negotiations has been started with İSKİ and current road and pipeline routes to be provided by İSKİ and road expansion and use plans according to pipe features will be prepared and shared with İSKİ in order to protect İSKİ pipelines with traverses. Detailed crossing designs will be prepared with the help of data provided by İSKİ regarding traverses and submitted for approval of İSKİ. Draft of the protocol to be signed with İSKİ is given in **ANNEX-5.A**.

11.3 Transboundary Impact Assessment

Transboundary impacts may be considered as impacts having a potential to occur outside of the impact area of the Project. As the Project covers the section from Kilometer Point 660 (KP660) in the border of Turkey-Bulgaria Exclusive Economic Zone (EEZ) to the exit section of the Receiving Terminal to be constructed in Kıyıköy town in Vize district of Kırklareli province in Turkey's mainland, the Project's offshore activities have a potential to effect the EEZ of Bulgaria in addition to the EEZ of Turkey.

The relative location of the Project to Turkey-Bulgaria EEZ border and Bulgaria shoreline is presented in Figure 11.3.

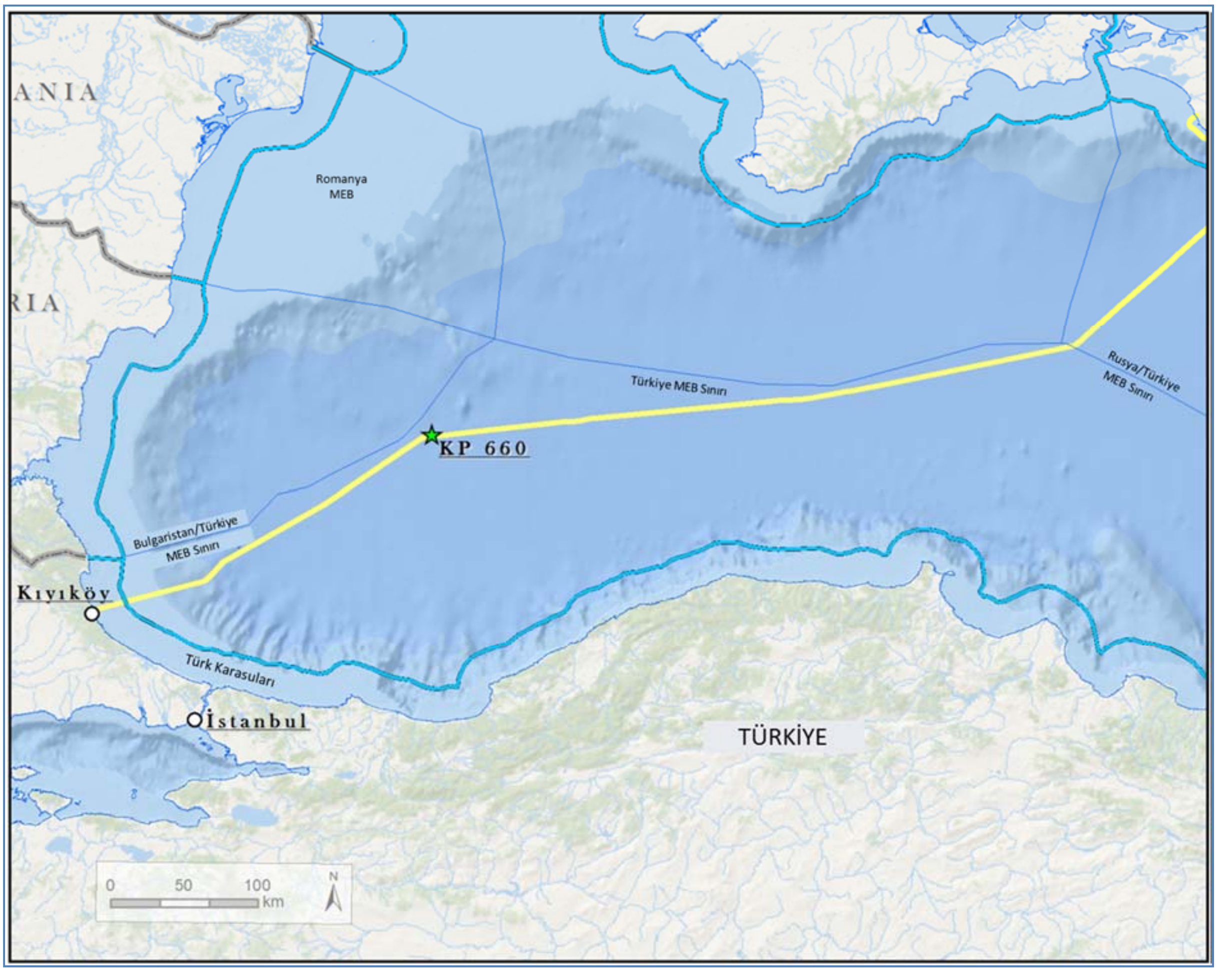

Figure 11.3: Relative location of the Project to Turkey-Bulgaria EEZ Border

Potential transboundary impacts that may result from the Project are as follows:

- Impacts resulting from underwater noise;
- Impacts on air quality;
- Impacts resulting from waste generation;
- Impacts that may result from increased marine traffic; and
- Impacts resulting from contingencies and emergencies.

In the event that negative transboundary impacts occur in the construction and operation phases of the Project, compensation for damages will be provided by the Project Owner, by ensuring coordination with the relevant institutions and organizations. Furthermore, the Project Owner makes a commitment to provide financial liability guarantees laid down in national and international legislation.

11.3.1 Underwater Noise

Noise and underwater noise resulting from construction activities that will be carried out both in Turkey's mainland and in Black Sea under the Project are expected to occur.

It is possible that the Project activities such as pipe-laying and vessel movements in Offshore and Shore Crossing sections increase the underwater noise levels and the noise levels associated with such activities have an impact on biological receptors in marine ecology. However, these impacts will be short-termed as they are limited to Construction Phase of the Project. Moreover, it is unlikely that underwater noise impacts resulting from construction activities of the Project won't have permanent impacts on biological receivers when current marine traffic of Black Sea is taken into account.

As the planned activities regarding the operation of the Project are limited to periodic and routine inspection and maintenance activities involving few vessels, transboundary impacts resulting from underwater noise are not expected in the operation phase of the Project.

11.3.2 Air Quality

Air emissions, by nature, have the potential to cross national borders by circulating in the atmosphere. There will be air emissions resulting from the activities that will be carried out in the construction phase of the Project. However, according to air quality modeling studies, these emissions are not expected to cause any transboundary impact.

As the planned activities regarding the operation of the Project are limited to periodic and routine inspection and maintenance activities, transboundary impacts resulting from air emissions are not expected in the operation phase of the Project.

All vessels in EEZ of Turkey will use fuel that is in conformity with fuel specifications laid down in MARPOL 73/78 Attachment VI and vessels in territorial waters of Turkey will use fuel in conformity with the relevant Turkish Legislation and necessary measurements and maintenance of the equipment on land will be carried out under the relevant legislation, in order to avoid or minimize the transboundary impacts resulting from air emissions.

Detailed information regarding the air quality assessment under the Project is given in **Chapter 10.5** (Air Quality Assessment).

11.3.3 Waste Generation

Under the construction activities in Offshore and Shore Crossing Sections of the Project, it will be ensured that the vessel-based wastes are reused/recycled/disposed in conformity with Turkish Legislation in territorial waters of Turkey and MARPOL 73/78 in EEZ of Turkey. In every event where management of vessel-based wastes is appropriate, it will be ensured that wastes are sent to waste receiving facilities located in ports, licensed by Ministry of Environment and Urbanization.

As it will be ensured that the wastes generated during the construction activities in the Landfall Section of the Project are reused/recycled/disposed within the framework of national legislation, no transboundary impacts are expected.

As the planned activities regarding the operation of the Project are limited to periodic and routine inspection and maintenance activities involving few vessels and land equipment, transboundary impacts resulting from waste generation are not expected in the operation phase of the Project.

Detailed information regarding the waste management of the Project is given in **Chapter 10.7** (Waste Generation and Waste Management).

11.3.4 Marine Traffic

Black Sea is an important transport route for its surrounding countries. It is possible that the vessel movements during pipe-laying activities in the Offshore and Onshore Sections and the routes of other vessels overlap. With the aim to prevent possible delays and accidents in marine traffic, a navigational safety zone will be established with a radius of around 2 km (1.1 nautical mile) for a vessel with dynamic positioning and with a radius of 1.5 km (0.8 nautical mile) for an anchored pipe-laying vessel. Navigational routes of Black Sea and junction points of these routes with pipeline of the Project are given in **Error! Reference source not found.** (Ref. 11.2).

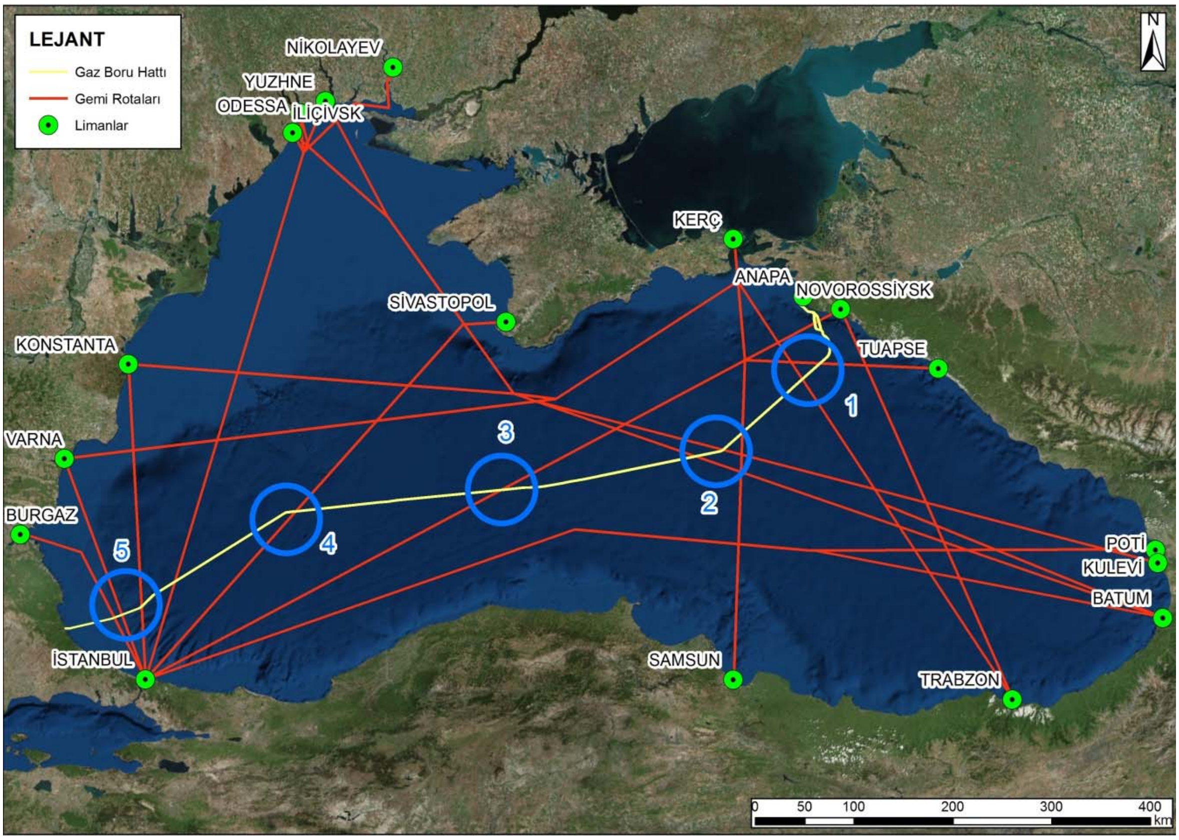

Figure 11.4: Harbour Master's Offices and Fishing Ports Located in Close Vicinity of Landfall Section of the Project

Notification on the location of pipe-laying activities and the zones temporarily closed to the vessels en route will be made by official maritime bodies.

Navigational safety zone won't limit the transportation between boats/vessels and piers or ports. Boats/vessels will be provided with access for their ports. During construction, the exact location of the vessels will be notified to competent authorities in accordance with Turkish legislation.

Furthermore, as laid down in the letter (**Annex-5.A**) of Directorate General of Shipyards and Coastal Structures of the Ministry of Transport, Maritime and Communications, dated 03.07.2017, although there aren't any important coastal structures near the site where the facility will be built, markings which should be visible day and night will be placed from seaside till the area which will be crossed by the pipes in a way that emphasizes the importance of and draws attention.

Furthermore, vessel routes and operating hours of vessels as to be determined in the construction and operation phases of the Project will be notified to the relevant Harbour Master's Offices, Office of Navigation, Hydrography and Oceanography and Coast Guard Commands and instructions of relevant official bodies will be followed.

11.3.5 Contingencies and Emergencies

Under the Project, transboundary impacts resulting from possible contingencies and emergencies are not expected during the construction phase of the Landfall Section. However, in the event that contingencies and emergencies take place in the Offshore and Shore Crossing sections, it is possible that some potential transboundary impacts take place as a consequence of proximity of the Project to the Turkey - Bulgaria EEZ border.

Occurrence of transboundary impacts resulting from contingencies and emergencies that may take place during the construction of the Offshore and Shore Crossing sections of the Project is mainly related to the scale and location of the incident. Possible cumulative impacts in the Offshore and Shore Crossing sections may take place as a consequence of contingencies such as oil leaks/spills. Design controls that are going to limit or minimize the potential impacts stemming from any contingency and emergency under the Project has been determined. Furthermore, incidents/emergencies will be included in the Management Plans (**Chapter 12:** Environmental and Social Management System) to be drafted in order to prevent or minimize the impacts that may stem from contingencies and emergencies.

As the planned activities regarding the operation of the Project will be limited to periodic and routine inspection and maintenance activities involving the use of few vessels and land equipment, transboundary impacts resulting from oil leak/spill are not expected in the Offshore and Shore Crossing sections in the operation phase of the Project. In the event that the pipeline is damaged in the operation phase, there will be natural gas loss in the pipeline. In the Offshore Section, natural gas leaking from the damaged pipeline will rise as a gas plume composed of natural gas bubbles inside the water column. When the natural gas reaches the sea surface, it will mix up with the air. No acute environmental damage is expected due to the natural gas mixing up with the air. Also, as local emergency shutdown and security systems will be established in the Receiving Terminal, it will be ensured that the pipelines are isolated by triggering Emergency Shutdown System in the event of a contingency. Gas in the pipelines will be automatically isolated from the Receiving Terminal by shutting off the entry and exit emergency shutdown valves in the onshore facilities and thus there will be a constant gas stock in the offshore pipelines. Detailed information on emergency shutdown is given in **Chapter 1.13** (Scope of the Project Process).

In the Landfall Section of the Project, the possibility of contingencies is considered to be low as the pipeline to be laid in surface using open-cut and the Receiving Terminal are equipped with high security measures (such as emergency warning systems, emergency automatic gas shutdown systems). Therefore, occurrence of any transboundary impact doesn’t seem possible. The Project Owner had a Numerical Risk Analysis done on the operation safety zones in the Landfall Section of the Project. The results of the Risk Analysis are given in **Chapter 1.10** (Operation Safety Zones)in detail. According to the Risk Analysis results, transboundary impacts are not expected.

11.4 Cumulative Impact Assessment Results

Cumulative impacts can be defined as the impacts resulting from the increasing changes that may be caused by current and foreseeable other projects and activities together with the Project. Cumulative impacts may occur as a result of the mutual interaction between the remaining impacts (after risk mitigation measures) and the impacts resulting from other activities and projects in the region.

Generally, an attempt will be made in order to act in coordination with the relevant institutions and organizations with the aim of eliminating or minimizing possible cumulative impacts. By doing so, cumulative impact risk will be minimized by developing work plans that will be carried out together with other project owners by getting information about activities to be carried out.

Other known projects and Project interactions in the region are given below.

11.4.1 Interaction with Other Projects

Described third party activities are not expected to have dangerous impacts on safety, environment and economy. Activities listed below are expected to have limited interaction with the pipeline:

- Cable crossings: Properly designed cable crossing methods will result in not placing pipelines above cable and not damaging cables.
- Military zones in Offshore Section: There are a training site and sector of fire in the routes of pipeline. This site won't cause any need of change in the route of the pipeline providing that the parties are in contact.
- Explosive ordnance dumping area (UXO): These areas are avoided in the foreseen route of the pipeline.
- Petroleum and gas exploration activities: Foreseen pipeline route passes through exploration block where exploration drillings of TPAO are carried out. It is foreseen that this situation won't cause any risk as communication with TPAO will continue.
- Cultural heritage objects: Any cultural heritage objects should be avoided at least 150 m.

Third party activities that may cause dangerous impact on security, environment and economy are specified below:

- Shipping activities: Main roads used by vessels in Black Sea and areas where fishing activities in shallow waters are carried out are in the direction of the pipeline route (Section 11.3.4). Wrecked ships, objects fallen into the sea and anchors may damage pipelines. As a result of the risk assessment carried out under the Project, it has been agreed upon that security risks that may arise from interaction between offshore pipelines and marine activities are reasonably applicable (ALARP).
- Fishing activities: Although fishing using bottom thrawling is banned in Black Sea, former studies has shown that bottom thrawling has been used during fishing. In the fishing risk assessment carried out under the Project, it has been concluded that impact load of the thrawl doors ensuring horizontal width of the thrawl nets won't damage the pipelines.
- Landfall Section: Cooperation between the Project Owner, owners of the lands surrounding Project Site and owners of the onshore water pipelines for a problem-free survey and construction.

11.4.1.1 Wind Power Plants

In the region where the Receiving Terminal of the Project is situated, Kıyıköy Wind Power Plant belonging to Borusan EnBW Enerji Yatırımları ve Üretim A.Ş (Borusan) is located. Receiving Terminal is located on the causeway of Kıyıköy Wind Power Plant Project. Kıyıköy Wind Power Plant has 23 MW installed power and there are 14 wind turbines in the plant area. The coordinates of the mentioned wind turbines are given in Table 11.3.

Table 11.3: Coordinates of Wind Turbines of Kıyıköy Wind Power Plant

Turbine No.	X	Y	Turbine No.	X	Y
T1	586024.00	4614981.00	T8	588604.00	4614502.00

Turbine No.	X	Y	Turbine No.	X	Y
T2	586329.00	4614939.00	T9	588872.00	4614359.00
T3	586607.00	4614820.00	T10	589143.00	4614214.00
T4	586848.00	4614631.00	T11	589477.00	4614078.00
T5	587319.00	4614461.00	T12	589685.00	4613699.00
T6	587728.00	4614468.00	T13	589975.00	4613608.00
T7	588378.00	4614719.00	T14	590275.00	4613545.00

The relative location of the Licensed Area of Kıyıköy Wind Power Plant and the wind turbines in this area to the Landfall Section of the Project addressed in this EIA report is given in

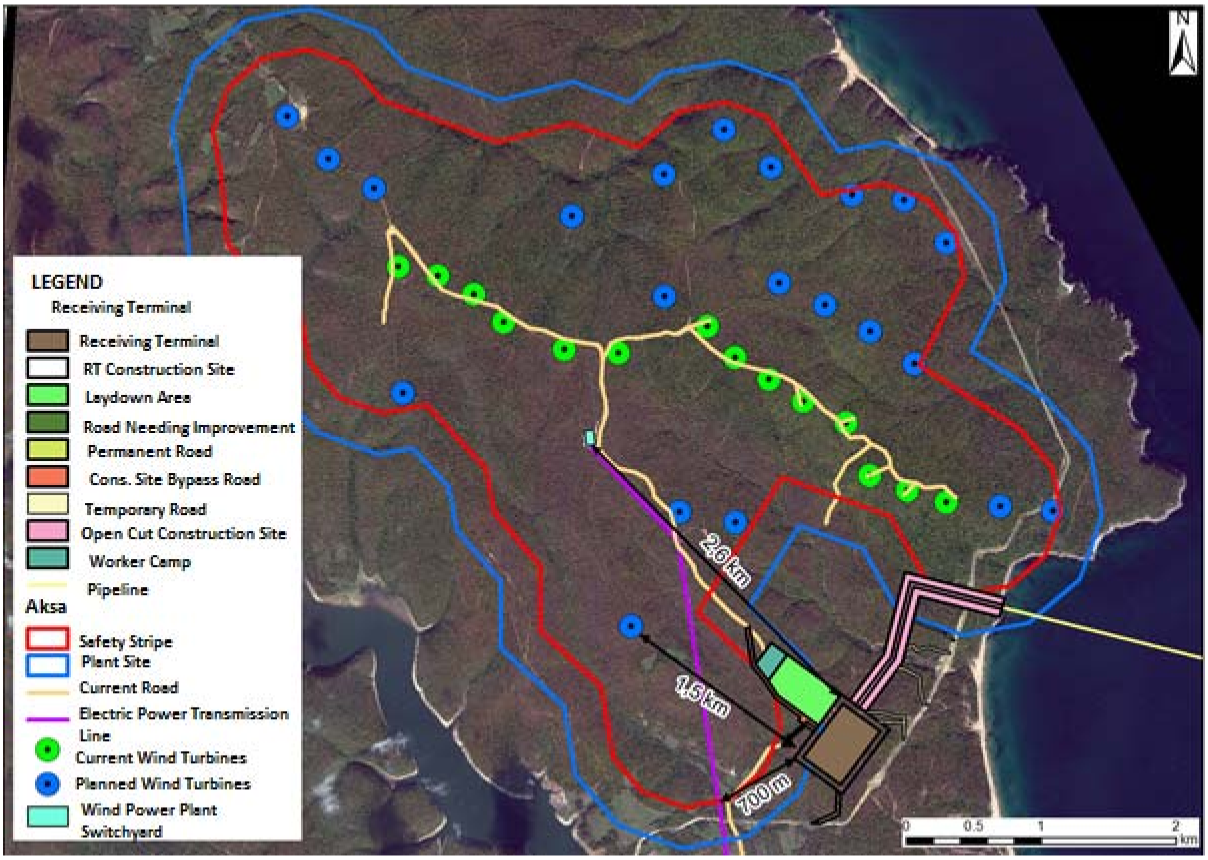

Figure 11 As seen in

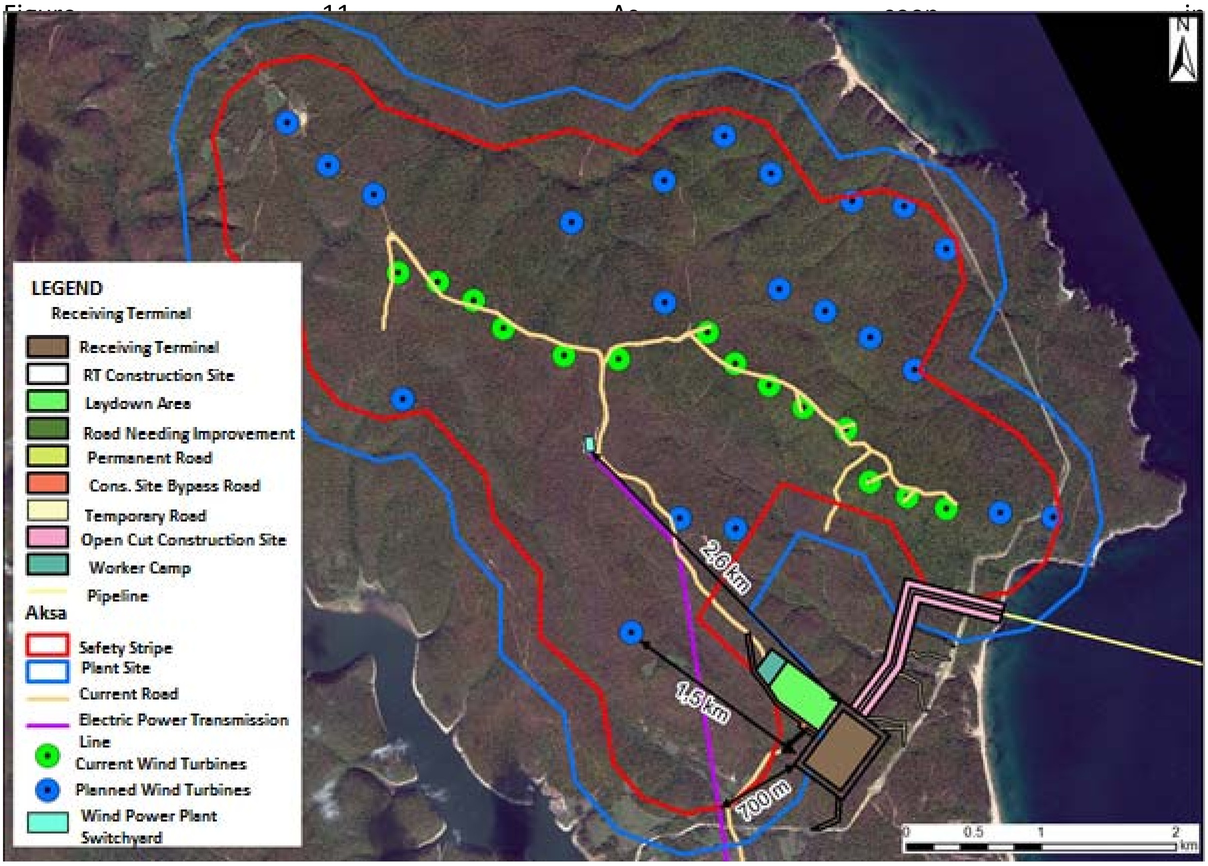

Figure 11., 21 wind turbines are planned to be installed in addition to the current 14 wind turbines in the Licensed Area of Kıyıköy Wind Power Plant. Thus, electricity power will be produced by increasing total installed power from 28 MWm/27MWe to 100Mm/100MWe. Power that will be produced by a total of 35 wind turbines (including additional 21 wind turbines under the planned “Kıyıköy Wind Power Plant Capacity Building Project) will be transmitted to national grid from switchyard.

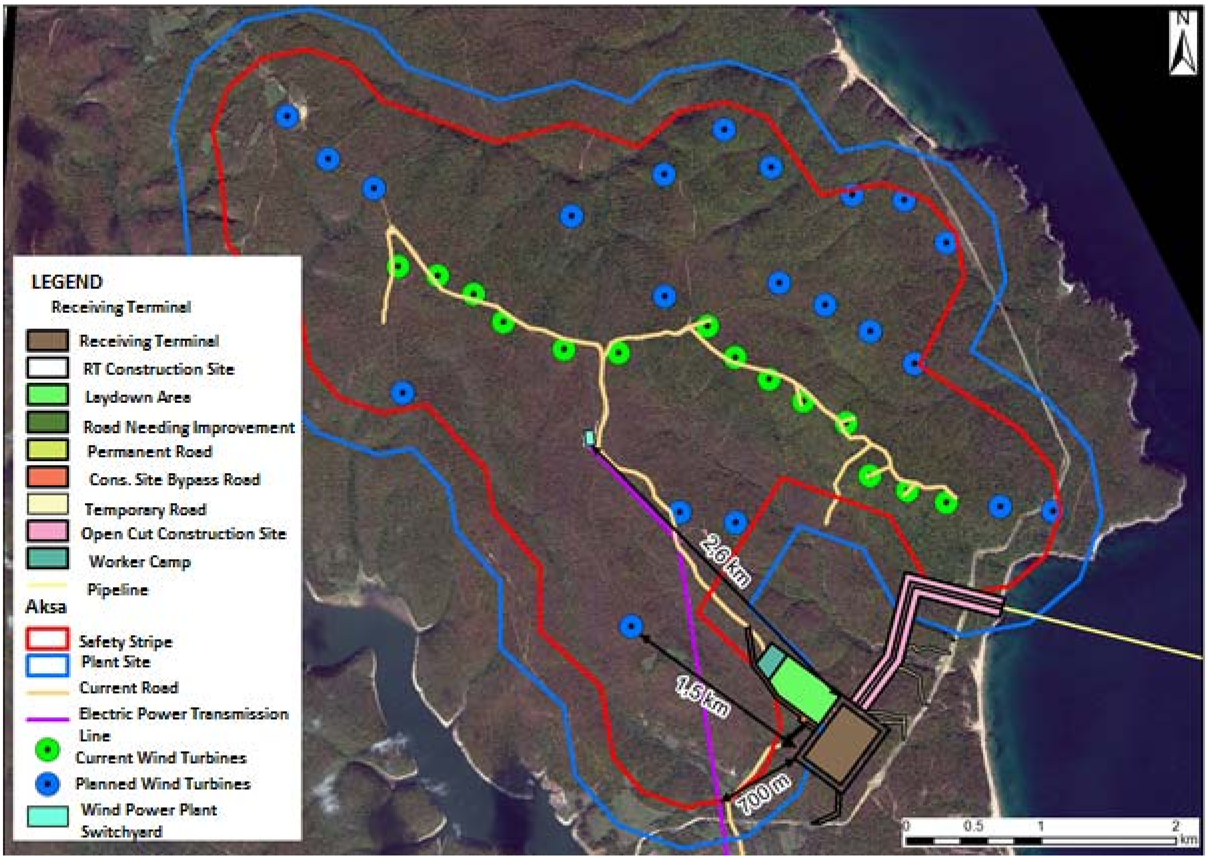

Figure 11.5: Relative Location of the Licensed Area of Kıyıköy Wind Power Plant and Wind Turbines to the Landfall Section of the Project

An Environmental Impact Assessment (EIA) Report was prepared by En-Çev Enerji Çevre Yatırımları ve Danışmanlığı Haritacılık İmar İnşaat A.Ş. on June 2017 for the said "Kıyıköy Wind Power Plant Capacity Building Project" (Ref. 11.3).

According to the information obtained from said EIA Report; it is planned that construction works and preparation period will last for 22 months, construction and installation period will be 14 months, thus Kıyıköy Wind Power Plant Capacity Building Project will be completed in 36 months totally. However, information of the commencing date regarding construction works of the Kıyıköy Wind Power Plant Capacity Building Project is unavailable. Mitigation methods for cumulative impacts that will be caused together with the Project will be specified as a result of the cooperation to be established with the project owners after the construction schedule of Kıyıköy Wind Power Plant Capacity Building Project is determined.

An attempt will be made in order to act in coordination with license owners with the aim of eliminating or minimizing the possible cumulative impacts.

11.4.1.2 Turkish Petroleum Corporation (TPAO) Oil Exploration Activities

Turkish Petroleum Corporation (TPAO), as specified in the letter of Directorate of Environmental Protection dated 04.07.2017, TPAO's 3D seismic data collection activity (Tuna 3D) which will concentrate on the area of the Black Sea and to be launched in November 2017 covering an area of 7.500 km^2 with an offshore license numbered 3921, is planned to last nearly for 6 months. Tuna 3D location hasn't been finalized yet. Furthermore, although exact location of the exploratory shaft (Riva-1) located in Western Black Sea with an offshore license numbered 3920 which is planned to be drilled in 2019, has not yet been determined, it is foreseen that it will not deviate much from its determined location. Drilling points of the TPOA are given in **Error! Reference source not found.**. Continuous coordination between Project Owner and TPAO will be ensured in order to prevent any overlaps between these works which are planned to be carried out in the future and construction activities of this Project.

The scale of the possible cumulative impacts depends on the activities that will be carried out by TPAO and in the event that simultaneous activities take place, cooperation will be made with TPAO in order to prevent or mitigate the possible cumulative impacts.

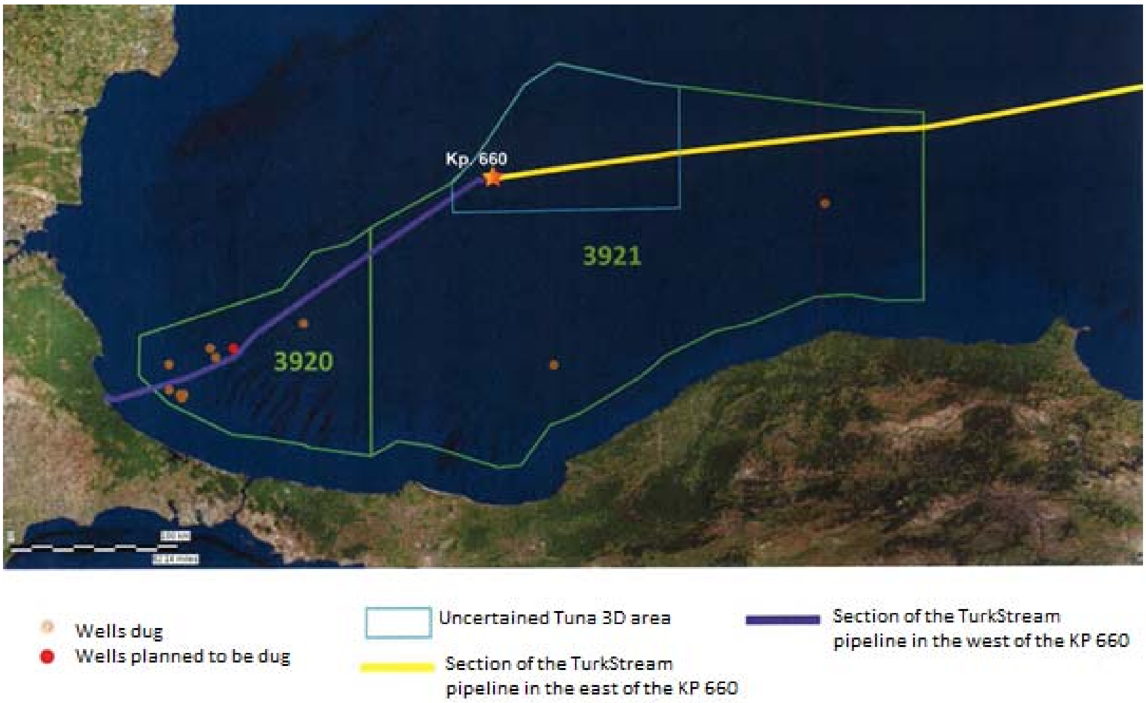

Figure 11.6: Drilling Points and Location of the Route of the Project Pipeline

Also, in order to carry out the works planned by TPAO in coordination with the works planned under this Project, TPAO will be notified of possible changes in pipeline routes of the Project as a priority and the Project activities will be carried out in coordination with TPAO.

11.4.1.3 Power/Mine Investments in the Region

In the areas licensed for mineral exploration near the Project Site, necessary information on the areas licensed for mineral exploration in the region and the activities that have been carried out/are planned to be carried out in these areas will be received from the Directorate General of Mining before the construction phase in order to assess the cumulative impacts likely to occur in the event of drilling-survey activities aiming at detecting mineral deposit reserves simultaneously with the Project activities.

Cooperation will be made with the Directorate General of Mining and other relevant firms holding a license in order to prevent or mitigate the possible cumulative impacts and thus, a work plan will be produced together with the relevant firms by receiving information regarding the activities to be carried out.

11.4.1.4 Electricity Transmission Lines

There are no power transmission lines passing through the Project Site, which belongs to Turkish Electricity Transmission Company (TEİAŞ). An electricity transmission line belonging to TEİAŞ passes by the Landfall Section of the Project and the relative location of this electricity line (pylons) to the Landfall Section is presented in Figure 11.. Also, there is a switchyard in the west of the Landfall Section which is nearly 1.9 km away from the Receiving Terminal (Figure 11.).

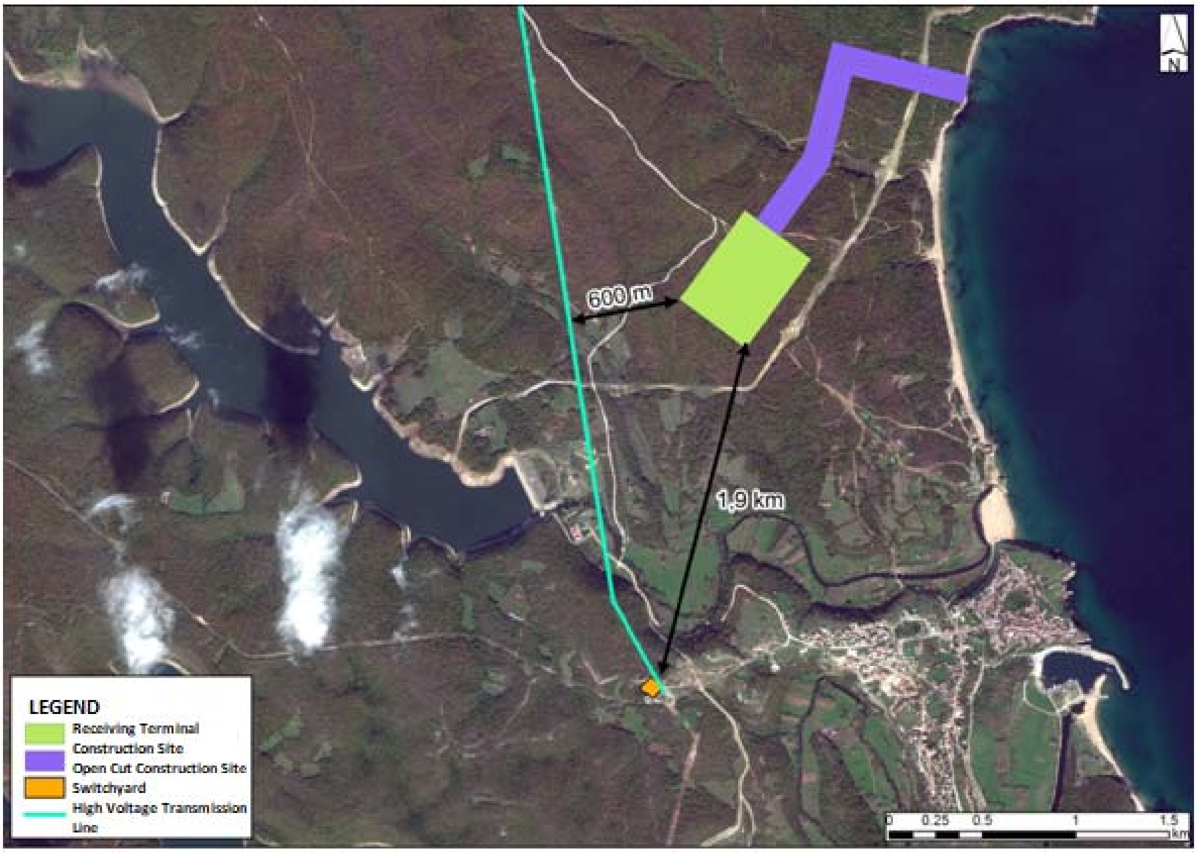

Figure 11.7: Pylons and Switchyard near the Landfall Section of the Project

Under the Project, horizontal and vertical approximation distances between the natural gas pipelines and the electricity lines will be determined in accordance with the provisions of "Regulation on Electric Power Installations".

The relative location of the telegraph poles that belong to the telegraph lines near the Landfall Section of the Project to the Landfall Section is presented in Figure 11..

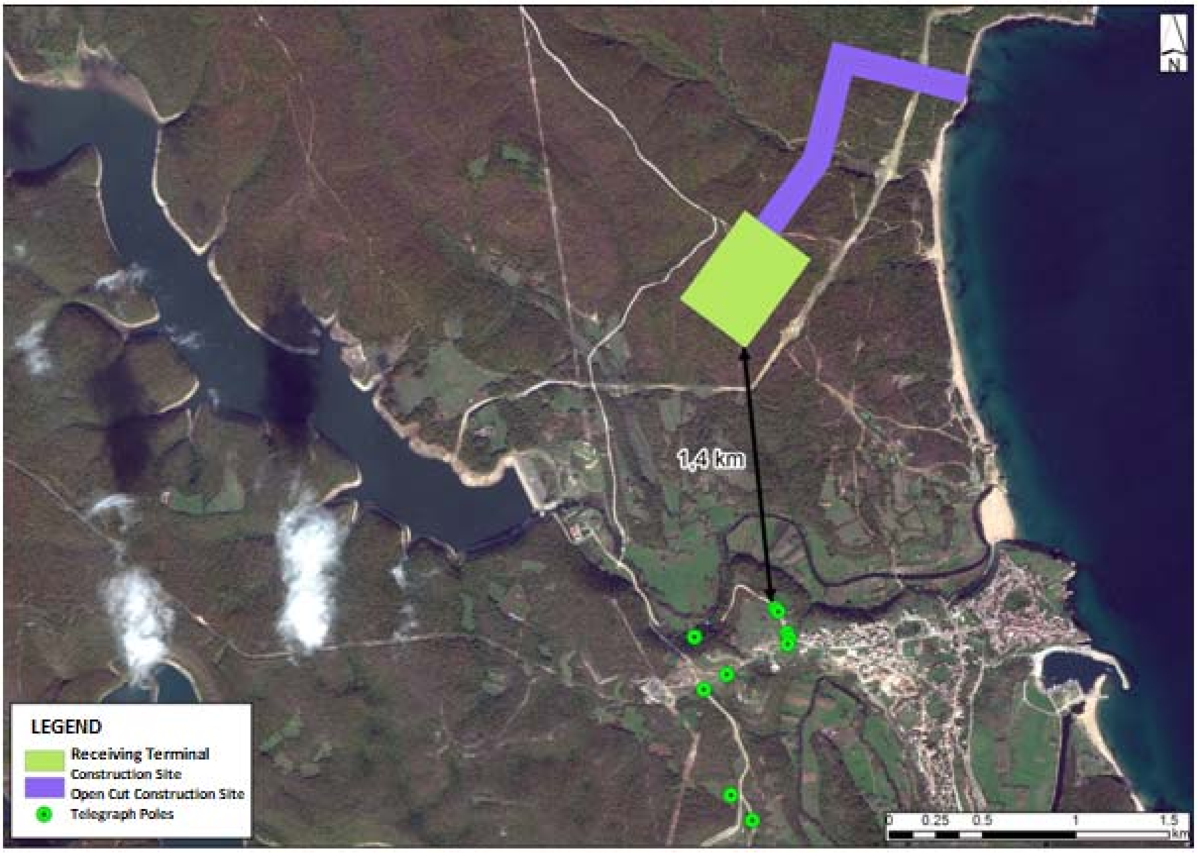

Figure 11.8: Telegraph Poles near the Landfall Section of the Project

Pursuant to Paragraph 10 of Article 8 of "Technical Safety and Environmental Regulation on Construction and Operation of Crude Oil and Natural Gas Facilities" of BOTAŞ; "*During their highest flexure, the shortest vertical distance between the overhead line conductors and the places they cross above (oil and natural gas pipelines)can't be shorter than 9 meters -pursuant to Chart-8 included in the Regulation on Electric Power Installations- regardless of the highest constant operating voltage allowed for the line (1-420 kV).*"

Chart-8 included in Regulation on Electric Power Installations is presented in Table 11.4.

Final layout plan of the Project will be determined by taking into consideration all of the current superstructure and infrastructure facilities and by employing the legal distances within the BOTAŞ Regulation mentioned above.

Table 11.4: The Shortest Vertical Distance during the Highest Flexure between Overhead Line Conductors and Places They Cross Above

Places above which conductors cross	Highest operating voltage allowed (kv)					
	(Including 1)	1-17.5	36	72.5	170	420
	Shortest vertical distance (m)					
Waterways without navigational activity	4.5*	5	5	5	6	8.5
Meadow, cultivated areas, grazing areas, etc. suitable for vehicle rides	5*	6	6	6	7	9.5
Village and urban roads suitable for vehicle rides	5.5*	7	7	7	8	12

Places above which conductors cross	Highest operating voltage allowed (kv)					
	(Including 1)	1-17.5	36	72.5	170	420
	Shortest vertical distance (m)					
Expressways	7	7	7	7	9	12
Trees	1.5	2.5	2.5	3	3	5
Open and flat-roofed buildings	2.5	3.5	3.5	4	5	8.7
Power lines	2	2	2	2	2.5	4.5
Oil and natural gas pipelines	9	9	9	9	9	9
Canals and waters with traffic	4.5	4.5	5	5	6	9
Communication lines	1	2.5	2.5	2.5	3.5	4.5
Railways without electiricty	7	7	7	7	8	10.5
Highways	14	14	14	14	14	14
(*) Height values will decrease by 0.5m if isolated overhead cables are used.						

11.4.1.5 Cable Crossing Agreements

4 known submarine cables pass through the EEZ of Turkey. These are Italy-Turkey-Ukraine (ITUR) submarine fiber-optic system operated by Rostelecom, Black Sea Fiber-Optic Cable System (KAFOS) operated by Vivacom, CAUCASUS submarine fiber-optic cable system operated by Caucasus Networks and Telegraph Cable (Kilia-Odessa).

Italy-Turkey-Ukraine-Russia Telecommunications cable line (ITUR) and Kilia-Odessa telegraph cable are inactive, and they don’t provide any service. Data regarding the location of the Kilia-Odessa telegraph cable which is one of these inactive cables under current conditions is received from the cable database of the Global Marine Systems. In the examinations which are carried out with remotely operated sea vehicles under Pre-Engineering and Design studies, this cable hasn’t been detected but the exploration still continues. It is known that the cable line is between Turkey and Kilia-Ukraine. According to the database, aforementioned telegraph line was installed in 1874 and it was left to the official Turkish authorities in 1934. Detailed information regarding these cable systems is given in **Chapter 4.5** (Issues to be Considered in Selecting a Route).

Also, a high-voltage transmission line to be transmitted from Constanta located on the Black Sea coast of Romania to İstanbul has been planned, and it is known that the anticipated construction schedule is between 2017-2019, and meetings will be held with the line owner in order to verify the planned route and construction schedule of this line and sign a crossing agreement.

Ministry of Transport, Maritime Affairs and Communications will be contacted and crossing agreements will be concluded with the cable line/pipeline owners in order to verify the locations of the current and planned pipelines and cable lines and to make necessary agreements regarding the studies that will be carried out under the Project.

Owners of active cables and if applicable, submarine pipelines will be contacted in order to ensure mutual crossing agreements in a way to cover the liabilities and procedures on crossing methods. Crossing designs and installment procedures will need to be specified by agreeing with the said cable/line owners before laying the pipeline. Crossing agreements with cable operators will be based on the guidelines prepared by the International Cable Protection Committee and used globally for telecommunication cables. Final crossing designs will be subject to the agreements that will be signed separately with cable owners. Detailed information about cable crossing methods is given in Chapter 1.13 (Scope of the Project Process).

11.4.1.6 Public Investments in the Region

If necessary, cumulative impact assessment will be made by evaluating the simultaneity of the Project with the development projects to be carried out by local municipalities and Governorship of Kırklareli and construction and operation phases. There is no information regarding the availability of a current public investment planned around the Project Site.

In the letter of comment of the Section of Industrial Waste Management, Directorate General of Environmental Management, Ministry of Environment and Urbanization dated 09.07.2015; it is stated that the shore facilities of the Project shouldn't pass through the Solid Waste Facility which belongs to Kırklareli Local Authorities Solid Waste Association in Kırmızıyar neighborhood of Central Kırklareli and this issue should be taken into consideration when locating the facilities. As the distance between the Project Site and the aforementioned facility is nearly 70 km, there isn't any interaction between the Project and the facility.

The scale of the impacts depends on the timing and the type of the planned possible projects. If it is determined that especially construction phases of the activities will be carried out simultaneously, local development plans will be reviewed and it will be ensured that a work plan is developed in cooperation with the project owners in order to prevent or mitigate the possible cumulative impacts. In the event that the aforementioned works are carried out in accordance with this work plan, it is expected that the remaining impacts are negligible.

11.4.1.6.1 Kıyıköy Fishing Port Extension Project

There are two main centers, İğneada and Kıyıköy, for marine transport in Kırklareli province. Kıyıköy and İğneada Ports are used as fishing ports. Within the scope of the meetings held with Kıyıköy Municipality in January 2017 for the Project, it is found out that a draft plan was prepared for the extension of Kıyıköy Fishing Port and an application will be made to the official authorities for approval of the aforementioned plan.

1st Regional Directorate of the Ministry of Transport, Maritime Affairs and Communications had a Project Introduction File dated March 2017 prepared for the aforementioned "Construction Project for Kıyıköy Fishing Port Extension" (Ref. 11.1). According to the information obtained from the Project Introduction File, the cost of the construction project owned by 1st Regional Directorate of the Ministry of Transport, Maritime Affairs and Communications is calculated as TRY 850,000.00.

The scope of the aforementioned construction Project is defined as follows in Project Introduction File:

"Total area of Kıyıköy Fishing Port will be in the sea side of the shore edge line which is fully owned by the state. 105-meter secondary breakwater will be completely dredged down to -5m to -6m during the extension construction works for fishing port. Also, a dredging activity starting from the lug of the 450-meter main breakwater will be carried out in -5m to -6m depth for 180m. Then, extension works for a size of 665m x 20m will be carried out by extending the main breakwater by 395 m. 144-meter secondary breakwater will be finalized as 284 m x 10 m with an extension of 14 meters. A 127-meter dock will be created adherent to the 130-meter inactive dock on the main breakwater."

The relative location of the planned "Construction Project for Kıyıköy Fishing Port Extension" to the Project is presented in Figure 11. below.

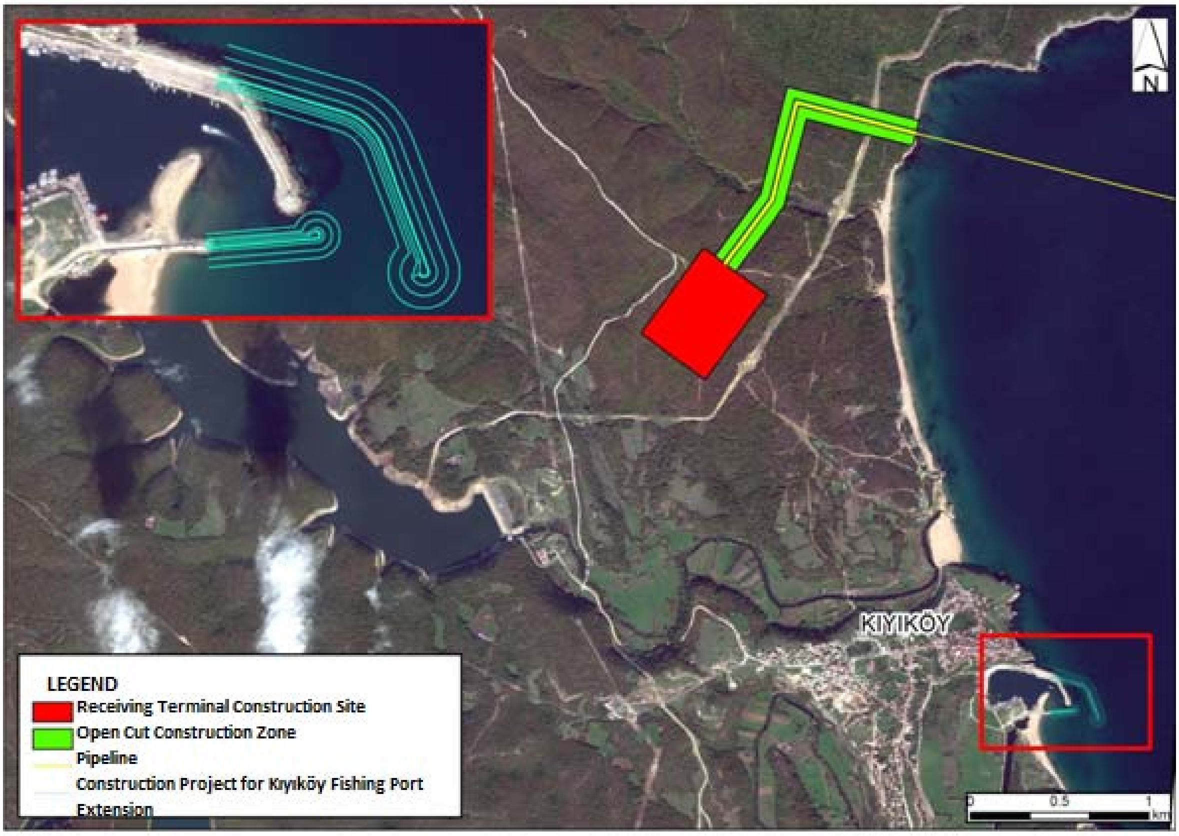

Figure 11.9: Relative Location of "Construction Project for Kıyıköy Fishing Port Extension" to "TurkStream Gas Pipeline Project- Offshore Section"

Under the Project Introduction File prepared for the Construction Project for Kıyıköy Fishing Port Extension, there is no exact business deadline plan, and the construction works will start following the completion of EIA process. As the construction project which is planned to be completed within 2 years (midyear of 2019) within the limits of appropriations is a public investment and the completion of the construction depends on the appropriations, it is also specified in the Project Introduction File that the extension of this time period is possible.

A cooperation will be ensured with Kıyıköy Municipality in order to prevent or mitigate possible cumulative impacts and thus, a work plan on activities to be carried out will be created together with the relevant firms.

11.4.1.6.2 Forestry Operation Activities

As forestry makes up most of the means of livelihood for citizens especially living in Kıyıköy Town and Kışlacık village, it is one of the important economic activities in the region. According to the findings of socioeconomic field studies, forestry is performed with the aim of gaining economic profit and meeting the need of firewood.

In socioeconomic studies, it has been learned from the meetings held with Kıyıköy Forestry Cooperative that the cooperative has 670 members. There is an obligation of residency in Kıyıköy Town in order to be a member of Kıyıköy Forestry Cooperative. According to the information provided by the Cooperative, at least one person from each family living in Kıyıköy is a member of Kıyıköy Forestry Cooperative.

As the majority of the construction site of the Project is in forest area and forestry is a traditional means of living for local communities, the Project happens to have impacts on forestry activities. These impacts and impact mitigation measures are given in **Chapter 9** (Assessment of Socioeconomic Environment) in details. Estimated total area requirement for the provisional facilities in land is 70.3 hectares, and pipeline construction corridor, material storage areas, worker camps and construction site of the Receiving Terminal are included in this total area. Detailed information about the estimated total area requirement for the provisional facilities in land is presented in **Chapter 1** (General Features of the Project). The laydown area which is 37.9 hectares and composed of construction site of the Receiving Terminal, required sites for pipeline construction corridor and laydown areas will be reinstated after the construction phase. A low level of possible impact is expected as the impacted area will be smaller than the current forestry land in Kıyıköy. Attempts will be made in order to eliminate or minimize the possible cumulative impacts and act in cooperation with the General Directorate of Forestry Operation of Vize and Kıyıköy Forestry Cooperative.

Potential impacts of the Project on forestry will be tried to be minimized with the measures given below as well as the general impact mitigation measures whose details are given in **Chapter 9.17**:

- Carrying out the lumbering activities in cooperation with the General Directorate of Forestry Operation of Vize in order to provide local benefits from lumbering in the best possible way ;
- Where applicable, ensuring coordination with the relevant competent authorities and Kıyıköy Forestry Cooperative for providing a safe access to currently available lumbering sites or other routes which may be continued to be used by people who are engaged in forestry; and
- Reinstating laydown areas (site areas such as material storage area and worker camps).

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12 Environmental and Social Management System

The Project Owner is committed to develop and operate the TurkStream Gas Pipeline – Offshore Section (the Project) in an environmentally and socially responsible manner.

As the Project will be constructed and operated as a single, coherent development across Russia and Turkey, it will be managed by means of an overarching corporate management system. A Health, Safety, Security and Environmental and Social Integrated Management System (HSSE-IMS) will form an important part of the corporate management system.

This chapter defines the Environmental and Social Management System (ESMS) being developed during the EIA report preparation for the Project and informs about the management plans within the context of ESMS.

This chapter also explains how commitments identified during planning stages are captured in Environmental and Social Management Plans (ESMPs) that in turn form an important element of the HSSE-IMS.

12.1 Components of the ESMS

Since the main purpose of the EIA process is the protection of the environment, people and cultural heritage, the ESMS, a part of the HSSE-IMS, is accepted as an inseparable part of the Project. The ESMS has been developed to form a framework for the assessment of and management of environmental and social issues and continuous improvement of performance.

In order to carry out the ESMS successfully, a clear organizational structure will be developed.

Key elements of the ESMS contains the followings:

- Defining and assessing major environmental and social factors;
- Improving the tools for specifying the related legislations and other standards and ensuring the continuous compliance with these standards;
- Constructing aims and objectives;
- Identifying sources, roles and responsibilities in order to introduce the ESMS
- Ensuring the project personnel have the competencies to avoid significant environmental and social risks;
- Specifying the procedures and processes in order to manage the significant environmental and social risks;
- Measuring the performance with the help of monitoring and inspection; and
- Identifying the systems that are going to be used in case any deficiency is detected.

The ESMS will be supported by the management plans detailed in Chapter 12.2. The plans will be developed in parallel with the EIA process and updated to include the commitments generated in the EIA process other permitting and Project Owner documents, other environmental, social and cultural heritage studies or documents and stakeholder engagement.

Plans will be developed in accordance with policies of the Project Owner and relative Turkish law and regulations.

The Project Owner will carry out the activities given below:

- Reviewing of all Contractor plans as a part of the document reviewing process of the Project;
- Approval of Contractor plans before implementation and/or commencing of the works; and
- Reviewing these plans regularly in order to be sure that the plans are in line with their objectives during all stages of the Project.

The Contractor will carry out the activities given below:

- Monitoring implementation of the plans (audits);
- Having the responsibility to inform their employees regarding the requirements of the plan and procedures (trainings);
- Managing the performance of all sub-contractors on each plan;
- Preparing reports with performance indicators and sharing these reports with the Project Owner for successful implementation of each plan;
- Updating the plans regularly by identifying the changes in needs and requirements of the Project; and
- Providing training for all relevant personnel on content of the plans and Project-specific procedures.

12.1.1 Environmental and Social Commitments

Commitments in the form of design controls, safeguards, mitigation measures and monitoring requirements that aim to avoid, prevent, minimise or where this is not possible, offset potential adverse impacts and enhance beneficial impacts, have been identified or developed during the planning stages of the Project. Figure 12.1 describes the key sources of environmental and social commitments, and their incorporation via a Master Commitments Register (MCR) into ESMPs.

As presented in the Figure 12.1 the ESMS will capture commitments from the following key sources:

- This Turkish Environmental Impact Assessment Report including Special Format required Management Plans;
- Approved Turkish Environmental Impact Assessment Report for former South Stream Project;
- Other approved permitting documents for construction;
- As a result of consultations with Review and Evaluation Commission (REC) members.
- Project Owner policies and documents;
- Other environmental, social and cultural heritage studies or documents; and
- Stakeholder and community engagement;

12.1.2 Environmental and Social Management Plans

ESMPs are the principal means by which environmental and social impacts are managed and compliance with Project Standards is assured. ESMPs are plans prepared to achieve certain goals and accomplish planned activities and tasks which have been planned within a certain time-frame and budget where human and physical resources are used. ESMPs are the plans prepared to achieve certain goals and accomplish the activities and tasks planned within a certain time-frame and budget where human and physical resources are used.

In order to determine adequacy and effectiveness, ESMPs may be adjusted in line with the model described by ISO14001 and OHSAS 18001 standards in order to improve future performance.

The ESMPs are Project Owner documents that will form the basis for subsequent, more detailed management topic specific plans (see Section 12.2) to be prepared and/or implemented by either the Project Owner or, more usually, the construction and operations contractors. Both Project Owner and contractors will be contractually obliged to comply with the relevant environmental and social requirements, specifications, and procedures set out in the Project Owner's ESMPs.

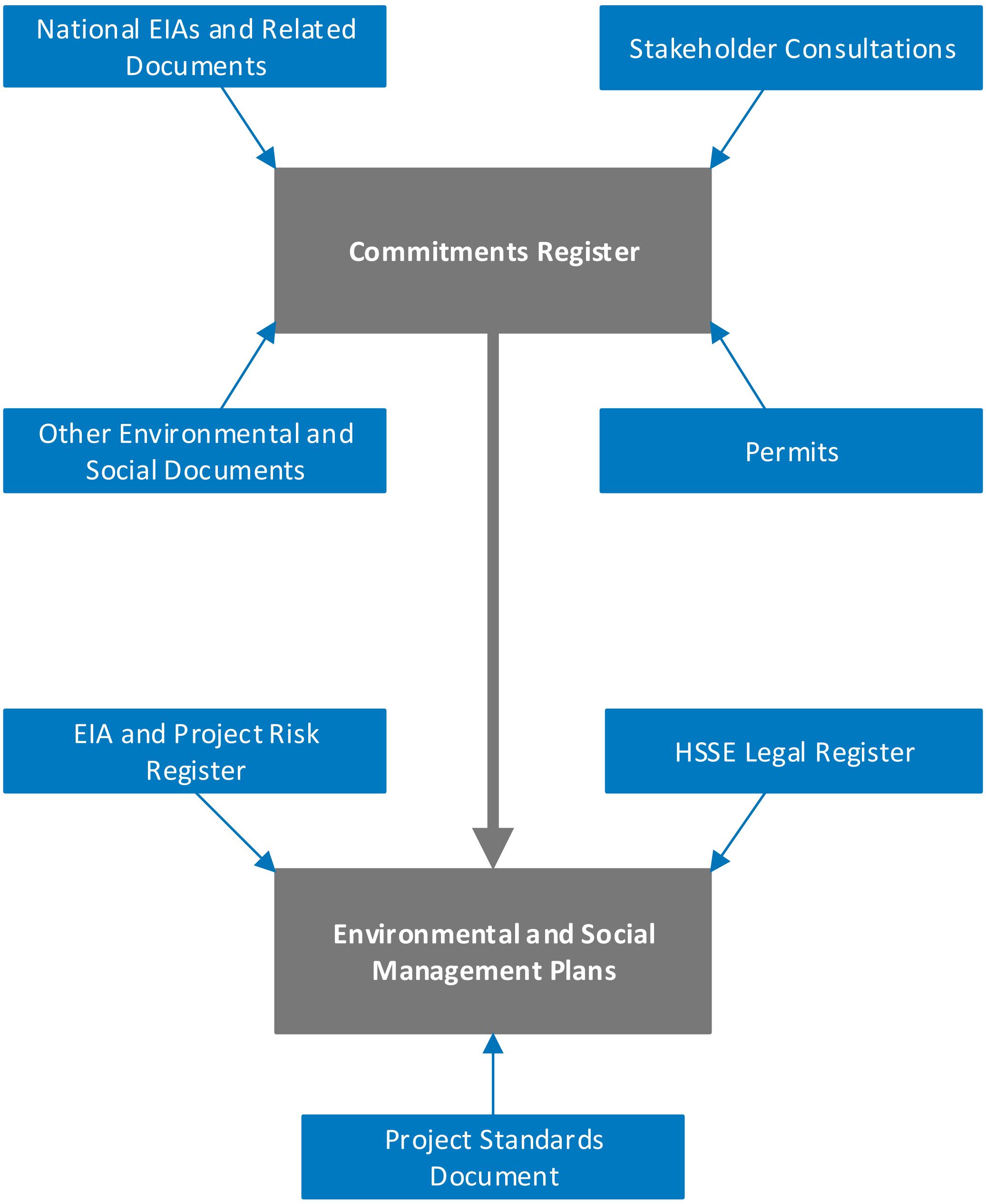

Figure 12.1: Inputs to Environmental and Social Management Plans

12.1.3 ESMP Structure

The potential impacts are markedly different between Project phases, with many construction-related impacts ceasing during the operational phase. The HSSE-IMS will therefore include development of phase-specific ESMPs:

- Construction Phase ESMPs; and
- Operational Phase ESMPs.

The Construction ESMPs and the Operations ESMPs will each comprise of a suite of documents including a Framework Document and a set of management plans as shown in Figure 12.2.

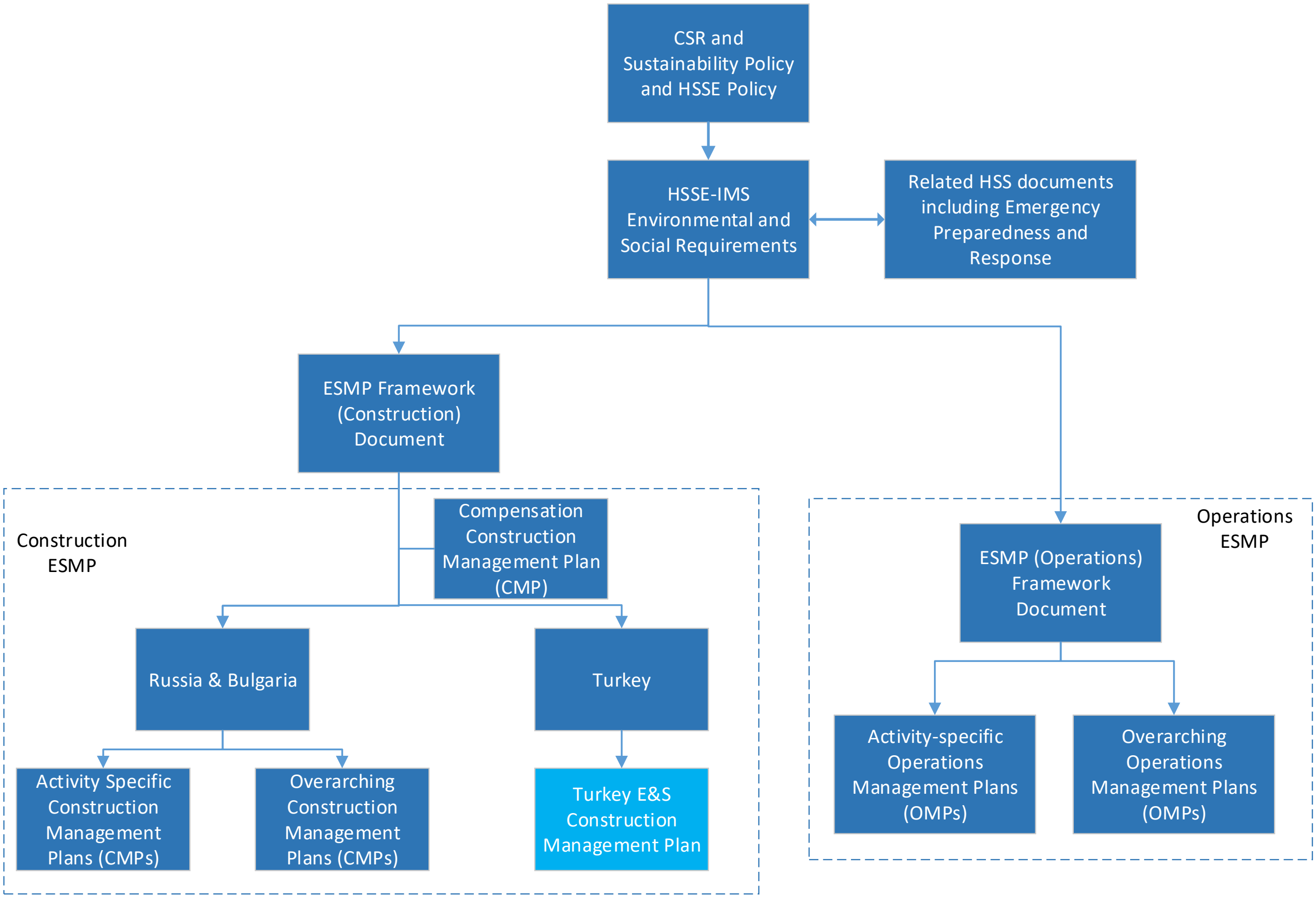

Figure 12.2: Project HSSE-IMS and ESMP Structure

12.1.3.1 Construction ESMPs

The Construction ESMPs will comprise of an "ESMP (Construction) Framework Document" and for Turkey a Turkey-specific E&S Construction Management Plan (CMP). Between them, these documents will capture all relevant Project commitments in terms of mitigation, management and monitoring actions defined in this EIA, and other permitting and Project Owner documentation (as outlined in Figure 12.1).

The ESMP (Construction) Framework Document will describe the Construction ESMP including its constituents and key linkages to other elements of the HSSE-IMS. This document will also include:

- A summary of the policies, legal and regulatory requirements and other applicable standards relevant to construction;
- Construction ESMP roles and responsibilities;

- Performance indicators adopted;
- Inspection, audit and reporting strategies; and
- General instructions as to how the Construction ESMP should be used.

The Turkish CMP will address the Project commitments (mitigation, management and monitoring) applicable to all Turkish onshore, shore crossing and offshore construction activities. The CMP will include contractors as well as Project Owner commitments.

On request of the Ministry of Environment and Urbanisation, a suite of topic-specific construction plans will be prepared as per the Special Format for the EIA. These are presented in Section 12.2 and are as follows:

- Security Plan for Local Communities;
- Community Engagement Plan;
- Employment and Training Plans;
- Supply and Procurement Management Plan;
- Land Acquisition Plan;
- Traffic Management Plan;
- Transportation Management Plan;
- Erosion, Reinstatement and Landscape Plan;
- Dredging Management Plan;
- Pollution Prevention Plan;
- Waste Management Plan;
- Cultural Heritage Objects Management Plan; and
- Emergency Response Plan.

12.1.3.2 Operations ESMPs

The Operations phase ESMPs for Turkey will follow the same structure as the Construction ESMP, including the development of an ESMP (Operations) Framework Document to describe the ESMP and key linkages to other elements of the HSSE-IMS, as well as Turkish OMP..

The OMP will describe environmental and social mitigation, management and monitoring requirements and actions in relation to normal operating conditions and planned maintenance, minor repairs and minor incidents. Unscheduled major repair works relating to the offshore pipelines will be subject to permitting and impact assessment activities and development of bespoke management plans and procedures. Emergency situations will be covered by the separate emergency response plans and procedures. [TON-EIA-12-003]

Decommissioning activities will be covered by specific management plans to be developed during the Operational Phase. [TON-EIA-12-004]

12.1.4 ESMP Content

The Turkey-specific ESMP documents consist of two main components:

- Management and Mitigation Plan; and
- Monitoring Plan.

These two components are contained within the Appendices to each of the management plans. The main body of the management plans contains supporting information specific to the topic of the management plan including scope, responsibilities, linkages to other documents, implementation and verification and a summary of policies and standards (including legal requirements).

12.1.4.1 Management and Mitigation Plan of ESMP

The Management and Mitigation Plan component captures all management and mitigation measures outlined in the source documents described in Figure 12.1. Those measures play a vital role in reducing the potential impacts associated with activities, and include:

- Design Control Measures: As part of the Project design process, measures to avoid or minimise impacts were identified and incorporated into the design. These are referred to as design controls and include physical design features and management measures. They are based on Good International Industry Practice (GIIP) and are intended to avoid or control unacceptable impacts; and
- Management and Mitigation Measures: Where construction and operational procedures are designed to reduce the risk and/or severity of an environmental or social impact occurring through actions or activities.

Management and Mitigation Actions

The ESMPs provide a detailed list of mitigation measures and actions that are required to reduce to acceptable standards the adverse environmental and social impacts and enhance the beneficial impacts of the Project.

The management and mitigation measures are presented in a tabular format in the ESMPs (and associated CMPs) setting out the location and impact that each mitigation measure or action relates to and the entity responsible for implementing each measure or action.

12.1.5 ESMP Responsibilities and Implementation

- The Project Owner holds ultimate responsibility for the environmental and social performance of the overall Project, including the performance of its contractors. Construction ESMPs will be implemented primarily via construction contractors and as appropriate will be issued to contractors who will be required to demonstrate how they will comply with the ESMPs through the development of their own contract-specific HSSE & CSR and other related plans and procedures. These will be approved by the Project Owner. [TON-EIA-12-006] In some instances it will be Project Owner's responsibility to implement construction related requirements.
- Operations ESMPs will be the responsibility of the operating company.

12.1.6 Project HSSE-IMS

12.1.6.1 Introduction

As already described under the preceding sections of this chapter, the ESMPs – based on commitments raised in EIAs, other permitting and Project Owner documents – form an important part of the Project Owner's HSSE-IMS. The HSSE-IMS, which provides the framework for implementation of the ESMPs, has been developed to align with the requirements of the two relevant international standards:

- ISO 14001:2015: Environmental management systems – requirements with guidance for use; and
- OHSAS 18001:2007: Occupational health and safety management systems – requirements.

The main objective of the HSSE-IMS is to provide a robust framework for meeting the Project Owner's HSSE & CSR objectives during the entire Project lifecycle, from development to decommissioning. More specifically, the system has been designed to:

- Manage health, safety, security, environmental and social issues in an integrated manner;
- Clearly define the interface with other Project's management systems (e.g. quality assurance, corporate management system);
- Ensure high standards of management;
- Provide a mechanism to ensure that contractors meet Project HSSE & CSR performance requirements;
- Establish procedures to allow the Project Owner to monitor its HSSE & CSR performance and to report such information to its stakeholders;
- Provide the Project Owner with a mechanism to meet its HSSE and CSR policies and sustainability goals; and
- Allow the Project Owner to demonstrate to its stakeholders that it is committed to effective HSSE & CSR management.

The HSSE-IMS covers all persons employed directly and indirectly by the Project Owner, including contractor and sub-contractor personnel.

The following sections provide a brief description of some of the key elements of the HSSE-IMS that are necessary to meet the HSSE & CSR objectives listed above and ensure implementation of the ESMPs.

12.1.6.2 Strategic Objectives and Targets

The approach to setting strategic HSSE & CSR goals by Senior Management is to define:

1. Annual strategic objectives and targets;
2. Performance Indicators (including Key Performance Indicators (KPIs)); and
3. Injury and other statistics to benchmark performance.

Annual strategic objectives are set by Senior Management, with associated targets determined at the expert-level as appropriate. The objectives and targets support the CSR Policy and HSSE Policy, and are connected to significant aspects and impacts, and/or risks, related to the Project.

Performance indicators are defined to provide proactive and leading measures of HSSE & CSR performance over time. They act as a positive incentive for the delivery of the intended management tasks dictated by the HSSE-IMS to prevent incidents and adverse outcomes, and measure how well the HSSE-IMS is being applied.

A limited subset of the performance indicators related to key HSSE & CSR risk areas are selected as KPIs. KPIs are limited in number in order to optimise performance monitoring, analysis and reporting by the Project Owner and its contractors and to allow Senior Management to track headline HSSE & CSR performance in an effective and efficient manner.

Injury and other safety statistics are used to benchmark Project performance against industry or sector statistics for similar activities, e.g. oil & gas industry, offshore pipeline construction, etc.

12.1.6.3 Contract Management

The Project Owner has developed a Contract Management Procedure. The procedure stipulates that contractors are held responsible as a condition of contract for the compliance of their workers and any subcontractors with the requirements of the HSSE-IMS and other relevant commitments defined in their tender.

All contractors are required to provide their workers and subcontractors with the means to ensure compliance, e.g. information, instruction and training, work equipment and personal protective equipment.

The ESMPs, or relevant parts thereof, will be issued to contractors who will be required to demonstrate how they will comply with the ESMPs through the development of their own contract-specific plans and procedures.

Compliance will be assured through a range of means, including HSSE & CSR audits and inspections.

The Contractor will develop a set of plans that describes how the CMP requirements will be met. The precise structure of the Contractors plan and procedures will be finalized by the Contractor in coordination with the Project Owner; however it is envisaged that the Contractor will have its own Management System (equivalent to Project Owner's HSSE-IMS). The HSSE-IMS will address the management of environmental and social issues.

12.2 Environmental and Social Management Plans (Construction, Operation and Post-Operation)

This section discusses the various **topic-specific plans** that will be prepared to address Turkish Special Format requirements of the management plans forming part of the ESMS. The definition, content and responsibilities for each topic specific plan required by the authorities are described here in turn. It is a requirement of the Project to adhere to the laws and regulations of Turkey and Good International Industrial Practices (GIIPs). Therefore the content of the management plans will ensure that all legal and regulatory requirements are met. As such, specific legal and regulatory requirements have not necessarily been included in the outline plans in this Section.

The plans in this section are for construction phase (including pre-commissioning). Some of the plans will be provided to the Operating Company and Operations Contractor for development of operations plans. As the Project will be decommissioned in 50 years these plans will be designed as per the legislation and standards applicable in the decommissioning stage.

The Special Format plans shall be prepared by the Project Owner or Contractor(s). The Project Owner will review the Contractor plans as part of the Project's established document review process. Table 12.1 lists the Topic Specific Plans and includes the rationale for the designation of responsibility between the Project Owner and the Contractor.

Table 12.1 Topic Specific Plans and Rationale for Responsibility Designation

Plan	***Phase***	***Responsibility***	
Security Plan for Local Communities	Construction	Onshore and Shore Crossing construction CONTRACTORs	
	Operation	Operating Company	
Community Engagement Plan	Construction	Project Owner	
	Operation	Operating Company	
Employment and Training Plans	Construction	Onshore and Shore Crossing construction CONTRACTORs	
Supply and Procurement Management Plan	Construction	Onshore and Shore Crossing construction CONTRACTORs	
Land Acquisition Plan	Construction	Project Owner	
Traffic Management Plan	Construction	Onshore and Shore Crossing construction CONTRACTORs	
Transportation Management Plan	Construction	Onshore and Shore Crossing construction CONTRACTOR	
Erosion, Reinstatement and Landscape Plan	Construction	Onshore and Shore Crossing construction CONTRACTORs	
Dredging Management Plan	Construction	Nearshore and Shore Crossing construction CONTRACTORs	
Pollution Prevention Plan	Construction	Onshore, Shore Crossing and Offshore crossing construction CONTRACTORs	
	Operation	Operating Company	
Waste Management Plan	Construction	Onshore, Shore Crossing and Offshore crossing construction CONTRACTORS	
	Operation	Operating Company	
Cultural Heritage Objects Management Plan	Construction	Project Owner	
	Construction	Onshore construction CONTRACTOR	

Onshore Emergency Response Plan	Operation	Operating Company	
Offshore Emergency Response Plan	Construction	Shore Crossing and Offshore crossing construction CONTRACTORs – (an officially approved one will be prepared by Project Owner)	
	Operation	Operating Company	

12.2.1 Security Plan for Local Communities

12.2.1.1 Design Safety Factors

Contractors will develop worksite-specific Security Plans including provisions for local community security. The Project Owner will review the Contractors' plans as part of the Project's established document review process, and will be approved before implementation. The Security Plan(s) will include issues related to security of both the construction site under the scope of their contracts and the local community/general public in relation to these sites.

12.2.1.2 Objective and Scope

The aim of this document is to explain the methods to secure the Project work sites, worker's accommodation and access roads to ensure the security and safety of Project personnel, site visitors, tourists, local community and their assets during the Project construction.

12.2.1.3 Outline Plan Contents

The Security Plan may include the following:

- policies;
- security infrastructure (fences, signs, markings, access gates);
- roles and responsibilities;
- inspections, auditing, incident reporting, non-compliance;
- interaction with communities;
- code of conduct; and
- selection and training of security personnel.

12.2.1.4 Plan commitments

- The Security Plan will comply with the Voluntary Principles on Security and Human Rights;
- Contractor will communicate with the local authority in coordination with Project Owner for specific Project activities which could present Security Risks;
- Contractor(s) will plan the construction work to reduce hindrance to communities, marine users and beach users; and
- Contractor will install fencing around construction areas including temporary areas, workers accommodation camps and areas of roadwork to ensure community safety.

12.2.2 Community Engagement Plan

12.2.2.1 Roles and Responsibilities

The Project Owner will prepare a Community (Stakeholder) Engagement Plan (SEP) for Project activities in Turkey which will cover engagement with stakeholders including community engagement. The SEP is a 'living' document and will be developed progressively and updated as the Project moves through the various phases of planning, construction and operation.

12.2.2.2 Objective and Scope

The aims of stakeholder engagement, outlined in this SEP, are to:

- promote the development of respectful and open relationships between stakeholders and South Stream Transport;
- identify Project stakeholders and understand their interests, concerns and influence in relation to Project activities;
- provide stakeholders with timely information about the Project and the ESMS process, in ways that are appropriate to their interests and needs (taking into account factors such as location, language, culture, access to information) and also appropriate to the level of expected risk and adverse impact;
- give stakeholders the opportunity, through consultation and other feedback mechanisms, to express their opinions and concerns in relation to the ESMS and Project development, and for these to be reflected in the EIA, the Project's ESMS, and decisions about Project activities, where possible;
- support compliance with Turkish legislation for public consultation and disclosure for EIA and alignment with financing standards and guidelines for stakeholder engagement for EIA; and
- record and resolve any grievances arising from Project-related activities.

The SEP will be designed to ensure that the Project's plans for engagement with stakeholders during all phases of development of the Project are communicated and understood by all those concerned. The SEP will set out the approach which the Project will follow to implement an engagement programme with stakeholders over the life of the Project.

12.2.2.3 Draft Plan Contents

The Stakeholder Engagement Plan will include the following (but not limited):

- the national and Project Owner requirements for stakeholder engagement;
- the process of stakeholder identification and the methods and tools used to support engagement;
- summary of stakeholder engagement undertaken to date and comments received;
- the programme for ongoing and future engagement;
- description of the roles, responsibilities and resources for stakeholder engagement;
- explanation of the ways in which stakeholders can contact the Project Owner, including the grievance procedure for the Project; and
- monitoring and reporting of stakeholder engagement activities.

12.2.2.4 Social Management Plan

In addition to the Stakeholder Engagement Plan, a Social Management Plan will be developed which will capture the measures to mitigate and monitor socio-economic impacts, including potential impacts on community health and safety. The Social Management Plan will include the following (but not limited to) commitments:

- Livelihood Restoration and Compensation Management measures, e.g:
  - Commitment to find alternative usable land (and access) for livelihood activities that are impaired due to Project land take
  - Livelihood restoration in the case of livelihood loss due to Project
  - Compensation in the case of damage caused to people, property or environment due to the Project
- Implementation of a Grievance Mechanism
- Development and implementation of a Community Investment Programme
- Completion of rapid appraisal prior to construction to identify and confirm appropriate housing and health provision for construction workforce

12.2.3 Employment and Training Plans

12.2.3.1 Roles and Responsibilities

The Project Owner will ensure that the Contractors develop and implement an Employment and Training Plan under each key contract. The Project Owner will review the Contractors' plans as part of the Project's established document review process prior to implementation. The level and duration of employment requirements will be determined on an 'as needs basis' per Contractor.

12.2.3.2 Objective and Scope

The Employment and Training Plans aim to promote local, regional and national employment opportunities and skills development for positions in which suitably qualified candidates are available.

12.2.3.3 Draft Plan Contents

The Employment and Training Plan(s) may include:

- human Resources policy;
- any relevant Project social commitments;
- definition of potential employment opportunities with defined competencies and skill requirements;
- the strategy and approach to facilitating and encouraging national (Turkey), regional (Kirklareli) and, especially, local (Kiyikoy and surrounds) employment (in line with Turkish Regulations) focusing on the unskilled and semi-skilled workforce requirements during construction phase of the Project;
- recruitment processes such as advertising, application procedures, non-discrimination etc;
- monitoring and reporting of recruitment;
- training requirements for each position, training procedures including training topics, training programmes (including schedule for refresher) and the content of the induction training for the new employees will be defined;
- roles and responsibilities;

- training records; and
- monitoring and reporting of recruitment.

12.2.3.4 Plan commitments

- Construction contractors will advertise locally available opportunities in local and regional media, and using local recruitment agencies or similar activities;
- Employees will not start work before completing compulsory training; and
- The employee training will include safety awareness in relation to the local community in the vicinity of the construction activities.

12.2.4 Supply and Procurement Management Plan

12.2.4.1 Roles and Responsibilities

The Project Owner will ensure that the Contractors develop and implement a Supply and Procurement Management Plan under each key contract. The Project Owner will review the Contractors' plans as part of the Project's established document review process.

12.2.4.2 Objectives and Scope

The Supply and Procurement Management Plan(s) will prioritise national (Turkey), regional (Kirklareli) and local (Kiyikoy and surrounds) procurement of goods and services to be used during the construction stage of the Project, as long as the goods and services adequately meet the Project's relevant requirements.

Goods and services which cannot be procured locally with the desired quality standards, in the required quantities or with the necessary Project characteristics shall instead be procured from other sources such as regional and/or national markets and international markets.

The Supply and Procurement Plan(s) will cover the approach to procurement of goods and services including strategy, legal and regulatory requirements, related quality issues, relevant procedures and roles and responsibilities.

12.2.4.3 Draft Plan Contents

The Contractor Supply and Procurement Plan may include the following:

- Procurement Policy;
- definition of goods and services required including acceptance requirements (i.e. provision of Material Safety Data Sheets, appropriate packaging and transportation);
- the approach to prioritising national (Turkey), regional (Kirklareli) and, especially, local (Kiyikoy and surrounds) procurement of goods and services (in line with Turkish Regulations);
- a monitoring system to ensure no child or indentured labour will be included in the Supply and Procurement Process;
- tendering processes such as advertising, application procedures etc;
- roles and responsibilities; and
- monitoring and reporting of recruitment.

12.2.4.4 Plan commitments

- Construction contractors will prioritise the sourcing of goods and services locally (Kiyikoy and surrounds) as much as possible, including opportunities for local suppliers and contractors to seek sub-contractor roles and/or supply material and equipment, as long as the goods and services adequately meet the Project's relevant requirements.

12.2.5 Land Acquisition Plan

12.2.5.1 Roles and Responsibilities

The party that will be responsible for preparation and implementation of the the Land Acquisition Plan (LAP) will be selected in accordance with legal land acquisition requirements.

12.2.5.2 Objectives and Scope

Permanent and temporary land use studies are being undertaken in the Project area. Land to be used within the boundaries of the Project is located outside of residential areas, therefore there is no need for relocation or resettlement of local residents.

The Land Acquisition Plan aims to:

- outline the Project's Land Acquisition strategy;
- present the legal background relevant to the Project;
- describe the Project land and associated impacts;
- outline the land access and acquisition process; and

12.2.5.3 Outline Plan Contents

The proposed LAP may include the following:

- Introduction, Scope and Project Description;
- Project Land Acquisition Strategy;
    - International Standards;
    - Key principles of the Project Owner land acquisition strategy; and
    - Exclusion Zones;
- Turkey;
    - Legal background;
    - Project land needs and associated impacts; and
    - Land access process;
- Action Plan;
- Roles and Responsibilities;
- Land access/use alternatives, compensation and restoration measures for impacted owners and/or communities or other stakeholders;
- Grievance Management; and
- Implementation Schedule.

12.2.6 Traffic Management Plan

12.2.6.1 Roles and Responsibilities

The Project Owner will ensure that the Contractors develop and implement a Traffic Management Plan under each key contract. The Project Owner will review the Contractors' plans as part of the Project's established document review process.

12.2.6.2 Objective and Scope

The Contractor Traffic Management Plan(s) will identify the mitigation measures that need to be taken in order to minimise the possible impacts related to traffic, due to Project activities, during the life of the Project. This includes onshore and offshore traffic movements.

12.2.6.3 Draft Plan Contents

The Traffic Management Plan(s) may include the following:

- construction traffic flow and site entrances;
- temporary traffic control and management;
- road crossings and cross roads/junctions;
- parking areas;
- signage and barriers, speed limits;
- transportation of work force from workers's camps (if any
- designated access routes and traffic flow to and from construction site;
- maintenance of roadways (including debris, dust, mud control);
- vehicle standards and maintenance;
- training for drivers;
- monitoring of traffic;
- interface with the Transportation (Logistics) Plan;
- any deficiencies in the existing local infrastructure in coordination with the Project Owner and develop upgrading plans;
- site specific mitigations to control traffic/ labour safety/ community safety/ impacts to environmentally sensitive areas defined by the EIA study; and
- all necessary permits from the authorities to work at night.

12.2.6.4 Plan commitments

- Provide all drivers appropriate training and adhere to the Project Owner driving rules;
- Related Turkish legislation on speed limits and the other traffic rules depending on the type of vehicles and roads shall be obeyed;
- Meetings (in coordination with Project Owner) will be held prior to start of construction with the local people to raise traffic awareness within the scope of the Traffic Management Plan;
- Mandatory coordination and management of all construction traffic; and
-
- Assess and address access route impacts on affected communities.

12.2.7 Transportation Management Plan

12.2.7.1 Roles and Responsibilities

The Project Owner will ensure that the Contractors develop and implement a Transportation Management Plan (also known as Logistics Plan) under each key contract. The Project Owner will review the Contractors' plans as part of the Project's established document review process.

Objectives and Scope

The Transportation Management Plan aims to identify mitigation measures that need to be taken in order to minimise the possible impacts related to the transportation of materials offshore (e.g. pipes and other construction materials, fuel, water etc.) to environment and the public.

12.2.7.2 Draft Plan Contents

The Transportation Management Plan(s) may include the following:

- Purpose & Scope;
- Codes & Standards;
- Schedule;
- Logistics;
    - Mode of transport and Packing;
    - Destinations;
    - Mode of transport;
    - Route of transport;
    - Duration of Transport;
    - Packing;
    - Shipping Documents;
    - Marking;
    - Pre-shipment Inspection;
    - Track and Trace, Receipt, Unloading and Customs Clearance, Storage; and
    - Shipping Instructions.

12.2.8 Erosion, Reinstatement and Landscape Plan

The management of erosion, reinstatement (technical and biological) and landscaping is addressed by the Project in separate plans as follows:

12.2.8.1 Soil Management and Erosion Control Plan

12.2.8.1.1 Roles and Responsibilities

The Contractor will be responsible for the preparation and implementation of a Soil Management and Erosion Control Plan during construction. The Project Owner will review the plan in accordance with the Project's established document review process.

12.2.8.1.2 Objective and Scope

The Soil and Erosion Control Plan aims to provide mitigation measures for the management of soil and control of erosion during construction activities. The Soil and Erosion Control Plan defines the methods that will be employed for the storage and reuse of topsoil, excavated subsoil and rocks, as well as the disposal procedures for soils and rocks that will not be reused. The choice of excavation method will have an important impact on the amount and characteristics of excavated soil that will need to be reused or disposed.

12.2.8.1.3 Draft Plan Contents

The Soil Management and Erosion Control Plan may include the following:

- introduction, scope, objectives, project description;
- main activities and work phases;
- baseline data collection and types of soil erosion;
- requirements and mitigation measures (temporary and permanent);
- methods for removing, storing, and replacing excavated topsoil, subsoil and rock and for disposing of material surplus to reinstatement requirements;
- Process for selection of the methods to be used for excavation and blasting;
- Process for selection of materials to be used for reinstatement;
- The minimum technical requirements for topographical replacement, erosion control and bio-restoration will be described; and
- inspection and maintenance.

12.2.8.2 Reinstatement and Landscape Restoration Plan

12.2.8.2.1 Roles and Responsibilities

The Contractor will be responsible for the preparation and implementation of a Reinstatement and Landscape Restoration Plan. The Project Owner will review the plan in accordance with the Project's established document review process.

12.2.8.2.2 Objective and Scope

The Reinstatement and Landscape Restoration Plan aims to provide the technical mitigation measures for the reinstatement and restoration of the areas impacted during construction phase, including technical aspects of landscaping. The Reinstatement and Landscape Restoration Plan will include the medium and long-term biological mitigation measures for the restoration of the areas impacted by construction activities, including biological aspects of landscaping.

12.2.8.2.3 Draft Plan Contents

The Reinstatement Plan may include the following:

- scope and objective;
- HSSE & CSR requirements;
- activities schedule;
- extent of reinstatement per area;
- site clean-up activities;
- third party properties;
- environmentally sensitive areas;
- topsoil and subsoil removal, storage and maintenance;
- waste soil management;
- reinstatement of soils and landscaping;
- restoration process per site;
- erosion assessment;

- erosion control during restoration;
- earthworks management;
- revegetation and ecology;
- procurement and cultivation of plant materials;
- nurseries and plant conservation centres;
- species to be used, planting methods and sterilizer use;
- minimum requirements for post-construction maintenance; and
- maintenance (aftercare) and monitoring.

12.2.8.2.4 Plan Commitments

- Relocation of protected species in advance of construction;
- Reinstatement of the land shall commence as soon as practicable on removal of each individual temporary facility. The reinstated condition shall be to a condition at least as good as that prevailing before establishment of the facilities, depending on the post construction land use and the Project's access agreement;
- Landscaping at all permanent aboveground installations are to be performed in accordance with the Project Drawings and specifications, with consideration of visual screening of facilities; and
- Reforestation of the Project area will occur wherever a forest existed before construction temporary construction sites. Permanent project sites such as the Receiving Terminal site with sizes of 650 m x 350 m and the pipeline right of way with a width of 31 m won't be reforested. For the purposes of this specification a forest is defined in accordance with Article 1 of the Forest Law that states 'trees and small trees, naturally or artificially grown, together with their surrounding area are considered as forest areas'.; and

12.2.9 Dredging Management Plan

12.2.9.1 Roles and Responsibilities

The Contractor will prepare a "Dredging Management Plan" in a way which will include the mitigation measures to be implemented for potential impacts during dredging activities during in Shore Crossing Section in order to obtain permits for dredging activities by submitting this plan to Ministry of Transport, Maritime and Communications under "Regulation on Maritime and Inland Waters". This plan will also include a "Dredging and Backfilling Procedure". Dredging activities won't be commenced until approval of the Dredging Plan and obtaining of dredging permit.

In addition, "Dredging Environmental Management Plan" is given in the annex of this EIA. The plan covers issues as materials requested by Directorate General of Environmental Management of Ministry of Environment and Urbanization and that will be surfaced during the dredging activity in Shore Crossing Section; environmental management in marine areas where this material will be obtained and dumped; and disposal and beneficial use of this material, Details of the aforementioned plan are given in **Chapter 7** (Assessment of Biological Environment).

12.2.9.2 Objectives and Scope

The Dredging Management Plan within the scope of the Implementing Regulation on Marine and Inland Waters Dredging Activities serves to explain the dredging operations that will be performed during the Shore Crossing Section construction of the Project. The format of the Dredging Plan shall be based on the Implementing Regulation on Marine and Inland Waters Dredging Activities and required activities shall not commence unless required permits have been obtained.

A Monitoring Program shall be created in accordance with the provisions stated in the Draft Regulation on Dredging Activities and Environmental Management of Dredging Equipment, and the Monitoring Reports which contains the results of the monitoring studies, conducted within this scope, shall be presented to Provincial Directorate of Ministry of Environment and Urbanization or to its approval.

12.2.9.3 Plan Commitments

- Dredging activities shall not commence unless the Dredging Plan has been prepared within the scope of the Implementing Regulation on Marine and Inland Waters Dredging Activities and the official permits required have been obtained.
- Selecting appropriate dredger/measures to minimise sediment re-suspension; and
- Environmental monitoring on Selves beach before, during and after dredging and other construction activities in Shore Crossing Section construction, including near-shore turbidity monitoring.

12.2.10 Pollution Prevention Plan

12.2.10.1 Roles and Responsibilities

The Contractor’s Environmental Management Plan will include measures for the prevention of pollution and will be reviewed by the Project Owner in accordance with the Project’s established document review process.

12.2.10.2 Objective and Scope

The CEMP constitutes the general framework of the practices to be undertaken for the prevention of environmental impacts that lead to soil, air quality, groundwater, surface waters (including Black Sea), noise/vibration in the construction phase of the Project. The CEMP also summarizes the plans and response procedures that will be applied in cases of an emergency release. The CEMP dictates any additional sub-plans needed to manage specific activities with regard to pollution prevention.

Mitigation measures concerning the control of pollution and problems associated with traffic during the project construction activities are described in the Contractors’ Traffic Management Plan(s). The requirements concerning the collection, reuse, recovery, storage, treatment and disposal of wastes that will potentially be generated by the project activities, as well as the measures for reducing impact, are defined in the Contractors’ Waste Management Plan(s).

12.2.10.3 Outline Plan Contents

The CEMP may include the following:

- scope and objectives;
- Project overview;
- identification of construction phases;
- requirements and references;
- Contractor environmental management system (EMS);
- HSSE & CSR Policies;

- HSSE Organisation and environmental responsibilities;
- environmental impacts identification and assessment;
- prevention and mitigation Measures;
- environmental training and information;
- environmental reporting and incident investigation; and
- environmental inspections and audits.

12.2.10.4 Plan Commitments

- CMP and procedures will ensure/provide for the following:
  - Dust suppression and monitoring during construction;
  - Directional shielding on lighting for operations and construction on land and shore crossing vessels;
  - Measures to minimise construction and visual impact;
  - Measures to mitigate impacts on streams;
  - Assessment and implementation of measures to ensure that the use of any water sources does not negatively impact either the source or the other users of the source (such as local communities etc); and
  - Drainage systems and erosion control measures to be installed.

12.2.11 Waste Management Plan

12.2.11.1 Roles and Responsibilities

The Contractor will develop and implement a Waste Management Plan. The Project Owner will review the Contractors' plans as part of the Project's established document review process. Also the Project Owner will develop a Waste Management Plan for Operation Phase of the Project.

12.2.11.2 Objective and Scope

The Waste Management Plans aim to collectively describe the activities generating wastes, the types of wastes generated, in addition to defining the procedures for storage, handling and treatment/disposal. The Waste Management Plans will follow the principles of the waste hierarchy (prevent, minimise, reuse, recycle, recover, dispose). The Waste Management Plans also define how to minimise the potential impacts from Project-generated wastes on human health and the environment and ensure compliance with Turkish legislation.

12.2.11.3 Draft Plan Contents

The Waste Management Plans may include the following:

- introduction, background, purpose, objectives and scope;
- roles and responsibilities;
- waste types and estimates; and
- waste management strategy – overview, assessment of waste treatment and disposal options, waste facility visits, awareness and training, applying the waste hierarchy, waste management at project worksites, use of disposal sites, contractor waste management plans, monitoring and analysis, reporting and review.

- In addition, an Industrial Waste Management Plan will be developed for the construction and operation phases of the Project in line with environmental legislation. The plan will be submitted for official approval and the responsibilities and responsible persons for the implementation, monitoring and update of the plan will be determined by the Project Owner.

12.2.11.4 Commitments in Plans

- Contractors will ensure that the waste disposal strategy developed for the project through their plan and procedures will follow the following handling hierarchy:
  - Waste avoidance is the most preferable option;
  - Minimisation of quantities and hazards of waste generated is the second preferred option;
  - Reuse, recovery and recycling shall be preferred over treatment of waste; and
  - Disposal shall be considered as a last resort.
- Contractors will follow the Basic Principles for Waste Management:
  - Follow-up of wastes from cradle to grave approach;
  - Segregation of wastes at source and waste categorization;
  - Reuse, recovery and recycling have the priority;
  - All wastes should be handled throughout the route and will not be left at site;
  - Waste transportation and disposal should be done via licensed facilities and according to the Turkish Regulations and international standards (e.g. MARPOL);
  - Mixing different waste types is strictly forbidden; and
  - Waste transportation using licensed vehicles to the nearest licensed facility to a possible extent.

12.2.12 Cultural Heritage Objects Management Plan

12.2.12.1 Roles and Responsibilities

The Project Owner will develop and is responsible for implementing a Cultural Heritage Objects Management Plan (CHOMP) which will ensure the protection of important cultural heritage resources from project impacts.

12.2.12.2 Objective and Scope

The Cultural Heritage Objects Management Plan aims to:

- summarise the compliance framework;
- identify Project Cultural Heritage management roles and responsibilities;
- summarise preconstruction actions taken to identify and protect sites in advance;
- identify any outstanding preconstruction studies and mitigation requirements, and provide a schedule for their completion
- outline measures to be taken during construction to protect known sites
- outline measures to be taken to identify and protect any currently unknown sites discovered as a result of earthmoving and construction (also known as Chance Finds); and

- include a Chance Finds Procedure outlining how the Project will comply with Article 4 of the Law on the Conservation of Cultural and Natural Property No. 2863 and how to inform the relevant authorities.

The Contractor also has responsibilities to implement relevant aspects of the CHOMP within its contractual obligations.

12.2.12.3 Draft Plan Content

The Cultural Heritage Objects Management Plan will include the following:

- Introduction, purpose and scope, compliance framework;
- Roles and responsibilities;
- Cultural heritage management per Project phase; and
- CHO Inventory.

12.2.12.4 Plan Commitments

- Identify cultural heritage in advance in order to plan for it's protection from Project impacts;
- Preservation in place will be the preferred option for cultural heritage site protection;
- Develop and execute alternative mitigation plans for any cultural heritage that cannot be avoided by design;
- Perform all cultural heritage studies in line with national law and best practice, by professional, qualified, licensed, and permitted specialists;
- For known cultural heritage located near Project areas and Chance Finds, install any necessary measures to ensure risks are minimized, for example avoidance signage, physical barriers, fencing, warning tape;
- Train personnel on Cultural Heritage protection requirements and the Chance Finds procedure;
- Confine all Project activity to the approved Project footprint;
- Any important marine CHO identified during FEED conducted on the Shore Crossing and Offshore Sections, will be avoided in line with Project policies and National law (target distance of 150 m or more);
- Route will be changed in order to avoid any accidental findings in Shore Crossing and Offshore Sections of the Project, in cases where the route change is not technically feasible alternative mitigation measures will be developed by coordinating with respective authorities;
- Where there is an opportunity, contribute to the enhancement local cultural heritage, capacity build with institutions entrusted with safeguarding Cultural Heritage; and
- Share important cultural heritage information that is a product of the Project with the scientific community and public.

12.2.13 Emergency Response Plan

12.2.13.1 Offshore and Nearshore

12.2.13.1.1 Roles and Responsibilities

As laid down in the letter (ANNEX-5.A) dated July 2017 of Maritime and Coastal Management Department of Directorate General of Environmental Management of Ministry of Environment and

Urbanization, in compliance with the Law No. 5312 on Principles Concerning the Emergency Response in the Event of Pollution of Marine Environment with Petroleum and Other Hazardous Materials and Compensation of Damages, and as per the provision of regulations thereunder, an Emergency Response Plan covering Offshore and Shore Crossing Sections of the Project has been prepared by an authorized body in the name of the Project Owner and approved by relevant authorities..

In addition to the above permit requirement, the Contractor will comply with MARPOL regulations and prepare an Offshore Spill Prevention and Response Plans including:

- shipboard oil pollution emergency plan (SOPEP including an oil record book); and
- shipboard marine pollution emergency plans (SMPEP).

12.2.13.1.2 Objective and Scope

The offshore emergency response plan aims to outline the steps that demonstrate all emergency situations are properly identified, reported and dealt with in a safe, efficient and effective manner during all construction and pre-commissioning works. The plan aims to satisfy Turkish regulatory requirements.

12.2.13.1.3 Outline Plan Contents

Standard contents as required by the Turkish regulations.

12.2.13.2 Onshore

12.2.13.2.1 Roles and Responsibilities

Contractors will prepare onshore construction emergency response plan in line with Turkish regulations including procedures on, for example, fire, traffic incidents etc, for Construction Phase of the Project which will be reviewed by Project Owner in accordance with the Project's established document review process.

A Facility Emergency Response Plan for Operation Phase of the Project will be prepared according to the "Regulation on Emergency Response Plan at Workplaces" by the Operations Company.

12.2.13.2.2 Objective and Scope

The onshore construction emergency response plan aims to outline the steps that demonstrate all emergency situations are properly identified, reported and dealt with in a safe, efficient and effective manner during all construction and pre-commissioning works.

12.2.13.2.3 Draft Plan Contents

The Contractor Onshore Construction Emergency Response Plan(s) may include the following:

- scope and objective;
- Project description;
- construction works area;
- major emergency scenarios;
- roles and responsibilities;
- site emergency/incident management team with clear responsibilities and training requirements;

- communication requirements;
- emergency management in the construction works area;
- simultaneous operations;
- notifications and reporting;
- emergency evacuation routes;
- training and drills (minimum every 6 months);
- emergency response equipment including location;
- medical facilities for construction works; and
- emergency system testing.

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13 Monitoring Programme

13.1 Monitoring Programme Recommended for Construction of the Project, Monitoring Programme Recommended for Operation and Post-Operation of the Project

In the entire Project, the requirements and commitments for environmental and social monitoring are obtained from national EIA reports, legal requirements and specific environmental permits.

Monitoring programme will be implemented according to national requirements and in accordance with national legislation and reference standards. Where national legislation and reference standards do not exist, the environmental and social monitoring will be carried out pursuant to internationally accepted standards (e.g. International Organization for Standardization (ISO) or European Committee for Standardization (CEN)).

It is envisaged that the scope of the environmental and social monitoring programme will include the following:

- Physical and chemical environment including air, water, soil and noise;
- Biological environment including terrestrial and marine ecosystems and relevant flora and fauna;
- Socio-economic conditions including cultural heritage.

Environmental and Social Monitoring Programme of the Project will contain all topics and requirements –including the impacts of the monitoring resulting from construction activities, pre-commissioning and operation activities- in order to prove conformity with EIA and permit approvals or to verify related results.

Environmental and Social Monitoring Programme will define the type and frequency of the monitorings mentioned above, the roles and responsibilities, and the requirements and it will be in line with legislation requirements of the country and its scope will be subject to national and international requirements.

Environmental and Social Monitoring Programme will include the details of 4 monitoring programmes given below;

13.1.1 Seasonal Monitoring Programme of the General Directorate of Nature Conservation and National Parks, Ministry of Forestry and Water Affairs

It will be developed so as to include the following requirements specified in the letter of information, comment and scope determination **(EK-5.A)** dated 29.07.2015 of the General Directorate of Nature Conservation and National Parks of the Ministry of Forestry and Water Affairs: "*determination of the sampling points in order to monitor the changes in the marine ecology and conducting seasonal monitoring programme, conducting surface water monitoring (metals to be analysed (obtainable metals lead, cadmium, nickel, chromium, zinc, copper, sulphur and chlorine, sulphur as sulphate in soil, pH, fluoride every year, aggregate stability every 3 year for the total amount of heavy metals and every 5 year to monitor the change in soil structure) will be specified), determining fields and types of plant analysis in the surrounding area and conducting monitoring programme and submitting the monitoring reports to our 1st Regional Directorate".* And, it will be submitted to the General Directorate of Nature Conservation and National Parks for approval.

In the letter of comment dated 05.07.2017 of the General Directorate of Nature Conservation and National Parks; appropriate opinion is given providing that conformity with issues specified in notification, letter dated 29.07.2017 ensured and necessary permits are obtained.

13.1.2 Ministry of Environment and Urbanization, Directorate General of Environmental Management, Seasonal Monitoring Programme for Sediment and Sea Water

It will include the following requirements specified in the letter of comment of the Directorate General of Environmental Management of the Ministry of Environment and Urbanization dated July 2015: "*In the report; a section/sub-section which includes monitorings to be performed during construction in shore or shore water (within 1 nautical mile) should be drafted. In this section, sediment sea water and biota sampling should be planned in order to detect the current situation before the construction phase. Sampling points should be detected at certain intervals along the route (in shore water) and by taking into consideration the direction of the current."* In the same letter of comment, detailed information is given about sampling and the timing for the sampling is defined as twice a year before construction, twice a year during construction and after construction. A monitoring plan including aforementioned requirements will be developed and submitted to the Directorate General of Environmental Management for approval.

13.1.3 Ministry of Environment and Urbanization, Directorate General of Environmental Management, Dredging Plan and Monitoring Programme

According to the results obtained from the meetings with the Directorate General of Environment Management of the Ministry of Environment and Urbanization; a Monitoring Programme will be prepared meeting the conditions specified in Regulation on Seafloor Dredging and Environmental Management of Dredging Material Draft and Monitoring Reports including results of monitoring activities to be carried out under this scope will be submitted to Provincial Directorate of Ministry of Environment and Urbanization and Ministry of Environment and Urbanization for approval.

13.2 Programme on the fulfilment of issues laid down in paragraph 4 under the heading of "Liabilities of Institutions/Organizations with a Certificate of Competency" in the Competency Communiqué, in the event that EIA Affirmative Certificate is awarded

According to Paragraph 4 of Article 9 of the said Competency Certificate Communiqué;

"(4) Project Owner of the projects with EIA Affirmative Decision is responsible for having any of the institutions/organizations authorized under this Communiqué perform on-site monitoring control to find out whether the commitments specified during the start-up and construction periods of the investment are fulfilled, by going to the project site before the transfer of the investment to the operation. Relevant EIA Departments notifies the Department about the institution/organization authorized by the Project owner with Annex-4 form of this Communiqué. The institution/organization authorized by the Project owner is liable to fill out the Monitoring-Control Form for Construction Period of the Investment Related to the Commitments Given in EIA Reports in Annex-4 of this Communiqué and submit it to the Ministry within twenty working days following the end of the monitoring-control periods specified in Final EIA Report. In the event that the certificate of competency of the institution/organization is terminated or the organization is closed; within one month following the notification of this situation to the Project owner, the Project owner is liable to make a contract with any of the institutions/organizations given a certificate of competency and notify the Ministry about it, and the relevant institution/organization is liable to fill out the Monitoring-Control Form for Construction Period of the Investment Related to the Commitments Given in EIA Reports in Annex-4 of

this Communiqué and submit it to the Ministry within twenty working days following the end of the monitoring-control periods specified in Final EIA Report."

However, regarding some articles of EIA Regulation, Article 9 of Competency Document Communiqué can't be implemented as "Motion for Stay of Execution" no 2016/79 of Plenary Session of Administrative Law Chambers of Council of State, covers project monitoring phase. Labilities below will be fulfilled with revoking of Motion for Stay of Execution and restoration of Article 9.

In accordance with legislation in force, monitoring parameters and monitoring period will be determined by taking into account all comments and recommendations within the scope of the Project provided by the Ministry of Environment and Urbanization and will be implemented by the Project Owner.

For the Project, whether the EIA commitments are fulfilled, will be monitored by an organization with EIA Competency Document selected by the Project Owner, at intervals determined by the Ministry of Environment and Urbanization as of the start of the Construction Phase. A firm with EIA competency which is selected by the Project Owner will be responsible for preparing the Construction and Operation Phase Monitoring-Control Form (Annex 4 of the Communiqué) and submitting it to the Ministry within 20 days following the end of the monitoring-control period specified by Ministry of Environment and Urbanization.

Additionally, enterprises subject to environmental permit or environmental permit and license under the Regulation on Environmental Permit and License are classified in Annex-1 and Annex-2 lists based on their environmental impacts. Since the Project falls within the scope of Annex-2 (1.2.2 Facilities which burn fuel gas (natural gas, liquefied petroleum gas, coke breeze, blast furnace gas, fuel gas) and whose total burning system thermal power is 2 MW or more and less than 100 MW) in accordance with Article 5 of the Regulation, an application for Temporary Operating Certificate will be made for Provincial Directorate of Kırklareli before the construction phase.

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14 Results

14.1 Non-Technical Summary of the Project

This Environmental Impact Assessment (EIA) Report has been prepared in line with Turkish EIA Regulation no: 29186 published in the National Gazette of 25 November 2014, for a section of the "**TurkStream Gas Pipeline –Offshore Section**" (*Project*); the design, installation and operation of which is planned by South Stream Transport B.V. (the Project Owner). The Government of the Russian Federation and the Government of the Republic of Turkey (*the parties*) signed an Intergovernmental Agreement (*IGA*) on 10 October 2016 for the TurkStream Gas Pipeline. The IGA entered into force on 21 February 2017 following the confirmation of the parties. In the IGA "**TurkStream Gas Pipeline**" project has been defined as below:

*"**TurkStream Gas Pipeline**" means a new gas pipeline system with a maximum technical design capacity of 31,5 billion cubic meters per annum, for two lines with technical design capacity of 15,75 billion cubic meters per annum per each line, running from the Russian Federation (from the Russkaya compressor station in the Krasnodar Region of the Russian Federation) across the Black Sea to the receiving terminal on the coast of the Republic of Turkey and further across the territory of the Republic of Turkey up to the border of the Republic of Turkey with its neighboring countries, constructed in order to supply natural gas from the Russian Federation to the Republic of Turkey, as well as to ensure transit of Russian gas across the Republic of Turkey into the countries bordering the Republic of Turkey, with the offshore section 1, the offshore section 2, the onshore section 1 and the onshore section 2.*

The TurkStream Gas Pipeline System is a new natural gas pipeline system, which, starting from Russia, crosses the Black Sea so as to reach, ultimately, to Eastern European states through Turkey. System is composed of five (5) separate components, which are as follows (Figure 14.1):

- (1) "**Russian Section**" which extends from Russkaya Compressor Station near the town of Anapa in the Russian Federation to the border of the Russian-Turkish EEZ (out of the scope of this EIA);
- (2) "**Turkish EEZ Section**" which starts at the border of Russian and Turkish Exclusive Economic Zones, extending to the KP660 point, close to the border of Turkish and Bulgarian Exclusive Economic Zones. This section has received an EIA Approval in July 2014 as "South Stream Offshore Pipeline – Turkey Section Project" and is out of the scope of this EIA. The validity of the EIA was confirmed in two nota verbale from the Turkish Government to the Russian government (NV 201583505896-ESGY8010242 dated 18 June 2015 and 2016/83505896-ESGY/11363303 dated 3 September 2016);
- (3) The '**Project**' which starts from the KP660 location close to the border of the Bulgarian-Turkish EEZ, extends over the Turkish mainland until the outlet of the Receiving Terminal which shall be built in the community of Kiyiköy at the district of Vize in the province of Kirklareli, which is composed of 2 pipelines called 'Offshore Section 1' and 'Offshore Section 2' and one Receiving Terminal and which concerns the scope of this EIA effort*;*
- (4) "**Onshore Section 1**" refers to the section from the first weld after the RT and up to the connection with the existing gas transmission system of the Republic of Turkey. This section is out of the scope of this EIA as it lies under the responsibility of BOTAŞ and is known as "**BOTAS section**" in this EIA; and

- (5) "**Onshore Section 2**" refers to the section from the first weld after the RT and across the Republic of Turkey until the border of Turkey with its neighboring countries. This section is out of the scope of this EIA and will be developed by a Turkish-Russian joint venture, and is known as "**European section**" in this EIA.

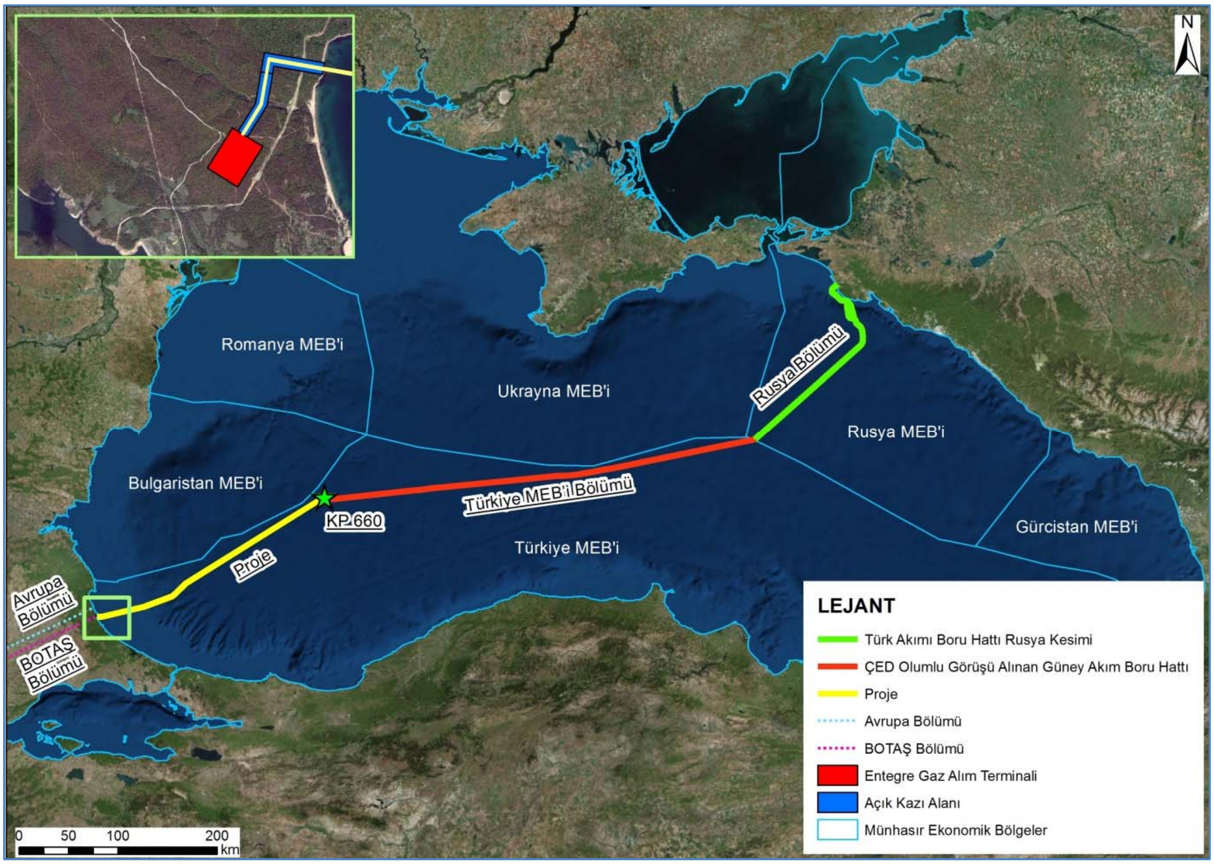


Figure 14.1 TurkStream Gas Pipeline System Components

"**The Project**" which is a component of the TurkStream Gas Pipeline Project – Offshore Section from KP 660 and the subject of this EIA Report, consists of three sections in itself;

- **The Offshore Section**: This section extends from KP660 in the Turkish EEZ to approximately 2.5 km from the Turkish coast, where the water depth is approximately 30 m. The offshore section passes through approximately 270 km of Turkish EEZ waters (measured along the pipeline route). In the Offshore Section, the pipelines will be laid directly on the seabed.
- **The Shore Crossing Section**: This section will commence approximately 2.5 km from the Turkish coast in a water depth of approximately 30 m and extend to the nearshore, north of Selves Beach. The Project also has a "*nearshore*" segment, which involves both marine construction activities in the Nearshore Section and terrestrial construction activities in the Landfall Section. The Shore Crossing segment is defined as the area necessary to construct and install the Pipeline where it makes landfall and there is a transition from the Shore Crossing section to the Landfall section. The nearshore segment commences approximately 200 m offshore (if required, at the end of the causeway), in a water depth of approximately 5 m and extends approximately 250 m (200 m Shore Crossing Section and 50 m Landfall section) inland. The activities for the nearshore will include both marine construction activities such as shallow water vessels to undertake shore crossing dredging, and terrestrial construction activities (north of Selves Beach), such as trench

excavation and pipeline installation via a shore pull. For the purposes of this EIA Report, marine construction activities will be dealt with in the Shore Crossing section, whilst terrestrial activities will be dealt with in the Landfall section.

- **Landfall Section:** The landfall section will commence north of Selves Beach and will extend inland from the coast to include the onshore pipelines and the RT. The Landfall Section, including the RT, will be approximately 2 km in length. From the coast to the RT, the pipelines will be buried using conventional terrestrial construction techniques. For safety reasons, the buried onshore Pipeline will have a minimum soil cover of 1,5 m.

Schematic drawing of the Project Area is presented in Figure 14.2.

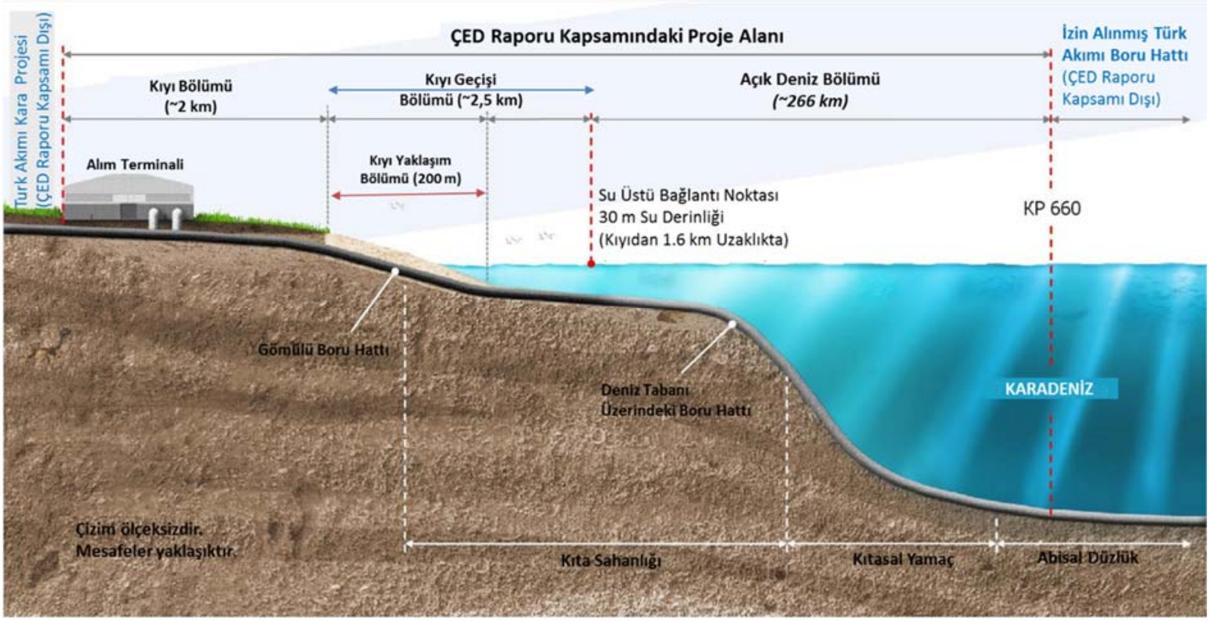


Figure 14.2 Schematic drawing of the Project Area within the scope of the EAI study

The Project, begins at KP 660 at the border of Turkish and Bulgarian Exclusive Economic Zones (EEZ) stretching approximately 270 km to the Receiving Terminal to be built in the town of Kiyiköy, Vize District of Kirklareli Province in Turkey. It consists of two 813-mm (32 inch) pipelines laid across the Black Sea creating a new route that will enhance the long-term security of gas supplies from Russia to Turkey and onwards to Southeastern European countries. The project will also contribute to strengthening the geostrategic position of Turkey in the regional energy scene.

The design capacity TurkStream Gas Pipeline Project– Offshore Section will be able to transport 31,5 billion cubic meters (bcm) of natural gas per year. Each of the two pipelines will have a maximum flow rate of approximately 47.9 million standard cubic meters (MSCM) per day (approximately 15.75 bcm per year).

TurkStream Offshore Pipeline and therefore the Project were designed by South Stream Transport B.V., a company founded in the Netherlands on 14 November 2012; responsible for the design, construction, operation and ownership of the pipeline. In the beginning, the company was founded as an international partnership between PAO Gazprom and European shareholder companies. In December of 2014, PAO Gazprom became the sole shareholder in South Stream Transport B.V., thus assuming responsibility for the TurkStream Gas Pipeline – Offshore Section.

As the world's largest supplier of natural gas, PAO Gazprom accounted for approximately 11% of global gas production as of 2015. It was founded as a corporation in 1993 and is partially owned by the Russian state. The company's primary activities are hydrocarbon exploration, production, transportation, storage and marketing as well as the generation and marketing of electrical power. The amount of natural gas to be supplied within the scope of the TurkStream Gas Pipeline corresponds to a 5% increase in the capacity of PAO Gazprom. Projected timeline for the project is presentedinTable 14.1.

Table 14.1 Project Timeline (2017-2019)

Sections	Operations	2017				2018				2019			
		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Offshore Section	Pre-lay preparation				■								
	Pipeline Route Pre-construction Survey (14 days in advance of pipe-lay)					■							
	Pipe-lay - KP 30 Turkish EEZ to approximately 30m WD					■	■		■				
	Above Water Welding in Pipeline Tie-in at 30 m WD										■		
	Post-lay in Seabed Intervention (including surveys)									■	■		
Shore Crossing Section	Access Roads for Shore			■	■								
	Shore Crossing Site Preparation						■						
	Construction of cofferdams or causeways							■	■				
	Dredging for open-cut (up to approximately 2km offshore)								■	■			
	Shore Pull and Shallow Water Pipe-lay to 30 m WD: approximately 5 days per pipeline									■			
	Shore Crossing Site Restoration and Backfill of Trenches										■	■	
Landfall Section	Landfall Section Pipelines - site establishment, offices and mobilisation of equipment					■	■						
	Landfall Section Pipelines Construction							■	■	■			
	RT - site establishment, offices and mobilisation of equipment						■						
	RT Enabling/Early Civil Works - Site Preparation/Leveling					■	■	■	■				
	RT Installation							■	■	■	■	■	■
	Land Clearing and Installation of Pipeline Markers											■	■
	Pre-Commissioning of Shore Crossing and Landfall Pipelines										■		
	Pre-Commissioning of the RT											■	■
	Pre-Commissioning of TurkStream Gas Pipeline											■	■
	Commissioning of TurkStream Gas Pipeline												■
	TurkStream Gas Pipeline Operational												■

All pipe-laying in the Offshore Section will be performed by the S-lay technique. Figure 14.3 below presents a schematic drawing of the S-Lay pipe-laying method. The S-Lay technique requires the load out of single 12 m pipe sections to the pipe-lay vessel. The average pipe-lay rate for S-Lay technique is expected to be in the order of 3.5 km per day (24-hour period), depending on weather conditions. During the pipe-lay process, a navigational Safety Exclusion Zone is proposed of 2 km radius (1.1 nautical miles (NM)) for DP vessels and 1.5 km (0.8 NM) radius for an anchored pipe-lay vessel (depending on the water depth and anchor spread).

Regarding the vessels types to be used for the construction activities of the Offshore Section, general characteristics of the vessels types selected are given in Section 1.11.6, Table 1.13. In addition, detailed information on the construction phase of the Offshore Section can be found under **Section 1.13.2** (Changes in Construction Activities and Construction Management).

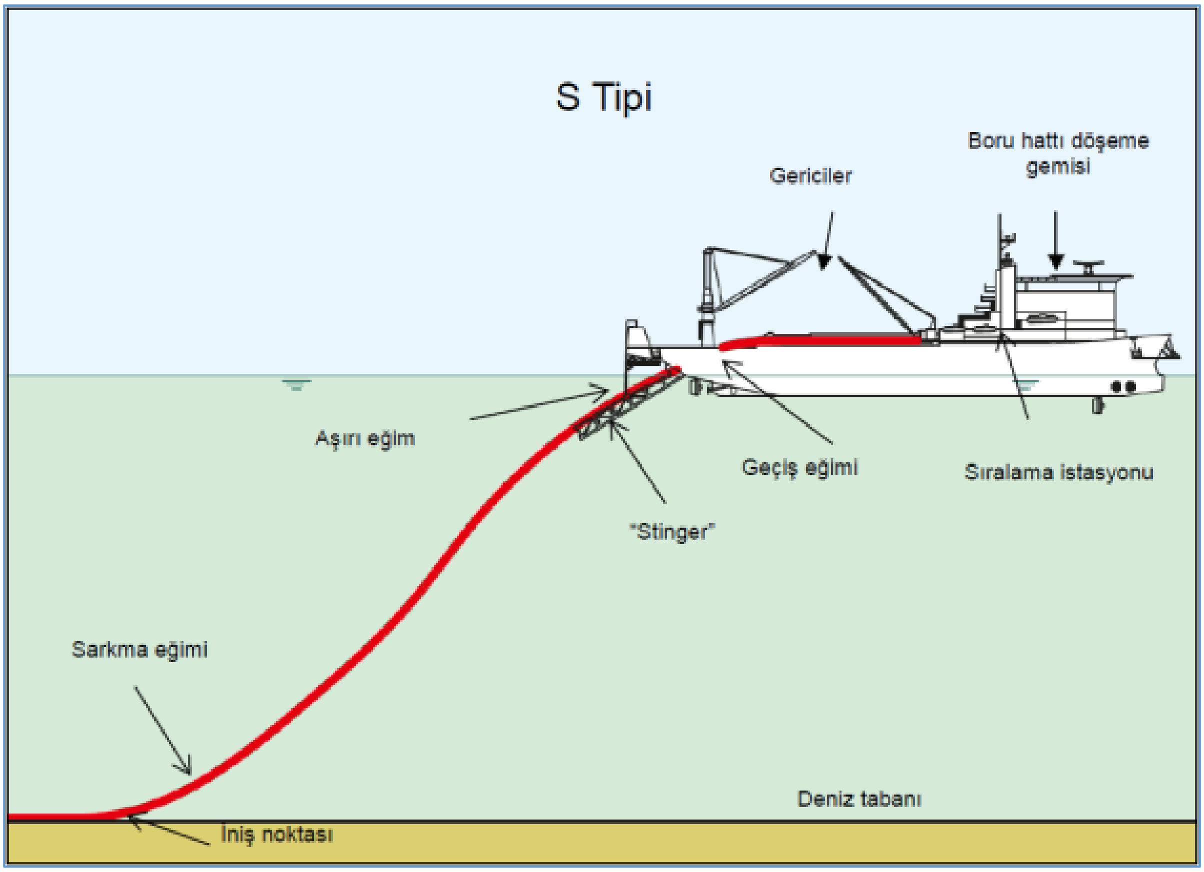


Figure 14.3 Schematic of S-Lay Pipe-Lay Method

In the Shore Crossing Section, 'shore pulling method' will be used during pipe laying operations. In this method, pipe strings will be manufactured in the pipe-lay vessels and pulled towards the shore with a winch. The Shore Crossing Section stretches up to 30 m depth offshore. Pipes will be installed into trenches dug by dredging at depths of approximately 2.5 m. The minimum cover on top of the pipelines is designed as at least 2.5 m for water depths less than 10 m, and 1 m for the trenched section beyond that point up to a water depth of 20-25 m.

Equipment and vessel list planned to be used in the Shore Crossing Section is shown in **Section 1.11.6** - Table 1.14 and a typical shallow water pipe laying vessel is shown below in Figure 14.4. In addition, detailed information on the construction phase of the Shore Crossing Section can be found under **Section 1.13.2** (Changes in Construction Activities and Construction Management).

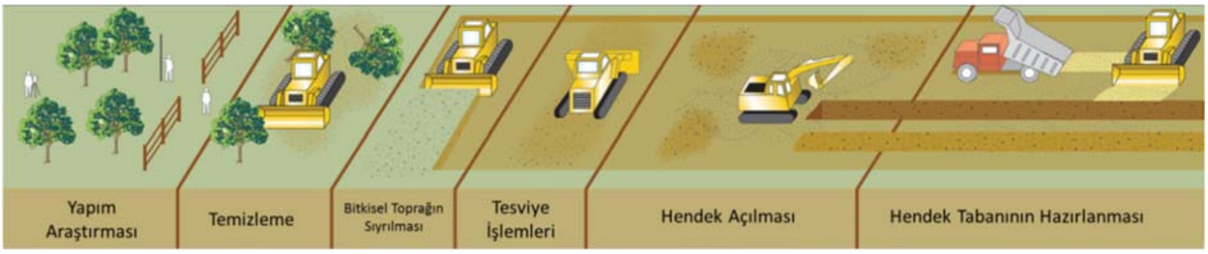
Figure 14.4: S-Lay Pipe-laying Vessel

In the Landfall Section, pipelines will be connected to the RT using conventional pipe laying methods. The "construction sites" in the Landfall Section are defined as follows in this EIA Report:

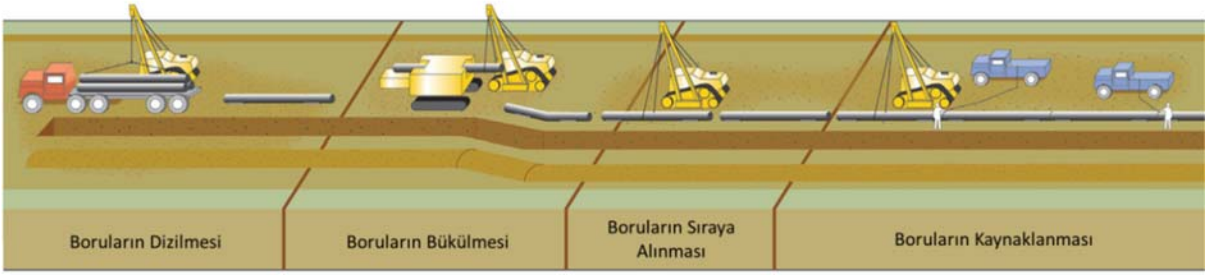
- Permanent construction sites: Sites where the RT and land pipelines are located;
- Temporary construction sites: Sites where laydown areas and labor camps are located.

The overall process of construction of the Coastal Zone is shown below in Figure 14.5 and explained in detail in **Section 1.13.2** (Changes in Construction Activities and Construction Management).

Phase 1: ROW (Construction corridor) preparation and Trenching



Phase 2: Stringing and Welding



Phase 3: Lowering-in, Backfilling and Reinstatement

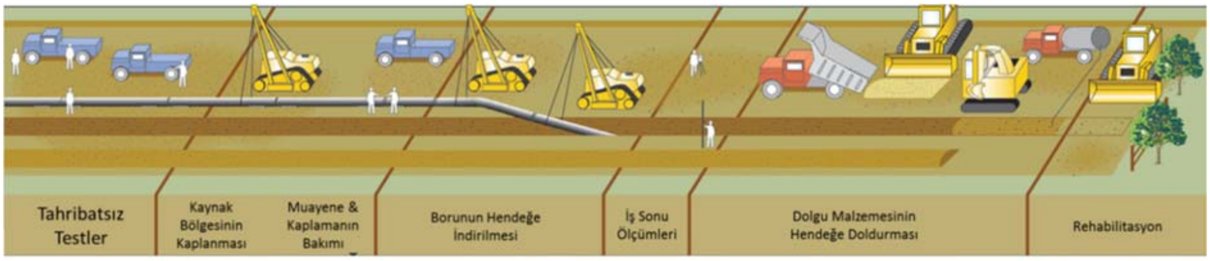


Figure 14.5: Phases of Typical Land Construction Technique for Pipelines

Pipelines will be connected to a Receiving Terminal on land. The equipment, materials and offices, etc. required for the construction of the RT will be located in the RT Construction Site and Pre-commissioning Spread. During the construction of the RT, the following operations will be performed:

- Preparatory works, including surveying, site clearance, access roads and earthworks;
- Construction of internal roads;
- Preparation and construction of foundations;
- Erection of equipment;
- Piping and mechanical works, including NDE of all welds;
- Laying of cables and carrying out the electrical works;
- Construction of operational and instrumentation control systems; and
- Service connections (electricity, water, communication).

The main components of the RT are the metrology equipment for monitoring the operations (gas temperatures, pressures etc.), gas metering and monitoring, Coarse Particle Removal, gas heating, over pressure protection, electrical heating system, a venting system for pipeline depressurization, and buildings, which will serve various purposes including providing office space, sanitary facilities and housing E&I equipment to monitor the operating conditions of the pipelines. Detailed information on the construction of the RT is provided in **Section 1.13.2** (Changes in Construction Activities and Construction Management).

The assigned contractor will carry out a preliminary survey, including topographic data and photographic records, prior to construction; reaching a consensus with the landowners and tenants, the contractor will record the existing conditions. These records will be used as a standard for the assessment of the quality of the restoration at any time during construction and at the end of the work. The restoration of the land required for temporary facilities to be used during the construction phase is predicted to last approximately 12 months.

After laying each pipeline, various activities known as “Precommissioning activities” will be conducted to ensure that the pipeline meets operational requirements. The main purpose of these activities is to ensure that the line is faultlessly laid and that the gas can be transported under the proper conditions, at the expected pressure, and that it meets the requirements for gas delivery. The equipment required for the pre-commissioning activities will be used for cleaning, gauging, hydrotesting (where necessary) and drying of the installed pipelines. Pre-commissioning activities can be found in detail under **Section 1.13.3** (Pre-Commissioning Phase).

The pipelines will be operated in accordance with the national legislation and internationally recognized standards.

A maintenance schedule will also be implemented to be used during operation phase of the pipelines. In addition, continuous measurement of pressure and flow will ensure regular monitoring of the pipelines from a central control and command room. Although unanticipated, in the event of any damages on the pipeline or identification of any leaks in the pipeline, emergency procedures shall be pursued. These procedures include emergency shutdown of the pipes and a later examination on the pipeline. Information on the operation phase of the Project are given in **Section 1.13.4** (Operation Phase).

At the end of the 50-year operational life the activity of the offshore pipeline shall be finalized. Decommissioning of the pipeline shall be carried out as per the national as well as international applicable legislation at that time and in line with Good International Industrial Practices (GIIP) whereby adequate contact with official authorities shall be ensured. Detailed information on the Decommissioning of the Project is given in **Section 1.13.5** (Decommissioning Phase).

14.2 Brief Assessment of Major Environmental Impacts

Environmental impacts from the Project have been considered on the basis of such activities as Construction, Pre-commissioning Operations and Decommissioning Phases, which have been defined in **Chapter 1** (General Characteristics of the Project). Assessments have been carried out as per the EIA Regulation as defined in **Chapter 2** (Environmental Impact Assessment Approach) and provided in **Chapter 6** (Assessment of the Existing Environmental Features), in **Chapter 7** (Assessment of the Biological Environment) and in **Chapter 11** (Cumulative Impact Assessment). Then, the assessment of Project activities as per respective legal requirements and standards are provided under **Chapter 10** (Assessment of Activities within the Scope of the Project). Detailed information regarding legal requirements which shall be observed by the Project are given in **Chapter 3** (Legal, Political, Administrative Framework).

Within the scope of the EIA works, environmental investigations have been planned with a consideration for the EIA requirements, and the views of the members of the Project Special Format Evaluation and Appraisal Commission as well as those of other stakeholders. Some of the planned environmental activities have been carried out in 2015 whereas some others have been performed in 2016 and 2017. Such environmental works include the following:

- Marine (shore crossing and offshore) biology;
- Chemical characteristics of seawater;
- Land and marine archeology;
- Land and marine ecology;
- Bird Watching;
- Monitoring of Air Quality and modelling studies;
- Environmental noise monitoring and modelling studies;

- Surface and groundwater analyses;
- Land Use;
- Assessment of agricultural lands;
- Assessment of forest areas;
- Assessment of visual impacts; and
- Land and marine traffic;

Apart from environmental investigations listed here above, socio-economic impacts have also been evaluated within the scope of the Project and analyzed in **Chapter 9** of this EIA Report (Assessment of the Socio-economic Environment), in further detail.

Primary environmental impacts to arise from Project activities have been analyzed under respective sections of the EIA Report and summarized below. Also, the Design Controls and Impact Mitigation Measures developed to minimize such impacts have been provided in detail in respective sections and summarized in **Section 14.3**.

14.2.1 Land Use

Landfall Section of the Project (Figure 14.6) remains within the remit of the Forestry General Directorate, Forestry Directorate of Vize, and the Forestry Section of Midye (Kiyiköy). The entirety of the land where Project activities will be carried out is state forest, which places such land, as a matter of the quality thereof, under the jurisdiction of the Forestry General Directorate whereby any and all disposition authority shall rest with the latter. The forest in the area is defined as a forest of broad leaved trees.

The net number of trees to be felled within the Landfall Section of the Project has been separately calculated for permanent and temporary areas. The net number of trees to be felled as a result of activities to be carried out in the Landfall Section of the Project is 57,709. The number of trees to be cut as a result of activities in the Landfall Section of the Project is 33.867, whereas the number of trees to be cut down for temporary areas (workers' camp, temporary material storage and temporary roads for construction) has been calculated as some 23.842. Through reinstatement activities to be carried out in such temporary areas will ensure that the area will be restored with indigenous flora.

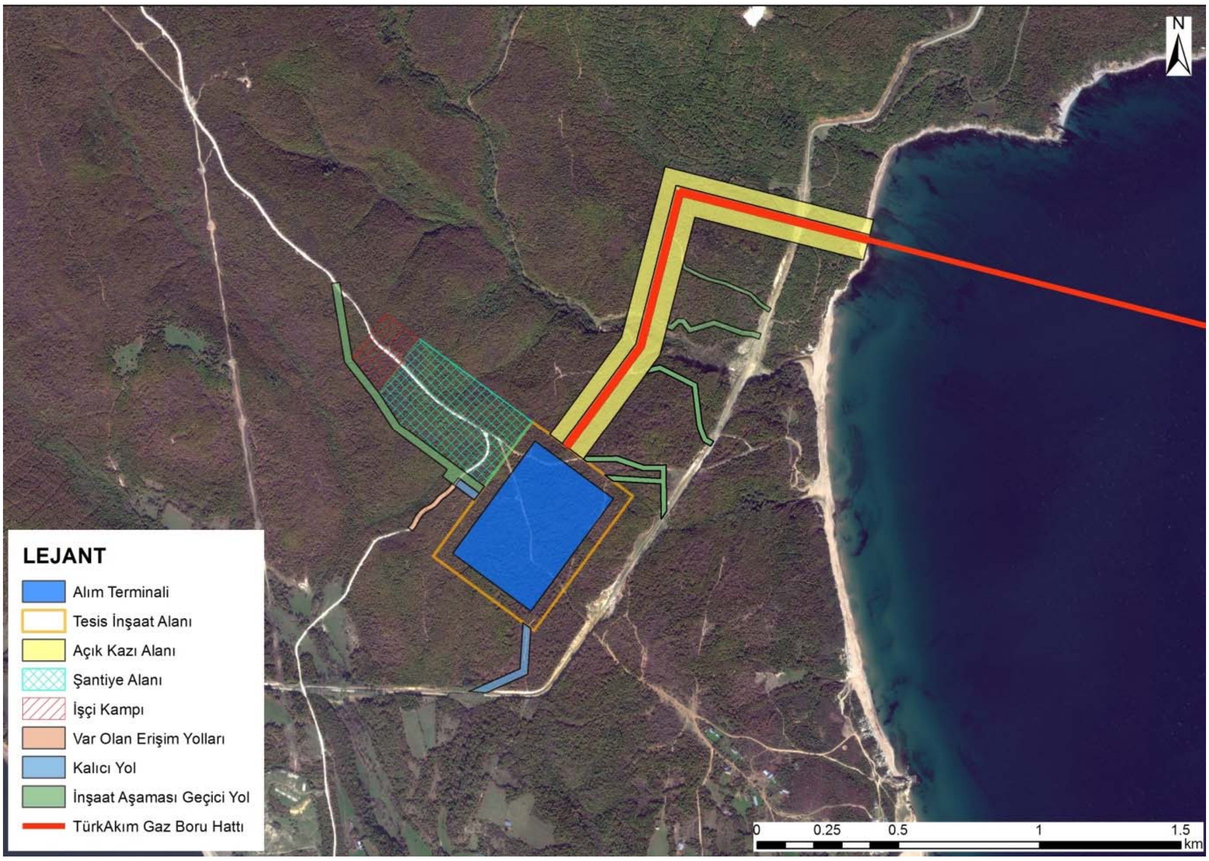


Figure 14.6: Project Landfall Section Components - Layout Plan

Since there is no land except for state forest and Treasury land in the Landfall Section of the Project, no expropriation as per the Expropriation Law No. 2942 shall be carried out. Although the field of activity in the Landfall Section of the Project remains entirely inside Treasury land, in compliance with the map of agricultural parcels prepared on the basis of data obtained from the General Directorate of Agricultural Reform under the Ministry of Food Agriculture and Livestock, digital data from updated satellite imagery and Present Land Use (SAK) data obtained from the Territorial Maps Database of the General Directorate of Agricultural Reform under the Ministry of Food Agriculture and Livestock, agricultural land closest to the Landfall Section of the Project lies 320 m to the South of the Landfall Section whereas the closes pasture 290 m to the South-west. It is for this reason that the Project stands a limited chance of having an impact on agricultural land.

14.2.2 Land Ecology

A variety of site surveys to identify territorial flora and fauna in the vicinity of the Landfall Section of the Project have been carried out since 2015.

Within the scope of these surveys some species such as arthropods (butterflies, dragonflies and damselflies), amphibians, reptiles, birds and mammals have been studied in addition, also, to some rare species that are seen coincidentally. In addition to territorial fauna surveys, a birdwatch was also carried out in Fall 2015 and Spring 2017 so as to both reveal the importance for birds of the Landfall Section of the Project and to record birds' migration in the area. As a result of work carried out 34 species of mammals, 34 butterflies, 8 dragonflies, 18 reptiles and 7 species of amphibians were identified in the Project Area and its vicinity. None of the species identified have been listed under the Endangered or Critically Endangered categories of the IUCN (International Union for the Conservation of Nature).

During the land surveys and bird migration watches performed within the scope of the Project, a total of 112 bird species have been observed. None of the species of birds identified are listed under the Critically Endangered Species according to the IUCN with the exception, only, of the Egyptian Vulture and the Steppe Eagle which trespass the region during the migration season, which have been categorized as Endangered species by the IUCN. In line with the surveys carried out, the two said species of birds do not flock the area for reproduction but are just trespassers during migration.

In the flora studies conducted, a total of 297 taxons of 68 genuses of plants of 5 different types of vegetation have been identified. 3 out of these taxons are endemic to the region and 5 not endemic but rare.

The existing forest habitats in the area where the RT, to be built within the scope of the Project will be located and areas where the pipeline RoW will pass will be lost as a result of the requirement to cut trees. However, for the forest area to be impacted by the Project corresponds to only a very small portion of the region's forest stock, the habitat loss to be incurred is believed to have only very limited impact on local ecology. That said, fauna species that can be encountered in construction zones which are listed as Endangered, Vulnerable or Under Near Threat by the IUCN will be collected and transported to suitable habitats outside of the sites concerned, under the supervision of expert biologists. Then, seeds of endemic species will also be collected and sent to the gene bank for seeds for further avail during reinstatement of affected areas. Additionally, temporary construction sites will be restored via the Erosion, Reinstatement and Landscaping Plan which shall be developed as per applicable legislation for temporary land use.

No adverse impacts are expected on land ecology during operation phase.

14.2.3 Marine Ecology

There are no national or international areas of protection in the Shore Crossing and Offshore Sections of the Project. As a result of the anoxic environment below the first 150 m of from the surface of the Black Sea, on the seabed in the offshore section, biological communities do not stand a chance of survival and it is for this reason that pipe laying activities to be carried out in the majority of the Offshore Section of the Project has but minimal chance of impacting any aquatic organisms.

Fish that live in the Shore Crossing and Offshore Sections of the Project are critically important regarding fishing activities in the Black Sea.. Since the offshore vessel spread of the Project which will operate during the construction of the Shore Crossing and Offshore Sections of the Project is only a small fleet in comparison with the fishing fleet of the region which comprises of a fleet of about 5.000 boats, the Project, with the design controls and mitigation methods mentioned above, is believed to lead to no changes in the region's marine environment. Thus, it seems not quite possible that the vessel activity in relation with the Project would lead to any alterations of the migration patterns of the anchovy which is already under considerable stress from hunting activity. Furthermore, the Black Sea basin is used by almost 600.000 commercial ships per annum. Underwater noise and vibration from the activities of already existing vessels and construction machinery, together with water and waste discharge and heavy vessel traffic in the area, impacts which the Project would cause are foreseen to remain at a minimum. The number of vessels and construction machinery to carry out activities in the Shore Crossing and Offshore Sections of the Project before and during the construction phase are considered to be far less than the number of vessels that are already active in the Black Sea, thus the impact on the fish behavior from such machinery and vessels to be employed during the Project is foreseen to remain at a minimum.

Findings of the marine biology survey which has been carried out in waters along the route of the pipeline (within 1 nautical miles) with the aim to define the biological environment in the Shore Crossing Section of the Project and make an assessment of the existing situation, reveal no significant ecological constraints. However, a series of surveillance programs shall be designed with the aim to determine the impacts of the Project activities on the marine environment, on flora and fauna as well as recreational prospects and on other environmental aspects, which shall be planned to run twice annually before and once after construction. In cases where the findings of the surveillance program require additional measures, legislative provisions shall be observed.

Taking into consideration the fact that the material to be dredged is 'non-hazardous 'and since it is considered that the possible impact on the marine ecology is negligible via the adoption of design controls developed in the scope of the project and the implementation of impact reduction measures, the dredged material will be temporarily stored alongside the trenches to be dug for later use to cover the pipelines, hence reused. Moreover, a monitoring program shall be conducted in accordance with the relative legislation within the scope of the Dredging Environmental Management Plan and additional measures shall be taken in order to reduce the impact on the marine ecology if necessary.

No adverse impacts on the marine ecology is expected during the Operation Phase.

14.2.4 Air Quality and Environmental Noise

As a result of the air quality and noise modelling performed for the Project’s construction activities and equipment, trucks hauling excavated material, and exhaust emissions from pipelaying, supply and support vessels can be expected to impact air quality. Furthermore, the noise from construction activities can also have a negative impact on vulnerable receptors in and around the vicinity of the Project Site., it was demonstrated that such emissions from construction activities would have no impact neither on human health nor on biological receptors. Noise and emissions into the air from the Operation Phase will be at a minimum and only limited to routine maintenance works.

14.2.5 Water Quality

In order to prevent the negative impacts on the water quality, wastes caused by vessels shall be managed in accordance with the Regulation Of Taking The Wastes From The Vessels And Control Of Wastes as stated in the July 2017 dated opinion letter of Ministry of Environment and Urbanization Directorate General of Environmental Management, Marine and Coastal Area Management (Annex-5.A) Other wastes caused within the scope of the project shall be disposed in accordance with the provisions of the Environmental Law and relative legislation. Furthermore, under the Project dumping of any liquid and solid waste material will not be allowed in construction and operation phases. Measures will be taken in order to prevent from falling down of construction remainders into sea and leaking of oil and petroleum products and no negative impacts are expected.

Actions shall be carried out in accordance with the requirements of the national legislation in order to prevent negative impacts on the water sources around the Shore Crossing Section of the Project.

Although not expected, accidental leaks and seeps of petroleum in relation with Project activities or gas leakages in the pipeline with the potential to have a negative impact on water quality can also be expected. In such an event, the Project-specific Risk Evaluation and Emergency Plan shall be implemented, which shall limit the scope of any leaks and seeps as well as the resulting effects.

Impacts on the water quality during the Operation Phase will be at a minimum, limited to treated domestic waste waters from ships to be employed during routine maintenance works to be performed and domestic water from the limited number of staff (20) to be employed during the operation of the Receiving Terminal.

14.2.6 Land and Marine Traffic

Additional traffic burden to the existing traffic load on the preferred route as a result of vehicle mobility during the construction phase of the Project and potential impacts to result from road improvement works which may be needed along access route(s) will be limited to the construction phase of the Project apart from which no such impacts are expected during the operation phase of the Project.

A collision risk analysis have been conducted and it has been agreed upon in this analysis that possibility of a collision during the construction stage is very low. In order to minimize vessel collisions, a temporary buffer zone around the pipe laying vessel shall be formed. The daily procession of the marine spread (the marine fleet comprising of the pipe-lay vessel and other supply and support vessels) will be at such law speed as nearly 3.5 kilometers. Respective authorities will be - informed about the location of the fleet.

Since vessel traffic during the Operation Phase of the Project will be limited to the routine and scarce navigational activities of vessels to be used for maintenance, no adverse impacts from marine traffic at this Phase are expected.

14.2.7 Cultural Heritage

Thrace is considerably rich in historical structures and stone houses. Edirne, Enez, Ereğli on Marmara, central Kirklareli and the district of Vize are the foremost locations regarding archaeology-tourism in the area. In line with the data obtained from the Cultural Assets Protection Board of Edirne, 15 registered archaeological sites have been identified around the Project Site. None of the 15 archaeological sites mentioned are directly influenced by existing Project activities.

Cultural Assets Protection Board of Edirne has carried out a site survey in the Landfall Section of the Project upon our request for their opinion regarding the Project. The opinion letter with the findings of the said site survey by the Board (No. 39.08.282/957 and dated 25.05.2017)(**Annex-5.A**) reads as follows: "As a result of the inspection of the site, no necropolises nor church remains have been found outside of the route of the pipeline, inside the Project site. It is for this reason that no interventions are deemed required in the area the coordinates of which have been specified in the attachment to this letter. No immovable cultural assets have been found outside of the said coordinates, inside the Project site, which need to be protected. Thus, there are no concerns regarding the implementation of the 'TurkStream Gas Pipeline - Offshore Section' Project under the condition that activities in the relative area are halted in the event of encountering any artefacts or remains during activities, which fall in the scope of the Law No. 2863, and that the closest Administrative Office or the Museum Directorate is notified."

Then, regarding the Shore Crossing Section of the Project, an underwater archeology survey has been carried out between the dates of 07.11.2015 and 13.11.2015 upon the request and with the coordination of the Excavations and Research Department of the General Directorate of Cultural Assets and Museums under the Ministry of Culture and Tourism and with the participation of a team from the Marine Sciences and Technologies Institute of Dokuz Eylül University and an expert from each of the Underwater Archeology Museum of Bodrum and the Kirklareli Museum. Following the 7-day marine survey, office work comprising of mapping and data interpretation has been completed and the scientific report dated 11.12.2015 has been published. According to the report prepared, no remains or artifacts which fall under Law No. 2863 on the Protection of Cultural and Natural Assets have been revealed apart from natural formations spotted during seismic and sonar surveys which have been carried out in the area covering the Selves Beach and the pipeline.

Also, according to the maps obtained from the Department of Navigation, Hydrography and Oceanography in February 2017 regarding the Offshore Section of the Project, no cultural heritage has been identified on the route of the pipeline. During engineering studies carried out in the Offshore Section of the Project, loci of objects with anthropogenic features have been recorded. These findings shall also be taken into consideration during the design of the route of the pipeline.

The Project is expected to have no negative impacts on cultural heritage during the Operation phase of the Project.

14.2.8 Socio-economic Impacts

In the month of October 2015 and in January and April 2017, Project Owner's socio-economic experts had out face-to-face or telephone conversations with local and official stakeholders so as to identify the socio-economic and demographic profile as well as the socio-economic impacts of the Project, all of which are considered as the socio-economic field work. Socio-economic conditions at the Project Site and its vicinity have been assessed on the basis of the findings of the socio-economic field work and literature studies and impact mitigation methodologies to be applied with the aim to prevent and minimize the negative impacts of the Project on socio-economic receptors.

The findings of the socio-economic surveys and literature studies which have been performed within the scope of the Project demonstrate that the main livelihood in Kiyiköy is fishing. In addition to fishing, another significant livelihood is tourism. Project's impacts on fishing and tourism have been primarily taken into consideration whereas other socio-economic activities pursued in the vicinity of the Project area such as forestry, apiculture, animal husbandry have also been studied.

Such studies conducted reveal that activities to be carried out during the Construction Phase of the Project can have some temporary (limited to the construction phase) impacts on fishing which is of economic importance for the Kiyiköy community. In order to ensure navigational safety around the pipelaying vessel during pipelaying operations respective official authorities shall be contacted regarding the setting-up of a buffer zone with a radius of 1.5 km (0.8 nautical miles) around a an anchored vessel and a buffer zone with a radius of 2 km (1.1 nautical miles) around a dynamically positioned vessel Such negotiations would also include the buffer zone with a radius of about 500 m (0,3 nautical miles) which shall be set-up during dredging works to be carried out as part of the Nearshore Section. However, navigational safety exclusion zone shall not limit transportation activities involving boats/vessels and such shore facilities as berths or ports. It will be ensured at all times that boat users are allowed passage to their harbor. The exact location of the vessel during the construction phase shall be notified to respective authorities as per Turkish legislation. Contrary to permanent and long-term construction equipment which, pipelaying vessels during the pipe laying activity will retain -generally- their fixed speed all along the line. Hence, the short-term and temporary impacts thereof.

As explained above, In addition to the limited and temporary impact on fishing sites especially in Shore Crossing Section during the construction stage of the Project, since construction works under the Shore Crossing Section will commence in the second quarter of 2018 and last until the end of the year, dust, noise, visual impacts and turbidity of seawater will only constitute local and short-term impacts on tourism activities. Such potential impacts will be minimized through the use of such mitigation measures as the Project-specific grievance mechanism, the compensation management and livelihood restitution framework, the ongoing stakeholder participation program, community investment program and supervision as well as tourism-specific mitigations.

In order to ensure navigational safety around the pipelaying vessel during pipelaying operations it is foreseen that a buffer zone with a radius of 1.5 km (0.8 nautical miles) around a an anchored vessel and a buffer zone with a radius of 2 km (1.1 nautical miles) around a dynamically positioned vessel and a buffer zone with a radius of about 500 m (0,3 nautical miles) which shall be set-up during dredging works to be carried out as part of the Shore Crossing Section shall be established. Navigational buffer zone won't restrict the access between boats / vessels and landing stages and ports. Exact locations of the project vessels will be conveyed to respective authorities as required by Turkish legislation.

The Government of the Republic of Turkey has sent to the Government of the Russian Federation a note No. 2017/87769974-Moskova BE/11978880 on the date of 13.02.2017 regarding a 420-m wide operational safety zone which can be applied in the Offshore Section of the TurkStream Gas Pipeline. As per this note verbale, such activities on the seabed as trawling and/or dropping anchor inside the operational safety zone which shall be established during the operation phase of the Project shall be restricted but not in a way inclusive neither of the surface traffic nor other activities which do not involve trawling and/or dropping anchor. Since the fishing zone for trawlers is immense in comparison with the operational safety zone and that these fishing boats can continue their fishing activities outside of the operational safety zone, the Project will not lead to any impacts on trawl fishing activities.

The Project will require qualified/unqualified and administrative/specialist staff. The majority of the qualified workforce required during the construction phase of the Project is expected to come from outside of Kiyiköy. Yet again, there is the possibility of temporary vacant positions where local workforce as well as workforce to come from the surrounding area can be employed. On the national front, most of the workforce to be employed for the onshore construction works of the Project shall be citizens of the Republic of Turkey. Job opportunities, if any, shall be announced by local and regional offices. The Project Owner shall comply with the regulations of the Ministry of Labor and Social Security regarding working permits. In addition to the direct employment opportunities the Project offers for construction works, a limited increase in local employment as a result of indirect and triggering effects of construction activities can be observed. Although the workforce to be supplied from local sources is limited, there is the possibility to have a positive impact on Kiyiköy locals as well as locals of the vicinity during and after the construction phase of the Project as a result of the direct and indirect employment to arise. The Project will also require the procurement of certain materials and equipment from Turkey the large-scale contracts for goods and services in relation to which can be established with local companies operating in Turkey.

Impacts of the Project regarding socio-economic activities are given in **Chapter 9** (Assessment of the Socio-economic Environment).

14.2.9 Cumulative Impacts

Within the scope of the cumulative impacts of the Project, such impacts within the same geographical environment and those which are planned for and expected as reasonable therein and which can lead (together with the Project or without the Project) to impacts larger or smaller than those of the Project as well as impacts to arise from existing or prospective projects and activities which can add up to the already existing potential impacts have been taken into consideration.

During the activities to be performed in the Landfall Section of the Project, there are other investments which are planned inside and around the Project area. However, on the date of writing of this EIA Report, many a data for use in the assessment of the cumulative impacts such as the construction plan of the said activities, roads to be used during the construction thereof and the operational safety zone were not available or accessible due to the said planned investments not having been finalized yet. Following the finalization of the construction schedule regarding the said investments, mitigation methods to be set up regarding the cumulative impacts thereof together with the Project can only be determined in collaboration with the owners of the said projects/investments. Respective institutions and bodies will be cooperated regarding the prevention and mitigation of possible cumulative impacts and a collaborative business plan will be ensured as a part of this cooperative effort and on the basis of information to be obtained in relation to activities to be carried out.

The details concerning the evaluation of cumulative impacts are presented in the EIA Report **Chapter 11** (Evaluation of Cumulative Impacts).

14.3 Brief Assessment of Mitigation Methods

As stated under **Section 1** (General Characteristics of the Project), two construction techniques have been selected in the EIA Application File, namely microtunnel and open-cut, for the Nearshore Section of the Project. Since the submission of the EIA Application File to the Provincial Directorate of Environment and Urbanization of Kirklareli (June 2015), a range of engineering studies, geological and environmental surveys and socio-economical assessments have been conducted to determine the pipeline route in the Shore Section, to optimize the location and to select the construction method.

As stated also in **Chapter** 2 (Environmental Impact Analysis Approach), the EIA is being carried out with a consideration for any and all control measures which have been included in the design of the Project so as to mitigate or delimit potential adverse impacts. These are coined as 'design controls' which have been listed in under impact assessment sections under respective headings. In cases where additional measures/precautions to reduce or control impacts identified, these have been proposed and listed as 'mitigation measures.'

Table 14.2 provides a general insight on design controls and mitigation methods to be included in the Project.

Table 14.2 Design Controls and Impact Mitigation Measures

Design Control/Impact Mitigation Measures	Scope of Impact/Receptor
Lighting measures shall be given utmost priority and care especially between late-March and late-May and between mid-September and late-October which signify the high-season for the migration of birds, during low-visibility conditions or at night as well as against the risk of schools of birds colliding with the vessels.	Ecology
Exterior lighting of the vessels will not be used when unnecessary.	

Design Control/Impact Mitigation Measures	Scope of Impact/Receptor
The assessment also handled the issue of import by the vessels to be used for Project activities of algae and other marine organisms that can pose a threat on the marine ecosystem of the Black Sea. Within the scope of the Project, quality standards for ballast procedures and ballast discharges on the basis of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) of the International Maritime Organization (IMO) and ballast water and sediment management plan to observe the requirements of the Protection and Management Guidelines for Invasive Species and Oil and Gas Industry will be developed and put into practice wherever applicable.	
Dredging activities to be carried out in the Shore Crossing Section shall be carried out within the scope of the dredging management plan.	
Following the completion of dredging activities, marine work sites (including temporary storage areas) shall be offset/restored as per the provisions of environmental permits. Such restoration work shall comprise disassembly of access roads, fillin-in of trenches and levelling of the temporary storage areas for dredged materials.	
Construction activities onshore will be carried out under supervision of expert biologist.	
Fauna species that can be encountered in construction zones which are listed as EN: Endangered, VU: Vulnerable, NT: Under Near Threat by the IUCN will be collected and transported to suitable habitats outside of the sites concerned, under the supervision of the expert biologist.	
During excavation works, vegetative topsoil shall be scraped separately and separately stored on site and covered as required.	
Seeds of endemic plant species will also be collected and sent to the gene bank for seeds for further avail during reinstatement of affected areas.	
Areas where plant analyses will be carried out during the construction phase of the Project and species will be determined to be covered under a monitoring program.	
If necessary, a Soil Protection Project shall be prepared in compliance with the Law No. 5403 on Soil Protection and Land Use.	
The sub-contractor, as per the Turkish legislation, shall prepare and implement an Erosion, Reinstatement and Landscape Plan.	
During the construction and operation stages of the Landfall Section of the Project, provisions of the environmental legislation including the 'Regulation on the Assessment and Management of Environmental Noise,' 'Regulation on the Control of Air Pollution from Industry' and the 'Regulation on the Assessment and Management of Air Quality.'	Air Quality and Environmental Noise
During the construction phase, necessary measures will be taken to reduce and control the spread of noise from the equipment to be used (silencers, barriers, etc.)	
Dust suppression methodologies shall be employed against dust from excavation and construction traffic.	

Design Control/Impact Mitigation Measures	Scope of Impact/Receptor
Disposing of domestic wastewater generated by ships in the Offshore Section of the Project will be carried out in accordance with provisions of Marine Pollution Control Regulation (SKKY)" in Turkish Territorial Waters and in accordance with the Annex 5 of "International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)", in the EEZ of Turkey. Necessary measures will be taken in order to prevent from falling down of construction remainders into the sea during the construction processes. Appropriate facilities licensed and contracted by Ministry of Environment and Urbanization and licensed devices in recovery of and disposal of wastes shall be utilized.	Water Quality
Respective authorities shall be continuously updated regarding the exact location of the vessels to work for the Project so as to keep the risk of collision at a minimum.	Marine and Land Traffic
In compliance with the Law No. 5312 on Principles Concerning the Emergency Response in the Event of Pollution of Marine Environment with Petroleum and Other Hazardous Materials and Compensation of Damages, and as per the provision of regulations thereunder, a Risk Evaluation and Emergency Response Plan covering Offshore and Shore Crossing Sections of the Project is prepared by an authorized body in the name of the Project Owner and approved by the relevant authorities (Annex-5.A). Aforementioned plan shall be carried out in case of an emergency.	
In order to minimize the effect of land traffic during the construction phase of the Project, a Construction Traffic Management Plan to include the following shall be developed and implemented: o Management of traffic in a way to keep traffic away from urban/settlement areas and especially out of Kiyiköy downtown area; o Regular dampening of roads especially in dry and windy season; o Wash-down of tires to prevent transportation of mud; o Strict observance of speed limits either during or out of office hours as well as of health and safety standards while driving; o Ensuring all drivers' adherence to driving and traffic rules through training and other practices; o Ensuring that all drivers receive any or all trainings on safe, advanced and defensive driving techniques; and o Ensuring the availability of required traffic signs and signalization applications.	
In the event of encountering any remains or artefacts which may qualify for the scope of the Law No. 2863 on the Protection of Cultural and Natural Assets during the construction phase of the Project, works in this area shall be stopped and the nearest Administrative Office or the Museum Directorate shall be notified.	Cultural Heritage
Within the scope of the Project, works will be conducted as per national legislation and international best practices so as to ensure protection of cultural heritage aspects. Again, a Cultural Heritage Protection Program containing a Coincidental Findings Procedure will be developed within the scope of the Project.	
Fisheries Cooperative of Kiyiköy and other communities concerned will be acknowledged regarding trawling in the vicinity of the pipeline during the operation phase of the Project as well as regarding the risks in relation thereto.	Socio-economy
It is important to implement strategies which will eliminate the negative effects of the construction works in order to control factors such as dust, noise, road deterioration during the main tourism season which is in summer.	

Design Control/Impact Mitigation Measures	Scope of Impact/Receptor
Before the start of construction activities, local authorities, tourism operators and the local people shall be contacted regarding the schedule of pre-operation activities, safety restrictions and potential impacts.	

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15 Information on Experts Required to Be Included In The Working Group on EIA Report According to Specific Format

15.1 Introduction of Those Who Prepare the EIA Report

As specified in the letter dated 10/09/2015 and numbered E.14819 of the Directorate General of Environmental Impact Assessment, Permit and Inspection; occupational groups such as Archaeologist, Agricultural Engineer, Aquaculture Engineer, Forest Engineer, and Expert Biologist have been included in the working group preparing the EIA File and information on experts is given below.

ARCHEOLOGIST

AGRICULTURAL ENGINEER

AQUACULTURE ENGINEER

FOREST ENGINEER

EXPERT BIOLOGIST

EXPERTS PREPARING ENVIRONMENTAL MANAGEMENT PLAN FOR DREDGING