



**BORASCO ELECTRICITY GENERATION INC**

Maslak Mah. Maslak Meydanı Sok.  
Veko GIZ Plaza No:3 Kat:16  
34396 Beşiktaş - İSTANBUL / TÜRKİYE  
Tel: +90 (212) 329 82 12 (pbx)  
Faks: +90 (212) 290 23 40

**SAMSUN PROVINCE, CARSAMBA and TERME DISTRICTS**

**SAMSUN NATURAL GAS  
PIPELINE PROJECT**

**FINAL  
ENVIRONMENTAL IMPACT ASSESSMENT  
(EIA)  
REPORT**

EIA Report

Final EIA Report



**ENERJİ VE ÇEVRE YATIRIMLARI TURİZM A.Ş.**  
ENERGY AND ENVIRONMENTAL INVESTMENTS TOURISM INC.

ENY Enerji ve Çevre Yatırımları A.Ş.  
Çetin Emeç Bulvarı 8. Cadde No: 7 Aşağı Öveçler 06450 ANKARA - TÜRKİYE  
Tel: +90 (312) 583 88 00 (Pbx) Faks: +90 (312) 472 67 10  
e-posta: envy@envy.com.tr  
www.envy.com.tr

**ANKARA – 2010**

**TITLE PAGE**

<b>Project Owner</b>	BORASCO Electricity Generation Inc.																																																																																																		
<b>Address</b>	Maslak Mahallesi, Maslak Meydan Sokak Veko Giz Plaza No: 3 Kat:16 34396 Beşiktaş / İSTANBUL																																																																																																		
<b>Telephone and Fax Numbers</b>	Telephone : +90 (212) 329 82 12 (pbx) Fax : +90 (212) 290 23 40																																																																																																		
<b>Name of the Project</b>	Samsun Natural Gas Pipeline Project																																																																																																		
<b>Project Budget</b>	App. 20 million €																																																																																																		
<b>Location of the Project</b>	Samsun Province Carsamba and Terme Districts Plan No: F34.a3, F37.b4, F37.b3, F37.c2, F38.d1 and F38.d2																																																																																																		
<b>Coordinates of the Project</b>	(Pipeline Route Coordinates) <table border="1" data-bbox="850 920 1270 2011"> <thead> <tr> <th rowspan="2">Point</th> <th colspan="2">UTM Zone 37 Datum ED50</th> </tr> <tr> <th>X</th> <th>Y</th> </tr> </thead> <tbody> <tr><td>IP-1</td><td>304910</td><td>4580463</td></tr> <tr><td>IP-2</td><td>304924</td><td>4580448</td></tr> <tr><td>IP-3</td><td>304849</td><td>4580359</td></tr> <tr><td>IP-4</td><td>304795</td><td>4580272</td></tr> <tr><td>IP-5</td><td>304740</td><td>4580035</td></tr> <tr><td>IP-6</td><td>305048</td><td>4579735</td></tr> <tr><td>IP-7</td><td>305289</td><td>4579526</td></tr> <tr><td>IP-8</td><td>305530</td><td>4579317</td></tr> <tr><td>IP-9</td><td>305757</td><td>4579139</td></tr> <tr><td>IP-10</td><td>306074</td><td>4578829</td></tr> <tr><td>IP-11</td><td>306185</td><td>4578790</td></tr> <tr><td>IP-12</td><td>307781</td><td>4577699</td></tr> <tr><td>IP-13</td><td>309377</td><td>4576608</td></tr> <tr><td>IP-14</td><td>309551</td><td>4576495</td></tr> <tr><td>IP-15</td><td>309826</td><td>4576370</td></tr> <tr><td>IP-16</td><td>310034</td><td>4576279</td></tr> <tr><td>IP-17</td><td>310242</td><td>4576187</td></tr> <tr><td>IP-18</td><td>310606</td><td>4576148</td></tr> <tr><td>IP-19</td><td>310970</td><td>4576109</td></tr> <tr><td>IP-20</td><td>311384</td><td>4575995</td></tr> <tr><td>IP-21</td><td>311502</td><td>4575955</td></tr> <tr><td>IP-22</td><td>311910</td><td>4575814</td></tr> <tr><td>IP-23</td><td>312317</td><td>4575674</td></tr> <tr><td>IP-24</td><td>312533</td><td>4575666</td></tr> <tr><td>IP-25</td><td>313336</td><td>4575630</td></tr> <tr><td>IP-26</td><td>313666</td><td>4575563</td></tr> <tr><td>IP-27</td><td>313994</td><td>4575492</td></tr> <tr><td>IP-28</td><td>314227</td><td>4575449</td></tr> <tr><td>IP-29</td><td>314460</td><td>4575407</td></tr> <tr><td>IP-30</td><td>315056</td><td>4575365</td></tr> <tr><td>IP-31</td><td>315426</td><td>4575428</td></tr> </tbody> </table>	Point	UTM Zone 37 Datum ED50		X	Y	IP-1	304910	4580463	IP-2	304924	4580448	IP-3	304849	4580359	IP-4	304795	4580272	IP-5	304740	4580035	IP-6	305048	4579735	IP-7	305289	4579526	IP-8	305530	4579317	IP-9	305757	4579139	IP-10	306074	4578829	IP-11	306185	4578790	IP-12	307781	4577699	IP-13	309377	4576608	IP-14	309551	4576495	IP-15	309826	4576370	IP-16	310034	4576279	IP-17	310242	4576187	IP-18	310606	4576148	IP-19	310970	4576109	IP-20	311384	4575995	IP-21	311502	4575955	IP-22	311910	4575814	IP-23	312317	4575674	IP-24	312533	4575666	IP-25	313336	4575630	IP-26	313666	4575563	IP-27	313994	4575492	IP-28	314227	4575449	IP-29	314460	4575407	IP-30	315056	4575365	IP-31	315426	4575428
Point	UTM Zone 37 Datum ED50																																																																																																		
	X	Y																																																																																																	
IP-1	304910	4580463																																																																																																	
IP-2	304924	4580448																																																																																																	
IP-3	304849	4580359																																																																																																	
IP-4	304795	4580272																																																																																																	
IP-5	304740	4580035																																																																																																	
IP-6	305048	4579735																																																																																																	
IP-7	305289	4579526																																																																																																	
IP-8	305530	4579317																																																																																																	
IP-9	305757	4579139																																																																																																	
IP-10	306074	4578829																																																																																																	
IP-11	306185	4578790																																																																																																	
IP-12	307781	4577699																																																																																																	
IP-13	309377	4576608																																																																																																	
IP-14	309551	4576495																																																																																																	
IP-15	309826	4576370																																																																																																	
IP-16	310034	4576279																																																																																																	
IP-17	310242	4576187																																																																																																	
IP-18	310606	4576148																																																																																																	
IP-19	310970	4576109																																																																																																	
IP-20	311384	4575995																																																																																																	
IP-21	311502	4575955																																																																																																	
IP-22	311910	4575814																																																																																																	
IP-23	312317	4575674																																																																																																	
IP-24	312533	4575666																																																																																																	
IP-25	313336	4575630																																																																																																	
IP-26	313666	4575563																																																																																																	
IP-27	313994	4575492																																																																																																	
IP-28	314227	4575449																																																																																																	
IP-29	314460	4575407																																																																																																	
IP-30	315056	4575365																																																																																																	
IP-31	315426	4575428																																																																																																	

		IP-32	315636	4575327	
		IP-33	315847	4575227	
		IP-34	316153	4575167	
		IP-35	316459	4575108	
		IP-36	316758	4575001	
		IP-37	317057	4574894	
		IP-38	317693	4574767	
		IP-39	318329	4574640	
		IP-40	319359	4574084	
		IP-41	319376	4573994	
		IP-42	319942	4573719	
		IP-43	320263	4573162	
		IP-44	320871	4572347	
		IP-45	320994	4572201	
		IP-46	321553	4571662	
		IP-47	322081	4570843	
		IP-48	322531	4570471	
		IP-49	322553	4570392	
		IP-50	323019	4569750	
		IP-51	323273	4569524	
		IP-52	323308	4569514	
		IP-53	323994	4568826	
		IP-54	324085	4568771	
		IP-55	324252	4568706	
		IP-56	324419	4568438	
		IP-57	324631	4568113	
		IP-58	324834	4567802	
		IP-59	324843	4567789	
		IP-60	325261	4567409	
		IP-61	325678	4567024	
		IP-62	325989	4566392	
		IP-63	326286	4566070	
		IP-64	326583	4565748	
		IP-65	326813	4565494	
		IP-66	327043	4565239	
		IP-67	327044	4565130	
		IP-68	327045	4565021	
		IP-69	327028	4564954	
		IP-70	327010	4564888	
		IP-71	326996	4564794	
		IP-72	327046	4564504	
		IP-73	327040	4564192	
		IP-74	326985	4564022	
		IP-75	327006	4563680	
		IP-76	327131	4563577	
		IP-77	328191	4562813	
		IP-78	328278	4562784	
		IP-79	328467	4562654	
		IP-80	328513	4562594	
		IP-81	328624	4562529	
		IP-82	328760	4562455	
		IP-83	329083	4562329	
		IP-84	329406	4562203	
		IP-85	329902	4562026	
		IP-86	330399	4561850	
		IP-87	331395	4561334	

		IP-88	332390	4560819	
		IP-89	333269	4560360	
		IP-90	334147	4559902	
		IP-91	334528	4559553	
		IP-92	334908	4559203	
		IP-93	335209	4559050	
		IP-94	335510	4558897	
		IP-95	335860	4558762	
		IP-96	336197	4558551	
		IP-97	336533	4558340	
		IP-98	337280	4557968	
		IP-99	338026	4557595	
		IP-100	338280	4557512	
		IP-101	338320	4557548	
		IP-102	338589	4557438	
		IP-103	338767	4557380	
		IP-104	338945	4557323	
		IP-105	339350	4557235	
		IP-106	339754	4557147	
		IP-107	340210	4557024	
		IP-108	340666	4556901	
		IP-109	340925	4556810	
		IP-110	341117	4556730	
		IP-111	341195	4556725	
		IP-112	341459	4556648	
		IP-113	341723	4556571	
		IP-114	341937	4556511	
		IP-115	342151	4556451	
		IP-116	342358	4556439	
		IP-117	342368	4556374	
		IP-118	342551	4556341	
		IP-119	342952	4556231	
		IP-120	344051	4556115	
		IP-121	345150	4555999	
		IP-122	345251	4556040	
		IP-123	345392	4556214	
		IP-124	345365	4556339	
		IP-125	345152	4556383	
		IP-126	345155	4556397	
<b>The situation of the Project in the scope of EIA Regulation</b>	App-I, Item 30: Transportation of the petroleum, natural gas and chemicals via pipes longer than 40 km in length and 600 mm and higher in diameter				
<b>The company preparing the report</b>	ENVY Energy and Environmental Investments Inc.				
<b>The address, telephone and fax number of the company preparing the report</b>	Çetin Emeç Bulvarı 8. Cadde No: 7 06450 A.Öveçler / ANKARA Telephone : + 90 (312) 583 88 00 (Pbx) Fax : + 90 (312) 472 67 10				
<b>Submission date</b>	November 2010				

**CONTENTS**

<b>CONTENTS</b> .....	<b>iv</b>
<b>THE PERFORMANCE TEAM</b> .....	<b>vi</b>
<b>APPENDICES</b> .....	<b>vi</b>
<b>LIST OF TABLES</b> .....	<b>vi</b>
<b>LIST OF FIGURES</b> .....	<b>vii</b>
<b>LIST OF PHOTOS</b> .....	<b>viii</b>
<b>ABBREVIATIONS</b> .....	<b>ix</b>
<b>I. DESCRIPTION, AIM AND CHARACTERISTICS OF THE PROJECT</b> .....	<b>1</b>
I.1 Description, Aims of Service, Importance and Necessity.....	1
<b>II. DETERMINATION AND CHARACTERISTICS OF THE CURRENT CONDITION OF PROJECT AREA AND INFLUENCE AREA</b> .....	<b>2</b>
II.1 Location and Characteristics of The Area Selected for the Project.....	2
II.1.1 Selection of Project Place (Display of the place of which has been verified by Relevant Governorship or Municipality on this area if within the border of Approved Environment Plan or Construction Plan, on the current land usage map if not with its coordinates, the area covered by the project and coordinates of it).....	2
II.1.2 Characteristics of the Project.....	5
II.1.2.1 Physical and Chemical features of the natural gas of which transportation shall be managed with a pipe within the scope of project.....	5
II.1.2.2 Technical characteristics of pipeline within the scope of the project and units within the scope of line, capacity of the pipeline, the area covered by it, the technologies to be used in the pipeline (highway, river, channel etc passages), work flow scheme, number of personnel who will be employed, life time.....	7
II.1.2.3 Planned location of units within the scope of project.....	30
II.1.2.4 Quantity and features of machines, vehicles and tools that are planned to be used within the scope of project.....	30
II.1.2.5 Time Table Related to The Project.....	30
II.1.2.6 Transportation infrastructure within the scope of the project (transportation route and way, current condition and capacity of roads on route, for which purposes they have been used, current traffic load, location as per settlements, repair, maintenance and improvement Works to be conducted etc),.....	32
II.2 Determination of Project Impact Area and Current Condition in The Impact Area.....	33
II.3 Other Considerations.....	34
<b>III. ECONOMICAL AND SOCIAL DIMENSION OF THE PROJECT</b> .....	<b>35</b>
III.1 Current and Planned Socio-Economical Characteristics of the Project and The Impact Area.....	35
III.1.1 Settlements Impacted from The Project.....	35
III.1.2 Cost-Benefit Analysis of the Project.....	35
III.1.3 Economical Characteristics (main industries which constitute economical structure of the district).....	35
III.1.4 Economical Life Time of the Project and The Added Value It Will Add to The Economy.....	36
III.1.5 The Population (Urban and rural population in the region, distribution of the population as per ages, structure of the household).....	37
III.1.6 Health (current endemic diseases in the region).....	38
III.1.7 Risky and Dangerous Activities In Terms of Human Health and Environment.....	38
III.1.8 Expected Revenue Increases; Employment Opportunities To Be Created, Population Movements.....	39

III.1.9	Current and Planned Social Infrastructure Services in The Region (education, health, cultural services, water projects, housing estate projects, railway projects) .....	39
III.1.10	Housing and Other Technical/Social Infrastructure Requirements of The Personnel Employed or To Be Employed and The Population That is Dependent To Them.....	40
III.2	Other Considerations .....	40
<b>IV.</b>	<b>Characteristics of physical and biological environment, usage of natural resources, impacts of the project and the measures to be taken .....</b>	<b>41</b>
IV.1	Land Usage and Property Condition.....	41
IV.1.1	Soil Characteristics .....	41
IV.1.2	Agriculture and Animal Husbandry .....	44
IV.1.3	Geological Characteristics.....	49
IV.1.4	Hydrological Characteristics .....	60
IV.1.5	Hydrogeological Characteristics .....	63
IV.1.6	Meteorological and Climatic Characteristics.....	65
IV.1.7	Forestry Areas .....	78
IV.1.8	Flora-Fauna .....	78
IV.1.9	Protection Areas (Within the scope of list of Sensitive Zones in Appendix-V) .....	98
IV.1.10	The Land Under Ruling and Possession of Competent Bodies of Government (military prohibited regions, areas assigned for public bodies and institutions for certain purposes, "Restricted Areas" with Decree of Council of Ministers numbered 7/16349 etc).....	100
IV.2	Assessment of the Area To Be Sold Off In The Project Place.....	100
IV.2.1	Type and Number of Trees to be Cut Off During the Project, Forest Fires and Measures to be Taken,.....	100
IV.2.2	Size of the Agricultural Areas To Be Sold Off, Land Usage Ability.....	101
IV.2.3	Natural Plant Types To be Impacted and In How Much Wide Area These Works Shall be Carried Out .....	101
IV.2.4	Condition of The Cultural and Natural Properties in The Project Area .....	101
IV.2.5	Impacts and Measures to be Taken Within the Scope of Works and Procedures to be Carried Out Within the Scope of the Project (land preparation, construction, operating and after operating) .....	101
IV.3	Other Considerations.....	103
<b>V.</b>	<b>ASSESSMENT OF ACTIVITIES WITHIN THE SCOPE OF THE PROJECT (REQUIRED ASSESSMENT SHALL BE MADE WITHIN THE SCOPE OF RELEVANT REGULATIONS.) ....</b>	<b>104</b>
V.1	Determination and assessment of impacts originated from activities within the scope of the project (comparison of the assessment with relevant regulations and specifying the measures to be taken) .....	104
V.1.1	Emission (dust and gas ) Calculations (land preparation, construction, operating and after operating) .....	104
V.1.2	Water Usage and Disposal (supply resources in land preparation construction, operating and after operating, water amounts, amounts as per potable and domestic water and other intended uses, amount and disposal of waste water to be arisen from usage).....	106
V.1.3	Wastes (land preparation, construction, operating and after operating waste types, their amounts and treatment) .....	109
V.1.4	Noise sources, levels and vibration .....	110
V.1.5	Health Protection Strip Distances.....	114
V.1.6	Recycling Studies and Works.....	114
V.1.7	Risk analysis .....	115
V.1.8	Risky and Dangerous Activities In Terms of Human Health and Environment.....	116

V.2	Impacts of the Project on Socio-Economical Environment: .....	116
V.3	Other Considerations .....	117
<b>VI.</b>	<b>IMPACTS POSSIBLE TO OCCUR AFTER THE TERMINATION OF ACTIVITY OF THE OPERATING AND ONGOING IMPACTS AND MEASURES TO BE TAKEN AGAINST THESE IMPACTS .....</b>	<b>118</b>
VI.1	Reclamation Works.....	118
VI.2	Land Development.....	118
VI.3	Impacts on Current Water Resources .....	118
<b>VII.</b>	<b>MONITORING PROGRAM.....</b>	<b>119</b>
VII.1	Monitoring Program Proposed for The Construction of the Project, Monitoring Program Proposed for Operating and After Operating of the Project and Emergency Response Plan .....	119
VII.2	The Program Related to Performing The Considerations That Take Place Within The Scope of 9th Article of “Liabilities of The Organizations/Institutions Which Received Certificate of Competency” Heading in Notice of Competency In Case EIA Positive Certificate is Given.....	120
<b>VIII.</b>	<b>PARTICIPATION OF THE PUBLIC.....</b>	<b>121</b>
<b>IX.</b>	<b>CONCLUSIONS.....</b>	<b>126</b>

## THE PERFORMANCE TEAM

## APPENDICES

Appendix-1	Topographical Map (scale 1/25000)
Appendix-2	Environment Plan
Appendix-3	Photo Album
Appendix-4	The Layout Plans of Surface Facilities
Appendix-5	Biological Package Treatment Plant
Appendix-6	Land Maps
Appendix-7	Long Term Newsletter of Samsun and Unye Meteorological Stations
Appendix-8	Official Letters
Appendix-9	Final EIA Monitoring Reports Form

## LIST OF TABLES

Table II.1. Pipeline Route Coordinates .....	4
Table II.2 Pipe Wall Thicknesses To Be Used in The Project .....	8
Table II.3 Characteristics of Used Pipes .....	8
Table II.4 River Crossing Classification .....	12
Table II.5 River Crossing List (RVC 1).....	13
Table II.6 Road Crossing Classification .....	16
Table II.7 List of Road Crossings (RDC 1) .....	21
Table II.8 List of Road Crossings (RDC 2) .....	21
Table II.9 List of Road Crossings (RDC 3) .....	22
Table II.10 List of Channel Crossing (DCC).....	24
Table II.11 Settlements On The Route.....	29
Table II.12 Vehicles and Equipments Planned to be Used Within the Scope of Project .....	30
Table II.13 Natural Gas Pipeline Estimated Time Schedule .....	31
Table II.14 Vehicle Increase Rates .....	32

<b>Table III.1:</b> Urban and Rural Population .....	37
<b>Table III.2:</b> Population Densities in The Region (2000 Year).....	38
<b>Table III.3:</b> Number of Hospitals and Beds in The Provinces .....	38
<b>Table III.4:</b> Number of Health Care Personnel.....	38
<b>Table III.5:</b> Distribution of Population As Per Literacy and Last Graduated Educational Institution	39
Table IV.1 Essential Soil Groups Throughout Pipeline Route.....	41
Table IV.2 Erosion Levels of The Lands Throughout The Pipeline .....	42
Table IV.3 General Important Impacts Intended For Soil During Pipeline Construction and Summary of Impact Reducing Measures .....	44
Table IV.4 Status of Land Usage Throughout Pipeline Route.....	45
<b>Table IV.5:</b> Distribution of Agriculture Lands.....	45
<b>Table IV.6:</b> Field Products Productivity Values .....	46
<b>Table IV.7:</b> Samsun Province Fruit Productivity Values .....	46
<b>Table IV.8:</b> Samsun Province Vegetable Production and Share in Turkey .....	47
<b>Table IV.9:</b> Animal Stock of Samsun Province and Turkey .....	48
<b>Table IV.10:</b> Samsun Province Beekeeping Status for 2006.....	48
Table IV.11 Meteorology Station Information .....	66
Table IV.12 Samsun and Unye Meteorology Stations Data General Assessment.....	67
Table IV.13 Samsun Meteorology Station Temperature Normals .....	67
Table IV.14 Unye Meteorology Station Temperature Normals.....	68
Table IV.15 Samsun Meteorology Station Precipitation Normals (1975-2007) .....	69
Table IV.16 Unye Meteorology Station Precipitation Normals (1975-2007).....	70
Table IV.17 Samsun Meteorology Station Counted Days and Annual Average Values .....	72
Table IV.18 Unye Meteorology Station Counted Days and Annual Average Values .....	72
Table IV.19 Samsun Meteorology Station Average Wind Speeds As Per The Directions (m/s).....	76
Table IV.20 Average Wind Speeds As Per the Directions Unye Meteorology Station (m/s) .....	76
Table IV.21 Unye M.S. Highest Precipitation Values Observed In Standard Times .....	77
Table IV.22 Project Area Floristic Species List.....	81
Table IV.23 Project Area and Impact Area Amphibian List .....	90
Table IV.24 Project Area and Impact Area Reptiles List.....	91
Table IV.25 Project Area and Impact Area Birds List.....	92
Table IV.26 Project Area and Impact Area List of Mammals.....	96
<b>Table V.1:</b> Dust Calculations Emission factors .....	105
Table V.2: Environmental Noise Limit Values for The Construction Site .....	110
<b>Table V.3:</b> Environmental Noise Limit Values for Industrial Facilities .....	111
Table V.4 Allowed Sound Power Level dB/1 pW.....	111
Table V.5 Heavy machinery to be Used in The Construction of the Project and Their Sound Power Levels .....	112
Table V.6 Distribution of Noise Levels As Per Distance and Frequency .....	113

### LIST OF FIGURES

Figure II.1 Project Area and Site Location Map.....	2
Figure II.2 Typical River Crossing.....	14
Figure II.3 Typical Stream Crossing.....	15
Figure II.4 Typical Road Crossing.....	18
Figure II.5 Typical Road Crossing (with casing) .....	19
Figure II.6 Typical Road Crossing (secondary roads).....	20
Figure II.7 Typical Railway Crossing.....	23



Figure II.8 Typical Drying Channel Crossing .....	25
Figure II.9 Typical Energy Transmission Line Crossing.....	27
Figure II.10 Working Corridor .....	34
Figure IV.1 Carsamba Plain Cage Diagram .....	51
Figure IV.2: General Geology Map of the Region.....	53
Figure IV.3 Stratigrafical Cross Section .....	54
Figure IV.4: Samsun Province Earthquake Map .....	58
Figure IV.5: Active Fault Map of the Region.....	58
Figure IV.6: Earthquakes Occurred in Samsun Province and Around.....	59
Figure IV.7 SWA Channel Type Cross-Section.....	62
Figure IV.8 Meteorology Stations .....	66
Figure IV.9 Samsun Meteorology Station Temperature Regime.....	68
Figure IV.10 Unye Meteorology Station Temperature Regime .....	69
Figure IV.11 Samsun Meteorology Station Evaporation and Precipitation Changes (1975-2007)...	70
Figure IV.12 Samsun Meteorology Station Monthly Average Precipitation (1975-2007).....	71
Figure IV.13 Unye Meteorology Station Monthly Average Precipitation (1975-2007) .....	71
Figure IV.14 Monthly Distribution of Days with Fog.....	73
Figure IV.15 Monthly Distribution of Days with Hail.....	73
Figure IV.16 Monthly Distribution of Days with Frost.....	74
Figure IV.17 Monthly Distribution of Days with Thunderstorm .....	75
Figure IV.18 Samsun Meteorology Station Evaporation and Precipitation Changes (1975-2007)...	75
Figure IV.19: Project Area and Surrounding Area Protection Areas.....	99
Figure V.1 Distribution of Sound Pressure Level As Per Distances .....	113
Figure VIII.1: Public Participation Meeting National Newspaper Advertisement.....	123
Figure VIII.2 Pipeline Information Leaflet Front Page.....	124
Figure VIII.3 Pipeline Information Leaflet Back Page .....	125

### LIST OF PHOTOS

Photo II.1 Natural Gas Pipeline Starting Point.....	3
Photo II.2 Natural Gas Pipeline Ending Point.....	3
Photo II.3 Terme Creek.....	13
Photo II.4 The Work in which Thrust Boring Method Was Used .....	16
Photo VIII.1 Public Availability Session -1 .....	122
Photo VIII.2 Public Availability Session-2.....	122
Photo VIII.3 Public Availability Session-3.....	123

**ABBREVIATIONS**

Inc.	Incorporated Company
BORASCO	BORASCO Electricity Generation Inc.
BOTAS	Petroleum Pipeline Corporation
EP	Environment Plan
EIA	Environmental Impact Assessment
RAMEN	Regulations of Assessment and Management of Environmental Noise
NGPL	Natural Gas Pipeline
SMA	State Meteorology Affairs
SWA	State Water Affairs
ETL	Energy Transmission Line
PTL	Power Transmission Line
GW	Gigawatt
RAMAQ	Regulations of Assessment and Management of Air Quality
KBA	Turkish Copper Administrating
L	Liter
R.T.	Republic of Turkey
RTH	General Directorate of Highways
TEDAS	Turkish Electricity Distribution Corporation
TEIAS	Turkish Electricity Transmission Corporation
GDRS	General Directorate of Rural Services
km	Kilometer
kV	Kilovolt
m	Meter
m <sup>3</sup>	Cubic meter
MRE	General Directorate of Mineral Research and Exploration
MWm	Megawatt mechanically
MWe	Megawatt electrically
NDT	Non-destructive Testing Method
PE	Polyethylene
PVC	Polyvinylchloride
s	second
SMS	General Directorate of State Meteorology Affairs
THT	Tetrahydrotheophen
°C	Centigrade Celsius

## **I. DESCRIPTION, AIM AND CHARACTERISTICS OF THE PROJECT**

### **I.1 Description, Aims of Service, Importance and Necessity**

It has been planned to construct a natural gas pipeline in a diameter of 24 inch and approximately 51 km (50+952 m) long within the borders of Carsamba and Terme districts of Samsun Province by BORASCO Electricity Generation Inc. (BORASCO).

BORASCO has been planning a construction of a power plant with a total capacity of 899,37 MWm / 890 MWe (2×445 MWe) within the borders of Terme District of Samsun Province. A “Environmental Impact Assessment Positive” resolution has been taken on the date of 01.04.2009 for the Environmental Impact Assessment (EIA) Report which was prepared for the aforesaid “Samsun Natural Gas Combined Cycle Plant” project. Annually approximately 7.796 GWhour electricity generation of the plant in which natural gas will be used as the fuel has been anticipated. This pipeline which has been planned to be constructed by BORASCO shall supply 240.000 m<sup>3</sup>/hour natural gas to the aforesaid plant.

It has been planned to procure the natural gas to be utilized within the scope of the project from the line which takes place approximately on 45 km west of the plant and has been used by Petroleum Pipeline Corporation (BOTAS) within the scope of Blue Stream Project. Aim of the project is the construction of the pipeline which will deliver the natural gas to be procured from Blue Stream Pipeline to Samsun Natural Gas Combined Cycle Plant. Cooperative studies had been carried out by receiving opinions of BOTAS regarding the route of the pipeline and gas procurement. Start up of the Pipeline has been planned for the end of October, 2011 and life-time of it has been anticipated as 30 years.

According to the Activity Report 2008 published by Turkish Electricity Transmission Corporation (TEIAS), installed power of electrical energy of Turkey has been realized as 41.817,2 MW with an increase of 981,5 MW which corresponds to %2,4 when compared to 2007. On the basis of primary energy sources; an increase of 323,4 MW in thermal plants, 433,8 MW in hydraulic plants, 224,3 MW in geothermal and wind farms has been realized.

As per the same Report, electricity production of Turkey in 2008 had been realized as 198.418 billion kWhour with an increase of 6.860 billion kWhour which corresponds to %3,6 when compared to the previous year. As for the consumption has been 198.085 billion kWhour with an increase of 8.085 billion kWhour which corresponds to %4,3.

## II. DETERMINATION AND CHARACTERISTICS OF THE CURRENT CONDITION OF PROJECT AREA AND INFLUENCE AREA

(Identification of environmental characteristics related to the current condition and planned condition of the place of project and influence area)

### II.1 Location and Characteristics of The Area Selected for the Project

II.1.1 Selection of Project Place (Display of the place of which has been verified by Relevant Governorship or Municipality on this area if within the border of Approved Environment Plan or Construction Plan, on the current land usage map if not with its coordinates, the area covered by the project and coordinates of it)

Samsun Province takes place between the delta's in the middle of Black Sea cost line in which Yesilirmak and Kizilirmak Rivers disembogue. As geographical location, it is between east longitudes of 36°39' - 37°11' and North latitudes of 41°07' - 41°22'. Neighbors of the Province of which Karadeniz takes place at the North are Ordu in the east, Sinop in the west, Tokat and Amasya in the South, Corum in the South west.

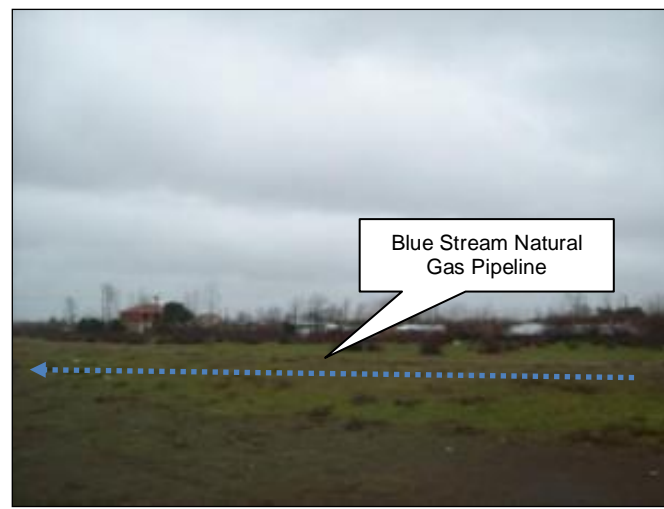
Samsun Province has 14 districts, 51 municipalities and 945 villages that have been composed of Alacam, Asarcik, Ayvacik, Bafra, Carsamba, Kavak, Ladik, Havza, 19 Mayıs, Salıpaزاری, Tekkekoy, Terme, Vezirkopru and Yakakent.



Figure II.1 Project Area and Site Location Map

The project area is located within the borders of Carsamba and Terme Districts in Samsun Province. Besides, while the area takes part in Samsun F34.a3, F37.b4, F37.b3, F37.c2, F38.d1 and F38.d2 map sections that are scaled 1/25.000, it is approximately in the magnitude of 85,6 ha (51 km line length × 17 m working corridor). The field of project takes place at approximately 30 km east of the Samsun Province Centre, 12 km northeast of Carsamba District Centre, and approximately 2km away from Terme District Centre (see Figure II.1 and Appendix-1).

Starting point of the anticipated natural gas pipeline (Blue Stream Natural Gas Pipeline) has been given in Photo II.1, while the ending point (Samsun Natural Gas Combined Cycle Plant Field) has been given in Photo II.2. At the east of the project area, Akcay Creek takes place.



**Photo II.1** Natural Gas Pipeline Starting Point



**Photo II.2** Natural Gas Pipeline Ending Point

When 1/100.000 scaled Environment Plan (EP) prepared by R.T. Ministry of Environment and Forestry for Samsun Province is considered; the field anticipated for Samsun Natural Gas Pipeline (NGPL) in general “qualified agricultural lands”. Besides, throughout the route, forestlands have been passed through in some regions. F-37 and F-38 map sections of 1/100.000 scaled Environment Plan which displays the project area is presented in Appendix-2. Required Works and procedures shall be arranged and carried out within the framework of relevant legislation after the

implementation construction plans related to the project receives the EP Positive resolution. Along with this, important points on pipeline route have been Photographed and presented in the Photo Album in Appendix-3.

Routing coordinates related to the pipeline are given in Table II.1.

Table II.1. Pipeline Route Coordinates

IP_No	KP (m)	UTM Zone 37 Datum ED50		IP_No	KP (m)	UTM Zone 37 Datum ED50	
		X (East)	Y (North)			X (East)	Y (North)
IP-1	0+000	304910	4580463	IP-42	17+431	319942	4573719
IP-2	0+021	304924	4580448	IP-43	18+074	320263	4573162
IP-3	0+137	304849	4580359	IP-44	19+090	320871	4572347
IP-4	0+239	304795	4580272	IP-45	19+281	320994	4572201
IP-5	0+483	304740	4580035	IP-46	20+058	321553	4571662
IP-6	0+912	305048	4579735	IP-47	21+033	322081	4570843
IP-7	1+231	305289	4579526	IP-48	21+616	322531	4570471
IP-8	1+550	305530	4579317	IP-49	21+698	322553	4570392
IP-9	1+839	305757	4579139	IP-50	22+491	323019	4569750
IP-10	2+282	306074	4578829	IP-51	22+831	323273	4569524
IP-11	2+400	306185	4578790	IP-52	22+868	323308	4569514
IP-12	4+333	307781	4577699	IP-53	23+840	323994	4568826
IP-13	6+267	309377	4576608	IP-54	23+946	324085	4568771
IP-14	6+474	309551	4576495	IP-55	24+125	324252	4568706
IP-15	6+776	309826	4576370	IP-56	24+441	324419	4568438
IP-16	7+003	310034	4576279	IP-57	24+829	324631	4568113
IP-17	7+231	310242	4576187	IP-58	25+200	324834	4567802
IP-18	7+597	310606	4576148	IP-59	25+216	324843	4567789
IP-19	7+963	310970	4576109	IP-60	25+781	325261	4567409
IP-20	8+392	311384	4575995	IP-61	26+348	325678	4567024
IP-21	8+516	311502	4575955	IP-62	27+053	325989	4566392
IP-22	8+948	311910	4575814	IP-63	27+491	326286	4566070
IP-23	9+379	312317	4575674	IP-64	27+929	326583	4565748
IP-24	9+595	312533	4575666	IP-65	28+272	326813	4565494
IP-25	10+399	313336	4575630	IP-66	28+615	327043	4565239
IP-26	10+735	313666	4575563	IP-67	28+724	327044	4565130
IP-27	11+071	313994	4575492	IP-68	28+833	327045	4565021
IP-28	11+308	314227	4575449	IP-69	28+902	327028	4564954
IP-29	11+545	314460	4575407	IP-70	28+971	327010	4564888
IP-30	12+142	315056	4575365	IP-71	29+065	326996	4564794
IP-31	12+517	315426	4575428	IP-72	29+360	327046	4564504
IP-32	12+750	315636	4575327	IP-73	29+672	327040	4564192
IP-33	12+984	315847	4575227	IP-74	29+851	326985	4564022
IP-34	13+295	316153	4575167	IP-75	30+193	327006	4563680
IP-35	13+607	316459	4575108	IP-76	30+355	327131	4563577

IP_No	KP (m)	UTM Zone 37 Datum ED50		IP_No	KP (m)	UTM Zone 37 Datum ED50	
		X (East)	Y (North)			X (East)	Y (North)
IP-36	13+925	316758	4575001	IP-77	31+662	328191	4562813
IP-37	14+242	317057	4574894	IP-78	31+754	328278	4562784
IP-38	14+891	317693	4574767	IP-79	31+983	328467	4562654
IP-39	15+540	318329	4574640	IP-80	32+058	328513	4562594
IP-40	16+710	319359	4574084	IP-81	32+187	328624	4562529
IP-41	16+802	319376	4573994	IP-82	32+342	328760	4562455
IP-83	32+688	329083	4562329	IP-105	44+260	339350	4557235
IP-84	33+035	329406	4562203	IP-106	44+674	339754	4557147
IP-85	33+562	329902	4562026	IP-107	45+146	340210	4557024
IP-86	34+089	330399	4561850	IP-108	45+618	340666	4556901
IP-87	35+210	331395	4561334	IP-109	45+893	340925	4556810
IP-88	36+332	332390	4560819	IP-110	46+101	341117	4556730
IP-89	37+322	333269	4560360	IP-111	46+179	341195	4556725
IP-90	38+313	334147	4559902	IP-112	46+454	341459	4556648
IP-91	38+830	334528	4559553	IP-113	46+729	341723	4556571
IP-92	39+346	334908	4559203	IP-114	46+951	341937	4556511
IP-93	39+684	335209	4559050	IP-115	47+174	342151	4556451
IP-94	40+022	335510	4558897	IP-116	47+380	342358	4556439
IP-95	40+397	335860	4558762	IP-117	47+446	342368	4556374
IP-96	40+794	336197	4558551	IP-118	47+632	342551	4556341
IP-97	41+191	336533	4558340	IP-119	48+048	342952	4556231
IP-98	42+026	337280	4557968	IP-120	49+153	344051	4556115
IP-99	42+860	338026	4557595	IP-121	50+258	345150	4555999
IP-100	43+127	338280	4557512	IP-122	50+367	345251	4556040
IP-101	43+181	338320	4557548	IP-123	50+591	345392	4556214
IP-102	43+471	338589	4557438	IP-124	50+719	345365	4556339
IP-103	43+659	338767	4557380	IP-125	50+937	345152	4556383
IP-104	43+846	338945	4557323	IP-126	50+952	345155	4556397

## II.1.2 Characteristics of the Project

Technical characteristics of the project are described in Chapter II.1.2.1 and Chapter II.1.2.2.

### II.1.2.1 Physical and Chemical features of the natural gas of which transportation shall be managed with a pipe within the scope of project

The natural gas that has been composed as a result of metamorphosis of fossils lived millions of years before with the effect of high temperature and pressure in the underground is found as entrapped in between the gaps of rocks or as gas in high volumes on petrol beds. ~ %95 of the natural gas has been constituted of methane (CH<sub>4</sub>). Other than methane; other hydrocarbons such as ethane (C<sub>2</sub>H<sub>6</sub>), propane (C<sub>3</sub>H<sub>8</sub>), butane (C<sub>4</sub>H<sub>10</sub>) are also available. Amount of carbon dioxide (CO<sub>2</sub>) within the waste gases is relatively at minimum amount than other fuel oils. This case reduces the “greenhouse effect” which causes global warming and climate changes.

Natural gas is colorless, odorless, drought and a lighter-than-air gas. It has been aromatized peculiarly in order to be distinguished in case of a possible gas leakage. For this purpose THT (tetra hydro teophen) or TBM (tertiary butyl mercaptan) is used. Natural gas is not poisonous, but when it fills in a volume in a high rate, it has a choking effect as there will be no more oxygen left in the room.

Combustion of it also easy as it has a simple chemical structure and full combustion accrues. Thereby; it doesn't create smoke, fume, soot and ash. It is the fuel oil of which combustion adjusting is the easiest and combustion efficiency is the highest. This feature of natural gas provides ease and economy of use. Due to low carbon content, carbon dioxide gas emission which constitutes greenhouse effect in the atmosphere and which is toxic in terms of human health is at the rate of 1/3 for solid fuels and ½ for liquid fuels.

Natural gas itself is not toxic. But in leakages, it could cause choking as the oxygen will reduce by the increase of the gas amount in the air. Sulphur is almost non-existing in natural gas. Absence of sulphur within combustion products which are composed as a result of combustion eliminate corrosion problem on the surfaces which contact with flame or smoke. Lower % Carbon amount in it than other fuel oils causes the natural gas to combust with a blue and faint flame. This reduces heat transfer which has composed due to radiation in quarries. Amount of air required for combustion is lesser. For this reason combustion efficiency of gases is also higher. Hydrogen amount in natural gas is quite a lot (approximately % 24). As a result of this, water vapor amount within combustion products is also high. When Nitrogen (N<sub>2</sub>) which is available in natural gas reacts with Oxygen at high temperatures (1900–2000 °C), nitrous oxides have been composed. Measures that prevent this composition which causes corrosion should be taken.

Transmission of natural gas is pretty easy via pipes. Pipe losses and conversion losses is almost not available in transmission. As residuals such as ash, fume, soot, tar are not available within combustion products; it does not create air pollution. Besides, along with carbon dioxide (CO<sub>2</sub>) and water vapor (H<sub>2</sub>O), amount of carbon monoxide (CO) is quite less.

Transmission of the natural gas from the source to consumption points has been assured with international conventions. In order to eliminate seasonal demand fluctuations and meet the need, natural has been stored in gas and liquid forms. For storage of natural gas; underground water lakes, underground rock salt beds, abandoned mines, natural gas and petrol fields have been preferred.

Known natural gas reserves are at a level of approximately 150 trillion m<sup>3</sup>, while only %15 of this reserve is at operable state today.

#### Features and superiorities of Natural Gas

- It is a cheap fuel.
- It is a neater gas than other fuel types.
- It does not leave combustion residuals as such in coal, fuel-oil.
- It is a non-toxic gas.
- It does not poison and kill when inhaled.
- It is a lighter gas than air. It does not cumulate on the ground in case of leakage.
- It is an odorless gas. But it has been aromatized with a similar odor such as rotten egg-garlic odor in order to understand leakages in urban transmission.



- No additional area for a fuel tank in buildings is required. Boiler dimensions are reducing and gain of more place has been provided.
- It is transmitted with pipes.
- A preliminary preparation, additional energy is not required for combustion. Maintenance costs of vesicants are low.
- The combustion can be controlled automatically. Safety systems are more advanced than other fuel systems. Combustion efficient is higher than other fuels.
- As natural gas installations work with low pressure; it does not has explosion, fragmentation effects as such in LPG tubes.

II.1.2.2 Technical characteristics of pipeline within the scope of the project and units within the scope of line, capacity of the pipeline, the area covered by it, the technologies to be used in the pipeline (highway, river, channel etc passages), work flow scheme, number of personnel who will be employed, life time

While diameter of natural gas pipeline which is planned to be constructed is 24", length of it is approximately 51 km. The capacity of pipeline shall be 240.000 m<sup>3</sup>/hour.

The units to be established within the scope of project are given below.

- Pigging station
- Natural Gas Pipe
- Blocking Valve Station
- MS Station

The units to be established within the scope of the project ad the methods to be implemented are described below in detail.

Natural Gas Pipe

- High pressure natural gas pipe including 24" and 8" shall be used in the pipeline. 8" pipeline shall be used in by-pass lines.
- High pressure natural gas pipe shall be carbon steel based.
- Outer side of the utilized natural gas pipe shall be coated with polyethylene (PE). Coatings shall be established in accordance with BOTAS 4-NGTL0-GN-P-002-5410 specifications. Minimum thickness of the PE coating on the pipes shall be 3 mm.
- Inner side shall be coated with epoxy paint. Interior coating thickness shall be minimum 80 micron.
- A concrete-coated 30" pipe through which 24" high pressure resistant natural gas pipe will pass shall be used at special passage points with protection purposes.
- Pipe wall thickness shall differ according to population density and on special passage points on its route. Pipe with more wall thickness shall be used in special passage points and at places with more dense population. While places at which pipes with thick walls shall be used within the scope of the project have been determined in field and map Works, pipe wall thicknesses to be used are presented in Table II.2.

**Table II.2** Pipe Wall Thicknesses to be Used in the Project

Pipe Diameter (inch)	Pipe Wall Thickness (mm)	Quality	Length (m)
24"	7,90	X 65M	45.000
	11,10		6.000
	17,48		200
8"	10,31	X 46M or N	160
30"	11,10	Gr. B	200

**Table II.3** Characteristics of Used Pipes

Substance	Gr.B	X 46 M or N	X 65 M
C	0,04-0,18%	0,04-0,18%	0,04-0,18%
Mn	1,20 %	1,40 %	1,45%
P	0,025 %	0,025 %	0,025 %
S	0,010 %	0,010%	0,010%
Nb	0,020 %	0,015-0,055%	0,015-0,055%
V	0,030 %	0,070 %	0,070 %
Ti	0,010 %	0,025 %	0,025 %
N	0,009 %	0,009 %	0,009 %

a) Total of Columbium (Niobium), Vanadium, and Titanium cannot exceed % 0,15.

b) For each %0,01 decrease from the specified Carbon rate (C %), specified maximum Manganese rate (Mn %) could be added, but rate of Manganese could be maximum %1,50 for API 5L X46, and %1,65 for API 5L X65.

### Natural Gas Fitting Materials

- All fitting materials to be used in the pipeline shall be in Class 600 material class.
- Materials to be used shall be selected in accordance with BOTAS Standards. These standards are given below:

General Piping Materials	BOTAS 4-NGTL0-GN-P-002-5110
Flanges	BOTAS 4-NGTL0-GN-P-002-5105
Insulating Gasket	BOTAS 4-NGTL0-GN-P-002-5106

### Pigging Station

- It is the system which is established for sending materials in different types that are called PIG into the pipe for the purpose of cleaning the debris that would compose in the line and drying its humidity.
- PIGGING Station shall be in compliance with BOTAS 4-MGTL0-GN-P-002-5107 Specifications.
- PIGGING Station is constituted of two separate divisions.
  - Launcher: It is situated on the pipeline at which the gas supply is provided. Located in an area of approximately 50 m x 50 m. The material which is called as PIG is placed in the pipeline at this point.

- Blocker: It is situated on the pipeline and at the end of the line. Also an area of 50 m x 50 m is sufficient for this part. The PIG within the pipeline is discharged from this point.
- Movement of the PIG which is delivered to the line from the launcher is provided by the pressure of the gas within the line. When it reaches to the end of the line or in other words to the blocker, then the line has been cleaned.
- This operation is repeated in certain periods by BOTAS.

#### Block Valve Station

- The Block Valve Station is a Group of valves with By-Pass in which couple of valves are used together.
- The Block Valve Station shall be established on a 25 m × 25 m area.
- The valves to be used shall be selected in accordance with BOTAS 4-NGTL0-GN-P-002-5108 specifications.
- In case of any problems on the line, the valve is closed remotely and provides the gas within the troubling part of the pipe to be discharged and the gas within the non-troubling part of the pipe to be preserved.
- It has been decided by a mutual agreement with BOTAS to fit one piece of it in a easy access place on the pipeline to be constructed, close to the middle of the line (around 25. Km).
- The valve Group to be utilized shall be designed as underground. The Block Valve shall be with ACTUATOR (remote-control).
- The Valve Actuators shall be selected in accordance with BOTAS 4-NGTL0-GN- P-002-5101 Specifications.

#### Hot-Tap Valve Group

- The Hot-Tap is the procedure of making a new connection from a pipe in which gas flow continues without throttling the gas flow.
- The Hot-Tap procedure shall be carried out in accordance with BOTAS 4-NGTL0-GN-P-002-5007 Specifications.
- The characteristics of the materials to be used for this procedure shall be selected according to the characteristics of the pipe to which the connection shall be applied (Blue Stream) and characteristics of the pipe to be used in the line to be recently constructed.
- While the Hot-Tap valve to be used is an underground valve, shall not be with remote-control.

#### Take-Off Valve Group

- It is situated after the Hot-Tap valve, at the inlet of the connection line.
- Take-Off Valve Group is a system with By-Pass in which a couple of valves are used together.
- The valves to be used shall be selected in accordance with BOTAS 4-NGTL0-GN-P-002-5108 specifications.
- While the Take-Off valve Group is an underground valve, shall be a valve with remote-control.

- It shall be with an actuator in a way that would be closed with remote intervention in case of any problems in the line.
- The Valve Actuators shall be selected according to BOTAS 4-NGTL0-GN- P-002-5101 Specifications.

### Cathodic Protection

Though the pipeline shall be constructed with high quality steel pipes, if not protected, it will be probably exposed to corrosion in time as a result of electrical currents which will be induced naturally by the contact of especially the metal pipe with the soil around it; these induced currents lead to metal loss, in other words corrosion in the pipe. The biological and chemical activity within the material surrounding the pipeline may contribute in the corrosion.

Before the pipes are delivered to the landing area, in the land of the manufacturer, a triple-layered polyethylene coating which has high integrity shall be applied on the outer surface of the pipe. This coating shall insulate the metal outer surface of the pipeline from soil and thus shall decrease the possibility of current corrosion induced on the pipeline as well as possible chemical attacks. During the pipeline construction, after the welding of the pipe connection points, an additional coating shall be applied on these points. This connection point coating shall be carried out in the pipeline mounting location, on the land. The whole coating of the pipe and weldings shall be subjected to Non-Destructive Testing Method (NDT) in order to assure the integrity before the pipe is installed in the channel. The preferred method is Automatic Ultrasound Testing Method which provides instant results.

An additional protection for protecting the embedded pipeline against corrosion shall be provided with the cathodic protection system that will be composed of a current system affected from sacrificial anode beds.

The natural gas pipeline shall be protected with Cathodic Protection Method against corrosion. The Cathodic Protection System is designed in accordance with relevant BOTAS Specifications. The continuity of the system is provided with Periodical Measurements carried out by BOTAS.

Specifications to be used within the scope of the project are given below.

- |                                                              |                       |
|--------------------------------------------------------------|-----------------------|
| ✓ General Cathodic Protection                                | 4-NGTL0-GN-E-002-8000 |
| ✓ Cathodic Protection Design Criteria and General Philosophy | 4-NGTL0-GN-E-002-8001 |
| ✓ Cathodic Protection Design Calculation and Dimensioning    | 4-NGTL0-GN-E-002-8002 |
| ✓ Cathodic Protection Installment                            | 4-NGTL0-GN-E-002-8003 |
| ✓ Cathodic Protection System Testing                         | 4-NGTL0-GN-E-002-8004 |
| ✓ Transformer and Rectifier                                  | 4-NGTL0-GN-E-002-8010 |
| ✓ Silicone                                                   | 4-NGTL0-GN-E-002-8011 |
| ✓ Backfill with Carbon                                       | 4-NGTL0-GN-E-002-8012 |
| ✓ Thermite Welding of Steel Cable                            | 4-NGTL0-GN-E-002-8013 |

### Non-Destructive Testing

Welding Works carried out in manufacturing of the natural gas pipeline shall be inspected by competent (authorized) and qualified staff with NDT Certificate every day with non-destructive testing

method and whether the welding Works are carried out in accordance with specifications shall be controlled.

The specifications to be used within the scope of the project are given below.

✓	Welding	4-NGTL0-GN-P-002-5005-R1
✓	Non-destructive Testing	4-NGTL0-GN-P-002-5006

### **Special Crossings**

While the pipeline has been designed, manufacturing which require special construction engineering and additional safety measurements may be defined as special crossings. These kind of special crossings that are met through the route are unavoidable for almost every pipeline. For this reason, in order to minimize the potential problems, this kind of crossings should be carefully assessed and examined in every respect.

Throughout Samsun NGPL, various special crossings that each of all requires different methods have been met. These special crossings may be classified as follows:

- River, creek and other stream crossings,
- Road crossings,
- Railway crossings,
- Drying channel crossings,
- Energy transmission crossings,
- Fault line crossings and
- Other crossings (communication line, domestic water line etc.).

The most commonly used methods for special crossings are open-cut and thrust boring methods.

In the open-cut method; whilst the pipe is installed in the trench opened by an open-cut, in thrust boring method casing pipes are used. In this method, another pipe which has a bigger diameter than the natural gas pipeline is installed at the point through which the special crossing will be managed without open-cuts with special equipments. On the other hand, as also mentioned in Chapter IV.1.5, underground water level is generally high throughout the route. Accordingly, as dealing with the underground water will be challenging for some cases for which thrust boring had been decided during construction Works, by taking the climate conditions in the working period into consideration, open-cut method may be preferred instead of thrust boring method. If considered that the diameter of Samsun NGPL is 24", the diameter of casing pipe to be installed shall be required to be 30" according to the characteristics given by BOTAS (see. Figure II.5). Besides, also the insulating material has been placed again in accordance with these characteristics in between the casing pipe and natural gas pipe.

In river or channel crossings, when open-cut method is used, the pipe should be taken into a concrete jacket. The concrete jacket both helps the pipe to sink into the water and also protects the pipe during improvement works.

The open-cut method is applied in two ways in road crossings. One of them is to use the casing pipe within the excavated trench, and other one is to install concrete plates on the pipe. While

the concrete plates are in dims of 0,5 m x 1,0 m x 0,1 m; they are installed on the pipe in a way that leaves 0,4m space between them and the pipe. These plates both distribute the dynamic forces which will come onto the pipe and also protect the pipe against possible activities afterwards.

The typical crossing documents (BOT-TYP-PL-0045) prepared by BOTAS do not allow the usage of elbows that are called hot bending throughout the route except for obligatory circumstances. Accordingly, the bendings (turnings) shall be installed according to the method called as cold bending method and shall be executed by means of bending the pipes. In this bending method, bending radius must be 40 times of the pipe diameter.

Another important subject is that depending on the depth of special crossing point (river, road crossing etc.), crossing shall be executed deeper than 2,0m which is the normal embedment depth of the pipeline. By this means, both the safety of the pipeline shall be assured and also the least damage would be given to the structure to be crossed.

All special crossing points that have been planned to cross throughout the route have been studied in the land and presented in the reports appendix with Photos (see Appendix-3 Photo Album).

### River Crossings

Characteristics of river crossings (RVC) which are grouped under three (3) categories according to various features are given in Table II.4.

**Table II.4** River Crossing Classification

Type of River Crossing	Type of Stream	Description
RVC 1	Rivers	<ul style="list-style-type: none"> <li>- Wide flood plain</li> <li>- Width of bed &gt; 25 m</li> <li>- High Flow rate</li> <li>- Sensible in terms of environment</li> <li>- Can be crossed with concrete coated pipes</li> </ul>
RVC 2	Creeks	<ul style="list-style-type: none"> <li>- Width of bed is between 5 and 25 m</li> <li>- Flow is available all over the year</li> <li>- Can be crossed with concrete coated pipes</li> </ul>
RVC 3	Small Creeks and Creeks Together with Seasonal Rivers	<ul style="list-style-type: none"> <li>- Width of bed &lt; 5 m</li> <li>- Seasonal or intermittent flow</li> <li>- Open-cut method can be used</li> </ul>

River crossings should not change the flow morphology in the river, besides should not lead to soil and sediment accumulation. Within this scope; while small creek, creek and seasonal creeks generally do not lead to problems for the pipeline, risk increases as the size and flow rate of the river gets bigger.

Every kinds of permission related to river crossings shall be taken from General Directorate of State Water Affairs (SWA) after the submission of all river crossings. In bigger river crossings, concrete coated pipes shall be used. On the other hand, other methods may be preferred for smaller rivers. Important respect is to take suitable measures in river crossings and to use required construction engineering. Otherwise, together with the increasing flow rate in wet periods, it is possible for the pipe to rise to the surface.

Typical drawings of river crossings prepared by BOTAS are given in Figure II.2 and Figure II.3, while information about rivers to be crossed is given in Table II.5.

**Table II.5** River Crossing List (RVC 1)

No	KP	Name of River	Coordinate (UTM ED50)		Photo No (*)
			East (x)	North (y)	
01	31+520	Terme Creek	328416	4562868	36

(\*) see Appendix-3 (Photo Album)

The Terme Creek is the widest water structure to be crossed throughout the route while it is presented in Photo II.3.



**Photo II.3** Terme Creek

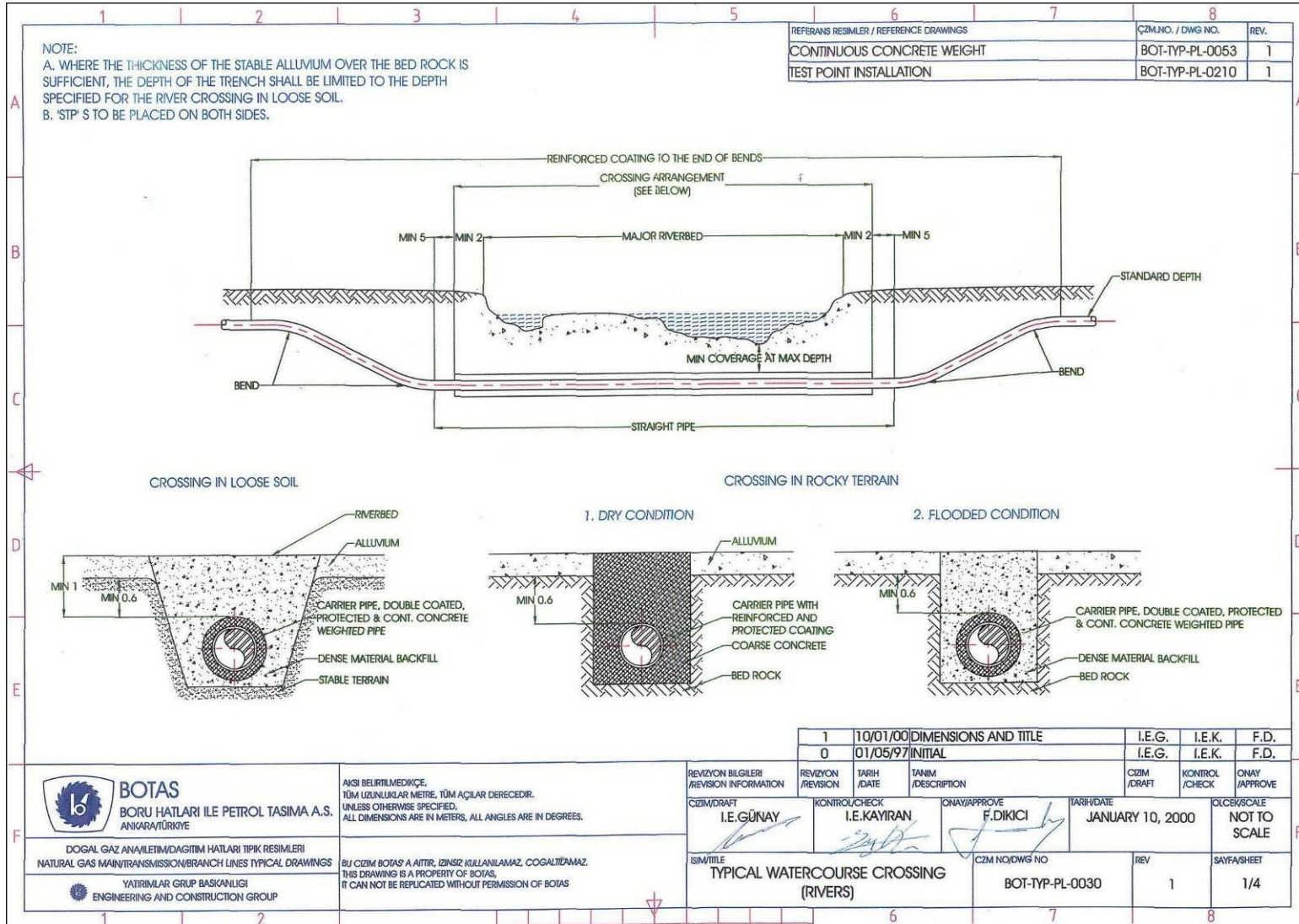


Figure II.2 Typical River Crossing



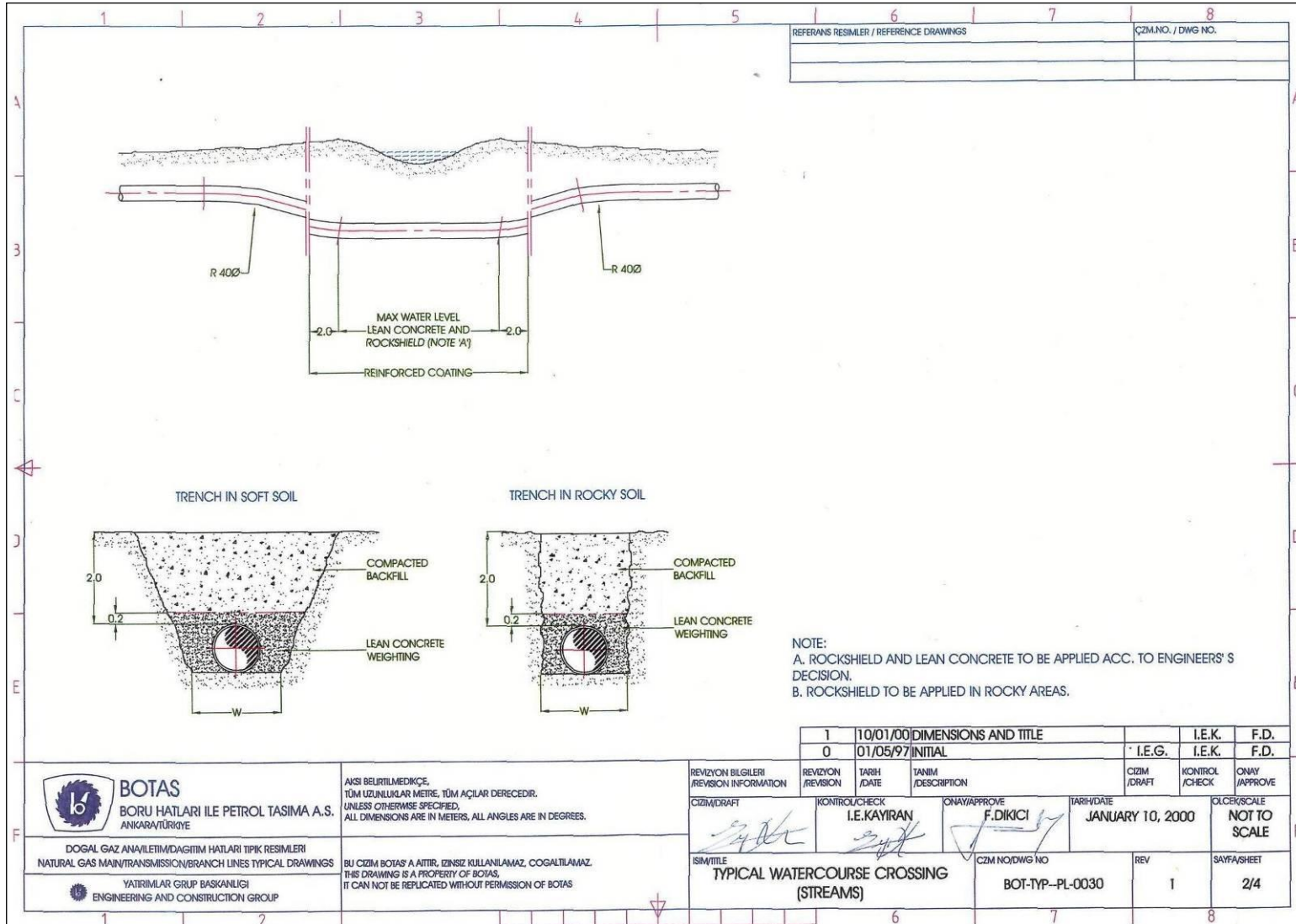


Figure II.3 Typical Stream Crossing

Road Crossings

The road crossings (RDC) within the scope of the project had been assessed under three categories. This classification had been carried out by considering the construction method, current traffic load and the road coating. On the other hand, the road crossings have been performed by means of;

- Thrust boring; as you remember in which casing pipe is used,
- Open-cut method by putting concrete plate on the pipe or
- Only one of the open-cut methods.

Road crossing classification and which method to be used in crossings are given in Table II.6.

**Table II.6** Road Crossing Classification

Type of Road Crossing	Type of Road	Description
RDC 1	State Highway, Highway	- Multilane wide roads - Very dense traffic load - Can be crossed with thrust boring method - Asphalt coated
RDC 2	Main road	- Multilane roads - Normal traffic load - Can be crossed with thrust boring or open-cut method - Asphalt coated
RDC 3	Small Rural Roads	- Single lane small roads - Very low traffic load - Can be crossed with concrete plated open-cut or only open-cut method - Generally stabilized, sometimes unpaved road

Which construction method will be used for which road has been determined by General Directorate of Highways (RDH). After confirming the crossings and their locations, these documents are submitted to RDH and required permissions can be received.

Thrust boring method is a general method used for RDC 1 and in some circumstances for roads in type of RDC 2, while roads with width up to 120 m can be crossed with this method.

The work performed with thrust boring method in previous projects is presented in Photo II.4.



**Photo II.4** The Work in which Thrust Boring Method Was Used

As for open-cut method is used for RDC 3 type roads. Small rural roads can be crossed with this method without any need for an additional protection, as well usage of concrete plates may be required depending upon the traffic load.

The typical drawings of road crossings prepared by BOTAS are given in between Figure II.4 and Figure II.6.

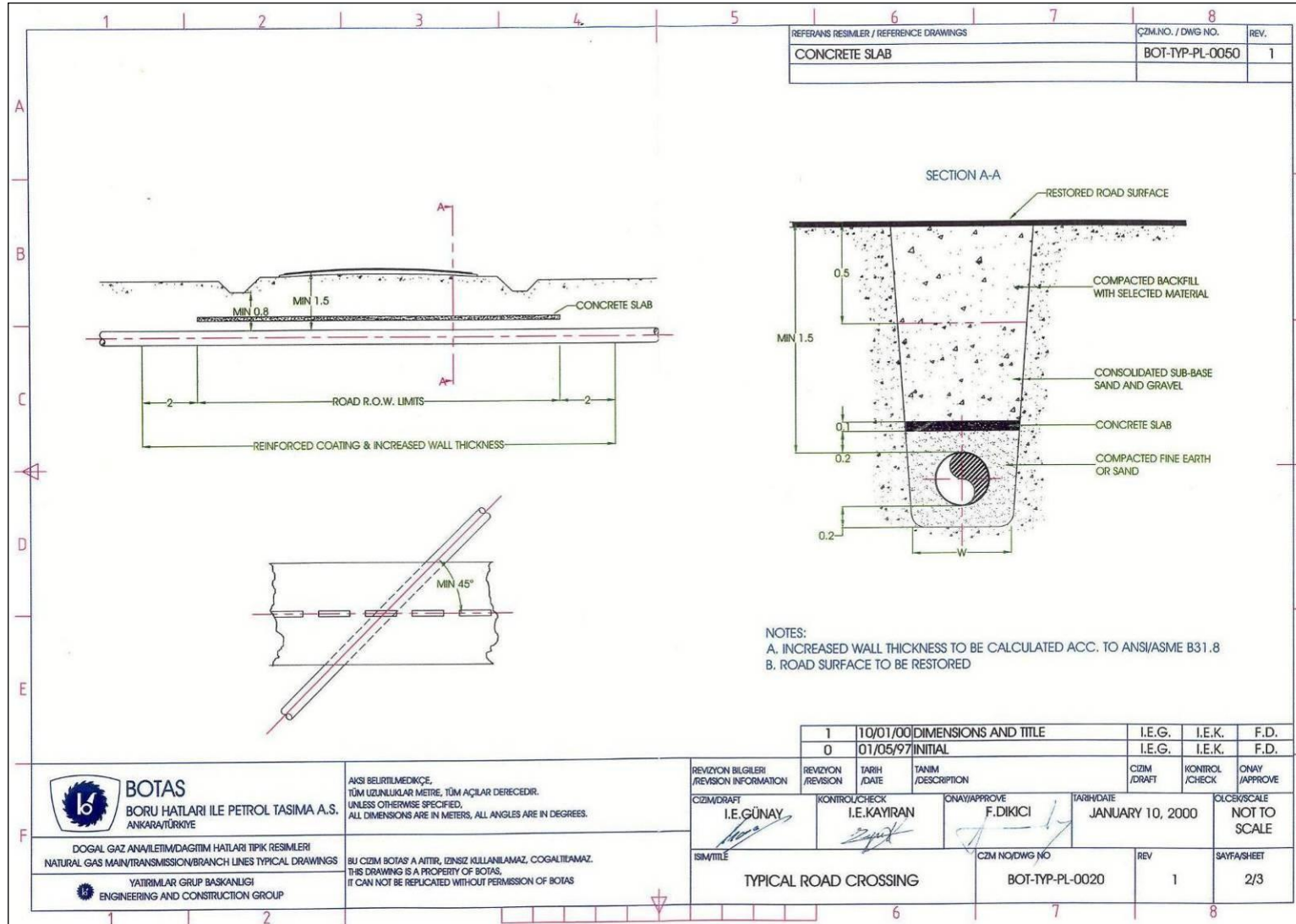


Figure II.4 Typical Road Crossing

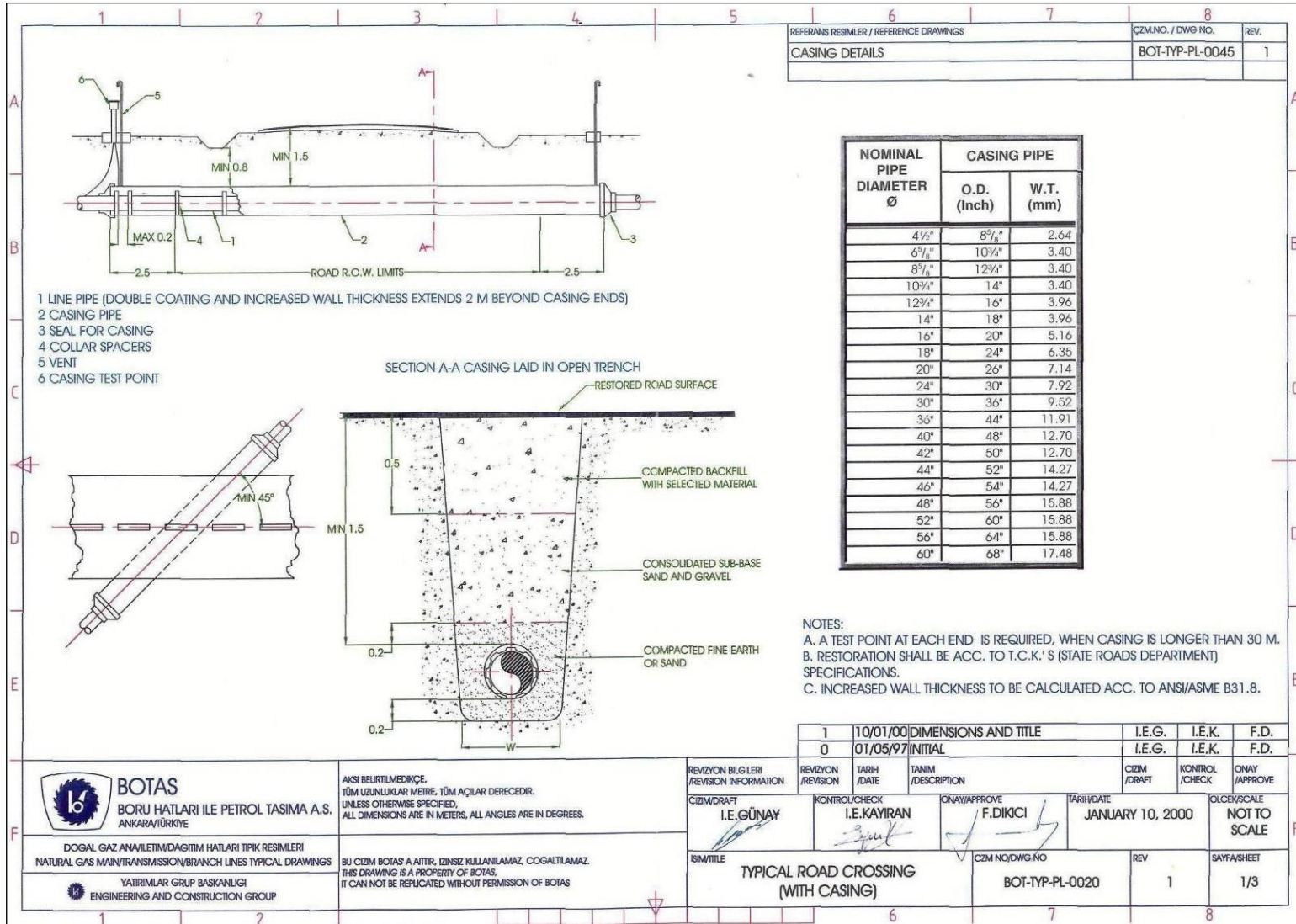


Figure II.5 Typical Road Crossing (with casing)

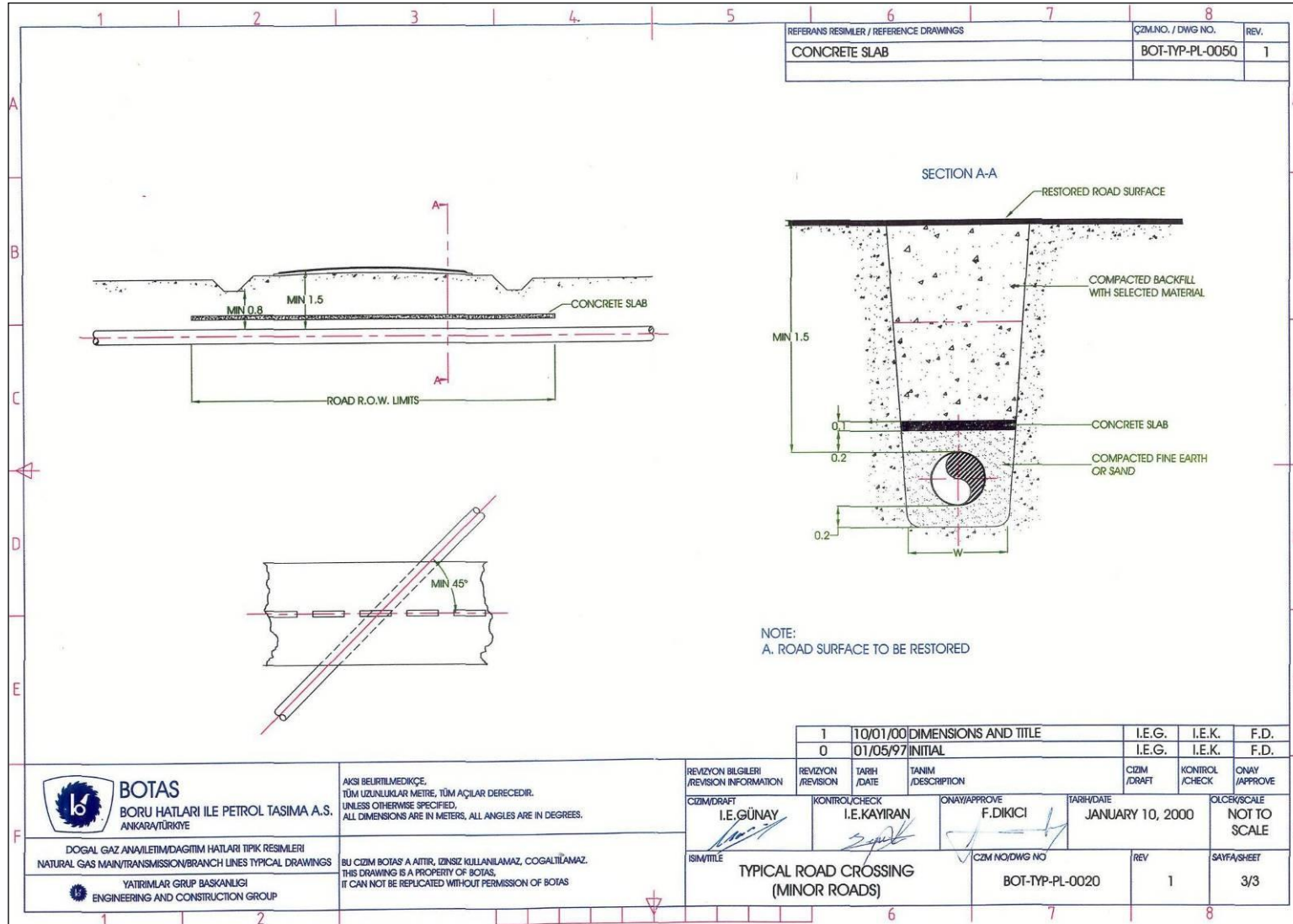


Figure II.6 Typical Road Crossing (secondary roads)

Information on the roads which will be special crossed throughout the route is given in Table II.7, Table II.8 and Table II.9.

**Table II.7** List of Road Crossings (RDC 1)

No	KP	Name of The Road	Coordinate (UTM ED50)		Photo No (*)
			East (x)	North (y)	
01	28+950	Samsun-Ordu Highway	327021	4564816	31
02	50+500	Samsun-Ordu Highway	345383	4556256	49

(\*) see Appendix-3 (Photo Album)

**Table II.8** List of Road Crossings (RDC 2)

No	KP	Name of The Road	Coordinate (UTM ED50)		Photo No (*)
			East (x)	North (y)	
01	0+850	Kadılı District Road	305050	4579725	2
02	1+750	Durusu-Kadılı District Road	305707	4579185	4
03	7+100	Delikbası District Road	310155	4576285	6
04	8+350	Drying Channel Service Road	311419	4575956	7
05	11+800	Karamanlı District Road	314751	4575393	11
06	11+900	Drying Channel Service Road	314846	4575376	12
07	15+300	Kırkharman District Road	318222	4574614	15
08	18+900	Meseyazı District Road	320823	4572521	19
09	25+150	Golyazı Rural Road	324843	4567748	26
10	31+400	Fakıralı District Road	328424	4562986	35
11	32+000	Saraykoy Rural Road	328672	4562476	37
12	39+200	Bagsaray Road	335198	4559678	40
13	40+900	Evcı Road	336419	4558458	42
14	43+300	Sakarlı Road	338580	4557439	43
15	46+100	Nalcılar District Road	341172	4556706	45
16	50+450	Akcay District Road	345399	4556233	48

(\*) see Appendix-3 (Photo Album)

**Table II.9** List of Road Crossings (RDC 3)

No	KP	Name of the Road	Coordinate (UTM ED50)		Photo No (*)
			East (x)	North (y)	
01	2+300	Cropland and/or Cross Linking Road	306153	4578801	5
02	9+300	Cropland and/or Cross Linking Road	312289	4575686	8
03	10+300	Cropland and/or Cross Linking Road	313299	4575625	9
04	11+500	Cropland and/or Cross Linking Road	314396	4575456	10
05	12+500	Cropland and/or Cross Linking Road	315464	4575347	13
06	13+500	Cropland and/or Cross Linking Road	316401	4575051	14
07	16+700	Cropland and/or Cross Linking Road	319364	4574057	16
08	17+300	Cropland and/or Cross Linking Road	319920	4573730	17
09	17+800	Cropland and/or Cross Linking Road	320204	4573270	18
10	19+100	Cropland and/or Cross Linking Road	321021	4572293	20
11	19+800	Cropland and/or Cross Linking Road	321447	4571799	21
12	20+950	Cropland and/or Cross Linking Road	322046	4570930	22
13	21+500	Cropland and/or Cross Linking Road	322529	4570431	23
14	22+350	Cropland and/or Cross Linking Road	323014	4569768	24
15	23+750	Cropland and/or Cross Linking Road	324030	4568822	25
16	26+250	Cropland and/or Cross Linking Road	325708	4567058	27
17	27+000	Cropland and/or Cross Linking Road	326052	4566413	28
18	28+100	Cropland and/or Cross Linking Road	326789	4565551	29
19	28+650	Cropland and/or Cross Linking Road	327056	4565131	30
20	29+500	Cropland and/or Cross Linking Road	327256	4564355	32
21	29+750	Cropland and/or Cross Linking Road	327415	4564217	33
22	30+250	Cropland and/or Cross Linking Road	327831	4563977	34
23	32+770	Cropland and/or Cross Linking Road	329381	4562179	38
24	39+850	Cropland and/or Cross Linking Road	335685	4559212	41
25	44+400	Cropland and/or Cross Linking Road	339788	4557220	43
26	47+900	Cropland and/or Cross Linking Road	342922	4556280	46
27	50+200	Cropland and/or Cross Linking Road	345250	4556036	47

(\*) see Appendix-3 (Photo Album)

**Railway Crossings**

Currently no railway line is available which is crossed on the route.

But in consequence of corporate negotiations carried out for completing the line, General Directorate of State Railways, Harbors and Airports Construction has mentioned that a railway line construction is planned throughout the route and the possible railway route has been adapted into 1/25.000 scaled topographical maps (see Appendix-1). As can be seen in the maps also, the possible railway line is in a location that is parallel to the natural gas pipe line.

Typical drawings prepared by BOTAS for railway crossings (RWC) is given in Figure II.7.



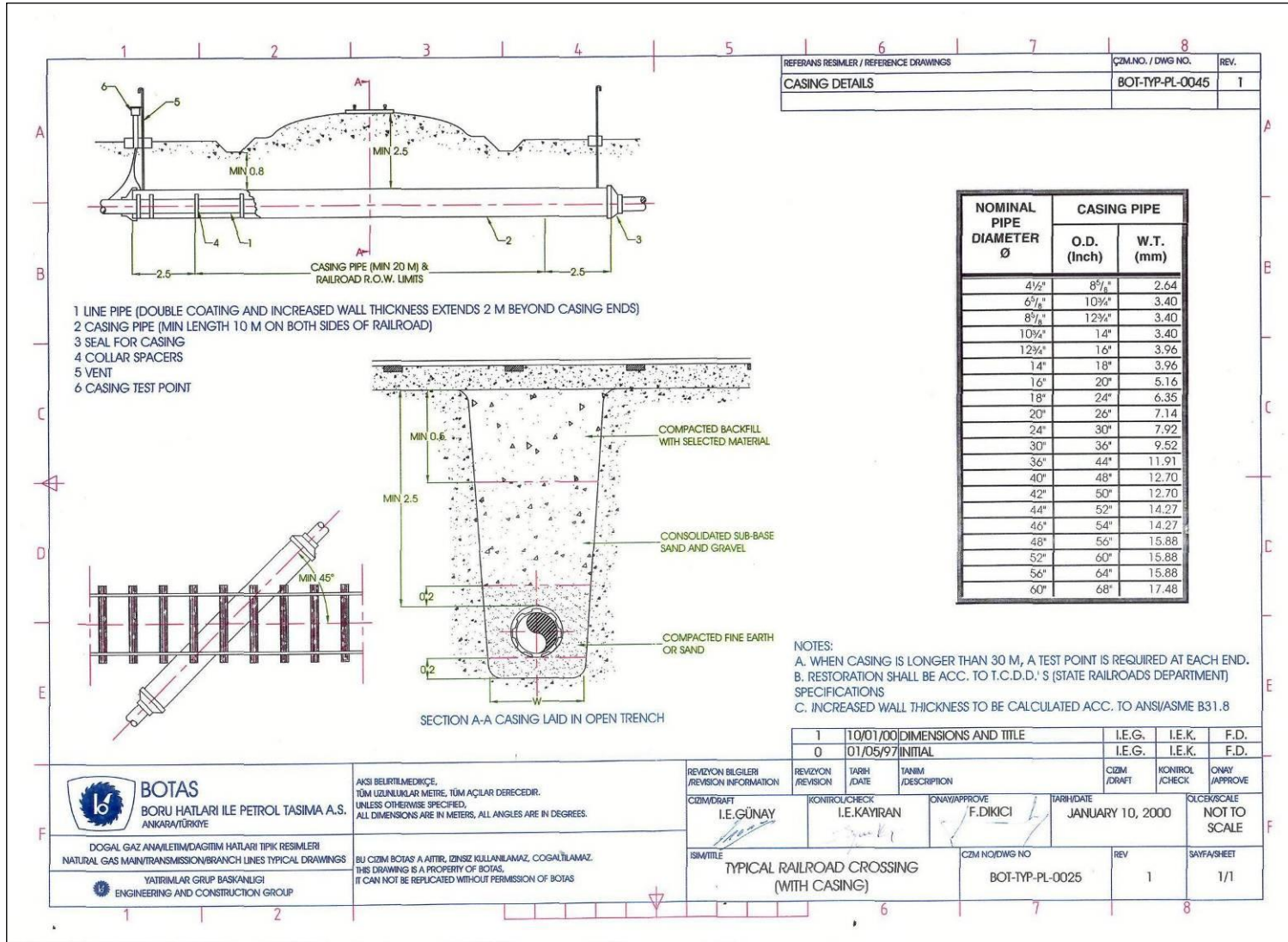


Figure II.7 Typical Railway Crossing

Channel Crossings

By channel crossing, drying channel crossings which is available on the route has been meant. All of these channels within the scope of the project are open soil channels.

The channels may be crossed with concrete coated pipes and open-cut method. But, as far as observed in the project area, drying channels as big as rivers have also been come across. For this reason, in such type channel crossings, thrust boring method may be required to use. All permissions within this scope also shall be taken from SWA.

The typical stream crossing drawing published by BOTAS is given in Figure II.8.

Information about drying channels to be special crossed throughout the route is given in Table II.10.

**Table II.10** List of Channel Crossing (DCC)

No	KP	Coordinate (UTM ED50)		Photo No (*)
		East (x)	North (y)	
01	2+300	306153	4578801	5
02	8+350	311419	4575956	7
03	11+500	314396	4575456	10
04	11+800	314751	4575393	11
05	11+900	314846	4575376	12
06	13+500	316401	4575051	14
07	16+700	319364	4574057	16
08	17+800	320204	4573270	18
09	21+500	322529	4570431	23
10	22+350	323014	4569768	24
11	23+750	324030	4568822	25
12	25+150	324843	4567748	26
13	26+250	325708	4567058	27
14	27+000	326052	4566413	28
15	28+100	326789	4565551	29
16	29+500	327256	4564355	32
17	39+850	335685	4559212	41

(\*) see Appendix-3 (Photo Album)

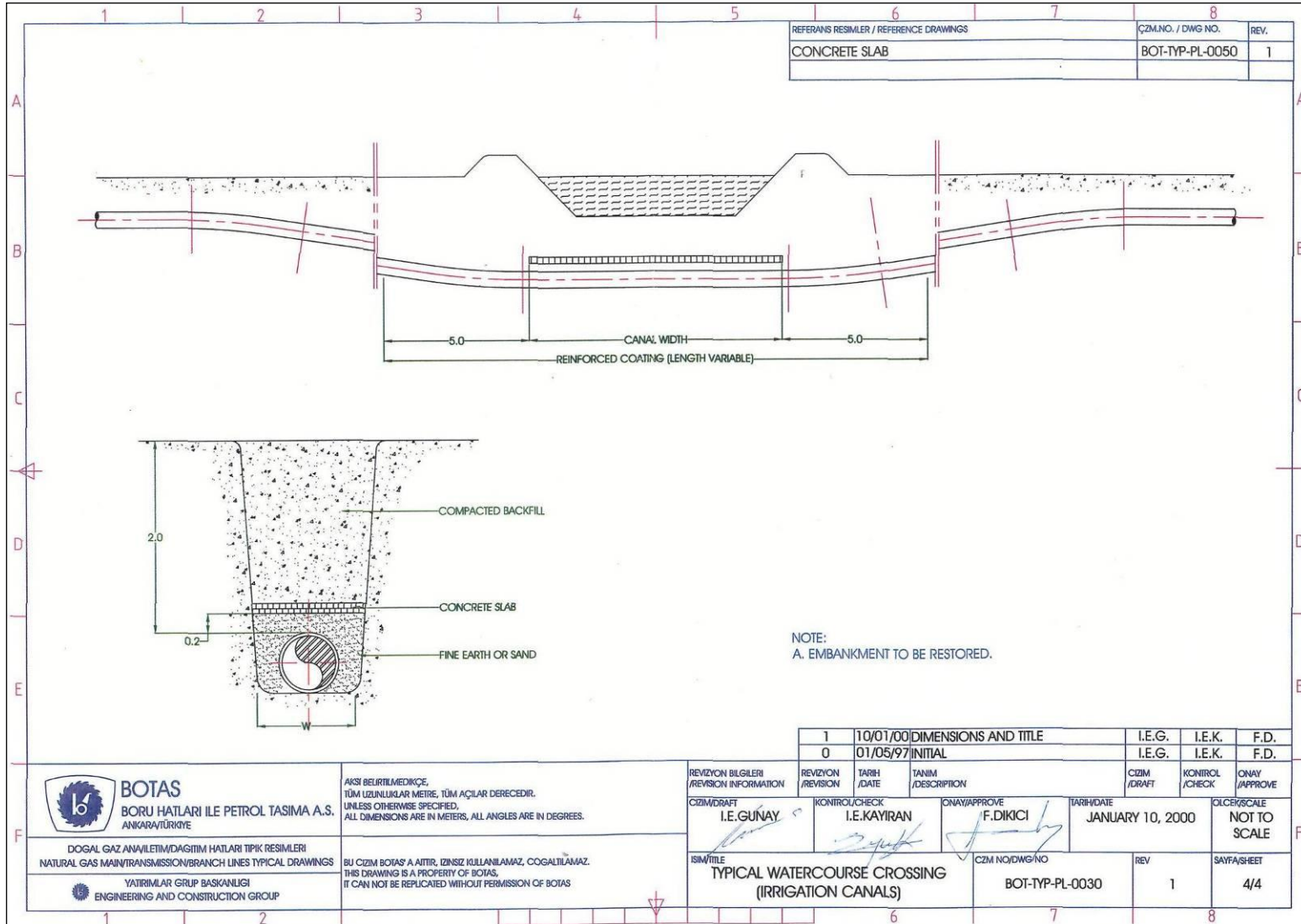


Figure II.8 Typical Drying Channel Crossing

### Energy Transmission Line Crossings

Energy transmission lines (ETL) are classified according to their energy levels. These may be gathered together under three main headers:

- 380 kV,
- 154 kV and
- 34.5 kV.

As well as generally 380 kV and 154 kV energy transmission lines are used in Turkey, mid-voltage lines are 34.5 kV.

Whilst Turkish Electricity Transmission Corporation (TEIAS) is responsible with transmission of electricity in high voltage, Turkish Electricity Distribution Corporation (TEDAS) is responsible with mid and low voltage lines. Both these two institutions have defined their own specifications for construction activities to be carried out around electricity lines. Drawing of typical energy transmission line crossing arranged by BOTAS is given in Figure II.9.

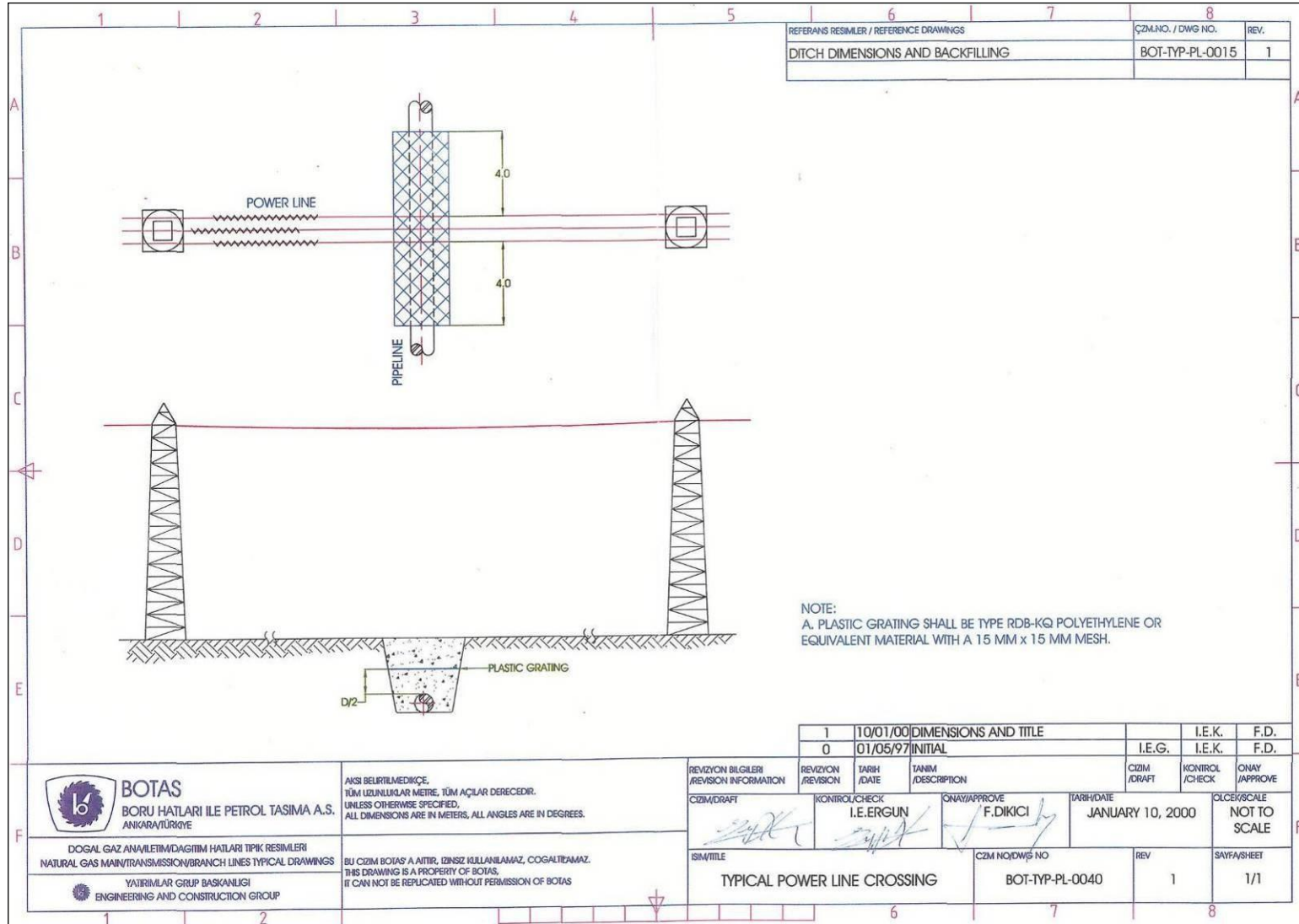


Figure II.9 Typical Energy Transmission Line Crossing

### Fault Line Crossings

No active fault line and crossing is available throughout Samsun Natural Gas Pipeline.

### Other Crossings

Additionally to the crossings described above. It is possible for the pipeline to have the crossings listed below. These are:

- Telecommunication crossings,
- Domestic water line crossings,
- Sewer line crossings and,
- Other infrastructure crossings.

But it is almost impossible to determine all of the lines listed above particularly the underground ones. Unfortunately, in Turkey, as the records of these lines have not been kept regularly, place of these lines, accordingly the crossing points could not have been determined. Most of these lines shall be required to be determined at construction stage.

### Rural and Settlement Crossings

Maximum operating pressure of Samsun NGPL shall be 70 bar and this value ranks in the high pressure class (40-75 bar) according to BOTAS Specifications. For this reason, highest level protection measures should be taken while crossing very close to settlements. Although settlement areas have been tried to be stayed out of in route determination studies, circumstances which require to cross over or close to the settlements have been met.

In such cases, while the formula described in Technical Safety Criteria submitted in BOTAS Resolution of Board of Directors dated 05.July.2003 and numbered 37-293 has been used in order to calculate maximum how much settlements could have been approached, the Formula is given below:

$20 \text{ m} + (\text{storey height of the building (m)} \times 1,0 \text{ m})$

In addition to this, as described in the Standard of American Society of Mechanical Engineers (ASME) numbered B31.8 (1995 Edition), calculation of pipe wall thickness should also be carried out and the design coefficient used for this calculation has been determined by considering the below factors:

- If 10 or less buildings in which people are living are available in a 1-mile area, design coefficient is taken as 0,72 or 0,80 as per the land conditions,
- If between 10 and 46 buildings in which people are living are available in a 1-mile area, design coefficient is taken as 0,6.
- If 46 and more than 46 buildings in which people are living are available in a 1-mile area, design coefficient is taken as 0,6.
- In regions with high dense of multi storey buildings, design coefficient is taken as 0,4.

As a result; BOTAS has specified pipe wall thickness as per the aforesaid conditions for this project. Mentioned thickness values have been determined as 7,9mm for open terrains and

11,1 mm while crossing through settlements. In this sense, wall thickness of the approximately 46 km of the pipeline is 7,9mm whilst throughout remaining approximately 4 km pipe wall thickness shall be 11,1mm.

Names of the settlements that have been crossed by the pipeline route closely, kilometer points and their distances to the pipeline are all together given in Table II.11.

**Table II.11** Settlements On The Route

No	KP	Name of Settlement	Distance to the Pipeline (m)
1	0+274	Kadili District	254
2	2+247	Kadili District	691
3	6+248	Delikbasi District	744
4	7+555	Tahtabahce District	829
5	7+660	Kabaarmut District	963
6	8+303	Cobanli District	240
7	14+419	Kirkharman District	457
8	15+481	Emiryusuf	819
9	22+259	Danakoy District	722
10	25+775	Golyazi	488
11	26+767	Yolbasi District	625
12	28+010	Gundogdu	947
13	32+718	Kizilcali District	456
14	34+349	Ahmetbey District	532
15	41+636	Karasu District	399
16	44+941	Karamese District	704
17	46+238	Gokceagac District	298
18	49+625	Akcaay District	221

As can be seen in the above Table, the closest settlement to the pipeline is Akcaay District while distance of it is approximately 221 m.

#### Graveyard, Military Area (Thana) and Archeological Site Crossings

The Environment Plan given in Appendix-2 and Land Maps given in Appendix-6 together with land studies have shown that there is no military and archeological area available throughout Samsun NGPL. But, when any archeological find is met, Samsun Provincial Museum Directorate shall be informed after the construction is left off. In such cases The Directorate assigns a personnel and studies are carried out under supervision of this person and towards his/her instructions.

Besides, while Samsun NGPL does not cross through any graveyard area, graveyard fields are available that are close to the route. But they won't be affected from the construction activities.

### II.1.2.3 Planned location of units within the scope of project

As also explained in Chapter II.1.2.2; a pigging station, a blok valve station and an MS-station shall be established within the scope of project.

Within the scope of the project, at approximately 5th km of the Blue Stream Natural Gas Pipeline which is the initial point of the line, one pigging station shall be established and the magnitude of this station shall be 2500 m<sup>2</sup> (50 m x 50 m).

With the purpose of providing the safety of the line, one Block Valve Station (BVS) shall be established at the 25th km of the line. Magnitude of BVS area shall be 25 m<sup>2</sup> (5 m x 5 m).

At the end point of the line, an MS Station shall be available. MS station shall take place within the plant field.

The layout plans of surface facilities to be established within the scope of project have been presented in Appendix-4.

### II.1.2.4 Quantity and features of machines, vehicles and tools that are planned to be used within the scope of project

Machines and vehicles to be used within the scope of the project are presented in Table II.12. Alongwith the equipments given in the Table, numerous number of pickup truck, small vehicles, diesel or electrical driven pump and generator also shall be utilized during construction stage.

**Table II.12** Vehicles and Equipments Planned to be Used Within the Scope of Project

Vehicle–Equipment	Number (pieces)
Excavator	10
Crane	2
Welding Machine	20
Trailer Truck	20
Truck	15

### II.1.2.5 Time Table Related to The Project

Time Table relating to the project is presented in Table II.13.



**Table II.13** Natural Gas Pipeline Estimated Time Schedule

Item No	Description / Years	2010												2011													
		Jan.10	Feb.10	Mar.10	Apr.10	May.10	Jun.10	Jul.10	Aug.10	Sep.10	Oct.10	Nov.10	Dec.10	Jan.11	Feb.11	Mar.11	Apr.11	May.11	Jun.11	Jul.11	Aug.11	Sep.11	Oct.11				
1	Feasibility Studies	█																									
2	EIA Process		█																								
3	Detailed Engineering												█														
4	Construction Process														█												
5	Test and Commissioning																						█				

**II.1.2.6 Transportation infrastructure within the scope of the project (transportation route and way, current condition and capacity of roads on route, for which purposes they have been used, current traffic load, location as per settlements, repair, maintenance and improvement Works to be conducted etc).**

Within the scope of planned pipeline, many rural roads are available as can be seen in the topographical map presented in Appendix-1. These roads are in general stabilized double-lane roads. Along with these, while main rural roads are asphalt coated, they enable transportation of big vehicles. If will be considered necessary during construction stage, these roads will be improved in order to enable the big vehicles to pass over. These improved roads shall be publicly available after the construction towards the request of the region public.

Besides pipeline route cuts off the Samsun-Ordu Highway (D-100) at two points. As can be seen in the topographical map given in Appendix-1, first of these points is on the west of Terme District and second one is very close to the Plant Field.

Basic impact to the transportation infrastructure at the construction stage of the project shall be the increase in the traffic load in the highway during the transportation of the pipes. It has been planned to procure the pipes planned to be used within the scope of the project from Marmara Region.

While the pipes shall be delivered to the construction site via trailer trucks, each trailer truck shall carry 6 pieces of pipes. For the project, approximately 3000 pieces of pipes with a length of 17m shall be used. At the construction stage of the project, approximately 500 trailer trucks (3000 pipes / 6 pipes / 1 trailer tr. = 500 trailer tr.) shall be used. When 60 days of shipment is considered, daily in average 9 trailer trucks shall be under way between İzmit and the storage area which will be established in Terme. Traffic load to be occurred in the roads to be used during the shipment of the pipes and the highways to be affected are presented below.

**Table II.14** Vehicle Increase Rates

The Highway Under Impact	Current Traffic Load		Vehicle Increase Rate (%)	
	Heavy Vehicle	Total	Heavy Vehicle	Total
Batı İzmit - Kandıra Highway	19969	49572	0.05	0.02
Kandıra Dogu - İzmit	16988	42802	0.05	0.02
Dogu İzmit - Sapanca	14586	37744	0.06	0.02
Sapanca - Adapazarı	14413	36737	0.06	0.02
Adapazarı - Akyazı	10118	26228	0.09	0.03
Akyazı - Hendek	9879	25140	0.09	0.04
Hendek - Duzce	9413	23774	0.1	0.04
Duzce - Kaynaslı	8500	20317	0.11	0.04
Kaynaslı- Eskipazar	6400	32224	0.14	0.03
Eskipazar - Hacıhamza	5742	42778	0.16	0.02
Hacıhamza- Merzifon	3887	24646	0.23	0.04
Merzifon - Samsun	15524	88245	0.06	0.01
Samsun-Terme	10365	84962	0.09	0.01

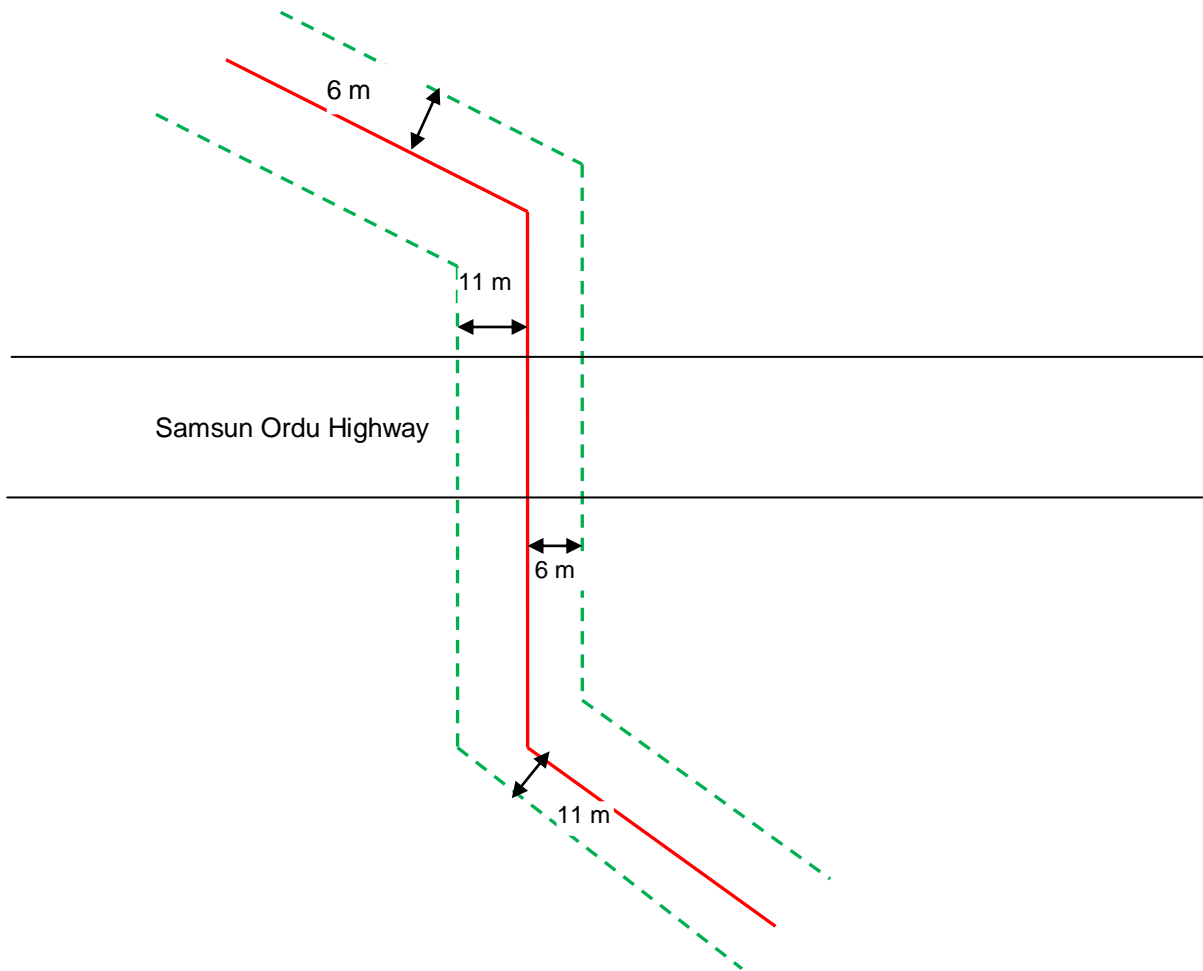
While vehicle increase rates had been calculating in the above Table, in order to calculate the maximum impact, total vehicle number and number of trucks from the highways traffic projection map had been considered.

The D-100 Highway which connects Samsun and Ordu Provinces is a six-lane road in both ways with a high traffic density. This Highway shall be used during the transportation of construction materials (pipe, heavy construction equipment, fittings materials etc) to the site and this operation shall be carried out in accordance with every kinds of legislations related to transportations. In this sense, vehicles shall be assured to take off non-rush hours and due to this any changes shall be occurred in the current density of the traffic.

- Besides, in parts through which natural gas pipeline and the road route goes parallel, shall be crossed outside of the expropriation border and security field,
- The project owner shall be liable with every kinds of Works which will affect the traffic safety of the road,
- Every kinds of facility, building etc to be established shall be compatible with health protection strip distance to be determined,
- Traffic Law numbered 2918 and relevant regulations shall be complied with during transportations,
- 31st Article of Regulations About Facilities To Be Built and Opened On The Roadside of the Highways shall be complied with,
- As specified in the 17th Article of Highway Traffic Law, for every kinds of Works to be carried out by other corporations and institutions within the 50m distance out of the highway expropriation border, a protocol shall be signed with Highway 7th Regional Directorate,
- In order to provide safety of pipeline route, highway and the pipeline; shall be projected in a way that will cross the highways at a minimum level and will be at least 500 m away from the highway axis,
- Road safety shall be provided at highway crossing points or when it goes parallel to the roads other than the expropriation border,
- In case of any damages to the rural roads at construction and operating stages of the project, they shall be met by the project owner within the framework of the protocol to be signed with Highway 7th Regional Directorate.

## **II.2 Determination of Project Impact Area and Current Condition in The Impact Area**

The impact area of the project at construction stage is 17 m for 24" pipelines as determined by BOTAS. The wider 11 m part of this area shall be the area in which the construction machinery shall work and the pipe shall be welded before lifting down the trench. As for the remaining part of 6 m shall be used for both the removed vegetal earth and the material resulted from the trench excavation. Within this scope, the 17 m has been arranged and shown as follows as per the construction and machinery working conditions.



**Figure II.10** Working Corridor

On the other hand, an area of 14m shall be sufficient for repair and maintenance Works at operating stage.

### **II.3 Other Considerations**

Despite a smaller scale of pipeline would be sufficient for providing the gas supply of Combined Cycle Plant which has been planned to be established by BORASCO Electricity Generation Inc., as a result of the negotiations with BOTAS, the diameter of the pipe had been selected as 24" in order to procure other gas demands in the future. The pipeline to be constructed shall be manufactured in accordance with national and international standards. Besides the route has been determined in a way that won't cross over Yesilirmak River which is considerably hard to cross in terms of construction.

Along with this, while General Directorate of Mining Affairs has been applied to for determination of mine sites within the project site, as a result of the field studies conducted with the officials of the corporation, it has been notified by the relevant Corporation that there is no harm seen in carrying out the project, the area in which the project shall be executed has been entered as natural gas pipeline project special permission area without making it closed for mining in MIGEM records, the ones who will carry out mining activities in this area should take permission from MIGEM. The Opinion Letter of MIGEM dated 14.09.2010 is presented in Appendix-8.

### III. ECONOMICAL AND SOCIAL DIMENSION OF THE PROJECT

#### III.1 Current and Planned Socio-Economical Characteristics of the Project and The Impact Area

##### III.1.1 Settlements Impacted from The Project

Improved lands have not been crossed over within the scope of the project. But due to dispersed settlement in the region, in some circumstances, by taking safety conditions into consideration, some rural settlements had been crossed closely. The settlements within the corridor of the pipeline and distances to these settlements are given in Table II.11.

##### III.1.2 Cost-Benefit Analysis of the Project

It has not been expected for the line to bring a considerable benefit on the bio-physical environment. As for the benefits expected in socio-economic environment are indirect impacts such as laborer employment from the surrounding settlements during construction of the line and continuation of the employment, investment and production depending on the intended use of the natural gas in the centers to which the gas shall be transmitted

Throughout the pipeline, even a leastwise spoilage would occur in terms of aesthetics in some places. But these aesthetics costs is a very small-scaled impact alongside the benefits that will be received by the industrial facilities in the country and the region from the pipeline project.

Number of laborers who will work during the construction stage of the planned pipeline that will last approximately 8 months shall not exceed 300. Recruitment of these workers from the district or accommodation of them in the region during the construction stage shall positively contribute in the regional economy even for a temporary period.

##### III.1.3 Economical Characteristics (main industries which constitute economical structure of the district)

Samsun Province is the largest metropolitan of East Black Sea Region of Turkey. Due to the population density of the city, commercial and industrial life is lively and investment of settlement and production areas in the city is more convenient than other Black Sea provinces. The city provides advantage and superiority as per the other cities in the region due to its strategically importance.

The feature of being the first sea door which opens to Black Sea Basin and being the first land door which opens to Central Anatolia has importance in the commercial structure of the region. Employment in the region is becoming difficult increasingly due to population explosion. Privatization of the public investments in the region in a short time also have great importance in terms of leading the region people and entrepreneurs for suitable and profitable investments. The region is highly suitable for guiding and establishment of the small and medium scaled enterprises.

The Samsun Province which is located in the middle of Black Sea coastline is one of the cities with the largest surface area within the coastline with a surface area of 9.579 km<sup>2</sup>. Despite large industrial enterprises such as Turkish Copper Administrating (KBA) , Nitrogen and Cigarette Factory are available in the province due to the features of it, as a result of emerging of an agriculture-based economy in the province, the city could still have not become an industrial

province. Commercial life of the province has always been lively especially because it is the first door which opens to Black Sea from Central Anatolia.

Especially after 1980, as a solution for the contraction of the employment in the Province, small industrial sites have emerged in accordance with the advancing industrial age both around the Province and in the districts, the employment gradually started to head towards labor intensive small enterprises. Most important products produced in Samsun and around Samsun are cement, fertilizer, copper, artificial jute, auto spare parts, pumps in various dimensions, furniture and textile, confection and medical instruments.

Alongside with large and medium scaled enterprises also there is small scaled enterprises which produces heating boiler, plastic PVC, agricultural tools and machinery, copper products, construction iron, plastic bags, various confectionery, jam, industrial type kitchen equipments and refrigerator in small facilities with labor intensive production.

*ETI Copper Inc.:* It has been established in 28.05.1968. With the purpose of meeting the copper requirement of Turkey, mines copper ore in the fields which belong it, concentrates it and subjects it to smelting thus obtains pure copper, as well as it aims to produce sulphuric acid, pyrite concentrate and pyrite ore. It is located within the Borders of Tekkekoy District 2004).

*Toros Fertilizer and Chemical Industry Inc.:* It has been established with the title of Nitrogen Industry Inc. with the decree of Council of Ministers dated 25.12.1953 and numbered 4/2006 with the purpose of producing, supplying and selling every kinds of simple, compound fertilizers required for country agriculture, producing nitrating acid and technical ammonium nitrate which constitute the basics of explosive materials for country defense, supporting progress of plastics materials industry, supplying nitrogen compounds used in every branch of the industry.

*Baslica Cigarette Factory:* The factory which display activity in 19 Mayıs district as an enterprise that is affiliated to General Directorate of Tekel Enterprises has a capacity of 10,000 tons/year filter-tipped cigarettes.

*Carsamba Sugar Factory:* The factory which was established in 1977 has come into activity in 1989.

Deployment of factories of Toros Fertilizer and Chemical Industry Inc. and Eti Copper Inc. at the borders of Tekkekoy district has commenced the process of concentration of Samsun 1st Organized Industrial Region, three sectoral industry investment and private sector industry investments in this region (Tekkekoy District Kutlukent Town) and this process still continues.

As for in the Carsamba and Terme Districts that are located within the pipeline corridor agricultural industry based on hazelnut and paddy has developed. In the region large and small many rice and hazelnut facilities are available.

#### III.1.4 Economical Life Time of the Project and The Added Value It Will Add to The Economy

The life-time of the pipeline which is planned to be constructed shall be approximately 30 years. It has been expected that 300 people will work during the construction stage. As the needs of the personnel to be employed such as food, beverage etc shall be met from the region, project shall have a positive impact on the regional economy.

III.1.5 The Population (Urban and rural population in the region, distribution of the population as per ages, structure of the household)

**Administrative Departmentalization**

According to the 2007 general population census results of Samsun Province, it has a total population of 1.228.959 while it has 15 districts. Out of these, Carsamba and Terme districts are the settlements which are expected to receive the highest impact from the project. Also according to the same population census results, total population of Carsamba District is 136.343 and total population of Terme District is 74.833 ([www.tuik.gov.tr](http://www.tuik.gov.tr)).

**Urban and Rural Population**

Urban and rural population rates according to the 2000 and 2007 population census results are presented in Table III.1. According to this, in Carsamba and Terme Districts, the rate of urban population in rural regions is higher than rate of urban population while this rate has showed a falling tendency in 2007.

**Table III.1: Urban and Rural Population**

Year	Region	Total Population (person)	Urban (%)	Rural (%)
2000	Samsun Province	1.209.137	53	47
	Terme District	82.608	30	70
	Turkey	67.803.927	65	35
2007	Samsun Province	1.228.959	59	41
	Terme District	74.833	38	62
	Turkey	70.586.256	70	30
Year	Region	Total Population (person)	Urban (%)	Rural (%)
2000	Samsun Province	1.209.137	53	47
	Terme District	131.194	38	62
	Turkey	67.803.927	65	35
2007	Samsun Province	1.228.959	59	41
	Terme District	136.343	45	55
	Turkey	70.586.256	70	30

Reference: Turkish Statistical Institute

**Population Density**

Population densities of Samsun Province, Carsamba and Terme Districts according to the 2000 population census results is given in Table III.2. According to this, population densities calculated for Samsun Province and these districts has been respectively 133 person/km<sup>2</sup>, 214 person/km<sup>2</sup> and 189 person/km<sup>2</sup>. These values are over Turkish average which is 88 person/km<sup>2</sup> (SII, 2000).

**Table III.2: Population Densities in The Region (2000 Year)**

Region	Population (person)	Area (km <sup>2</sup> )	Population Density (person/km <sup>2</sup> )
Samsun Province	1.209.137	9.083	133
Terme District	82.608	436	189
Carsamba District	131.194	614	214
Turkey	67.803.927	769.604	88

Reference: State Statistical Institute

### III.1.6 Health (current endemic diseases in the region)

The health condition and number of beds recorded by 2004 in Samsun province are respectively 19 and 4057 (see Table III.3). List of the healthcare personnel who serves as per the 2006 records of Samsun Province Department of Health is given in Table III.4.

In the current condition available within the borders of Terme District, there are 1 hospital and 10 Health Care Center available.

**Table III.3: Number of Hospitals and Beds in The Provinces**

Province	Institution	Number of Hospitals (quantity)	Number of Beds (pieces)
Samsun	Public Hospital	17	3.956
	Private Hospital	2	101

Reference: State Statistical Institute, 2004

**Table III.4: Number of Health Care Personnel**

Healthcare Personnel	Samsun Province (person)
Specialist Physician	484
Practitioner	566
Dentist	86
Pharmacist	14
Health Technician*	1040
Nurse	1333
Midwife	833
Other	1765

\* Health Technician : Including Health Staff, Roentgen, Laboratory, Anesthesia, Orthopedics, Dental, Eudiometry, Environment Health, First Emergency Aid Ass. technicians.

Reference: Samsun Province Health Department 2006

### III.1.7 Risky and Dangerous Activities In Terms of Human Health and Environment

Within the scope of Samsun Natural Gas Pipeline Project construction, risks that would occur as intended for human health and safety are related to accidents which are possible to be met in such construction works. In this sense, the contractor company which will carry out the construction activities shall practice upon safety rules accepted worldwide alongside with knowledge and experience in order to make the field safe for all workers and to provide the safety



of excavation, scaffold age together with heavy construction equipments (cranes etc). Workers shall be assured to use personal protective materials (helmet, goggles, gloves, belt etc).

As the usage of dangerous chemicals at the construction stage of the project will be at a minimum level, any risks would be available during transportation, storage and usage of these materials. Besides, required protective measures shall be taken by the contractor company in order to minimize the potential environment pollution risks. All activities to be carried out within the scope of the project shall be performed in accordance with the relevant provisions of Regulations for Work Health and Work Safety which has become effective by being published in the Official Gazette dated 09.12.2003 and numbered 25311.

### III.1.8 Expected Revenue Increases; Employment Opportunities To Be Created, Population Movements

It has been planned that 300 people will work at the construction stage of the project. The personnel other than qualified personnel (engineer, welder, operator etc.) shall be supplied from the region people. Needs for carrying on the vital activities of the personnel coming from outside shall be supplied from the markets within the region. Number of personnel who will come from outside of the region at the construction stage of the project shall be limited during construction.

### III.1.9 Current and Planned Social Infrastructure Services in The Region (education, health, cultural services, water projects, housing estate projects, railway projects)

#### **Education**

All kinds of educational institutions are available in Samsun province. 19 Mayıs University in the province has been established after Karadeniz University which is also available in the region. In the province; 1084 primary schools, 7 private primary schools, 58 general high schools, 8 private high schools, 50 vocational and technical high schools and 9 private education schools are available (Samsun Governorship, 2006).

According to 2000 population census, rate of literacy of Samsun province is approximately %86 while this rate is very close to the Turkey average (%87). Rate of literacy in Terme District is %89,3 while this value is over averages of Turkey and Samsun. Distributions of literates in the aforesaid province and district according to the last educational institution are given in Table III.5.

**Table III.5:** Distribution of Population As Per Literacy and Last Graduated Educational Institution

Condition of Literacy	Terme District	Samsun Province	Turkey
Illiterate	1.827	147.540	7.589.657
Literate	15.629	922.313	52.259.381
Literacy Unknown	-	6	10.205
Non-graduate	3.900	257.158	12.886.331
Primary School Graduate	6.484	419.894	22.166.827
Elementary	707	27.489	1.719.479
Secondary school graduate	1.218	56.174	4.161.798
Sec. Sch. Equivalent Voc. Sch. Graduate	34	1.611	146.232
High School Graduate	1.791	85.935	6.096.662

Condition of Literacy	Terme District	Samsun Province	Turkey
High Sch. Equi. Voc. Sch. Graduate	693	30.140	1.916.845
College and Faculty Graduate	802	43.859	3.151.964

Reference: *State Statistical Institute, 2000*

Within the corridor of the project, Fatsa-Carsamba Railway project which is planned to be constructed by General Directorate of State Harbors and Airports Construction is available. While the route of the aforesaid project has been provided, it has been presented in the 1/25.000 topographical map in Appendix-1.

Within the corridor of the project, irrigation channels which belong to State Water Affairs are available. Aforesaid projects have been procured from SWA and the route has been finalized by receiving the approval of relevant Institution.

A housing estate project and a cultural project which has been available within the corridor of the project or which has been planned to be realized are not available.

#### III.1.10 Housing and Other Technical/Social Infrastructure Requirements of The Personnel Employed or To Be Employed and The Population That is Dependent To Them

A construction site shall be established within the project area for the personnel who will work at the construction stage of the project. The construction site to be established shall meet the requirements of the personnel such as food, beverage, accommodation etc within the construction site. While electricity and domestic water shall be supplied to the construction site temporarily, potable water shall be supplied with dispensers from the market.

Accommodation requirement of the personnel shall be provided from the current facilities in the region alongside with the construction fields at construction stage. Any social infrastructure facilities shall be established for the personnel at operating stage.

### III.2 **Other Considerations**

No other considerations to be explained are available in this subject.

#### IV. CHARACTERISTICS OF PHYSICAL AND BIOLOGICAL ENVIRONMENT, USAGE OF NATURAL RESOURCES, IMPACTS OF THE PROJECT AND THE MEASURES TO BE TAKEN

(Current and planned conditions should be given by basing upon regional and working area)

##### IV.1 Land Usage and Property Condition

###### IV.1.1 Soil Characteristics

###### a) Soil structure and land usage ability classification

Map of essential soil groups observed throughout the pipeline route are given in Appendix-6 while length and rates of soil groups observed throughout Samsun NGPL route are given in Table IV.1.

**Table IV.1** Essential Soil Groups Throughout Pipeline Route

Essential Soil Groups	Length (km)	Rate
Alluvial Soils	46,753	% 92,7
Red-Yellow Podzolic	1,062	% 2,1
Gray-Brown Podzolic	759	% 1,5
River	211	% 0,5
No Data	1,655	% 3,3
<b>TOTAL</b>	<b>50,342</b>	<b>% 100,0</b>

As seen in the Table, most essential soil Group which has been crossed by Samsun NGPL route has been the alluvial soils with a rate of %92,7. Descriptions compiled by General Directorate of Rural Affairs (GDRA) for alluvial and other soil groups are presented below.

Alluvial Soils: The alluvial soils, mostly flat or slightly sloped, young soils have been observed as situated in moved and surface water beds and on recent sediments accumulated in regions that have been affected from rivers. Generally the soil profiles have various layers depending upon the severity of the sedimentation throughout various periods. They include lime which is carried via surface flow from high slopes. Upper soil slightly transitions into the subsoil. In wide flood plains; soil structure, drainage and even topography tends to show a variation with the increase of distance to the river. The organic content shows a large variation depending upon factors such as climate, drainage, and usage methods. New layers in various thicknesses might have composed as a result of ongoing sedimentation. As azonal soils, these alluvial types are not related with any climate types or any special vegetation.

Grayish-Brown Podzolic Soils: These soils are composed in cool and rainy climates, under mostly deciduous partly needle-leaved forest cover and on different main material. A podzolization occasion progressing slightly reigns in their composition. In their typical samples, slim and unspoilt leaf layer takes place, beneath this layer dark chukker-brown granular humus layer in 5-10cm thickness takes place. Reaction is slight acid or neutral. The humus layer converts into grayish Brown mineral A1 after 5-10cm transitively. Thickness of it is 5-6 cm. Generally it is medium bodied and granular. A2 horizon is also medium bodied and in flaky structure just like A1.

The color changes between chukker-brown and tawny. Due to washing, base saturation rate and clay rate are low. Upper side of B Horizon changes from tawny to light russet. As a result of accumulation of clays washed from A horizon the body generally is clayed, the structure mostly is block and the reaction is medium acid. Fertility in these soils changes essentially according to the type and characteristics of the main material.

Red-Yellow Podzolic Soils: Red-yellow podzolic soils are well-grown and well-drained acid soils. Natural vegetation cover is deciduous or needle-leaved or mixture of both forests. Main material is rather silicious and poor in calcium. The O horizon is thin while beneath the organic mineral A1 horizon is available. Light colored A2 horizon takes place above red, yellowish-red or yellow colored and more clayed B horizon. The B horizon has clay pellicle on ped surfaces and a block structure. In red-yellow podzolic soils in which main material is thick; lines and spots in red, yellow, Brown and light gray color and in thick net forms are available characteristically in lower horizons. As in soils dominated by yellow color, relatively more efficient humidity conditions are available, iron oxides are more hydrated rather than the ones in red-color soils. Accordingly colors are less bright. A2 horizon also is thicker.

b) Slope Stability

Height of the topography through which the pipeline crosses over ranges between 2 and 5 m. Accordingly within the scope of the project there is no subject to be assessed in consideration of slope stability.

c) Erosion

GDRAs describe the level of the erosion as per eroded soil. Here, eroded soil has been described and classified via a comparison with characteristics and management requirement of uneroded soil on similar slopes. The erosion level used in the maps of GDRAs has been assessed as per rate of eroded upper horizons. According to this, erosion has been classified in four levels:

Level I	: none or slight erosion
Level II	: medium erosion
Level III	: severe erosion
Level IV	: very severe erosion

Erosion levels of lands throughout the pipeline are shown in the maps given in Appendix-6. Rates of lengths in terms of erosion levels throughout the pipeline are given in Table IV.2.

**Table IV.2** Erosion Levels of The Lands Throughout The Pipeline

Erosion Levels	Length (m)	Rate
Level I	1.062	% 2,1
Level II	759	% 1,5
Level III	0,0	% 0,0
Level IV	0,0	% 0,0
River	211	% 0,4
No Date	48.309	% 96,0
<b>TOTAL</b>	<b>50.342</b>	<b>% 100,0</b>

---

As clearly seen in the Table, due to plainness of the route topography, erosion either is not observed or has a very low level.

d) Reservoir Sedimentation

Any reservoir areas throughout the corridor crossed by the pipeline route are available.

- e) Impacts on the soil within the scope of the Works and operations to be carried out within the scope of the project and measures to be taken (land preparation, construction, operating and after operating)

Impacts on the soil shall start at construction stage. How long these impacts will continue shall depend on the success of restoration and restitution works. Most essential change which would occur in the soil are structural changes that are arisen from erosion or jamming and a decrease in soil quality. At what level shall the soil expose to erosion or jamming depends on its structural characteristics. Without a doubt, different soils shall require different care and significance of impact reduction shall change according to soil type as well as factors such as degradation, seasons, slope etc.

Depending on local conditions; the upper soil layer which is approximately in depth of 0,25 and 0,30 m shall be stripped from the working corridor and be stored in a separate place throughout the route. Following the digging of upper soil layer, the working corridor might be arranged in required places (hilly, rocky areas etc) in order to carry on with pipeline construction.

The upper soil shall be stripped carefully down to 15-30 cm depth (or to a depth suitable for local conditions) during construction and shall be stored in a way that shall not be jammed by vehicles or jumble with other materials, separately from the lower soil. The lower soil shall be removed by avoiding from excessive erosion.

Following the construction, these soils shall be restored as follows:

- The lower soil shall be jammed in order to bring it to the similar conditions with neighborhood areas which have not been destroyed after putting into the channel.
- Upper soil shall be laid down to the depth at similar level and shall be in compliance with the ground at both sides of working width.

**Table IV.3** General Important Impacts Intended For Soil During Pipeline Construction and Summary of Impact Reducing Measures

Potential Impacts	Impact Reducing Measures
Changes in Soil Hydrology	Suitable and efficient drainage and construction procedures shall be used.
Changes limited with a certain point in lower and upper soil structure	Lower and upper soils and removed every kinds of main material shall be digged, handled, stored and placed separately. Access areas shall be restricted. Period of upper soil storage period shall be kept at minimum level.
Jamming of the lower soil limited at a certain place	Suitable machinery and/or protective structures shall be used during soil digging (for ex. Rail machinery shall be used in places in which jamming of the soil is possible; in cases of jamming, before laying on the upper layer of the soil, lower layer of the soil shall be excavated). In order to prevent jamming of the lower soil due to weight, soil stocks shall be limited up to max 2 m height. Throughout the working width or in other places which would affect restoring in agricultural terms, in order to deal with jamming, additional impact reducing measures shall be implemented. (for ex., lower soil digging) Access areas shall be restricted.
Pollution in the soil limited with a certain point	Where possible, fuel oil keeping shall be carried out in areas with safety line. Absorbent in a sufficient amount shall be available in all fuel oil storage and processing areas and personnel shall be trained about usage and safely removal of them. Same conditions shall be applied to oils, chemicals and fluid wastes. In case of diffusion of these materials, polluted soil shall be cleaned or shall be removed in accordance with requirements of Regulations of Soil Pollution Control, other Turkish Legislation and World Bank. All wastes shall be kept, stored and removed in accordance with Waste Management Plan.
Contact with potentially dangerous materials in the areas which were used as waste storage area	Suitable machinery and/or protective structures shall be used in order to minimize jamming during soil digging. Access areas shall be restricted.
Soil stability loss throughout river sides, step slopes etc	Suitable machinery and/or protective structures shall be used in soil digging
Silt loaded flows from soil deposits	Where necessary, in especially slopes, in places close to sensitive habitats and land usage and around river, in order to prevent the movement of the silt, measures such as covering on the deposits and building silt cages shall be implemented.

#### IV.1.2 Agriculture and Animal Husbandry

##### a) Agricultural development project areas

Within the project corridor, while any agricultural development areas are available, it has been determined both in field studies and in negotiations with the region public during Public Participation Meeting that organic hazelnut has been produced in some areas in the region. While Terme Association of Organic Hazelnut Producers has been negotiated related to the subject, given verbal answer was that organic hazelnut production has been carried out in highlands and no organic hazelnut production has been carried out in the coastline region and within the project corridor. Accordingly no interaction originating from the project in consideration of organic hazelnut production shall be available.

##### b) Size of irrigated and dry farming lands

Throughout the pipeline route agriculture lands is the main land usage type. These areas are classified as follows:

- Dry farming lands,
  - Fallow,
  - Non-fallow,
- Irrigated farming lands.

Status of land usage throughout Samsun NGPL route can be seen in the maps given in Appendix-6. Rates of status of land usage throughout the pipeline route are given in Table IV.4.

**Table IV.4** Status of Land Usage Throughout Pipeline Route

Land Usage	Length (km)	Rate
Hazelnut grove	1.821,4	3,6
Irrigated farming land	3.385,8	6,7
Dry farming land	41.703,8	82,8
River Crossing	211,2	0,4
Scrub	949,7	1,9
Meadow	614,5	1,2
No Data	1.655,9	3,3
<b>TOTAL</b>	<b>50.342,3</b>	<b>100,0</b>

As seen in Table IV.4, 83% of the lands which lie along the pipeline is used for dry farming land.

c) Product patterns and their annual production amounts

#### **Annual Agricultural Product Patterns**

Distribution of farming lands according to the grown field products in Samsun province are presented in Table IV.5. According to this, cereals are placed on the top with a rate of 42,45%. Even it seems as if fruit growing takes the second rank with a share of 20,06%, 85.532 ha of 91.334 ha fruit growing field is used for hazelnut agriculture.

**Table IV.5:** Distribution of Agriculture Lands

Type of Land	Amount (ha)	Ratio to Agriculture Lands (%)
Cereals	197.866	42,45
Industrial Plants	23.675	5,20
Edible Legume	18.539	4,07
Vegetable Grove	28.645	8,43
Fruit Grove	91.334	20,06
Fallow	12.656	2,77
Tuber Plant	2.370	0,52
Other	80.239	16,50
<b>TOTAL</b>	<b>455.324</b>	<b>100,00</b>

Reference: Samsun Governorship, 2006

Most important products grown in Samsun Province in terms of economy are wheat, corn, paddy, and tobacco. As industrial plant, sunflower plantation has been carried out. Closure fruit growing has been implemented. Important part of this is hazelnut area. Mostly grown vegetables are tomatoes, green pepper, cucumber, eggplant, spinach, beans, cabbage, leek, watermelon and melon. Besides vegetable growing in plastic greenhouses and in high tunnels has been increasingly implemented.

As can be seen in Table IV.6; wheat, barley, rye, corn and paddy out of cereals; green lentil and vetch out of legumes; clover, sainfoin, corn and triticales out of fodder crops; tobacco, sugar beet and cannabis out of industrial plants have higher productivity values than values of

Turkey in general. Samsun province fruit productivity value is given in Table IV.7. Vegetable production of Samsun province in 2003 and share of it in Turkey is presented in Table IV.8.

**Table IV.6: Field Products Productivity Values**

Product	Samsun Province			Turkey		
	Cultivated Area (hectare)	Production (ton)	Productivity (kg/hectare)	Cultivated Area (hectare)	Production (ton)	Productivity (kg/hectare)
<b>Cereals</b>						
Wheat	139.825	459.177	3.284	8.490.000	20.010.000	2.357
Barley	13.328	36.902	2.769	3.649.800	9.551.000	2617
Rye	1.628	3.692	2.268	131.246	271.000	2.065
Oat (piece)	275	463	1.684	100.112	208.787	2.086
Corn (piece)	36.521	205.037	5.614	536.000	3.811.000	7.110
Paddy	10.090	80.607	7.989	99.100	417.600	4.214
<b>Legumes</b>						
Broad Bean	11	4	364	10.539	21.316	2.023
Peas (dry)	100	50	500	1.566	4373	2.792
Chick Pea	1.338	1.309	978	524.367	551746	1.052
Dry beans)	15.340	9.336	609	129.052	195970	1.519
Green Lentil	2	2	1.000	45.463	42326	931
Vetch (piece)	1.778	2.895	1.628	134.526	175522	1.305
<b>Fodder Plant</b>						
Clover	835	10.244	12.268	444.030	4.637.929	10.445
Sainfoin	78	5.476	70.205	117.603	621.737	5.287
Corn	1698	408.205	240.403	259.891	10.502.836	40.412
Triticale	45	3.726	82.800	24.112	77.642	3.220
Vetch (plant)	3.190	120.036	37.629	386.288	2.236.942	5.791
Trefoil (plant)	-	-	-	2.000	10.844	5.422
<b>Industrial Plants</b>						
Tobacco	1.240	11.930	9.621	146.167	98.137	671
Sugar Beet	1.123	487.365	433.985	325.700	14.452.162	44.373
Cannabis (fibre)	5	52	10.400	65	60	923

Reference: Samsun Governorship, 2006

As seen in Table IV.6, cereals cover the widest area among cultivated products in Samsun Province.

**Table IV.7: Samsun Province Fruit Productivity Values**

Product	Samsun Province			Turkey		
	Number of Trees	Production (ton)	Productivity (kg/tree)	Number of Trees	Production (ton)	Productivity (kg/tree)
<b>Pome Fruits</b>						
Pear	202.418	8.045	39,74	9.956	317.750	31.915,43
Quince	52.275	787	15,05	3.121	106.214	34.032,04
Apple	324.630	13.063	40,24	36.444	2.002.033	54.934,50
Medlar	28.660	515	17,97	281	4.471	15.911,03
<b>Stone Fruits</b>						
Plum	135.550	3.245	23,94	7.572	214.416	28.316,96
Apricot	260	6	23,08	12.202	460.182	3.7713,65
Cherry	95.250	3.178	33,36	10.616	310.254	29.225,13
Cranberry	97.810	1.055	10,79	879	9.303	10.583,62
Peach	589.672	28.146	47,73	13.840	552.775	39.940,39
Sour Cherry	31.452	937	29,79	5.214	121.499	23.302,45
<b>Nuts</b>						



Product	Samsun Province			Turkey		
	Number of Trees	Production (ton)	Productivity (kg/tree)	Number of Trees	Production (ton)	Productivity (kg/tree)
Walnut	107.325	2.716	25,31	4.595	129.614	28.207,62
Almond	690	20	28,99	3.236	43.285	13.376,08
Hazelnut	42.105.155	107.298	2,55	337.380	661.000	1.959,22
Chestnut	27.000	602	22,30	1.863	53.814	28.885,67
<b>Berry Fruits</b>						
Raspberry (decare)	38	36	947,37	3.387	1.997	589,61
Strawberry (decare)	1.454	1.005	691,20	104.101	211.127	2.028,10
Mulberry	47.510	1.413	29,74	2.029	51.558	25.410,55
Fig	59.840	2.148	35,90	9.958	290.151	29.137,48
Kiwi	13.050	429	32,87	322	10.962	34.043,48
Pomegranate	9.487	198	20,87	3.136	90.737	28.933,99
Trabzon Palm	10.475	520	49,64	589	19.297	32.762,31
Grape (decare)	216.375	1.318	6,09	5.138.256	4.000.063	778,49

Reference: Samsun Governorship, 2006

As seen in Table IV.7, hazelnut cultivation is the most important fruit production in the province.

**Table IV.8:** Samsun Province Vegetable Production and Share in Turkey

Vegetables	Samsun Production Amount (ton)	Turkey Production Amount (ton)	Share of Samsun Province (%)
Leaf-edible vegetables	250.028	1.696.600	14,74
Legume vegetables	100.508	709.000	14,18
Fruit-edible vegetables	946.245	20.678.500	4,58
Bulb- tuberous vegetables	6.118	826.580	0,74
Other vegetables	1.500	108.017	1,39
<b>TOTAL</b>	<b>1.304.399</b>	<b>24.018.697</b>	-

d) Types of animal husbandry, amounts and feeding areas

Samsun Province is among the provinces of the country which have high potential in husbandry and animal production. In highlands in the South of the province and sections which display flatland characteristics, husbandry is the most important source of living. 2006 animal stock data of this province is given comparatively for Samsun Province and Turkey in Table IV.9. Bee keeping is also can be counted as another husbandry activity carried out in the province (see Table IV.10). In Samsun province; animal products such as meat, milk, chicken meat etc constitute the most important animal products.

**Table IV.9:** Animal Stock of Samsun Province and Turkey

	Samsun	Turkey	Rate (%)
<b>A-Small Cattle</b>	<b>195.017</b>	<b>33.050.656</b>	<b>0,59</b>
1-Sheep	184.153	26.616.912	0,69
2-Hair Goat	10.864	6.433.744	0,17
<b>B-Bovine</b>	<b>297.144</b>	<b>10.971.880</b>	<b>2,71</b>
1-Beef Cattle	284.882	10.871.364	2,62
a-Culture	31.696	2.771.818	1,14
b-Crossbreed	141.407	4.694.197	3,01
c-Local	111.779	3.405.349	3,28
2-Water Buffalo	12.262	100.516	12,20

Reference: Samsun Provincial Directorate of Agriculture

**Table IV.10:** Samsun Province Beekeeping Status for 2006

Status of Beekeeping	2006 year
Number of hives	82.988
Honey production (kg)	1.261
Beewax (kg)	105

Reference: Samsun Provincial Directorate of Agriculture

### **Fishery**

Samsun Province with a coast lies ahead of Black Sea, two big rivers as Kızılırmak and Yesilirmak and four great dam lakes established on these rivers and other natural lakes bears a major potential in terms of wetlands and aqua cultural products. In the province which also offers important opportunities in terms of sea foods, every kinds of fish can be fished as well as other sea foods also can be used economically. In the channels, lakes and sea of Terme District and affiliated villages, fishery activities with commercial purpose have been carried out.

- e) Impacts on agriculture and animal husbandry within the scope of Works and transactions within the scope of the project and the measures to be taken (land preparation, construction, operating and after operating)

As mentioned in above parts, agricultural lands are available on the route of pipeline planned to be constructed. When it is considered that a 17 m working corridor shall be used during construction of pipeline, current land usage in the parts matching with agricultural lands shall change. But following the completion of the construction, areas within the working corridor shall immediately be rehabilitated and restored. Providing that no rooted-plant is available in the parts crossed by the route, seasonal products shall be cultivated.

Ground facilities planned to be constructed within the scope of the project shall be surrounded by the wire fence, so that animal entrance to these areas shall be prevented. As no interaction with the sea shall be available at both construction and operating stages of the project, no negative impact shall be available on fishery activities.

One of the special crossings to be constructed within the scope of the project is the Terme Creek crossing as explained in the above parts. Terme Creek has been described as "Aqua Cultural Products Acquisition Field". While river crossings shall be completed as soon as possible at construction stage of the project, fishers in the region shall be communicated by hanging required warning and caution signs. While the manufacturing of the special crossing shall be

completed as soon as possible, crossing of acquisition vehicles such as rowboat, cockleboat shall be permitted. As the pipeline shall be placed 2,0m underneath of the water base and covered at operating stage of the project, no negative impacts shall be available for aqua cultural products acquisition fields.

#### IV.1.3 Geological Characteristics

##### a) Geology of the Region

Information related to the general geology of the region has been compiled from Hydrogeological Research Report which has been obtained as a result of studies conducted near Carsamba Plain in 1979 by General Directorate of State Water Affairs (SWA). General geology map of the region is shown in Figure IV.2.

In the working field which is located within Carsamba Plain; Eocene old flysch and volcanic origin rocks together with Mio-Pliocene old detritic series and Quaternary old alluvium exposures are available. Eocene old flysch series has been constituted of Conglomerate, sandstone, siltstone and marl; as for volcanic have been constituted of agglomerate, tuff, andesite, basalt, and lava levels. Mio-pliocene has been constituted of conglomerate and sandstone together with consolidated clay and gravel clay layers. Alluvium has been composed of clay, silt, sand and detritic material in gravel dimensions together with mixtures of coquinas in patches in different amounts. Thickness of it can go up to 110 m. Delta characteristics of the plain has led the alluvium to stack intricately in horizontal and vertical directions and to display different lithologic characteristics.

##### b) Geology of The Project Area

The project area has been composed of Quaternary old alluviums as a geological structure. In the Carsamba Plain which has been composed by the accumulation of detrital materials carried by Yesilirmak River; there is an alluvial stacking in which generally intensities of clay, silt, sand and gravel materials change in lateral directions and has been composed of cross bedding is available.

In order to describe geotechnical characteristics in the excavation depth throughout the natural gas pipeline route, bevel sections of many boreholes opened by SWA in order to supply underground water in the plain together with boreholes opened by Terme Municipality in order to meet portable water requirement (see Figure IV.1) and many soil irrigation and drying channels with 3 m depth available in the plain have been referred.

While making these assessments, lithological structures of channel bevels have been examined during field researches, SWA and Provincial Bank well loggings have been assessed with Office studies. In these assessments, characteristics of underground water of the region have been considered.

By using many current data, risks of trench excavations in approximately 3 m depth to be made throughout the 50 km pipeline route and measures to be taken against these risks have been determined.

When negativities arisen from highness of underground water levels are added to excavation risks originated from high slope stability of the ground to be excavated throughout the

pipeline, shoring and sheet-piling supported measures should be taken with the purpose of preventing the flow and slumps in trench excavations in the region.

According to this case, in the excavation depth of pipeline (3 m);

- In the 0-6 km part of the line, current alluvial deposits of Yesilirmak River which has been composed by generally silt and sand density materials shall be excavated. In this part, underground water level in pluvials climbs up to 0,00 m. As for in the dry spells, it has been realized around 1,00 m. As these grounds to be excavated are composed of thin-material, they will show a fluent characteristics also with the effect of the underground water. Due to this reason, in order to prevent the trench slopes from subsiding during excavation, measures such as shoring or sheet-piling shall be taken.
- As for the 6-28 km of the line takes place in the middle of the Carsamba Plain, while in these sections, alluviums have been composed of relatively older river sediments. In the excavation depth of this part, with the impacts of agricultural activities also, agricultural soil which reaches up to 1 m thickness on the upper side and beneath this sandy-gravel grounds in which clay density increases take place. In this part also underground water level is observed as 0,00 m in pluvials and as 1-2 m in dry spells. Underground water level decreases down to 2 m in dry spells in the section before and after the crossing of Karadeniz (Black Sea) highway at the 30th km. Parts which show fluent ground characteristics in patches between approximately the 6th and 25th km of this part of the line shall be crossed. In the excavations in these characteristics also shoring and sheet-piling measures shall be taken. But a large section of this part shall be crossed with suitable sloped excavations without any need for shoring or sheet-piling.
- In the 28-50 km part of the line, density of gravel in slope material characteristics increases within the content of material in excavation depth, materials with silt decreases down to almost non-existing. Depth of underground water is observed as 1 m in pluvials and 2 m in dry spells. Due to these reasons in the excavations in this part pipeline manufacturing shall be carried out with suitable sloped excavations without any need for shoring and sheet-piling measures.
- Geological units to be crossed by the route have been constituted of loose, unattached, gravel, sand, silt and clay mixture sediments. In the units in which underground water is very close to the surface or underground water levels show much changes it has been thought that risks could be available in these units in terms of geological. Although general descriptions of them have been made, required commitments about taking measures related to reinforcement of the ground before installing the pipes in places which would create problem at construction stage and carrying out the activities safely in other words without shear and sinking risks shall be requested from the construction company which will carry out the Works by the project owner.

As the project area crosses thoroughly alluviums and different geological structures are not crossed, 1/25.000 scaled geology map of the area has not taken place in the report, however, 1/100.000 scaled geological map has been included (see Figure IV.2).

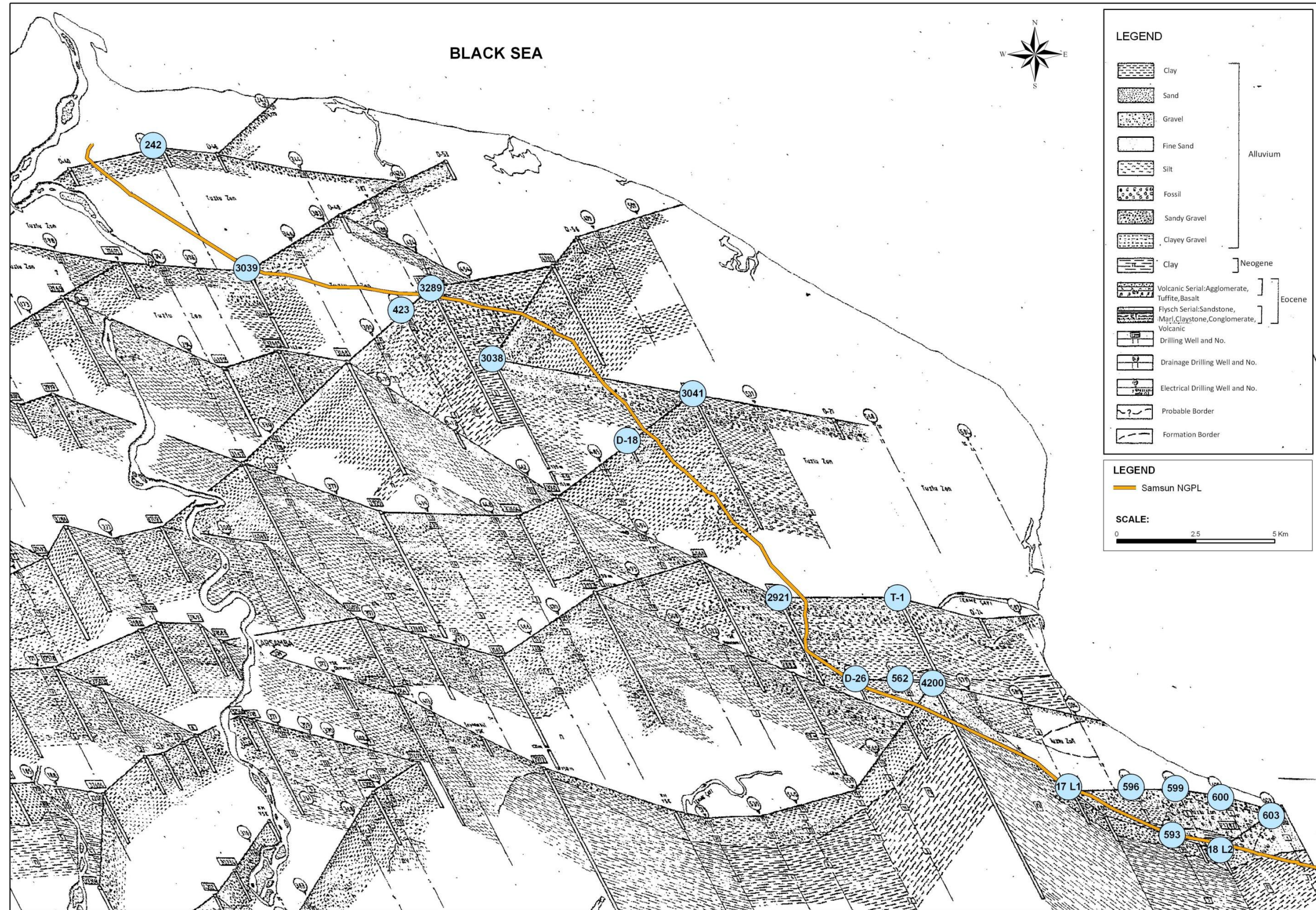


Figure IV.1 Carsamba Plain Cage Diagram

Using both by channel cleavages and descriptions in SWA well loggings, it has been observed that an alluvial material which shows differences in lateral direction shall be crossed in pipeline excavation depth. Below details have been determined related to the grounds to be crossed in excavation depth.

- It has been observed that the first 0,0 and 0,5 m part of the ground in agricultural areas is agriculture soil, beneath this part alluviums composed of clay, silt, sand and gravel takes place.
- It has been observed that the upper agricultural soil in the parts very close to the creek and river beds has become thin and rate of gravel in alluvial material has increased. As for in plain parts which are away from creeks, it has been observed that rate of gravel decreases and rate of clay increases.
- Underground water level in excavation depth has been observed very high. It has been observed that the underground water rises up to topographical surface in patches in spring period.
- Channel and creeks generally shall be crossed with open cut method due to physical conditions of the working area. Only in highway crossings, thrust boring method shall be implemented.

#### Quaternary-Holocene

##### *Current Flood Plain Sediments (Qt)*

These sediments for which formation denomination cannot be made have been introduced with the environment in which they have been composed and the period of composition. The area covered by the unit are the most common among the Quaternary sediments while it is approximately 620 km<sup>2</sup>. This unit also is known as Carsamba (flood) plain sediments. The unit generally has been constituted of Brown-light Brown silt, clay and very thin sands. Even in very wide areas it has not composed a microtopographia. It is in intensive, homogenous, thick layers in cross section.

Current flood plain sediments is out of keeping with old Quaternary sediments or older units. No other units take place on it. According to the researches, thickness of the unit ranges between a couple of meters and 20 m. Age of the unit in which any fossils are available has been determined as Holocene according to its stratigraphic location. Current flood plain sediments in Carsamba plain are the product of seasonal floods of Yesilirmak, Terme Creek and Abdal Creek. But today floods have been put down in many places of the plain (see Figure IV.3, MRE, 1989).

When risk of settlement and subsidence is possible in places either in which underground water level changes (where the underground water is close to the surface) or where lithology is permanent in alluvium units is considered before the construction stage, required measures shall be taken in these areas. Consequently; geological risks in the route shall be assessed and required measures shall be taken.

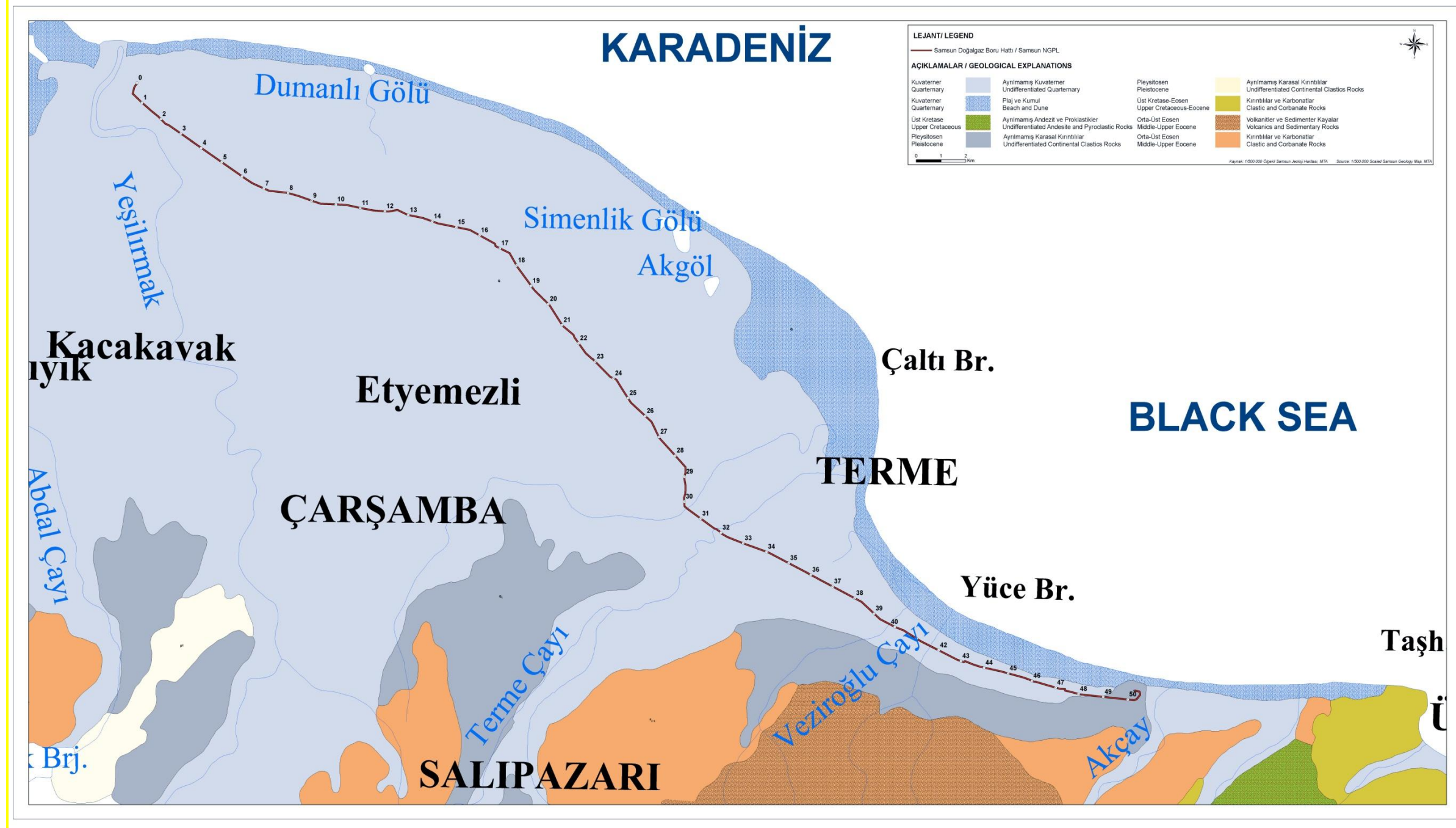


Figure IV.2: General Geology Map of the Region

PERIOD	SUB-PERIOD	AGE	FORMATION STACKING
QUATERNARY			Qa, Qb, Qk, Qt
			Qea, Qeb, QAPP, Qet, Qey
TERTIARY	Mio-Pliocene		Discordance
			Tg
			Discordance
	Eocene		Tψ
			Discordance
			Ts
			Discordance
			Ttp, Tt, Tty
	Paleocene		Tk
			Ta
CRETACEOUS	Upper Cretaceous	Maestrihtian	Ka

Figure IV.3 Stratigrafical Cross Section

*Current Beach Sediments (Qk)*

The unit has been described with the environment in which it has been compsed and the name of the composition period. This unit takes place on the coast section of Yesilirmak delta as a straight line while covers an area of approximately 20 km<sup>2</sup>. It expands on the west of Semail Village, in the east of the place at which Yesilirmak meets with Black Sea and relatively in the northwest and northeast of Simenlik Village and Acıgol. Typical profile of the unit can be seen in Kumcagız Village together with the North of Simenlik Village.



The beach sediments have been constituted of gray, white and black, unattached, well-sorted sands of which laminating is clear with heavy mineral surfaces. Grain size is thin-medium sand. Dominant subsidence structure types are cross bedding in dunes, cross and parallel laminating behind the coast, plane cross bedding inclined to sea and land in the front of the coast. Most of the grains – due to the extensity in the source area – have been derived from volcanic.

Current sand sediments is discordant to old sand, old marsh-lagoon and old river channel sediments. No other units take place on it and it has been anticipated that the thickness of it is a couple of meters.

Current pelecypoda and gastropod shells are available within the unit. Age of it has been determined as Holocene as per its stratigraphical location. When it is examined in typical profiles, current sand sediments have been observed as contenting dune from land towards sea, back-shore and front-shore environments. The beach is very low sloped towards sea.

#### *Current Marsh-Lagoon Sediments (Qb)*

This unit has been described with the environments in which it has been composed and the period in which it has been composed. In the west and east of the place at which Yesilirmak meets Black Sea, in northwest and northeast of Taslık village and in the east of Suleymanlı in a large area gives marine-origin (lagoon) crops; s for in two small locations in the southwest of Dikbiyık gives river origin crops. Crop area is approximately 30 km<sup>2</sup>. Typically, can be observed around Caltı Lighthouse and in east and southeast of Aybeder Village.

Humid-wet planes and occasionally current marsh-lagoon sediments which constitute lagoon areas covered by sea water have been composed of dark color, unattached silt and clays. Old beach sediments take place under current marsh-lagoon sediments. Over it, any sediments take place and the thickness does not exceed 20 m.

The lagoon sediments in the north have been composed in the lagoons that have been separated from the sea with the current beach. As for the river origin marsh sediments in the South are the products of the marshes consisted as a result of filling of abandoned river beds or pit areas on the flood plain by flood or rain waters.

#### *Current River Channel Sediments (Qa)*

Just as other Quaternary units, this unit also has been described as the consisting environment and the name of the period. Outcrops close to Yesilirmak, in the upstream part of the point at which Abdal Creek meets with delta plane, in the place of Terme Creek between Salıpazarı and Terme and in the upstream of other rivers in the region before they meet with the delta plane. Current river channel sediments which show transition forms from braided to meandering from upstream part down to downstream part exposures superficially lenticular forms and covers an area of approximately 60 km<sup>2</sup>. Places in which the unit has been best observed are bars between Egrikum and Kumkoy and the ledge set sediments in the South of Kumtepe.

Current river channel sediments generally have been composed of whitish, unattached gravel, little gravels and sands. But in some bar and ledge sets, grain size gets thinner. Gravels and little gravels are round-very round while they are grain-supported. Most common sediment structure observed within the unit is large and small scaled cross bedding.

Current river channel sediments are discordant over older units and no other units take place over it. Thickness of the unit approaches to 20 m at some points. While the unit does not content any fossils, age of it has been determined as Holocene according to the stratigraphical location (see Figure IV.2).

#### Quaternary - Pleistocene

##### *Old Sand Sediments (QAPP)*

This unit has not been applied any formation denomination while it has been introduced with the environment and period of it. This formation widely crops out in the last delta lobe composed by Yesilirmak, behind the current coast of Yesilirmak delta with NE-SW displace, in the SE of Balkanlı Village. Old beach sediments cover an area of approximately 40 km<sup>2</sup> in total.

Oblate-faint parallel ridges which constitute the extents that specifies the oldest coastal lines in the range include old beach sediments in general sands and less often slightly attached sandstones. Sand and sandstones are in grayish white color, well-grown and in fine-grain sized. In dunes large scaled cross beddings could be observed.

The bottom contacts of the old beach sediments cannot be observed. Over it, current beach and flood plain sediments are placed. Visible thickness of the unit is around 5 m. Inside the unit, broken pelecypoda and gastropoda shell parts could have been found. But, while these are not characteristics, they do not reveal their ages. Age of the unit has been determined as Pleistocene as per the stratigraphical location. Within the old beach sediments; dune, backshore and shorefront environments has been determined by basing upon sediment conditions but mostly on their morphological characteristics. Another characteristics of this sediments is to reflect well the old wind directions of which orientation changes especially in aerial photographs. (see Figure IV.2, MRE, 1989)

##### *Old River Channel Sediments (Qea)*

As other Quaternary sediments, this unit also has been described with the sedimentary environment and the period in which it has been settled. Old river sediments which crop out in the North part of Carsamba area give meandering and braided range samples. The unit which covers approximately an area of 75 km<sup>2</sup> typically is observed in both northeast of Carsamba town district and in approximately 1 km northwest of Kumtepe Village.

Rock type of the unit generally is consisted of sand and gravel together with slightly attached sandstone and gravel stones. In these sediments, in downstream direction, a grain-size downsizing has been observed. The gravels are well-rounded and medium-good gradation. While the sandstones are cross and parallel layered, they are clarified with their heavy mineral lamina. The unit which comes with angular unconformity on the units older than itself is covered up by current units with an unconformity. Thickness of the old river channel sediments can go up to 40-45 m.

Age of the unit in which no fossils can be determined according to the stratigraphical location and has been commented as Pleistocene. Old river channel sediments generally displays braided characteristics in the South while gets a meandering characteristics towards north. These sediments are the old channel sediments of Abdal Creek, Yesilirmak and Terme Creek. While it leaps out especially as channels left on both two sides of Yesilirmak, it is in characteristics of distribution channel towards the end of the delta. (see Figure IV.2, MRE, 1989).

c) Seismicity and seismic risk

North Anatolian Mountains which is located in the South of the project area have separated by fault lines partially. Here at the foot of the mountain no open passage is available to the plain ground of Eocene-flysch layers. Neogene dives under the plain alluvium gradually, it has withdrawn slightly upwards partially at the mountain side. While North Anatolia Mountains is a igneous masses mountain, only the core part of it has a description in The Alps. The tectonic is weak within the plain and is limited with slight fractures or flexions. These lead the Neogene to leap forward into the plain at various distances in stead of following North Anatolia Mountains properly as a side. Compared to important earthquake line which is located in the South, the searching field and nearby may be accepted as "slight active" in terms of earthquake.

The proposed project area lies within the 3rd Grade Earthquake Region according to the Turkey Earthquake Regions Map published in 1996 by Department of Earthquake Research of General Directorate of Natural Disasters which is affiliated to .R.T Ministry of Public Works (see Figure IV.4) (R.T. Ministry of Public Works, 1996).

Additionally, the active fault map of the proposed project area has been shown in Figure IV.5 (MRE, 1992). According to this, any active fault line is available nearby the project area while faults around Carsamba leaps out. The most important fault line in the region is the North Anatolia Fault Zone which passes from the South of approximately 70 km of the proposed project field.

Related to the aforesaid faults, the findings obtained from the field studies conducted by MRE between May-October 1987 in the region has been utilized (MRE, 1989).

Damatkır Reverse Fault which is one of the two faults in the area constitutes probably the last part which can be observed in the southeast of Erikli Fault. This fault does not show a single and precise linearity while it has been observed throughout the zone in an over-folding, aversion and fracture way. General range of it is in NW-SE direction. The fault plane is SW sloped with slopes range between 45-70°. Its length in the area is approximately 13 km. While this reverse fault seems as attenuated around the point at which Terice Creek meets with Yesilirmak, it has been thought that it continues towards southeast within Karakus Creek which meets with Yesilirmak.

A secondary reverse fault is the Terice Fault in 5 km length. The slope of this fault is higher than Damatkır Reverse Fault and deformation area of it is wider.

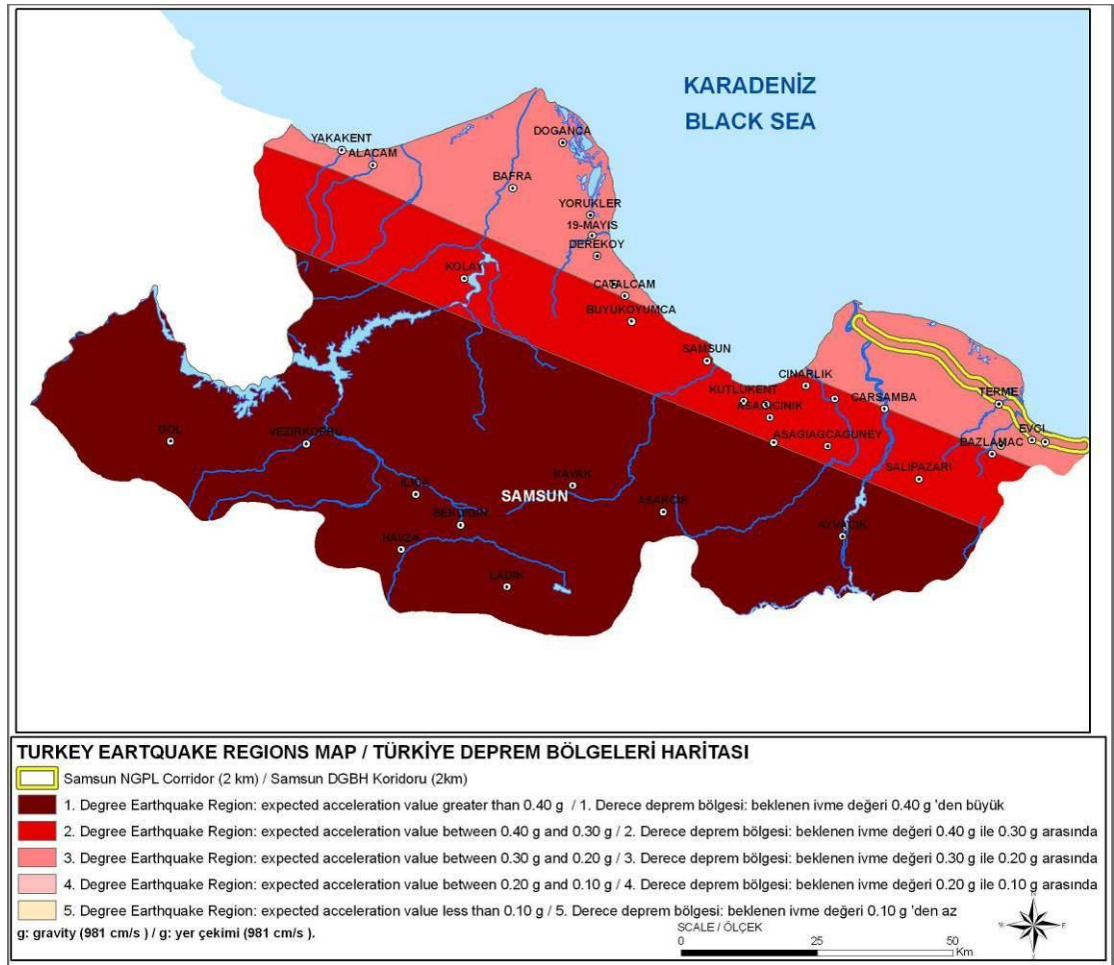


Figure IV.4: Samsun Province Earthquake Map

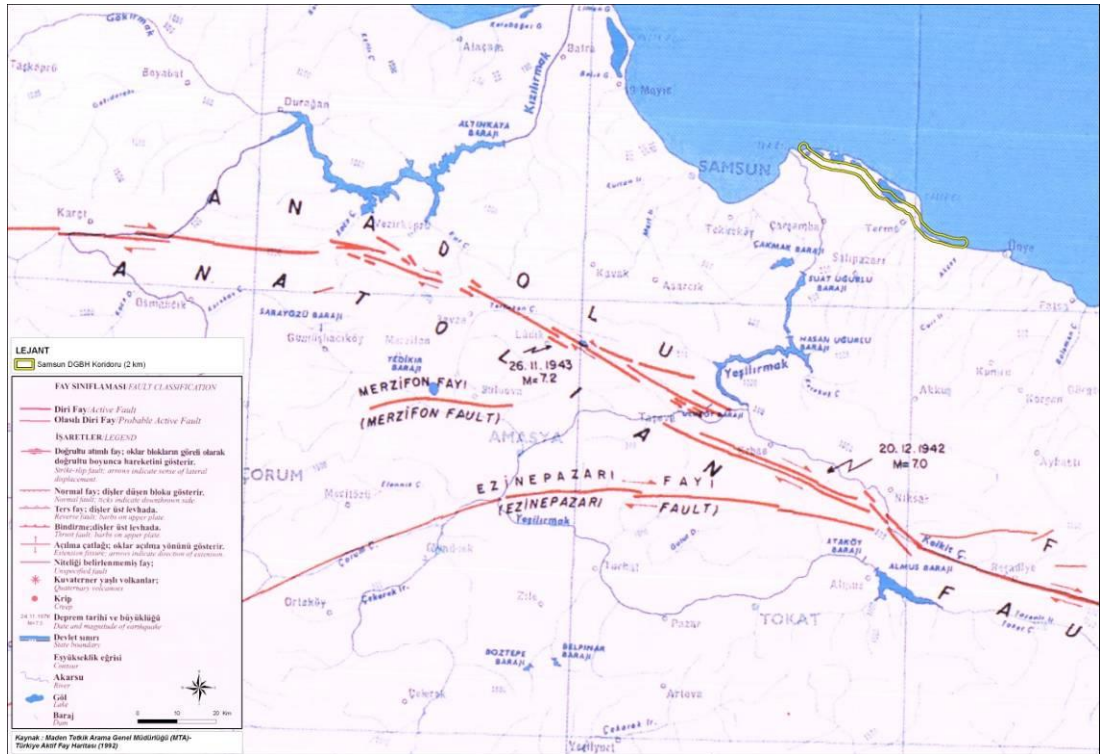
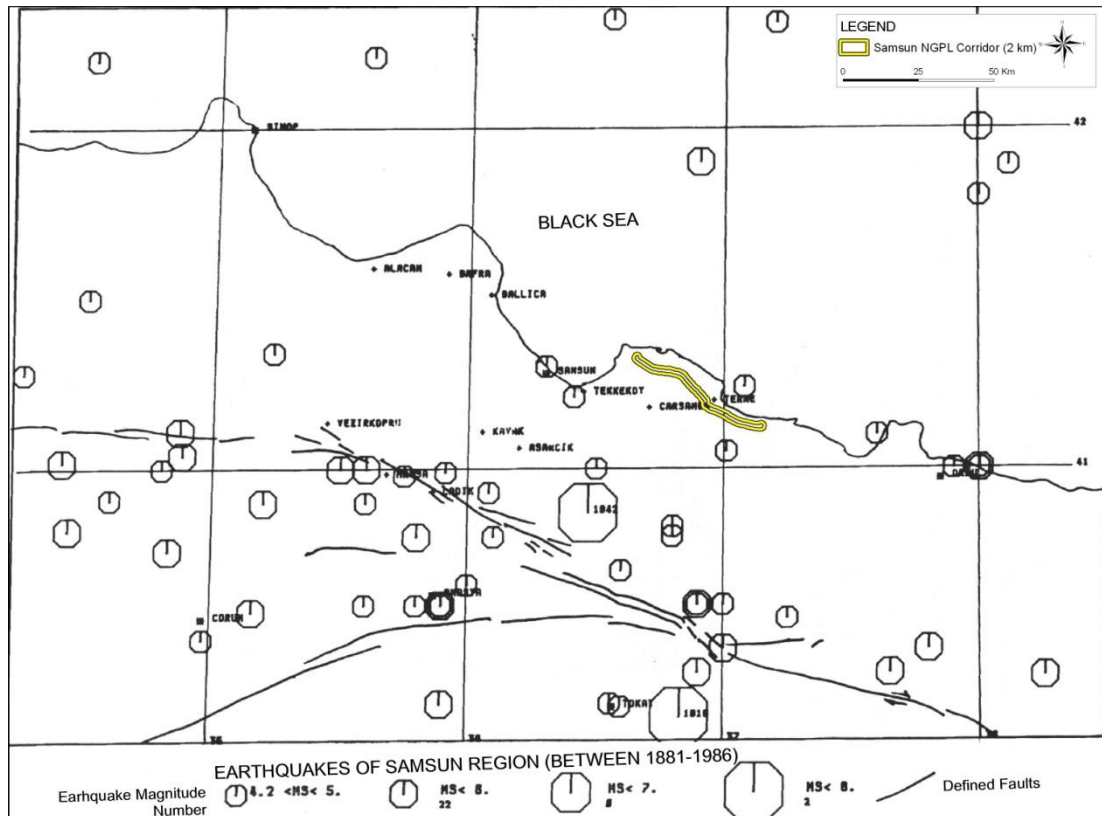


Figure IV.5: Active Fault Map of the Region

The most important fault of the research area is Carsamba Fault which is described as reverse fault by the researchers of MRE. This fault which dives in the sea in the west of Tekkekoy Town District roughly arches by guiding firstly in southeast, then east and than northeast. The aforesaid fault then continues to eastward starting from Umyan and Salıpaazarı. Length of it is approximately 27 km. Faults have generally developed towards northeast-southwest and North-south.

The latest direction in the region is in NE-SW and NW-SW. But dominant one among them is NE-SW. This orientation has determined the extent of Abdal Creek, Yesilirmak and Curuk River (MRE, 1989) (see Figure IV.5).

The earthquakes recorded between 1881-1986 in Samsun Province and around have been compiled by Society of Geophysics Engineer of The Union of Turkish Engineers and Architects (UTEA, 1990), earthquakes between these years are shown in Figure IV.6. According to this, there is no significant earthquakes recorded nearby the project field between 1881-1986. One earthquake each is recorded between the same years in Tekkekoy and Terme settlement units while the magnitude of these earthquakes are respectively 4,2 and 5,0.



**Figure IV.6:** Earthquakes Occurred in Samsun Province and Around

- d) Geological impacts within the scope of Works and transactions within the scope of project and measures to be taken (land preparation, construction, operating and after operating)

At the construction activities stage of the project, in order to assure the slope stability in earth moves within the alluvial material saturated to underground water, measures such as shoring,

sheet-piling shall be taken. No negative impacts to the underground water are available during construction.

#### IV.1.4 Hydrological Characteristics

##### a) Region and Project Area Hydrological Characteristics

###### Rivers

Largest rivers of the province are Yesilirmak, Kızılırmak and Curuk Irmak (Terme Creek). Yesilirmak which meets with Carsamba by crossing over Erbaa District (Tokat) then disembogues to Black Sea at Civa Cape by dividing the District into 2 pieces. Kızılırmak disembogues to Black Sea at Bafra Cape. Other than these rivers in the region there are also large and small rivers such as Mert River, Kurtun Creek, Ters Akan Creek, Kara Bogaz Creek, Akcay, Ulucay, Esenli, Incesu, Hızırilyas, Ballica Creek, and Gudedi.

Rain area of Yesilirmak River in Carsamba Town Center is 36.000 km<sup>2</sup> and grade of it is 10 m. Yesilirmak mainstream, Cekerek River, Corum Cat River, Kelkit River, Tersakan River and Karakus River are sidestreams of Yesilirmak River. Within this basin; electric energy has been produced in Kılıckaya, Almus, Atakoy, Hasan Ugurlu and Suat Ugurlu dams.

Annual average flow of Yesilirmak River in Carsamba town center which comes from the 36.000 km<sup>2</sup> precipitation area is 5790 hm<sup>3</sup> and as per the annual average flow rate is 183,7 m<sup>3</sup>/s. Average flow of August which is the most arid month of the year is 61,3 m<sup>3</sup>/s.

###### Lakes and Ponds

Lakes in the region have been originated from the river beds which changes time to time. The lakes have gathered together in Bafra, Carsamba and Ladik districts. Simenlik Lake which has been originated by the change of the bed of Terme Creek is 20 km away from Terme while it seems as two lakes attached each other with a channel. Other these big lakes, many other large and small lakes are available in the region. In Carsamba District there are Akcagol, Akarcık, Dumanlı and Kor Irmak Lakes available which have been originated from Yesilirmak. Surrounding of Dumanlı Lake has been covered with reeds and marsh areas.

Besides in general of Carsamba Plain smaller lakes which serves as a nest for fishes are available. Level of all these lakes increases in pluvials and decreases in the dry season. Total surface area of all these lakes in the plain is 9250 ha when the lakes are full (which corresponds with sea level) and in arid summer season it ranges between 2440 ha.

###### The Dams

Out of the dams which have been already constructed, still constructing and planned to be constructed on Yesilirmak and its branches, some are for irrigation, some are for energy and some are for flood control purposes, while some of them are for multiple purpose which combines the aforesaid purposes. The Cakmak Dam with potable water purpose has been established in approximately 20 km southwest of the Samsun Province Carsamba District, while it has been used as the storage facility of Samsun Potable Water Project.

Total installed power of the Hydroelectric plants on Yesilirmak Basin on which the Samsun NGPL route is available is 1259 MW while annual energy amounts produced by these plants are respectively 5297 GWhour and 4266 GWhour as averagely and safely.

### The Sea

While Black Sea is one of the largest semi-closed seas of the world with a surface area of 432.000 km<sup>2</sup> and a volume of 547.000 km<sup>3</sup>, there are six countries around it. In spite it is surrounded by steep mountains, it has a poor structure in terms of gulfs and bays. Annual average precipitation amount ranges between 400 mm and 2.500 mm when compared to west and east parts while an approximately 750 km<sup>3</sup> of fresh water has been flowed in the sea annually.

Approximately 350 km<sup>3</sup> of this amount comes from the rivers that are the main resource of fresh water flow with rich nutrient content carried to Black Sea.

The route continues from the North of Carsamba and Terme Districts and approximately 4 km South of the Black Sea, while ends up in approximately 1 km distance to Black Sea in the Plant area.

#### **b) Location of the project as per the lake, dam, pond, river and other wetlands**

Terme Creek shall be crossed within the scope of the project planned to be constructed. Terme Creek rises in Kara forest. Terme Creek which feeds the reeds around Simenit divides the district in to two parts and disembogues in Black Sea. Terme Creek with a width of 30 m and approximately 1 m depth gives life to the paddy fields.

Throughout the route, any dams and dam lakes have been crossed. Accordingly any interactions have been expected which will be arisen from construction and operating activities.

Any aforesaid large and small lakes or ponds have been crossed closely throughout the route area. Accordingly any interactions which will be originated from the project have been expected during construction and operating activities.

#### **c) Current and planned usage of surface water resources (potable, domestic, irrigation water, water products procurement, transportation, tourism, electricity production, other usages),**

Throughout the route, many irrigation and drainage channels already constructed or planned to be constructed by SWA within the scope of "Carsamba Plain Irrigation and Drainage Project" are available. Width and heights of these channels range depending while their depths find 3 m. Channel type cross section of SWA channels are shown in Figure IV.7.

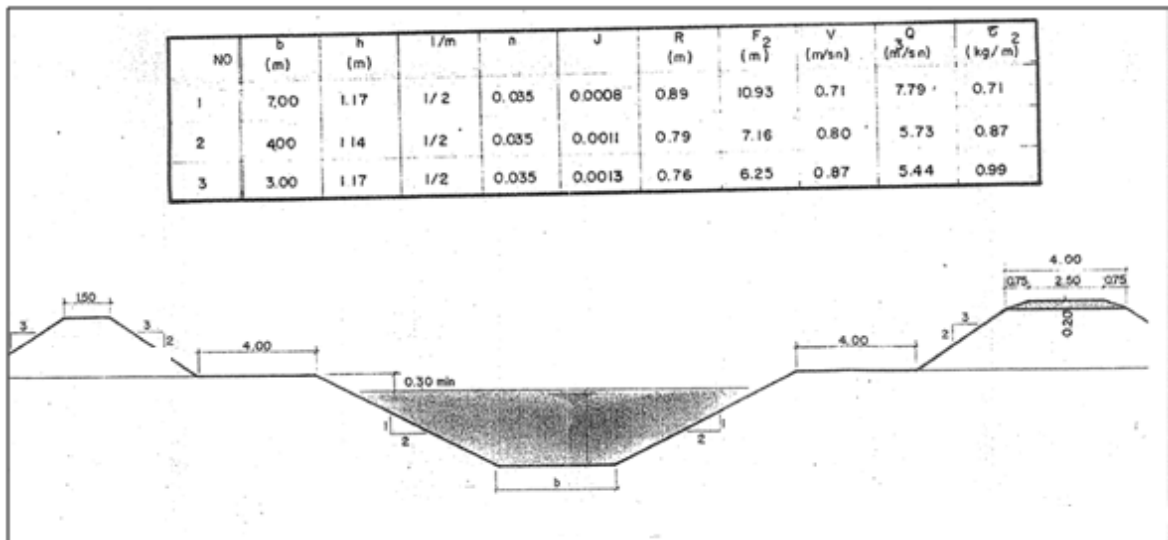


Figure IV.7 SWA Channel Type Cross-Section

Any surface water resources used for water products procurement, transportation and electricity production purpose are available throughout the route area.

- d) Hydrological impacts and measures to be taken within the scope of the Works and procedures to be carried out within the scope of the project (land preparation, construction, operating and after operating)

Impact of the pipeline to be constructed on the irrigation and drainage channels in the region shall be in question during construction works. Related to the subject, a consensus has been reached about working as coordinated with the relevant Institution with the purpose of preventing the current and planned irrigation drainage channels and other art structures from any damage during the construction studies of the pipeline with SWA 7. Directorate of Region.

Measures and considerations specified below by SWA within the scope of pipeline project shall be complied with:

- Top elevation of natural gas transition pipes shall be in 2,00 m depth starting from the drainage channels opened in previous years by the Institution.
- In the sections at which the channels of which the project studies have been completed but have not opened yet have been crossed by the natural gas transition line shall be in minimum 5,00 m depth and the pipe top elevation shall be determined according to this.
- Failures to be arisen from natural gas pipeline construction in the facilities of which construction is completed within the scope of the project shall be repaired by the company.
- Construction of SWA project manufacturing of which construction has not started yet shall not be prevented due to natural gas pipeline.
- Change in route of channel and irrigation facilities to be constructed by SWA shall not be requested for natural gas pipeline.
- SWA shall not be held responsible with possible damages in the natural gas line during the production of irrigation systems and other various structures of art which has not been made yet.



- Detailed projects of parts in which natural gas pipeline crossed with channels shall be prepared and submitted to Regional Directorate and construction shall not be started before receiving any opinions
- In case of any changes in the route of natural gas pipeline of which construction has been planned, SWA shall be informed.

#### IV.1.5 Hydrogeological Characteristics

##### a) Hydrogeological Characteristics of the region and the project area

Primary geological unit in the project field which shows aquifer characteristics is the alluvial backfill material in delta characteristics, subsidiary unit is the Eocene aged volcanic rocks. As Carsamba Plain is a delta plain, it shows a very complicated bedding in horizontal and vertical directions and a different lithological characteristics. When the clay thickness map prepared with the logs of boreholes abridged by SWA are examined, it has been observed that in Carsamba Delta Plain free, semi pressured and pressured aquifer levels take place. Pressured and semi pressured aquifer levels take place in the parts of Yesilirmak which were flood fields in the geological past. In such aquifers; on the top always a thick clay layer, which means an impermeable zone, beneath it an aquifer level consists of large materials such as sand-gravel, and at the bottom again a permeable clay level is available.

Samsun NGPL field which is in the right coastal side of Yesilirmak constitutes the pressured-semi pressured aquifer part. Remaining field consists of free aquifer levels.

##### b) Hydrogeological characteristics of surface water resources

Most important surface water resources in the project area are Yesilirmak, Terme Creek and large and small many creeks. Annual average flow of Yesilirmak River which comes from the 36.000 km<sup>2</sup> precipitation area in the town center of Carsamba is 5790 hm<sup>3</sup> and according to this annual average flow rate of is it 183,7 m<sup>3</sup>/s. Average flow rate of August which is the most arid month of the year is 61,3 m<sup>3</sup>/s. According to the data of Terme flow observation station which has been established on the Terme Creek, average of total flow values average between the years 1964-1988 shall be 304,6 hm<sup>3</sup>/ year.

##### c) Hydrogeological characteristics of underground and thermal water resources (water levels, amount, safe drawing values, flow rates of the resources, current and planned usage),

Carsamba Plain has the characteristics of a delta plain consisted of alluviums carried by Yesilirmak. For this reason, samples taken from the plain show varieties consisted of a mixture of gravel, sand and silt.

While the aquifer layers consisted of sandy and graveled material shows cross bedding, in some places it has been observed as thick and continuous, in some places has been observed as thin and in a couple of levels separated by clay. In the plain, layers which constitute the underground water reservoir are filled up with water completely. While it is thin in the South, blue neogene clays constitute the alluvium ground towards north.

The plain generally is rich in terms of underground water content. While the underground water level is considerably high, static level is generally 1-2 m and mostly is 5 m. For this reason, water needs of the region public has been met by the wells opened in the region. Depth of these wells generally climbs down to 10 m. Flow rate ranges between 1-10 L/s, drawdown ranges between 1-15 m and specific flow ranges between 0,2-6,0 L/s/m.

#### Water Bearing Formations

In the project field, primary geological unit which shows aquifer characteristics is the alluvial backfill material in delta characteristics, subsidiary is the Eocene aged volcanic rocks. As Carsamba Plain is a delta plain, it shows a very complicated bedding in horizontal and vertical directions and different lithological characteristics. When the boreholes abridged in different periods and with different purposes by SWA are examined, it is seen that in Carsamba Delta Plain, free, semi-pressured and pressured aquifer levels are available. Pressured and semi-pressured aquifer levels take place in the parts of Yesilirmak which were the flood plain in the geological past. In this kind of aquifer, on the top always a thick clay layer, which means an impermeable zone, beneath this the aquifer level constituted of large materials such as sand-gravel, and beneath it again an impermeable clay level is available.

In the South of the plain, aquifer levels rather consist of gravel-sandy gravel, gravel and blocked-sand gravel. While grain sizes gets smaller southward; a transition to fine-grained material such as sand, silt and clay has been observed and shell rate in the alluvial backfill increases.

Samsun NGPL field which is in the right coastal side of Yesilirmak constituted the pressured-semi pressured aquifer part. Remaining field consists of free aquifer levels. The field which includes , Sutozu, Canaklı and Gudogdu Villages which take place in the North of Samsun-Ordu State Highway constituted that the flowing artesian part of the plain.

#### *Hydrological Characteristics of The Formations Which Carry Underground Water*

Aquifer thickness, depth and quantity changes a lot in patches. Sometimes a layer of clay is available on the upper side, beneath that aquifer levels in different thicknesses are available. The aquifer levels generally consist of gravel, clayed-sandy gravel, silted-shelled sand, clayed-shalled gravel, silted sand and blocked sand-gravel. The depth of aquifer ranges between 5-58 m, thickness of aquifer ranges between 2 and 15 m.

Cross bedding which is one of the characteristics of delta plains also shows itself in this plain while aquifer is far away from being homogenous. Accordingly, hydrological characteristics of the plain also differs. The material gets thinner from the North which means the mountain foot to the sea, thickness and lithology of the aquifer levels shows great changes locally.

As a result of the pump tests in the boreholes abridged in the plain by SWA, it has been determined that the transmissibility values range between 11 and 16760 m<sup>2</sup>/day. This circumstance is resulted from the discontinuity of the aquifer levels in horizontal and vertical directions and differentiation of their lithological characteristics in patches. The transmissibility coefficient has been described as 1 m width and the amount of water passed at a unit of time under a %100 hydraulic slope from a section in the thickness of aquifer, while it depends on transmissibility and the thickness of aquifer.

Transmissibility values in the field which lies towards North throughout 7-8 km of the right coast of Yesilirmak range between 285 and 1865 m<sup>2</sup>/day, while specific efficiency ranges between 0,12 and 6,0 L/s/m. In the region in which also Taspınar, Sutozu, Canaklı, Gecmis and Bafracalı villages are available, transmissibility and specific efficiency values decline.

#### *Feeding of Underground Water*

Feeding of the aquifer levels have been realized via infiltration into the alluvium from precipitation, surface flow and river bed by force of lithological and petrographical characteristics of the geological units that give exposure in the project field. The alluvium has been surrounded by Black Sea in the North, Eocene age flysch and volcanic origin rocks in the South together with Neogene age detritic series. Eocene and Neogene old geological formations affect the underground water reserve in the plain only in the direction of surface flow due to their lithological and petrographical characteristics. As for the volcanic rocks constitute the circumstantial geological unit of the plain after alluvium in terms of underground water.

- d)** Hydrogeological Impacts and Measures To Be Taken Within the Scope of the Works and Procedure to be Carried Out Within the Scope of the Project (land preparation, construction, operating and after operating)

The pipeline to be constructed shall have any negative impacts on the underground water formations at construction and operating stages.

In the Works that will be carried out in the areas to be crossed by the pipeline route any wastes shall be released, the creeks will be protected and measures shall be taken and studies shall be conducted which are required for the wetlands within the scope of the relevant regulations.

#### IV.1.6 Meteorological and Climatic Characteristics

##### **a)** General and Local Climate Conditions of the Region

Meteorological data is very important in terms of general construction activities of pipelines. Data provides critical information about external elements which may be effective on the pipeline together with the design elements of the pipeline, by this means, it describes the regions in which measures should be taken for safe construction and operating of the pipeline. This data also provides information which may be useful for the personnel who will be employed in the pipeline about harsh weather conditions that may lead to breakdown at construction and/or operating stages of the pipeline system.

Office studies had been conducted related to the current meteorology stations throughout the proposed route corridor. Official records of General Directorate of State Meteorology Affairs (SMS) has been reviewed with the purpose of determination of stations suitable for the requirements of the project. Below criteria has been used in the selection of the meteorological stations:

- Distance of the station to the pipeline route: stations around the pipeline route have been preferred.
- Station Which Could Represent the Pipeline Route: Stations which will represent the topography and urbanization around the pipeline route has been preferred.

- Tracking density and data period: Stations in which weather conditions are tracked hourly and long-term information has been gathered together have been preferred.
- Varieties of tracked meteorological factors: Stations in which meteorological factors that are important for this project have been tracked have been preferred.

In the light of the criteria mentioned above, Samsun and Ünye Meteorological Stations have been selected with the data gathering purposes. These both two stations are the main climatic stations in which parameters such as pressure, temperature, wind speed, and direction, precipitation, humidity, soil temperature and cloudiness have been gathered together as hourly data. Information about these meteorological stations are given in Table IV.11, places of the stations are given in Figure IV.8.

Table IV.11 Meteorology Station Information

Meteorology Station	Station No.	Data Period	Location		Level (m)
			Latitude	Longitude	
Samsun Meteorology Station	17030	1975-2007	41°17'	36°18'	4
Ünye Meteorology Station	17624	1975-2005	41°08'	37°17'	20

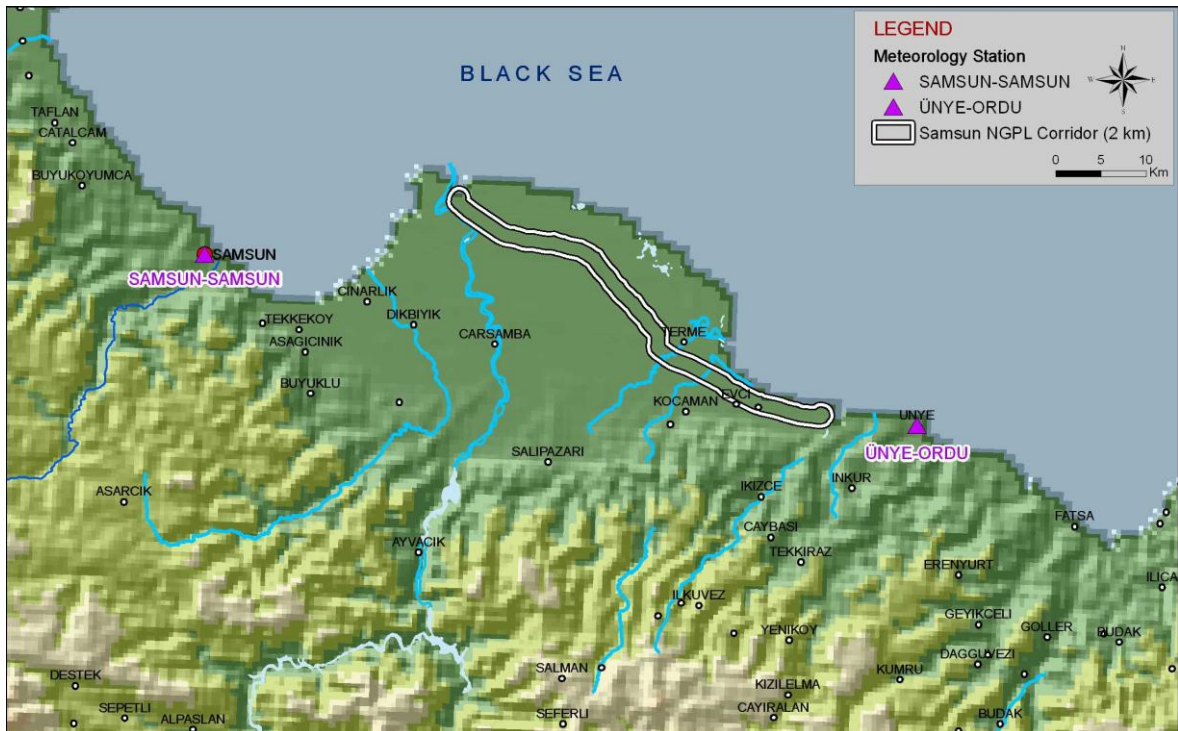


Figure IV.8 Meteorology Stations

Long-years newsletter of both two stations are given in Appendix-7.

Climate of Samsun Province displays different characteristics in coastal and interior parts. In coastal parts effect of Black Sea, in interior parts effect of Akdag and Canik Mountains has been observed. The province does not resemble both East and West Black Sea climates in terms of temperature and precipitations. Amount of precipitation is less than East Black Sea Region while average temperature is higher. As for the interior parts of the province are colder due to being

away from sea effect. Winters are warm at coastal parts while spring is foggy and chilly and summer is arid.

General Assessment of data from Samsun and Unye Meteorology Stations are presented in Table IV.12.

**Table IV.12** Samsun and Unye Meteorology Stations Data General Assessment

Parameters	Samsun Meteorology Station	Unye Meteorology Station
Annual Average Temperature	14,3°C	14,1°C
Warmest Month	August (23,5°C)	August (23,1°C)
Coldest Month	February (6,6°C)	February (6,5°C)
Annual Average Precipitation	687,4 mm	1165 mm
Highest Precipitation	October (Generally precipitation)	October (Generally precipitation)
Direction of the Wind	South-southwest	South-southwest
Average Wind Speed	2,4 m/s	1,9 m/s
Average Number of Cloudy Days	218,9	175,9
Number of Sunny Days	50,3	73,3
Average Number of Days with Snowfall	13,3	11,9
Number of Days With Snow cover	6,7	11,4
Average Rate of Relative Humidity	%73	%75
Maximum Rate of Humidity	%80 - spring	%82- spring
Minimum Rate of Humidity	%66 - winter	%69 - winter

As can be seen in Table IV.12; October is the month with most precipitation in the region. When meteorological conditions are considered, the construction Works shall be carried out in the months with less precipitation.

**b) Verbal and Graphical Distribution of The Pressure, Humidity, Temperature and Precipitation of The Region**

Monthly minimum, average and maximum temperature values acquired from Samsun Meteorology Station are presented in Table IV.13 and Figure IV.9, while monthly minimum, average and maximum temperature values acquired from Unye Meteorology Station are presented in Table IV.14 and Figure IV.10. Aforesaid values include a period of 33 years between 1975-2007.

**Table IV.13** Samsun Meteorology Station Temperature Normals

Months	Maximum (°C)	Average (°C)	Minimum (°C)
Januray	24,2	7,1	-6,6
February	26,2	6,6	-6,8
March	32,3	7,9	-7,0
April	37,0	11,2	-2,4
May	34,4	15,3	2,7
June	37,4	20,2	9,0
July	35,4	23,2	13,6
August	35,2	23,5	14,0
September	34,8	19,9	7,0
October	38,4	15,9	1,5
November	29,0	11,8	-2,2
December	25,4	8,9	-3,6
<b>Annual</b>	<b>38,4</b>	<b>14,3</b>	<b>-7,0</b>

Reference: SMS

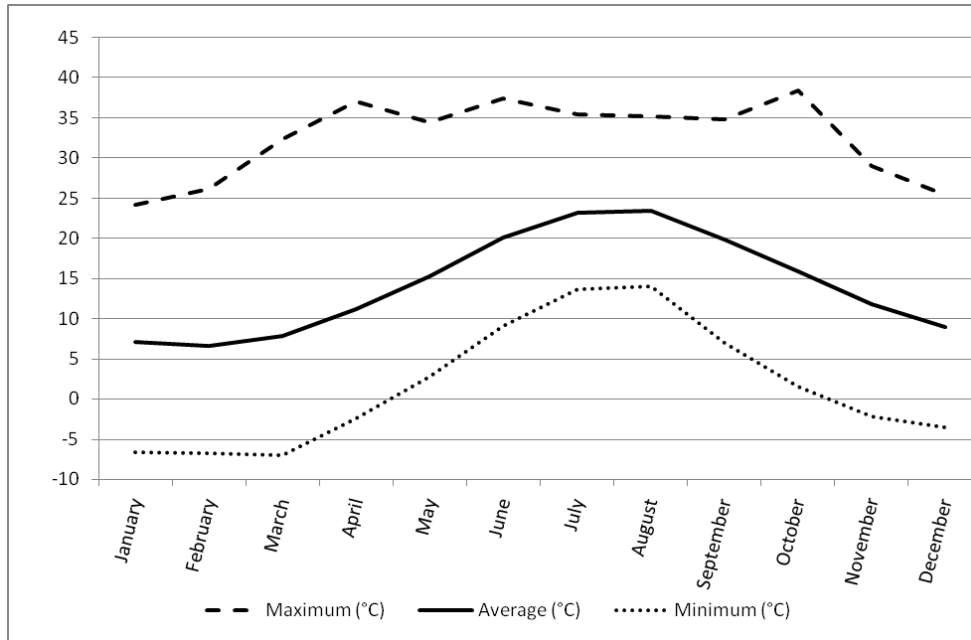
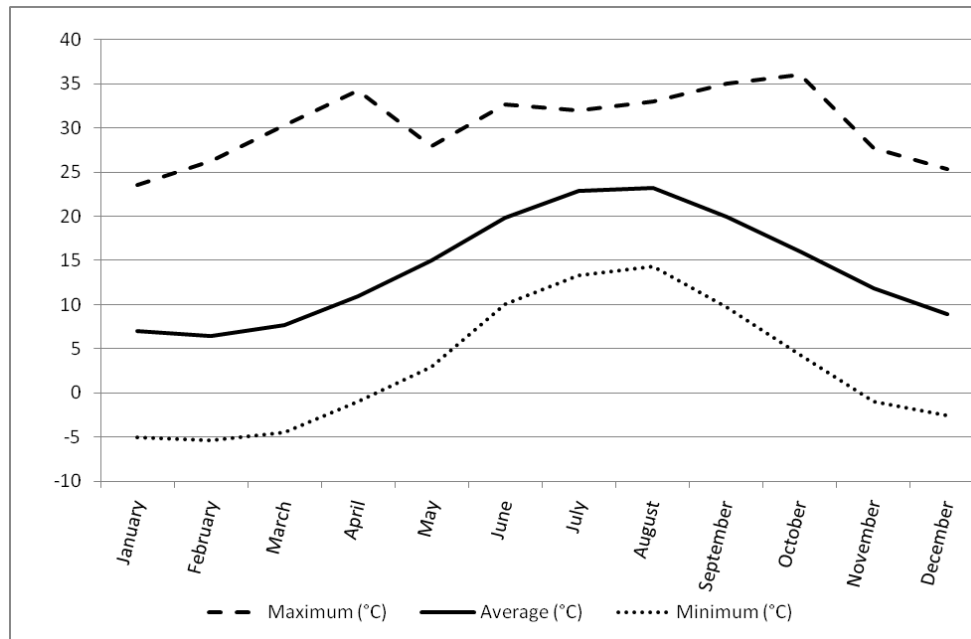


Figure IV.9 Samsun Meteorology Station Temperature Regime

Table IV.14 Unye Meteorology Station Temperature Normals

Months	Maximum (°C)	Average (°C)	Minimum (°C)
Januray	23,6	7,0	-5,0
February	26,2	6,5	-5,4
March	30,3	7,7	-4,5
April	34,2	10,9	-1,0
May	28,0	15,0	3,0
June	32,7	19,8	10,0
July	32,0	22,9	13,3
August	33,0	23,2	14,3
September	35,0	19,9	9,7
October	36,1	16,0	4,3
November	27,7	11,9	-1,0
December	25,3	8,9	-2,6
<b>Annual</b>	<b>36,1</b>	<b>14,1</b>	<b>-5,4</b>

Reference: SMS



**Figure IV.10** Unye Meteorology Station Temperature Regime

For both Samsun and Unye Stations; average temperature ranges between 6,6°C (February) and 23,5°C (August). Average temperature in January and February months which are the coldest months does not decline under 6,5°C. Highest temperature values measured in Samsun Meteorology Station between 1975-2007 has been observed in October with 38,4°C and lowest temperature value has been observed in March with -7,0°C, Whilst highest temperature value measured in Unye Meteorology Station has been observed in October with 36,1°C and the lowest temperature has been observed in February with -5,4°C.

As the distribution, amount and type of the recorded precipitations have an impact on the level of underground water, it is of the essence. In assessment of the precipitation regime in the region; precipitation data recorded between 1975-2007 in Samsun and Unye Meteorology Stations has been used. Precipitation normals of Samsun and Unye Meteorology Stations as per the recorded data are presented in Table IV.15 and Table IV.16 respectively.

**Table IV.15** Samsun Meteorology Station Precipitation Normals (1975-2007)

Months	Average Total Precipitation (mm)	Daily Maximum Precipitation (mm)	≥ 0,1 mm Number of Days With Precipitation	Daily Most Evaporation (mm)	Average Evaporation (mm)
January	61,3	45,7	13,4	9,5	66,4
February	50,1	39,9	13,7	11,8	61,6
March	57,4	31,1	15,1	7,2	54,2
April	59,0	45,6	14,8	11,0	64,7
May	49,6	56,2	12,6	8,0	89,0
June	49,0	77,5	9,6	15,9	124,8
July	30,5	54,6	5,6	10,0	156,6
August	38,6	113,2	6,5	10,2	148,0
September	51,6	58,4	9,9	9,0	100,4
October	86,3	61,0	12,5	8,6	69,3
November	82,2	66,5	12,8	11,8	54,1
December	71,8	39,8	13,4	10,0	61,5
<b>Annual</b>	<b>687,4</b>	<b>113,2</b>	<b>139,9</b>	<b>15,0</b>	<b>1050,6</b>

Reference: SMS

**Table IV.16** Unye Meteorology Station Precipitation Normals (1975-2007)

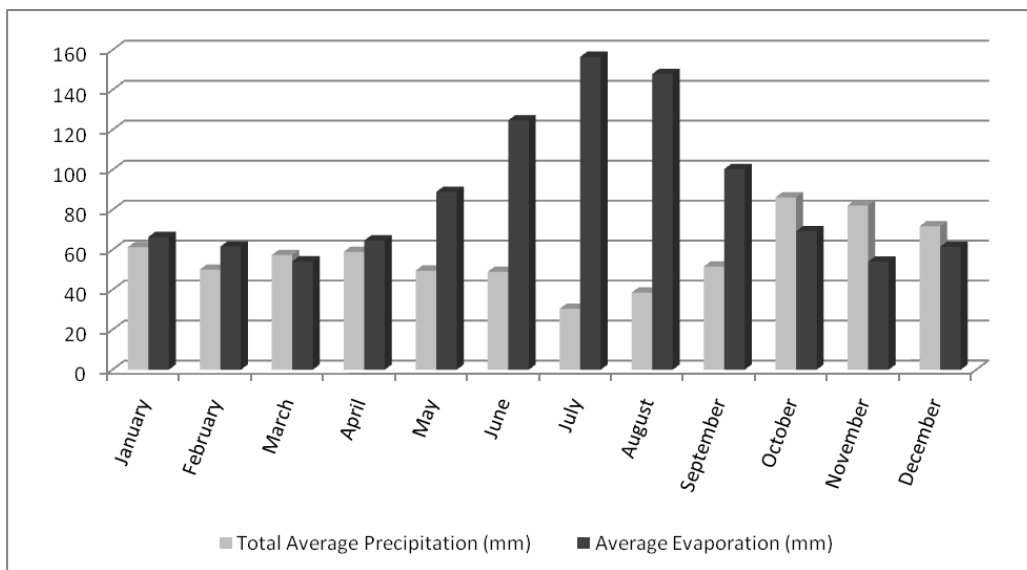
Months	Average Total Precipitation (mm)	Daily Maximum Precipitation (mm)	≥ 0,1 mm Number of Days With Precipitation
January	105.2	58.7	14.3
February	97.0	50.6	13.7
March	88.2	38.4	14.9
April	80.7	59.6	14.3
May	60.1	47.5	12.6
June	76.8	22.4	10.2
July	66.7	126.4	8.9
August	97.9	174.6	9.5
September	92.1	97.7	10.6
October	146.1	128.2	13.6
November	139.3	81.4	13.2
December	121.3	73.7	14.5
<b>Annual</b>	<b>1172.0</b>	<b>222.4</b>	<b>150.3</b>

Reference: SMS

Whilst annual average total precipitation amount in Samsun has been 687,4 mm; in Unye it is 1172,0 mm. The season with the highest number of days with precipitation is autumn for both Samsun and Unye Stations. Average evaporation value has only been measured for Samsun Station; it climbs up to 1050,6 mm. %27 of the total precipitation has been observed in winter while %24 of it has been observed in spring.

Most precipitation has been recorded in October (Samsun 86,3 mm and Unye 146,1) and the least precipitation has been recorded in July for Samsun (30,5 mm), May for Unye (60,1 mm). Annual average number of days with precipitation is 139,9 for Samsun whilst it is 222,4 in Unye. As per the data from Samsun Meteorology Station, the month in which evaporation occurs monthly is June with 15,9 mm.

Samsun Meteorology Station precipitation and evaporation changes are presented in Figure IV.11. Average total precipitation and daily maximum precipitation values for Samsun and Unye is presented in Figure IV.12 and Figure IV.13 respectively.



**Figure IV.11** Samsun Meteorology Station Evaporation and Precipitation Changes (1975-2007)



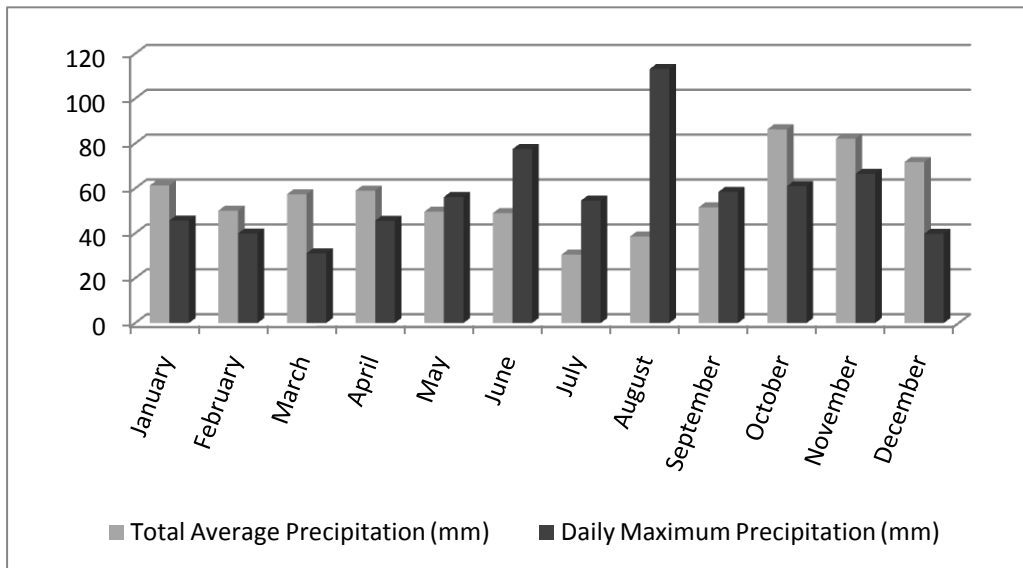


Figure IV.12 Samsun Meteorology Station Monthly Average Precipitation (1975-2007)

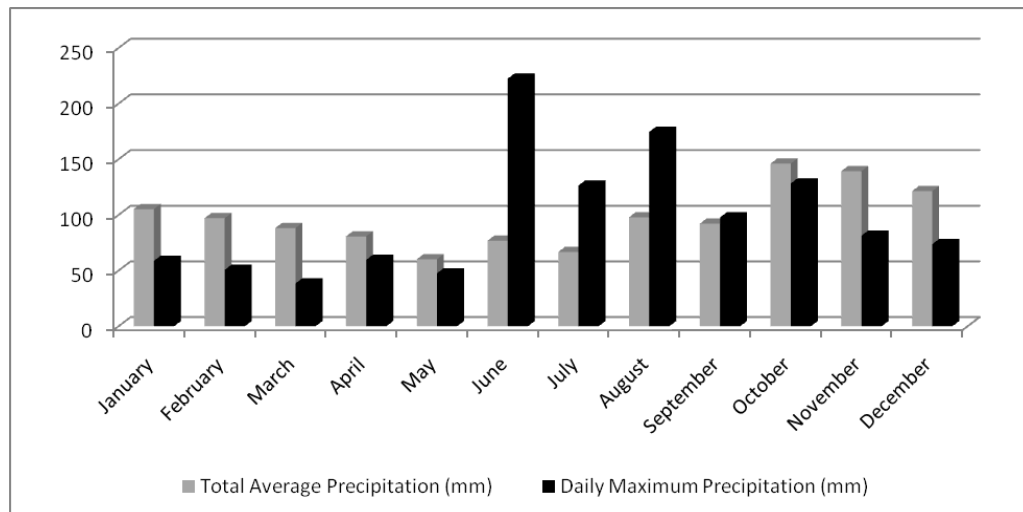


Figure IV.13 Unye Meteorology Station Monthly Average Precipitation (1975-2007)

c) Distribution of the Counted Days of the Region

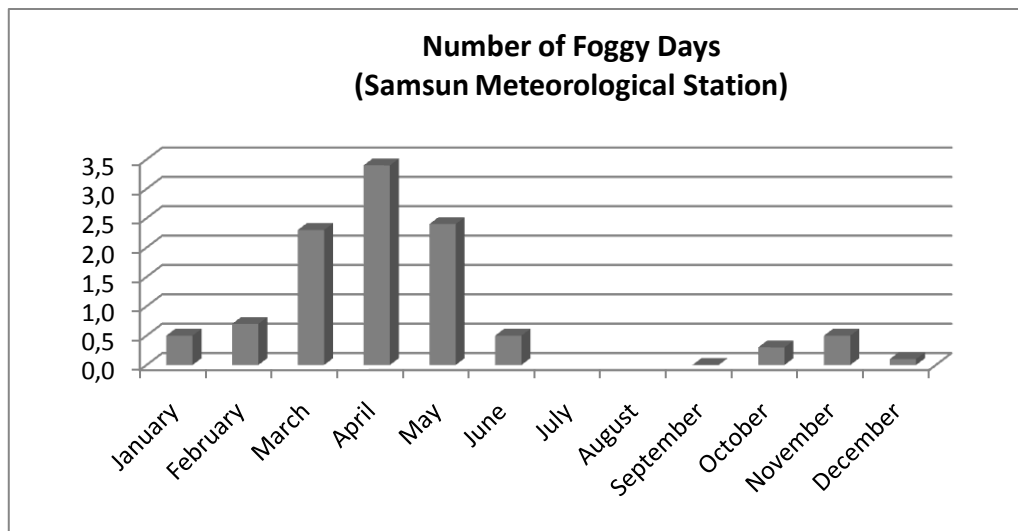
Values of distribution of counted days for Samsun and Unye Meteorology Stations include the average values of 33 years between 1975-2007. Distribution of days as per months are presented in Table IV.17 for Samsun and Table IV.18 together with Figure IV.14 and Figure IV.18 for Unye.

**Table IV.17** Samsun Meteorology Station Counted Days and Annual Average Values

Months	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Number of Days With Snowfall	3,7	4,9	2,2	0,2	-	-	-	-	-	-	0,3	2,0	<b>13,3</b>
Number of Days With Snow Cover	2,0	3,0	0,8	0,1	-	-	-	-	-	-	0,0	0,8	<b>6,7</b>
Highest Snow Cover Thickness (cm)	36,0	22,0	8,0	9,0	-	-	-	-	-	-	2,0	23,0	<b>36,0</b>
Number of Foggy Days	0,5	0,7	2,3	3,4	2,4	0,5	-	-	0,0	0,3	0,5	0,1	<b>10,7</b>
Number of Days with Hail	0,0	0,1	0,1	0,1	0,2	0,0	-	-	0,0	0,0	0,2	0,0	<b>0,7</b>
Number of Days With Frost	0,9	1,4	1,4	0,2	-	-	-	-	-	-	0,2	0,6	<b>4,6</b>
Number of Days With Thunderstorm	0,1	0,2	0,4	2,4	4,9	5,5	2,6	3,7	3,7	1,5	0,7	0,2	<b>25,9</b>

**Table IV.18** Unye Meteorology Station Counted Days and Annual Average Values

Months	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Number of Days With Snowfall	3,3	4,3	2,2	0,2							0,4	1,6	<b>11,7</b>
Number of Days With Snow Cover	3,5	4,8	1,4	0,1							0,1	1,5	<b>11,4</b>
Highest Snow Cover Thickness (cm)	42,0	42,0	25,0	6,0							3,0	28,0	<b>42,0</b>
Number of Foggy Days	0,4	0,7	2,1	4,1	1,8	0,4			0,0	0,1	0,2	0,3	<b>9,8</b>
Number of Days with Hail	0,5	0,3	0,2	0,2	0,1	0,1	0,0		0,0	0,0	0,4	0,3	<b>2,2</b>
Number of Days With Frost	4,0	3,2	2,6	0,1						0,1	0,4	3,6	<b>13,5</b>
Number of Days With Thunderstorm	0,1	0,1	0,3	1,8	2,9	3,0	1,9	3,0	2,9	0,9	0,5	0,3	<b>17,7</b>



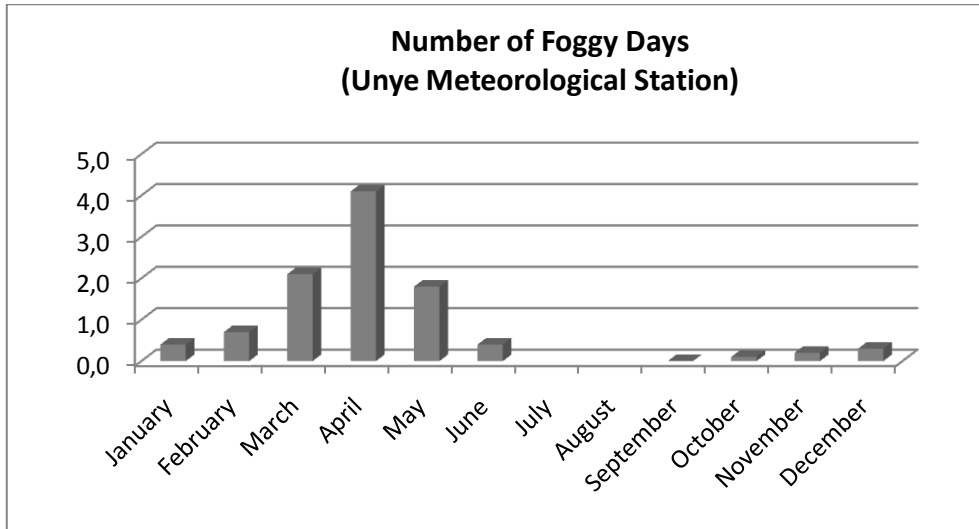


Figure IV.14 Monthly Distribution of Days with Fog

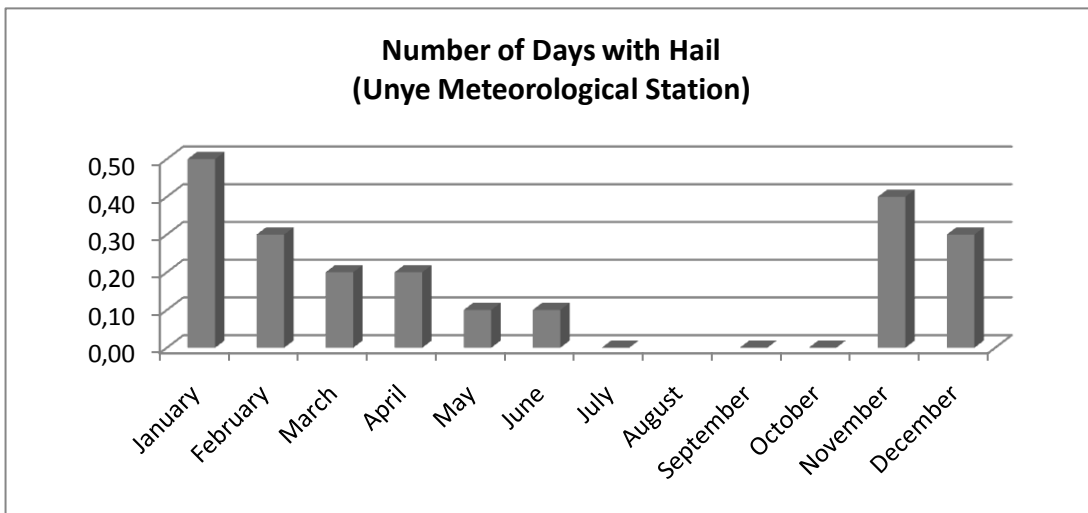
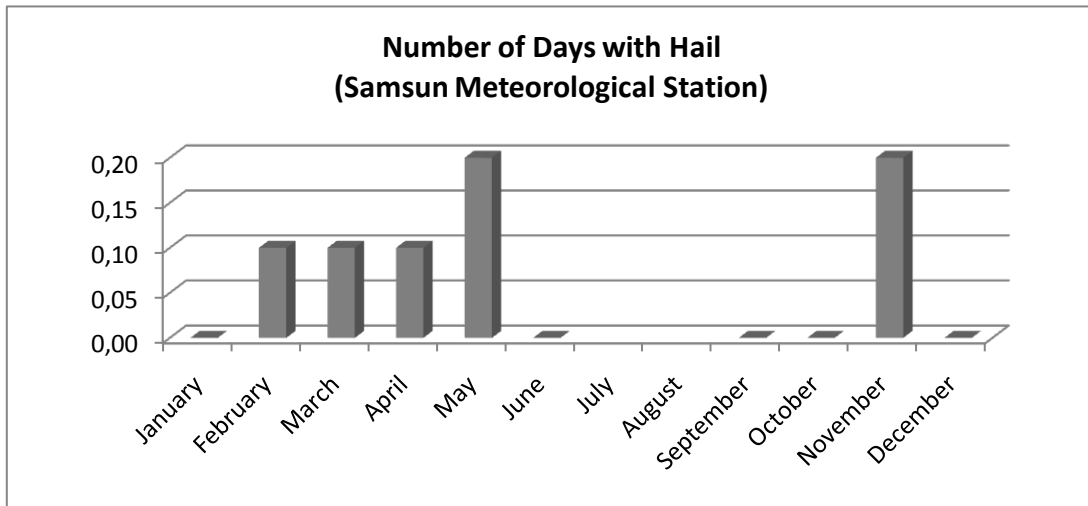


Figure IV.15 Monthly Distribution of Days with Hail

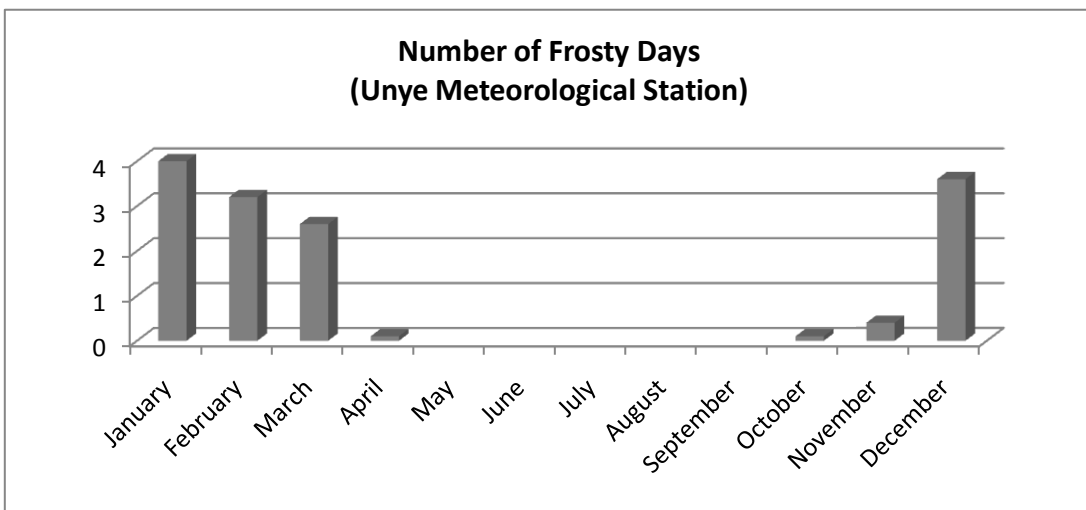
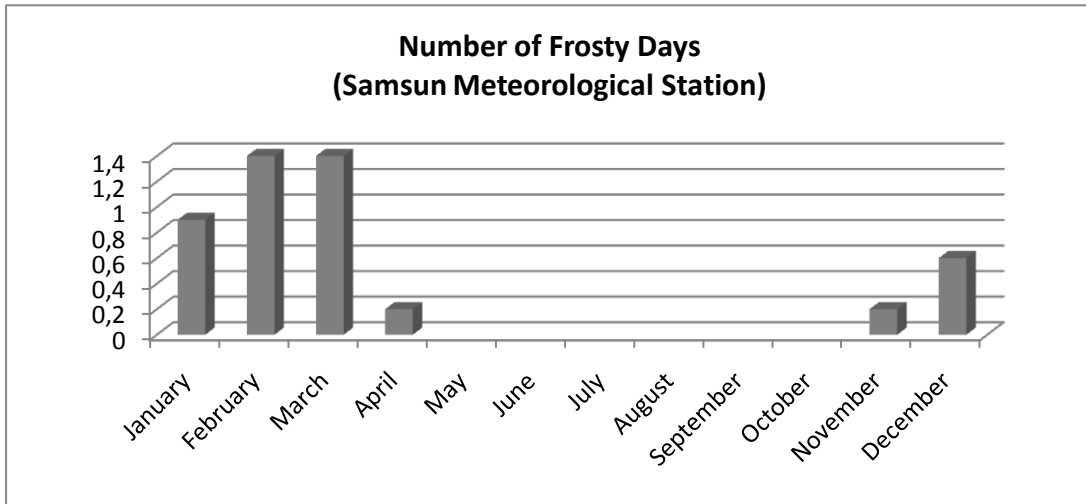
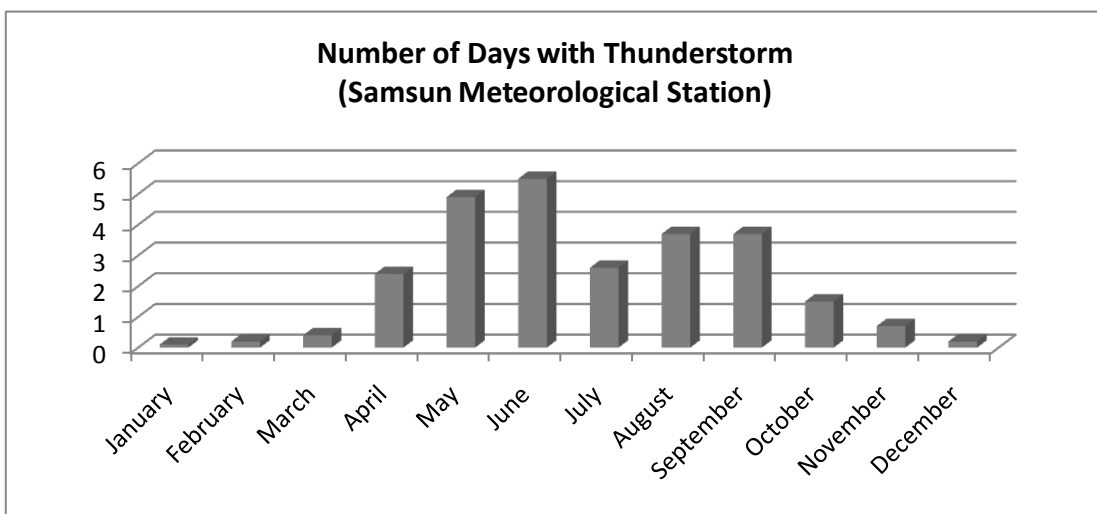


Figure IV.16 Monthly Distribution of Days with Frost



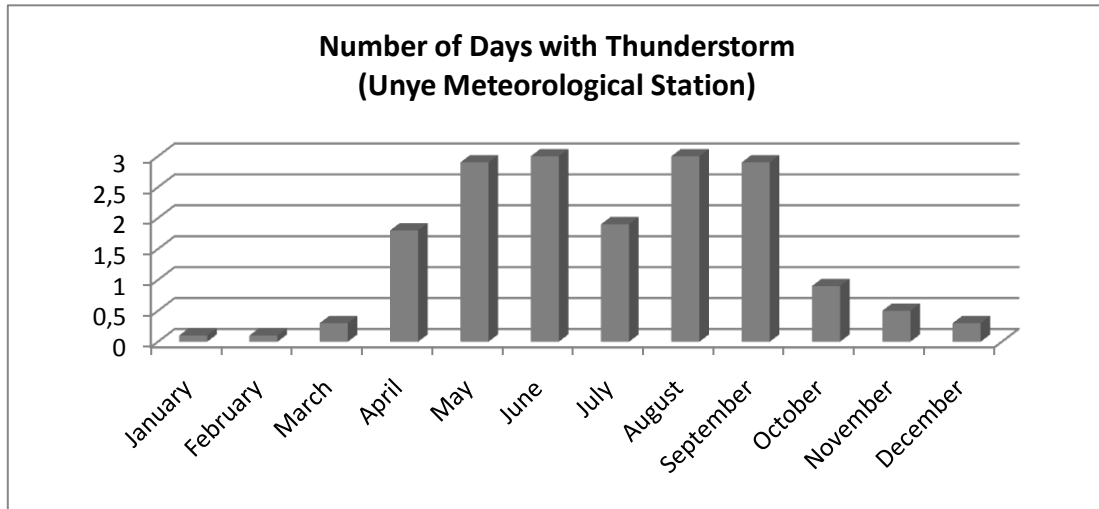


Figure IV.17 Monthly Distribution of Days with Thunderstorm

**d) Evaporation Condition of the Region**

Samsun Meteorology Station precipitation and evaporation changes are presented in Figure IV.11. Average total precipitation and daily maximum precipitation values for Samsun and Unye are presented in Figure IV.12 and Figure IV.13.

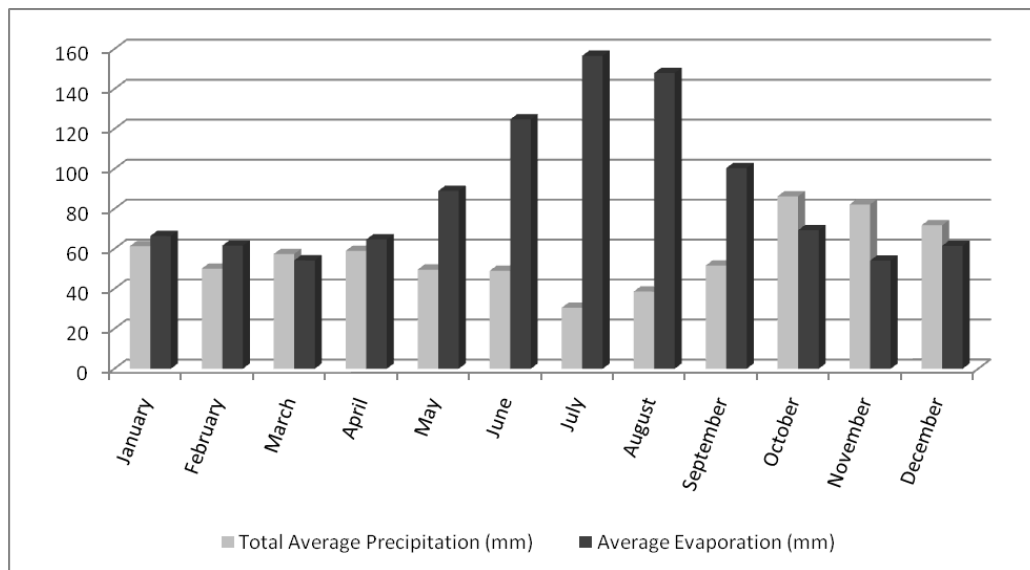


Figure IV.18 Samsun Meteorology Station Evaporation and Precipitation Changes (1975-2007)

**e) Verbal and Graphical Distribution of the Wind in the Region (monthly, seasonal and annual wind diagrams, dominant wind directions, days with strong winds and gales)**

As per the measurements carried out in Samsun and Unye Meteorology Station between 1975-2007; the distribution of the speed of winds (m/s) as per directions has been given in Table IV.19 and Table IV.20. According to this, dominant winds within a year are in South-southwest direction (SSW) (%11,6) and southwest (%11,3) direction while average wind speeds of these directions are 2,9 m/s and 2,4 m/s respectively.

While the strongest wind in Samsun Meteorology Station has been in South-southwest (SSW) direction with a speed of 34,5 m/s, it has been observed in December. While the strongest wind in Unye Meteorology Station has been in west (W) direction with a speed of 28,6 m/s, it has been observed in April.

**Table IV.19** Samsun Meteorology Station Average Wind Speeds As Per The Directions (m/s)

Directions	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
N	2,3	2,6	2,4	2,2	2,1	2,5	3,7	3,6	3,4	2,8	2,2	2,3	2,7
NNE	2,3	2,4	2,3	2,1	2,1	2,7	3,5	3,6	3,0	2,4	2,1	2,5	2,7
NE	2,1	2,2	2,3	1,9	2,0	2,3	2,8	3,2	2,9	2,3	2,0	1,7	2,4
ENE	2,0	2,1	2,2	2,0	1,9	2,3	2,9	3,1	3,0	2,6	1,9	2,0	2,4
E	2,0	2,4	2,3	1,8	1,7	2,1	2,3	3,3	3,2	2,5	1,8	2,1	2,3
ESE	2,5	2,0	2,1	1,7	1,7	1,7	2,0	2,0	2,3	2,1	2,1	2,3	2,0
SE	2,2	2,2	2,0	1,6	1,2	1,5	1,3	1,2	1,1	1,5	1,9	2,5	1,7
SSE	3,7	2,8	2,4	1,7	1,7	1,5	1,5	1,6	1,5	1,9	2,6	3,8	2,4
S	4,3	3,1	2,5	2,0	1,3	1,4	1,2	1,5	1,5	1,9	2,9	3,4	2,5
SSW	4,6	4,0	2,9	2,3	1,6	1,5	1,5	1,5	1,8	2,1	3,2	4,3	2,9
SW	4,1	3,6	2,5	1,9	1,5	1,4	1,3	1,3	1,6	1,7	2,5	3,8	2,4
WSW	3,8	3,4	2,8	2,0	1,5	1,4	1,3	1,5	1,6	1,8	2,4	3,4	2,4
W	2,9	3,1	2,2	2,3	1,7	1,7	2,0	1,5	1,6	2,0	2,2	2,7	2,2
WNW	3,0	2,6	2,9	2,5	2,2	2,4	2,4	2,3	2,2	2,3	2,5	2,9	2,5
NW	2,8	3,0	3,0	2,5	2,2	2,6	2,8	2,5	2,6	2,5	2,8	2,5	2,7
NNW	3,0	3,1	2,9	2,6	2,4	2,6	3,1	3,3	3,0	2,9	2,8	2,7	2,9

**Table IV.20** Average Wind Speeds As Per the Directions Unye Meteorology Station (m/s)

Directions	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
N	2,2	2,2	2,1	1,7	1,4	1,9	2,1	2,2	2,3	2,1	2,0	2,1	2,0
NNE	1,5	1,9	1,9	1,3	1,5	1,5	1,8	1,9	1,7	1,9	1,7	1,9	1,7
NE	1,6	1,9	1,6	1,5	1,7	1,5	1,4	1,8	1,7	1,7	1,6	1,3	1,6
ENE	2,7	3,2	3,0	2,8	2,4	2,5	2,8	2,6	3,2	2,8	2,5	2,5	2,7
E	2,0	2,3	2,6	2,5	2,2	2,1	2,3	3,1	2,8	2,6	2,5	1,8	2,4
ESE	2,0	1,7	2,1	1,9	1,7	1,6	1,7	1,7	1,6	1,7	1,7	1,8	1,8
SE	1,5	1,6	1,9	1,6	1,4	1,4	1,5	1,5	1,8	1,5	1,6	1,5	1,6
SSE	1,6	1,6	1,7	1,5	1,2	1,2	1,1	1,2	1,2	1,4	1,5	1,4	1,4
S	2,0	1,9	1,7	1,6	1,4	1,3	1,4	1,4	1,4	1,4	1,4	1,7	1,5
SSW	1,9	1,9	1,7	1,7	1,5	1,6	1,6	1,7	1,7	1,7	1,7	1,8	1,7
SW	1,9	1,9	1,8	1,4	1,3	1,4	1,4	1,4	1,6	1,6	1,6	1,8	1,6
WSW	2,2	2,3	2,1	2,0	1,8	2,0	2,1	2,1	2,0	2,1	2,1	2,2	2,1
W	2,4	2,6	2,4	2,3	2,0	2,0	2,3	2,4	2,4	2,3	2,1	2,3	2,3
WNW	1,9	2,1	2,1	1,9	1,7	1,8	1,9	2,0	1,9	1,7	1,7	1,7	1,9
NW	1,7	2,0	2,0	1,6	1,6	2,2	2,4	2,4	2,5	2,1	2,2	1,7	2,0
NNW	1,9	2,0	2,2	1,5	1,6	1,9	2,2	2,4	2,5	2,3	2,2	2,0	2,1

Number of gales observed within the year within the period of time in which the data has been recorded (wind speed  $\geq 17,2$  m/s) has been as 16,2 for Samsun and 4,1 for Unye. Number of days with high wind s (wind speed 10,8 – 17,1 m/s) is 64,3 for Samsun and 49,8 for Unye. The month with the highest number of storms is January with an average of 4,6 for Samsun and an average 0,8 for Unye.

**f) Highest precipitation values observed in Standard times**

Highest precipitation values observed in Unye Meteorology Station which is close to the project area is presented in Table IV.21.

**Table IV.21** Unye M.S. Highest Precipitation Values Observed In Standard Times

<b>UNYE M.S. HIGHEST PRECIPITATION VALUES OBSERVED IN STANDARD TIMES (mm)</b>															
<b>OBSERVATION</b>	<b>Minute</b>				<b>Hour</b>										
<b>YEAR</b>	<b>5</b>	<b>10</b>	<b>15</b>	<b>30</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>8</b>	<b>12</b>	<b>18</b>	<b>24</b>	<b>24 +</b>
2005	6.5	8.2	10.1	17.8	21.3	22.8	23.4	26.3	29.8	33.0	37.7	45.2	50.2	56.6	
2004	9.2	9.7	15.0	20.0	24.8	27.5	28.1	29.6	36.1	41.2	49.5	61.0	71.8	77.7	
2003	5.5	7.6	9.6	15.6	19.5	25.5	28.1	32.9	37.3	41.8	46.6	60.7	70.2	70.5	
2002	9.4	16.2	20.2	31.7	33.7	50.2	53.6	55.2	55.5	55.8	59.8	59.8	60.3	61.2	
2001	10.2	17.8	21.8	31.8	57.3	71.3	85.7	112.4	122.0	133.6	141.1	170.7	170.8	173.1	
2000	7.0	10.8	16.9	30.7	52.1	81.6	94.1	98.3	99.2	99.5	99.6	99.6	99.7	99.8	
1999	13.7	17.8	25.9	47.6	55.8	57.5	66.7	69.4	89.7	100.0	116.6	123.1	123.2	134.3	
1998	6.0	10.8	13.8	16.7	22.5	27.2	30.7	35.0	39.3	42.4	50.5	65.6	76.7	77.7	
1997	8.7	11.5	14.2	20.8	24.6	27.4	27.4	29.9	33.3	34.5	38.9	48.5	53.7	81.1	
1996	8.8	15.5	20.5	33.9	48.8	59.4	59.6	68.4	71.6	73.0	75.3	75.7	75.7	75.8	
1995	10.2	16.1	20.4	22.4	25.6	27.4	27.5	27.5	27.6	40.4	44.7	47.6	58.2	65.0	
1994	8.9	13.5	18.9	30.1	37.5	46.4	58.3	59.3	59.4	59.4	59.4	61.8	67.3	69.5	
1993	10.0	16.2	20.5	27.2	29.6	35.8	37.8	37.9	37.9	38.0	38.0	38.7	50.4	64.9	
1992	5.0	6.0	7.5	8.0	9.2	13.5	20.2	25.3	27.7	35.2	45.2	54.1	80.8	81.4	
1991	8.6	13.0	18.7	20.8	24.8	35.5	38.5	40.5	41.9	42.1	42.1	42.2	42.2	43.9	
1990	10.5	17.0	19.1	24.1	38.1	38.1	38.1	38.1	38.1	57.0	57.0	57.0	57.0	123.9	*
1989	11.1	11.4	11.8	13.8	18.3	22.6	23.5	26.1	31.0	38.1	44.0	52.0	56.5	58.0	
1988	13.1	20.5	27.2	41.7	65.0	84.2	87.8	93.1	96.4	96.6	96.9	117.3	117.3	117.3	
1987	9.3	12.4	14.2	17.0	18.5	26.0	37.8	48.9	52.9	55.7	59.5	66.2	77.3	81.8	
1986	6.2	9.5	11.1	11.1	13.3	19.0	22.4	28.6	31.5	31.5	35.9	45.2	46.9	53.9	
1985	9.4	12.5	12.9	13.3	20.4	28.1	30.9	32.5	32.8	32.9	35.0	35.6	37.8	50.4	
1984	14.0	18.2	19.3	21.1	22.4	27.0	29.5	33.5	36.5	45.9	47.5	49.1	68.1	83.1	
1983	13.7	13.8	13.9	14.9	15.0	16.8	22.4	26.4	31.6	36.0	41.3	41.4	44.6	48.4	
1982	10.4	12.7	17.0	23.0	35.1	46.1	48.4	49.5	50.6	50.6	52.9	53.5	53.5	77.9	
1981	10.0	15.8	17.0	17.3	26.0	31.0	41.9	42.7	46.3	55.6	74.1	111.2	166.8	222.4	
1980	21.0	26.8	40.1	52.8	73.2	100.0	103.3	106.8	108.8	110.4	120.8	120.8	120.8	189.7	
1979	13.4	17.1	22.1	27.5	30.0	39.0	40.2	42.6	45.3	46.5	48.2	54.7	71.3	74.4	
1978	11.1	14.6	20.0	28.3	37.9	57.4	63.7	67.0	69.2	69.4	72.7	86.7	97.8	111.0	
1977	8.1	12.9	14.1	14.5	22.5	26.8	31.9	35.1	37.9	40.0	43.5	48.6	55.7	58.9	
1976	10.9	16.6	19.8	31.2	55.6	64.0	73.9	83.2	88.9	97.5	104.6	125.1	140.6	142.6	
1975	21.7	26.6	37.6	64.9	87.3	96.5	97.4	97.9	98.0	98.0	98.0	98.1	98.2	98.5	
1974	7.4	13.0	16.0	20.1	26.0	29.2	30.7	31.5	31.8	31.8	31.8	36.0	48.5	62.7	
1973	3.5	5.0	7.5	11.0	14.7	19.7	22.9	23.7	23.7	23.7	23.7	23.7	24.0	36.2	
1972	9.5	15.9	20.9	34.6	36.3	37.2	37.3	38.0	38.7	38.7	38.9	48.9	49.7	66.0	
1971	7.9	14.3	21.2	39.4	44.3	52.3	52.3	52.5	59.9	61.4	63.4	65.6	79.7	99.5	
1970	10.4	14.8	17.4	21.0	34.5	35.7	39.3	50.8	57.1	61.0	62.1	62.1	106.8	127.1	
1969	8.5	13.2	19.1	33.8	48.0	52.3	54.2	56.1	58.0	58.8	62.2	63.5	63.8	68.5	
1968	10.3	17.7	17.7	20.4	22.8	24.6	31.2	33.2	35.2	37.2	40.5	41.4	42.5	42.5	
1967	7.3	13.5	19.2	35.3	40.5	58.1	68.6	73.2	77.2	79.3	80.2	80.2	80.7	111.8	
1966	8.2	15.0	18.7	37.4	41.8	83.5	94.8	112.8	123.2	135.7	143.1	145.6	153.7	153.7	
N	39	39	39	39	39	39	39	39	39	39	39	39	39	39	40
Y-ORT	9.85	14.22	18.20	26.17	34.27	43.23	47.85	52.14	55.66	59.03	63.23	69.92	78.30	88.94	89.82
Y-EB	21.70	26.80	40.10	64.90	87.30	100.00	103.30	112.80	123.20	135.70	143.10	170.70	170.80	222.40	222.40
Std.S	3.63	4.49	6.62	12.20	17.50	22.96	24.47	26.84	28.13	29.21	30.48	33.75	36.08	42.06	41.89
Car.K	1.54	0.68	1.38	1.10	1.11	0.99	0.92	1.03	1.05	1.20	1.23	1.27	1.11	1.46	1.39
U.D.F	LN3	LN3	LN2	LP3	LP3	LP3	LP3	LP3	LP3	LP3	LP3	LP3	LN2	LP3	LP3
2	9.13	13.75	17.10	23.79	30.44	37.39	41.34	44.76	47.99	51.13	55.32	61.54	71.12	78.37	79.58
5	12.32	17.76	23.01	34.91	46.31	58.12	63.29	68.30	72.62	76.26	81.60	90.74	102.88	114.16	115.62
10	14.53	20.15	26.87	42.50	57.61	73.92	80.37	87.10	92.21	96.26	102.12	113.10	124.79	141.83	143.08
25	17.39	22.96	31.71	52.30	72.67	96.21	105.00	114.78	120.98	125.75	131.83	144.85	153.34	181.57	181.96
50	19.58	24.93	35.28	59.71	84.39	114.46	125.72	138.52	145.60	151.02	156.92	171.24	175.12	214.91	214.19
100	21.82	26.81	38.83	67.17	96.48	134.23	148.50	165.10	173.10	179.35	184.67	200.04	197.37	251.59	249.30
PLF	0.10	0.14	0.18	0.29	0.40	0.52	0.57	0.62	0.66	0.68	0.72	0.79	0.86	1.00	1.00
PLV	0.12	0.18	0.23	0.32	0.40	0.50	0.56	0.60	0.64	0.68	0.73	0.80	0.89	1.00	1.00

g) Meteorological and Climatic Impacts That May Occur in the Local and Regional Climate during Works and Procedures to be Carried Out within the Scope of the Project and The Measures To be Taken (land preparation, construction, operating and after operating)

The pipeline planned to be constructed shall take place under the earth and only pigging station and block valve station shall take place as the surface facilities. These facilities shall not lead to any change in local and regional climate. The project has no impacts on the meteorology neither at construction nor at operating stages.

#### IV.1.7 Forestry Areas

##### a) Forestry Areas Within the Impact Area of the Project

Amasya Regional Directorate of Forestry has been applied to in consideration of determination of the forestry areas within the 17 m working corridor of the pipeline route planned to be constructed, while according to the Investigation and Assessment Report arranged by the Directorate, an area of 53.536 m<sup>2</sup> has been considered as forestry area. The Stand Type within the working corridor has been specified as "Z".

The project area is not an area subjected to a fire, or a rejuvenation area or an afforesting area.

##### b) Impacts on the Forestry Areas and The Measures To Be Taken Within the Scope of the Works and Procedures That Have been Already carried out and To Be Carried Out Within The Scope of the Project (land preparation, construction, operating and after operating)

Cutting off trees shall be in question in the area through which the line shall cross in the forestry part that shall be crossed by the route. For the parts of the line which will cross the forestry areas, required permissions shall be acquired from General Directorate of Forestry in accordance with the Law of Forestry numbered 6831. Additionally, required measures related to the possibility of forest fires and extinguishing shall be taken and required coordination with Samsun, Terme, Carsamba Operating Directorate of Forestry which are affiliated to Amasya Regional Directorate of Forestry shall be assured. Besides, no fires shall be lighted in the forest during the project and assessment of the trees to be cut off by the relevant operating directorate of forestry shall be assured.

#### IV.1.8 Flora-Fauna

##### a) Flora-Fauna of Project Area

While the project area and the impact area have been examined together, explained below.

##### b) Flora-Fauna of Project Impact Area

#### **Flora**

Black Sea Region takes place within Europe-Siberia Region. Dominant vegetation of this floristic region is forests. But along with this, other formations suitable with the conditions arranged by climate and location or composed under human effect are also available.

As the basic source in identification of the species, "Flora of Turkey and the East Aegean Islands (Davis, 1988)" has been utilized. The project area in general takes place in the frame A6 of Grid Quadrature system of Davis. For the Turkish names of the plants; "Buyuk Bitkiler Kılavuzu" (Grand Plant Guide) arranged by Sinasi Akalın and "Turkce Bitki Adları" (Turkish Names of PLants) arranged by Prof. Dr. Turhan Baytop has been utilized. The taxons determined generally at



species, subspecies and variety level in the impact area and surrounding area belong to Pteridophyta, Dicotyledones and Monocotyledones groups. The taxons belong to Euro-Siberian, Mediterranean, Euxine and Irano-Turanien flora element. Besides multi-regional taxons are also available. Though the working area and surrounding area take place in Euxine province of Euro-Siberian flora region, existence of Mediterranean flora elements in a considerable amount is a result of existence of Mediterranean similar climate conditions in the region. Because, it is possible to observe species with Mediterranean deployment in Black Sea region at low levels. These are especially frequent in Middle Black Sea region.

### Methodology

Literature studies have been conducted with the purpose of determination of risks for the components constituting the floral structure and the flora of the area and their protection status within the scope of the project which has been planned within the borders of Samsun Province.

In determination of the Turkish names of the plants, "Buyuk Bitkiler Kılavuzu" (Grand Plants Guide) which was arranged by Sinasi Akalın and "Turkce Bitki Adları" (Turkish Names of Plants) which was prepared by Prof. Dr. Turhan Baytop have been utilized.

For the danger category of the plants; the source named as "Plants of Turkey Red Book" which has been arranged according to the criteria determined by IUCN committee and by Ekim vd. and published by "Association for Conservation of Nature of Turkey" has been utilized.

Abbreviations and descriptions used in determination of danger categories of the plant species:

EX: Extincted	LC: Least Concern
EW: Extincted in the Wild	DD: Data deficient
CR: Critically Endangered	NT: Near Threatened
EN: Endangered	
VU: Vulnerable	
NE: Non-evaluable	

### Habitat Classes:

- 1- Forest
- 2- Maquis
- 3- Frigane (Plants of which most are spiny, short and constitute a ball cushion)
- 4- Culture areas (Vineyard, garden etc.)
- 5- Dry meadow
- 6- Wet meadow, Marshland and Wetland
- 7- Road side
- 8- Rockland

### Relative Abundance Classes:

- 1- Very rare
- 2- Rare
- 3- Reasonably abundant
- 4- Abundant
- 5- Very abundant

### Endemism:

- L- Locally endemic
- B- Regionally endemic
- Y- Widely endemic

### Vegetation

The project area covers agricultural lands together with areas which have been partially afforested economically. Most of the plant species have been determined in the unplowed and uncultivated lands agricultural lands which are located among agricultural lands. Besides with the effect of proximity of the area to the sea, species peculiar to humid areas are also found.

### Conclusion

Plant species which have been taken under protection and of which Trade has been prohibited in accordance with CITES (Convention on International Trade in Endangered Species) signed in Washington on the date of 03.03.1978 have not been met in the area. Besides, plant species which are under protection in accordance with BERN Convention (Convention on the Conservation of European Wildlife and Natural Habitats) which also has been approved by Turkey formally as a State party on the date of 09.01.1984 have also not been met in the project area. Floristic Species List for Project Area and impact area are given in Table IV.22.

Table IV.22 Project Area Floristic Species List

Name of Family	Name of Species	English Name	Phytogeographical Region	Habitat								Relative Abundance					End. Condition			Danger Category
				1	2	3	4	5	6	7	8	1	2	3	4	5	L	B	Y	
<b>SPERMATOPHYTA</b>																				
<b>ANGIOSPERMAE</b>																				
<b>DICOTYLEDONES</b>																				
<b>AMARANTHACEAE</b>	<i>Amaranthus albus</i> L.	Amaranth	—				x								x				LC	
	<i>Amaranthus lividus</i> L.	Amaranth	—				x								x				LC	
	<i>Amaranthus retroflexus</i> L.	Amaranth	—				x								x				LC	
<b>ASTERACEAE (COMPOSITAE)</b>	<i>Anthemis cotula</i> L.	Daisy	Med. element.					x							x				LC	
	<i>Bidens tripartita</i> L.		—				x								x				LC	
	<i>Cichorium intybus</i> L.	Succory					x								x				LC	
	<i>Doronicum orientale</i> Hoffm.	Leopard's Bane	—				x								x				LC	
	<i>Eupatorium cannabinum</i> L.	Sheep Cocklebur	Eurasia.-Sib. element.					x							x				LC	
	<i>Inula vulgaris</i> (Lam.) Trevisan	Elecampane	Eurasia.-Sib. element.					x							x				LC	
	<i>Otanthus maritimus</i> (L.) Hoffmans. & Link	—	Med. element.						x						x				LC	
	<i>Senecio vulgaris</i> L.	Groundsel	—					x							x				LC	
	<i>Xanthium spinosum</i> L.	Cocklebur	—											x					LC	
<b>BERBERIDACEAE</b>	<i>Berberis vulgaris</i> L.	<i>Berberis vulgaris</i>	—				x								x				LC	
<b>BORAGINACEAE</b>	<i>Buglossoides arvensis</i> (L.) Johnston	—	—						x						x				LC	
	<i>Echium italicum</i> L.	Blueweed	Med. element.				x	x							x				LC	
	<i>Echium plantagineum</i> L.	Blueweed	—				x								x				LC	
	<i>Echium vulgare</i> L.	Blueweed	Eurasia.-Sib. element.					x							x				LC	
	<i>Heliotropium europaeum</i> L.	Heliotrope	Med. element.				x	x							x				LC	
	<i>Myosotis arvensis</i> (L.) Hill ssp. <i>arvensis</i>	Forget-me-not	Eurasia.-Sib. element.				x	x							x				LC	

Name of Family	Name of Species	English Name	Phytogeographical Region	Habitat								Relative Abundance				End. Condition	Danger Category	
	<i>Tournefortii sibirica</i> L.	—	Eurasia.-Sib. element.						x					x				
<b>BRASSICACEAE (CRUCIFERAE)</b>	<i>Cardamine hirsuta</i> L.	Coralroot	—		x		x								x			
	<i>Clypeola jonthaspia</i> L.	—	—						x						x			
	<i>Conringia perfoliata</i> (C.A.Mey.) Busch	—	—										x					
	<i>Erysimum pulchellum</i> (Willd.) Gay	Erisimum	—		x									x				
	<i>Rapistrum rugosum</i> (L.) All.	Rapistrum	—				x							x				
	<i>Sisymbrium looselii</i> L.	<i>Sisymbrium</i>	—						x					x				
	<i>Sisymbrium officinale</i> (L.) Scop.	<i>Sisymbrium</i>	—					x	x						x			
	<i>Thlaspi perfoliatum</i> L.	<i>perfoliatum</i>	—				x								x			
<b>CAMPANULACEAE</b>	<i>Asyneuma amplexicaule</i> (Willd.) Hand.-Mazz. var. <i>amplexicaule</i>	—	—						x					x				
	<i>Campanula rapunculoides</i> L. ssp. <i>rapunculoides</i>	Blue bell	Eurasia.-Sib. element.				x								x			
<b>CARYOPHYLLACEAE</b>	<i>Agrostemma githago</i> L.	Ryegrass	—						x					x				
	<i>Arenaria rotundifolia</i> L. ssp. <i>rotundifolia</i>	Sandwort	—						x					x				
	<i>Arenaria serpyllifolia</i> L.	Sandwort	—					x	x						x			
	<i>Cerastium glomeratum</i> Thuill.	<i>glomeratum</i>	—		x				x						x			
	<i>Holosteum umbellatum</i> L. var. <i>glutinosum</i> (Bieb.) Gay.	Holosteum	—						x						x			
	<i>Moenchia mantica</i> ssp. <i>mantica</i>	—	—						x						x			
	<i>Petrorhagia saxifraga</i> (L.) Link	—	—		x				x					x				
	<i>Sagina procumbens</i> L.	Pearlwort	—						x					x				
	<i>Silene conica</i> L.	Bladder Champion	—				x		x					x				

Name of Family	Name of Species	English Name	Phytogeographical Region	Habitat								Relative Abundance				End. Condition	Danger Category			
	<i>Silene dichotoma</i> Ehrh. ssp. <i>euxina</i> (Rupr.) Coode & Cullen	Bladder Champion	Auxin element.		x	x								x						LC
	<i>Silene vulgaris</i> (Moench.) Garcke ssp. <i>vulgaris</i>	Bladder Champion	—				x							x						LC
	<i>Spergularia media</i> (L.) C. Presl.	—	—					x						x						LC
	<i>Stellaria media</i> (L.) Vill. ssp. <i>media</i>	Chickweed	—		x			x							x					LC
	<i>Vaccaria pyramidata</i> Medik	<i>Vaccaria pyramidata</i>	—					x						x						LC
<b>CISTACEAE</b>	<i>Helianthemum nummularium</i> (L.) Miller ssp. <i>tomentosum</i> (Scop.) Schinz & Thellung	Sundew	—		x								x							LC
<b>CONVOLVULACEAE</b>	<i>Calystegia silvatica</i> (Kit.) Griseb.	Sea Ivy	—		x										x					LC
	<i>Convolvulus arvensis</i> L.	<i>Convolvulus</i>	—				x	x							x					LC
<b>CORNACEAE</b>	<i>Cornus sanguinea</i> L. ssp. <i>australis</i> (C.A.Meyer) Jav.	Cornus	Eurasia.-Sib. element.		x									x						LC
<b>EUPHORBIACEAE</b>	<i>Euphorbia amygdaloides</i> L. ssp. <i>amygdaloides</i>	Spurge	Eurasia.-Sib. element.		x									x						LC
	<i>Euphorbia platyphyllos</i> L.	Spurge	—				x	x						x						LC
	<i>Euphorbia stricta</i> L.	Spurge	Eurasia.-Sib. element.				x	x							x					LC
	<i>Mercurialis annua</i> L.	Mercury	—								x				x					LC
<b>FABACEAE (LEGUMINOSAE)</b>	<i>Antylis vulneraria</i> L. ssp. <i>boissieri</i> (Sag.) Bornm.	—	—					x						x						LC
	<i>Dorycnium graecum</i> (L.) Ser.	Trefoil (Clover)	Auxin element.			x								x						LC
	<i>Genista tinctoria</i> L.	Woodwaxen	Eurasia.-Sib. element.		x									x						LC
	<i>Glycyrrhiza glabra</i> L. var. <i>glabra</i>	<i>Glycyrrhiza glabra</i>	—			x	x							x						LC
	<i>Glycyrrhiza glabra</i> L. var. <i>glandulifera</i> (Waldst. & Kit.) Boiss.	<i>Glycyrrhiza glabra</i>	—			x	x							x						LC

Name of Family	Name of Species	English Name	Phytogeographical Region	Habitat								Relative Abundance				End. Condition	Danger Category		
	<i>Lotus corniculatus</i> L. var. <i>corniculatus</i>	Bird's foot trefoil	—					x						x					LC
	<i>Medicago lupulina</i> L.	Clover	—			x		x						x					LC
	<i>Medicago orbicularis</i> (L.) Bart.	Clover	—			x		x						x					LC
	<i>Psoralea butiminosa</i> L.	—	Med. element.			x		x						x					LC
	<i>Rohinia pseudoacacia</i> L.	Locust	—		x											x			LC
	<i>Sophora alopecuroides</i> L. var. <i>alopecuroides</i>	Sophora	—			x		x					x						LC
	<i>Trifolium campestre</i> Schreb.	Trefoil	—		x			x								x			LC
	<i>Vicia crocea</i> (Desf.) B. Fedtsch.	vetch	Auxin element.					x						x					LC
	<i>Vicia hirsuta</i> (L.) S.F.Gray	vetch	—		x			x						x					LC
<b>FAGACEAE</b>	<i>Quercus cerris</i> L. var. <i>cerris</i>	Oak									x			x					LC
<b>LAMIACEAE (LABIATAE)</b>	<i>Ballota nigra</i> L. ssp. <i>nigra</i>	<i>Ballota nigra</i>	Eurasia.-Sib. element.		x			x							x				LC
	<i>Glechoma hederacea</i> L.	—	Eurasia.-Sib. element.					x						x					LC
	<i>Lallementia iberica</i> (Bieb.) Fisch. & Mey.	Lallemant	Ir.-Tur. element.			x		x						x					LC
	<i>Lamium amplexicaule</i> L.	Deadnettle	Eurasia.-Sib. element.												x				LC
	<i>Mentha aquatica</i> L.	Menthae	—					x							x				LC
	<i>Nepeta nuda</i> L. ssp. <i>albiflora</i> (Boiss.) Gams	Polemonium	—					x				x			x				LC
	<i>Origanum vulgare</i> L. ssp. <i>vulgare</i>	Marjoram	—		x		x								x				LC
	<i>Prunella vulgaris</i> L.	Brunella	Eurasia.-Sib. element.		x			x								x			LC
	<i>Salvia forskahlei</i> L.	Wild Clary	Auxin element.					x							x				LC
	<i>Salvia viridis</i> L.	Wild Clary	Med. element.					x		x					x				LC
	<i>Satureja spicigera</i> C.Koch	<i>Satureja</i>	Eurasia.-Sib. element.											x					LC
	<i>Stachys macrantha</i> (C.Koch) Stearn	Buckwheat	Auxin element.												x				LC
	<i>Stachys sylvatica</i> C. Koch	Buckwheat	Eurasia.-Sib. element.					x							x				LC

Name of Family	Name of Species	English Name	Phytogeographical Region	Habitat							Relative Abundance				End. Condition	Danger Category		
OLEACEAE	<i>Fraxinus angustifolia</i> Vahl <i>ssp. oxycarpa</i> (Bieb. ex Willd.) Franco & Rocha	European Ash	Eurasia.-Sib. element.			x							x					LC
	<i>Ligustrum vulgare</i> L.	Privet	Eurasia.-Sib. element.		x								x					LC
OXALIDACEAE	<i>Oxalis corniculata</i> L.	<i>Oxalis</i>	—		x		x						x					LC
PAPAVERAVEAE	<i>Papaver dubium</i> L.	Corn Poppy	—			x							x					LC
	<i>Papaver rhoeas</i> L.	Corn Poppy	—			x							x					LC
POLYGONACEAE	<i>Polygonum arenastrum</i> Bor.	Shepperd's Crook	—			x		x						x				LC
	<i>Polygonum aviculare</i> L.	Shepperd's Crook	—			x		x						x				LC
	<i>Polygonum convolvulus</i> L.	Shepperd's Crook	—		x								x					LC
	<i>Polygonum maritimum</i> L.	Shepperd's Crook	—					x					x					LC
	<i>Rumex acetosella</i> L.	<i>Rumex</i>	—		x	x								x				LC
PORTULACACEAE	<i>Portulaca oleraceae</i> ssp. <i>oleraceae</i>	Purslane	—			x							x					LC
PRIMULACEAE	<i>Lysimachia verticillaris</i> Sprengel	—	Auxin element.				x						x					LC
RANUNCULACEAE	<i>Ranunculus muricatus</i> L.	Buttercup	—				x						x					LC
	<i>Ranunculus repens</i> L.	Buttercup	—				x						x					LC
	<i>Ranunculus</i> . <i>Costantinopolitanus</i> (DC.) d'Urv.	Buttercup	—				x						x					LC
RESEDACEAE	<i>Reseda lutea</i> L. var. <i>lutea</i>	Woald	—			x							x					LC
ROSACEAE	<i>Crataegus monogyna</i> Jacq. <i>ssp. monogyna</i>	Hawthorn	—		x								x					LC
	<i>Fragaria vesca</i> L.	Wild wood strawberry	—		x									x				LC
	<i>Mespilus germanica</i> L.	Medlar	Auxin element.		x								x					LC
	<i>Potentilla erecta</i> (L.) Rauschel	Silverweed	—					x					x					LC
	<i>Prunus divaricata</i> Ledeb. ssp. <i>divaricata</i>	Greengage plum	—		x								x					LC
	<i>Pyracantha coccinea</i> Roemer	Fire thorn	—		x								x					LC





Name of Family	Name of Species	English Name	Phytogeographical Region	Habitat								Relative Abundance				End. Condition	Danger Category	
	(Custer) Rchb.																	
<b>POACEAE</b>	<i>Avena barbata</i> Pott ex Link	Widl oat grass	Med. element.			x		x						x				LC
	<i>Brachypodium sylvaticum</i> (Hudson) P. Beauv.	<i>Brachypodium</i>	Eurasia.-Sib. element.		x			x							x			LC
	<i>Bromus sterilis</i> L.	Bromene	—			x		x						x				LC
	<i>Bromus arvensis</i> L.	Bromene	—		x	x		x						x				LC
	<i>Bromus scoparius</i> L.	Bromene	—			x		x						x				LC
	<i>Bromus tectorum</i> L.	Bromene	—			x		x						x				LC
	<i>Cynodon dactylon</i> (L.) Pers. var. <i>dactylon</i>	<i>Cynodon</i>	—			x									x			LC
	<i>Elymus farctus</i> (Viv.) Runemark var. <i>farctus</i>	Elym	med. element.			x		x						x				LC
	<i>Poa annua</i> L.	<i>Poa</i>	—					x	x						x			LC

### **Fauna**

In the framework of studies conducted related to the continental fauna; wild fauna species belonging to Amphibian, Reptiles, Birds and Mammal classes existing in the close surrounding environment with the project area and their habitats have been examined and assessed with field studies. During these studies, the fauna species which are available or which are with high existing probability in the impact area have been listed by utilizing also from the literature sources. Next to the species, information related to deployment of them in Turkey, their habitat characteristics and risk conditions have also been given.

Latest updates and effective Appendix lists of criteria of Bern Convention which has been used at an international level for protection of bird species, signed by many States in Europe and also signed by Turkey has been utilized.

In addition to the 2006 version of The European Red List (ERL) which was arranged by IUCN, "Türkiye Kuşları Kırmızı Listesi" (Species List in Red Data Book ) prepared by Kızıroglu (1993) has also been based on in the Table arranged for avifauna.

Besides EVRDB (=European Vertebrate Red Data Book) criteris also has been based on in this assessment.

In addition to all these, protection conditions of the bird species determined in the area has been examined by also checking the 2009-2010 protection lists arranged by R.T. Ministry of Environment and Forestry, General Directorate of Nature Conservation and National parks, Central Hunting Committee.

With the purpose of determination of protection status of the bird species of which existing has been determined in the project area and in the surrounding area, primarily an assessment according to the Bern Convention criteria has been executed. Among the bird species determined in the region as per the protection lists;

Bern List APPENDIX-II (List of Species Under Strict Protection),  
Bern List APPENDIX-III (List of Species Under Protection) have been considered.

Besides, by making an assessment as per the ERL list which has been arranged and updated by IUCN (International Union for Nature Conservation), species under "Near Threatened" (=NT) category and "Least Concern" (=LC) category have been specified.

As a result of the assessment made as per EVRDB; the bird species of which existing has been determined in the project area and in the surrounding area are available in both Bern Convention Appendix Lists and Protection Lists of Central Hunting Committee.

As per the results of the assessment made according to the lists of General Directorate of Nature Conservation and National Parks together with Central Hunting Committee:

APPENDIX-I List of "Wild Animals Under Protection"  
APPENDIX-II List of "Game Animals Under Protection"  
APPENDIX-III List of "Game Animals Premitted in Certain Periods" have also been expressed.

Any endemic bird species have been determined among the bird species recorded in the project area and in the surrounding area. List of amphibian, reptiles, birds and mammals that are available in the project and impact area are presented in Table IV.23, Table IV.24, Table IV.25 and Table IV.26 respectively.

Table IV.23 Project Area and Impact Area Amphibian List

Scientific Name	English Name	Habitat Characteristics	ERL (IUCN)	BERN
<b>URODELA</b>	<b>URODELA</b>			
<b>SALAMANDRIDAE</b>	<b>SALAMANDRIDAE</b>			
<i>Triturus vittatus ophyrticus</i>	Banded newt	Temporary or permanent, slack or slowly flowing vegetation plenty of water	LC	APP-III
<b>ANURA</b>	<b>ANURA</b>			
<b>BUFONIDAE</b>	<b>EASTERN SPADEFOOT</b>			
<i>Bufo bufo bufo</i>	European Toad	Various environment such as under the Stones, within the soil in the mornings,	LC	APP-III
<i>Bufo viridis viridis</i>	Bufo Viridis	Various hollows such as under Stones, within the soil	LC	APP-II
<b>HYLIDAE</b>	<b>HYLIDAE</b>			
<i>Hyla arborea</i>	European Tree Frog	On the trees, leaves and scrubs	LC	APP-II
<b>RANIDAE</b>	<b>MARSH-WATER FROGS</b>			
<i>Rana ridibunda ridibunda</i>	Ranidae	Can be found in all types of freshwater	LC	APP-III

Table IV.24 Project Area and Impact Area Reptiles List

Scientific Name	English Name	Habitat Characteristics	ERL (IUCN)	BERN	MAK
<b>TESTUDINATA</b>	<b>TESTUDINATA</b>				
<b>EMYDIDAE</b>	<b>TERRAPINS</b>				
<i>Emys orbicularis</i>	European Pond Turtle	At the coast sides of slacks and slowly flowing waters	LR/nt *)	APP-II	APP-I
<b>TESTUDINIDAE</b>	<b>TESTUDINIDAE</b>				
<i>Testudo graeca iberica</i>	Greek Spur-thighed tortoise	Dune-graveled and dry lands	VU A1 cd	APP-II	APP-I
<b>SQUAMATA</b>	<b>SQUAMATA</b>				
<b>LACERTILIA</b>	<b>LACERTILIA</b>				
<b>GEKKONIDAE</b>	<b>GEKKONIDAE</b>				
<i>Hemidactylus turcicus</i>	Mediterranean House Gecko	Stony lands, rocks, walls	LC	APP-III	--
<b>LACERTIDAE</b>	<b>LACERTIDAE</b>				
<i>Lacerta viridis meridionalis</i>	Green Lizards	Under the Stones in forestries and scrubs	LC	APP-III	APP-I
<b>ANGUIDAE</b>	<b>ANGUIDAE</b>				
<i>Anguis fragilis</i>	Blind Worm	Forest, scrubs and meadows	LR-Ic	APP-III	-
<i>Ophisaurus apodus apodus</i>	European Legless Lizard	Scrubs and stony slopes with plent vegetation	LR-Ic	APP-II	-
<b>OPHIDIA(=SERPENTES)</b>	<b>SNAKES</b>				
<b>TYPHLOPIDAE</b>	<b>TYPHLOPIDAE</b>				
<i>Typhlops vermicularis</i>	Blunt-nosed viper	Humid in-stone and under stones	LC	APP-III	APP-I
<b>COLUBRIDAE</b>					
<i>Coronella austriaca</i>	South Snake	Sandy and stony places at the border of scrubs and forest	--	APP-III	APP-I
<i>Elaphe quatuorlineata</i>	Yellow Snake	Forest, scrubs and stony areas	--	APP-II	APP-I
<i>Natrix natrix persa</i>	Grass Snake	Meadow and stny areas close to water	LR-Ic*)	APP-III	APP-I
<i>Natrix tessellata</i>	Water Snake	In-water and water sides	LC	APP-II	APP-I

**Table IV.25** Project Area and Impact Area Birds List

Scientific Name	English Name	Habitat Characteristics	R.D.B	ERL (IUCN)	END	BERN	MAK
<b>PODICIPEDIFORMES</b>	<b>PODICIPEDIFORMES</b>						
<b>PODICIPEDIDAE</b>	<b>PODICIPEDIDAE</b>						
<i>Tachybaptus ruficollis</i>	Little Grebe	Coast sides of slacks and slowly flowing waters, reeds	A.3	LC	--	APP-II	APP-I
<b>PHALACROCORACIDAE</b>	<b>PHALACROCORACIDAE</b>						
<i>Phalacrocorax carbo</i>	Cormorant	Trees, rocks at coast sides, coast sides	A.2	LC	--	APP-III	APP-II
<b>CICONIIFORMES</b>	<b>CICONIIFORMES</b>						
<b>ARDEIDAE</b>	<b>ARDEIDAE</b>						
<i>Ardea cinerea</i>	Grey Heron	Woodlands, woodlands at the side of lakes and brackishes	A.3	LC	--	APP-III	APP-II
<b>CICONIIDAE</b>	<b>CICONIIDAE</b>						
<i>Ciconia ciconia</i>	White Stork	Sparse woodlands, settlements, marshlands and wetlands	A.3	LC	--	APP-II	APP-I
<i>Ciconia nigra</i>	Black Stork	Sparse woodlands, settlements, marshlands and wetlands	A.2	LC	--	APP-II	APP-I
<b>ANSERIFORMES</b>	<b>GOOSE AND DUCKS</b>						
<b>ANATIDAE</b>	<b>ANATIDAE</b>						
<i>Tadorna ferruginea</i>	Ruddy Shelduck	At the sides of freshwater, saltwater lakes and rivers; even can be found at hill and mountain foot.	A.2	LC	--	APP-II	APP-I
<i>Anas platyrhynchos</i>	Mallard	In settlements, eutrophic lakes, woodland, reeds and sea coasts	A.4	LC	--	APP-III	APP-III
<i>Aythya ferina</i>	Pochard	Eutrophic lakes, reeds with mirror, sea sides	A.4	LC	--	APP-III	APP-III
<b>ACCIPITRIFORMES</b>	<b>RAPTORIAL</b>						
<b>ACCIPITRIDAE</b>	<b>ACCIPITRIDAE</b>						
<i>Circaetus gallicus</i>	Short-Toed Eagle	Dry, open areas in mountainous terrain; river valleys, forests.	A.1.2	LC	--	APP-II	APP-I
<i>Circus aeruginosus</i>	Marsh Harrier	Shallow freshwater lakes and rivers.	A.3	LC	--	APP-II	APP-I
<i>Accipiter nisus</i>	Sparrow Hawk	Woodlands, big parks, around settlements	A.4	LC	--	APP-II	APP-I
<i>Buteo rufinus</i>	Long-legged Buzzard	Dry, semi-dry step areas, mountainous terrain	A.3	LC	--	APP-II	APP-I
<b>FALCONIFORMES</b>	<b>FALCONIFORMES</b>						
<b>FALCONIDAE</b>	<b>FALCONIDAE</b>						
<i>Falco tinnunculus</i>	Kestrel	Open areas, forests, cities	A.3	LC	--	APP-II	APP-I
<b>GALLIFORMES</b>	<b>CHICKENS</b>						
<b>PHASIANIDAE</b>	<b>PHASIANIDAE</b>						
<i>Coturnix coturnix</i>	Quail	Field areas and long vegetation covered meadows	A.4	LC	--	APP-III	APP-III
<b>GRUIFORMES</b>	<b>GRUIFORMES</b>						

Scientific Name	English Name	Habitat Characteristics	R.D.B	ERL (IUCN)	END	BERN	MAK
<b>RALLIDAE</b>	<b>RALLIDAE</b>						
<i>Gallinula chloropus</i>	Green-legged Water Hen	Small lakes, puddles, ponds and rivers with rich vegetation	A.4	LC	--	APP-III	APP-II
<i>Fulica atra</i>	Coot	Lakes with rich vegetation and slowly flowing rivers, sea coasts	--	LC	--	APP-III	APP-I
<b>CHARADRIIFORMES</b>	<b>CHARADRIIFORMES</b>						
<b>CHARADRIIDAE</b>	<b>CHARADRIIDAE</b>						
<i>Charadrius dubius</i>	Little ringed plover	Sandy, stony shores of freshwater lakes and rivers	A.2	LC	--	APP-II	APP-I
<i>Tringa erythropus</i>	Spotted redshank	At coast sides of inland water or seas	B.2	LC	--	APP-III	APP-II
<b>LARIDAE</b>	<b>LARIDAE</b>						
<i>Larus ridibundus</i>	Sea gull	Puddles close to coasts, lakes with reeds and bamboos	A.3	LC	--	APP-III	APP-II
<b>STERNIDAE</b>	<b>STERNIDAE</b>						
<i>Chlidonias leucopterus</i>	White winged black tern	Slacks and marshlands	A.2	LC	--	APP-III	APP-I
<i>Sterna nilotica</i>	Gull-billed tern	River, lake and sea sides	A.2	LC	--	APP-III	APP-I
<b>COLUMBIFORMES</b>	<b>COLUMBIFORMES</b>						
<b>COLUMBIDAE</b>	<b>COLUMBIDAE</b>						
<i>Columba livia</i>	Rock Dove	In a wide range from rockylands to settlements	--	LC	--	APP-III	APP-III
<i>Streptopelia decaocto</i>	Pigeon	Woodlands, Settlements	--	LC	--	APP-III	APP-III
<i>Streptopelia turtur</i>	Turtle-dove	Forestries close to agricultural areas, around settlements	A.2	LC	--	APP-III	APP-III
<b>CUCULIFORMES</b>	<b>CUCULIFORMES</b>						
<b>CUCULIDAE</b>	<b>CUCULIDAE</b>						
<i>Cuculus canorus</i>	Cuckoo	Open areas with very close forestry, woodlands	--	LC	--	APP-III	APP I
<b>STRIGIFORMES</b>	<b>STRIGIFORMES</b>						
<b>STRIGIDAE</b>	<b>STRIGIDAE</b>						
<i>Athene noctua</i>	Owlet	Fields, vineyards and gardens, rockylands	A.3	LC	--	APP-II	APP-I
<b>APODIFORMES</b>	<b>APODIFORMES</b>						
<b>APODIDAE</b>	<b>APODIDAE</b>						
<i>Apus apus</i>	Swift	Around settlement areas, rocklands and woodlands	A.4	LC	--	APP-III	APP-I
<i>Apus melba</i>	Alpine Swift	Generallt rocky slopes, settlements	A.4	LC	--	APP-II	APP-I
<b>CORACIIFORMES</b>	<b>CORACIIFORMES</b>						
<b>ALCEDINIDAE</b>	<b>ALCEDINIDAE</b>						
<i>Alcedo atthis</i>	Kingfisher	Especially at river and lake sides; rocky sea sides	A.1.2	LC	--	APP-II	APP-I
<b>MEROPIIDAE</b>	<b>MEROPIIDAE</b>						
<i>Merops apiaster</i>	Bee-eater	Areas with sparse trees and scrubs and open habitats	A.4	LC	--	APP-II	APP-I
<b>UPUPIDAE</b>	<b>UPUPIDAE</b>						

Scientific Name	English Name	Habitat Characteristics	R.D.B	ERL (IUCN)	END	BERN	MAK
<i>Upupa epops</i>	Hoopoe	Agricultural areas, open areas with trees, scrubs which is suitable for grazing	A.2	LC	--	APP-II	APP-I
<b>PICIFORMES</b>	<b>PICIFORMES</b>						
<b>PICIDAE</b>	<b>PICIDAE</b>						
<i>Dendrocopos syriacus</i>	Syrian Woodpecker	Open, culture areas, parks, tree lines, vineyards	A.3	LC	--	APP-II	APP-I
<b>PASSERIFORMES</b>	<b>PASSERIFORMES</b>						
<b>ALAUDIDAE</b>	<b>ALAUDIDAE</b>						
<i>Galerida cristata</i>	Crested Lark	Open lands and Agricultural Areas	--	LC	--	APP-III	APP-II
<i>Alauda arvensis</i>	Skylark	Dry step areas, Agricultural Areas	--	LC	--	APP-II	APP-II
<b>HIRUNDINIDAE</b>	<b>HIRUNDINIDAE</b>						
<i>Hirundo rustica</i>	Barn Swallow	Settlements and open areas	--	LC		APP-II	APP-I
<i>Riparia riparia</i>	Bank Swallow	Sandy and Slimy river and lake sides	--	LC	--	APP-II	APP-I
<i>Delichon urbica</i>	House Swallow	Yerlesim alanları ve kayalıklar	A.4	LC	--	APP-II	APP-I
<b>MOTACILLIDAE</b>	<b>MOTACILLIDAE</b>						
<i>Anthus pratensis</i>	Meadow pipit	Wet meadow and marshlands	--	LC	--	APP-II	APP-I
<i>Anthus spinoletta</i>	Water pipit	Meadows at river side; rocky coasts	--	LC	--	APP-II	APP-I
<i>Motacilla flava</i>	Citrine Wagtail	Wetlands, meadows, lake and pool sides	--	LC	--	APP-II	APP-I
<i>Motacilla alba</i>	Pied (White)Wagtail	River, lake and sea sides, meadows, step areas	A.4	LC	--	APP-II	APP-I
<b>TROGLODYTIDAE</b>	<b>TROGLODYTIDAE</b>						
<i>Troglodytes troglodytes</i>	Wren	Forests and scrubs	A.3	LC	--	APP-II	APP-I
<b>TURDIDAE</b>	<b>TURDIDAE</b>						
<i>Erithacus rubecula</i>	Redbreast	Forests, plains, parks and gardens	--	LC	--	APP-II	APP-I
<i>Luscinia megarhynchos</i>	Nightingale	Forests, plains, parks and gardens	A.3	LC	--	APP-II	APP-I
<i>Phoenicurus phoenicurus</i>	Redstart	Woodlands, parks and gardens	--	LC	--	APP-II	APP-I
<i>Saxicola torquata</i>	Stonechat	Stony and arid hills, scrubs, dune areas	--	LC	--	APP-II	APP-I
<i>Oenanthe oenanthe</i>	Whinchat	Open and dry areas, field and meadows	A.3	LC	--	APP-II	APP-I
<i>Oenanthe hispanica</i>	Black-eared wheatear	Open brushwood and woodlands	--	LC	--	APP-II	APP-I
<i>Turdus merula</i>	Ousel	Forests, plains, parks and gardens	--	LC	--	APP-III	APP-III
<b>SYLVIIDAE</b>	<b>SYLVIIDAE</b>						
<i>Phylloscopus collybita</i>	Chiffchaff	Forests, parks and gardens, water sides	--	LC	--	APP-II	APP-I
<i>Sylvia atricapilla</i>	Blackcap		--	LC	--	APP-II	APP-I
<i>Regulus regulus</i>	Goldcrest	Forests, parks and gardens	--	LC	--	APP-II	APP-I
<b>MUSCICAPIDAE</b>	<b>MUSCICAPIDAE</b>						
<i>Muscicapa striata</i>	Spotted Flycatcher	Forests, parks, gardens, especially open ones	--	LC	--	APP-II	APP-I



Scientific Name	English Name	Habitat Characteristics	R.D.B	ERL (IUCN)	END	BERN	MAK
<b>PARIDAE</b>	<b>PARIDAE</b>						
<i>Parus major</i>	Great Tit	Every kinds of forestry, woodlands and gardens	--	LC	--	APP-II	APP-I
<i>Parus ater</i>	Coal Tit	Especially Pinewood and other types	--	LC	--	APP-II	APP-I
<b>LANIIDAE</b>	<b>BUTCHER BIRDS</b>						
<i>Lanius collurio</i>	Red-backed Shrike	Open areas, forest sides, park and gardens	--	LC	--	APP-III	APP-I
<i>Lanius minor</i>	Lesser gray Shrike	Forest sides, park and gardens	--	LC	--	APP-III	APP-I
<b>CORVIDAE</b>	<b>CORVUS</b>						
<i>Garrulus glandarius</i>	Jaybird	Forests, woodlands and parks	--	LC	--	APP-III	APP-III
<i>Pica pica</i>	Magpie	Sparse woodlands, scrubs, fields and fruit gardens, parks	--	LC	--	--	APP-III
<i>Corvus monedula</i>	Jackdaw	Forests, woodlands, rocklands and ruins	--	LC	--	APP-II	APP-III
<i>Corvus frugilegus</i>	Rook	Forest, open lands and fields	--	LC	--	--	APP-III
<i>Corvus corone</i>	Carrion Crow	Forests, open lands and crop fields	--	LC	--	--	APP-III
<b>STURNIDAE</b>	<b>STURNIDAE</b>						
<i>Sturnus vulgaris</i>	Starling	Forests and woodlands	--	LC	--	--	APP-II
<b>PASSERIDAE</b>	<b>PASSERIDAE</b>						
<i>Passer domesticus</i>	Sparrow	In rural and urban areas, fields	--	LC	--	--	APP-III
<i>Passer hispaniolensis</i>	Spanish Sparrow	Scrubs, crop fields, vineyards and gardens, open lands	--	LC	--	APP-III	APP-II
<i>Passer montanus</i>	Tree Sparrow	Rocklands, ruins and forests	--	LC	--	APP-III	APP-II
<b>FRINGILLIDAE</b>	<b>FRINGILLIDAE</b>						
<i>Fringilla coelebs</i>	Finch	Forests; parks, garden and bottom lands.	--	LC	--	APP-III	APP-II
<i>Carduelis chloris</i>	Greenfinch	Forests, parks and gardens, scrubs, forest sides	A.4	LC	--	APP-II	APP-I
<i>Carduelis carduelis</i>	European Gold Finch	Gardens, forest spaces, settlements	A.4	LC	--	APP-II	APP-I
<b>EMBERIZIDAE</b>	<b>EMBERIZIDAE</b>						
<i>Emberiza hortulana</i>	Ortolan Bunting	Woodlands, forests and crop fields	A.3	LC	--	APP-III	APP-II
<i>Emberiza melanocephala</i>	Black-Headed Bunting	Open lands with scrubs and trees, around field areas	A.3	LC	--	APP-II	APP-I

Table IV.26 Project Area and Impact Area List of Mammals

Scientific Name	English Name	Habitat Characteristics	ERL (IUCN)	BERN	MAK
<b>INSECTIVORA</b>	<b>INSECTIVORA</b>				
<b>ERINACEIDAE</b>	<b>PORCUPINES</b>				
<i>Erinaceus concolor</i>	Porcupine	Agricultural areas and natural fences between gardens.	LR-lc*	APP-III	APP-I
<b>SORICIDAE</b>	<b>WHITE-TOOTHED SHREWS</b>				
<i>Sorex minutus</i>	Pygmy Shrew	Meadow, marsh, forestry areas	LR-lc*	APP-III	--
<i>Sorex araneus</i>	Forest pygmy shrew	Forestry areas, around marshlands, scrubs	LR-lc*	APP-III	--
<i>Neomys schelkonnkovi</i>	Eurasian water white-toothed shrew	Areas with plenty of plants at shores of dead water and rivers	LR-lc*	APP-III	--
<b>TALPIDAE</b>	<b>MOLES</b>				
<i>Talpa levantis levantis</i>	Blind Mole	Sandy and loose soils with plenty of plant	LR-lc*	--	--
<b>CHIROPTERA</b>	<b>INSECTIVORE BATS</b>				
<b>RHINOLOPHIDAE</b>					
<i>Rhinolophus hipposideros</i>	Small Rhinolophidae	In areas in which trees take place in a part	LC	APP-II	APP-I
<b>VESPERTILIONIDAE</b>	<b>VESPERTILIONIDAE</b>				
<i>Myotis emarginatus</i>	Bat	Trees in summer, settlements in winter	VUA2C	APP-II	APP-I
<i>Pipistrellus pipistrellus</i>	Pipistrellus	Forestry areas, openair areas, cultural areas, parks	LC	APP-III	--
<b>LAGOMORPHA</b>	<b>RABBITS</b>				
<b>LAPORIDAE</b>	<b>RABBITS</b>				
<i>Lepus europaeus</i>	Wild Rabbit	Forest, scrub and rockwork	LR-lc*	APP-III	APP-III
<b>RODENTIA</b>	<b>RODENTIA</b>				
<b>CRICETIDAE</b>	<b>CRICETIDAE</b>				
<i>Arvicola amphibius (terrestris)</i>	Water Vole	Areas in water sides covered with dense grass; forestry areas	LR-lc*	--	--
<b>GLIRIDAE</b>	<b>GLIRIDAE</b>				
<i>Dryomys nitedula</i>	Tree Gliridae	Broad-leaved tress and forests constituted of scrubs	LR/nt*)	APP-III	APP-I
<b>MURIDAE</b>	<b>MOUSES AND RATS</b>				
<i>Rattus rattus</i>	Black rat, House Rat	Settlement areas and other habitats	LR-lc*)	--	--
<i>Apodemus sylvaticus</i>	Wood Mouse	Forest spaces, steps and gardens	LC	--	--
<b>CARNIVORA</b>	<b>CARNIVORA</b>				
<b>CANIDAE</b>	<b>CANIDAE</b>				
<i>Vulpes vulpes</i>	Fox	Forestry areas, open areas with scrubs, meadows	LC	--	APP-III
<b>MUSTELIDAE</b>	<b>MUSTELIDAE</b>				
<i>Mustela nivalis</i>	Weasel	Every kinds of hallows, holes, plant and scrub residue masses	LR-lc*)	APP-III	APP-II
<i>Martes martes</i>	Pine marten, marten	Wood areas and forestry areas	LR-lc*)	APP-III	APP-III
<i>Meles meles</i>	Badger	Mixed forests and gardens with meadows	LR-lc*)	APP-III	APP-II

- c) Impacts on flora-fauna and measures to be taken within the scope of the Works and procedures which have been already carried out and to be carried out within the scope of the project (land preparation, construction, operating and after operating)

***Possible Impacts of the Activity On Continental Flora and Measures Which Should be Taken***

In the project area, any endemic or under protection plant types have been met. For this reason, other than the considerations which should be paid attention generally regarding the protection of the plant types, no other special measures have been suggested.

Besides, while excavation Works have been carrying out in the pipeline route, vegetable soil shall be removed and stored in a suitable place and after the line is covered, vegetable soil shall then be laid again and vegetation studies suitable for the region shall be conducted. The loss shall be minimized with the plantation to be executed and damage to the flora shall be kept at minimum level.

***Possible Impacts of the Activity On the Continental Fauna and Measures Which Should be Taken***

What must have done related to the species take place in Bern Convention Appendix Lists (Appendix-II and Appendix-III) of fauna elements around the activity area and in surrounding area are specified in the relevant articles of the Convention. According to the 6th article of the Convention, all state parties signed Bern Convention are liable with protection of habitat of all wild species which take place in especially Appendix-II.

In the II. Chapter of Bern Convention, it has been emphasized that areas which bear importance in terms of migratory species which take place in Appendix-II and Appendix-III should be given special importance by all the State Parties.

Besides,

- Every kinds of deliberate entrapping and retention together with premeditated killing ways
- Spoiling or destroying recreation and production areas of these species,
- Disturbing the wild fauna species especially in reproduction, feeding, wintering periods,
- Damaging eggs of these species, collecting these eggs even they are empty are all prohibited.
- Keeping these species alive or dead and domestic Trade of them are prohibited.

During every kinds of activities to be executed in the project area, especially the measures given above relating to the wild animal species which enter into the convention appendixes Appendix-II and Appendix-III of Bern Convention shall be complied with precisely.

Arrangements related to the wild fauna species entered into the Appendix-III of the Agreement are specified in Article 7. According to this article, all State Parties are obliged to take the required legal and administrative measures which would serve for protection of wild fauna species in Appendix-III. These measures set condition of arrangement of every kinds of operating activities related to the types in Appendix-III in a way that would not endanger the populations of wild animal species. Required sensitivity shall be displayed in this consideration.

Protection measures specified in the committee resolutions for the species available in the protection lists of 2010-2011 Hunting Period prepared towards the resolutions of General Directorate of National Parks and Nature Conservation Central Hunting Committee shall be complied with.

Besides, flora shall be assured to leave the area in the route of pipeline before the commencement of excavation Works and Works shall then be commenced. Prevention of any negative impacts on the fauna shall be paid attention with the measures to be taken.

#### IV.1.9 Protection Areas (Within the scope of list of Sensitive Zones in Appendix-V)

##### a) Protection Areas in The Project Area

Any areas are available on the pipeline route within the scope of list of Appendix-V Sensitive Zones.

##### b) Protection Areas in Project Impact Area

Delta Yesilirmak in which also the project area takes place is the biggest delta of Turkey at the coast of Black Sea (90.000 ha). A very large part of the delta has been converted into an agricultural area.

The Wetland Areas Committee has drawn the borders of the wetlands as a result of the investigations and studies conducted by it in the area related to the Delta Yesilirmak. In accordance with the 5th Article of 2008 2nd National Wetland Committee Meeting dated 6.November.2008, Yesilirmak Wetland Protection Region has been approved unanimously. As natural gas supply shall be provided over Blue Stream Pipeline, first couple of kilometers of the planned pipeline stays within this wetland borders. (see Figure IV.19 and Appendix-1).

In approximately 4-5 km northeast of the stipulated project area, Delta Yesilirmak Important Bird Area (IBA) is available (see Figure IV.19). In the east part of the delta, Simenlik Lake-Akgol Wetland Area Complex which could barely protect natural beauties, dune areas together with Cladium communities developed behind them and a wide afforestation area is available. 200 ha of the 1.900 ha of surface area of Simenlik Lake-Akgol is open water area, remaining part is reeds and marsh. Not being so remarkable, among the areas left out of the borders of Special Environment Protection Area, small lakes and lagoons called Gagalı, Dumanlı, Akcasaz and Ahubaba can be pointed out in the middle and west part of the delta. Throughout the pipeline route within the scope of the project, any of these aforesaid sensitive regions are available.

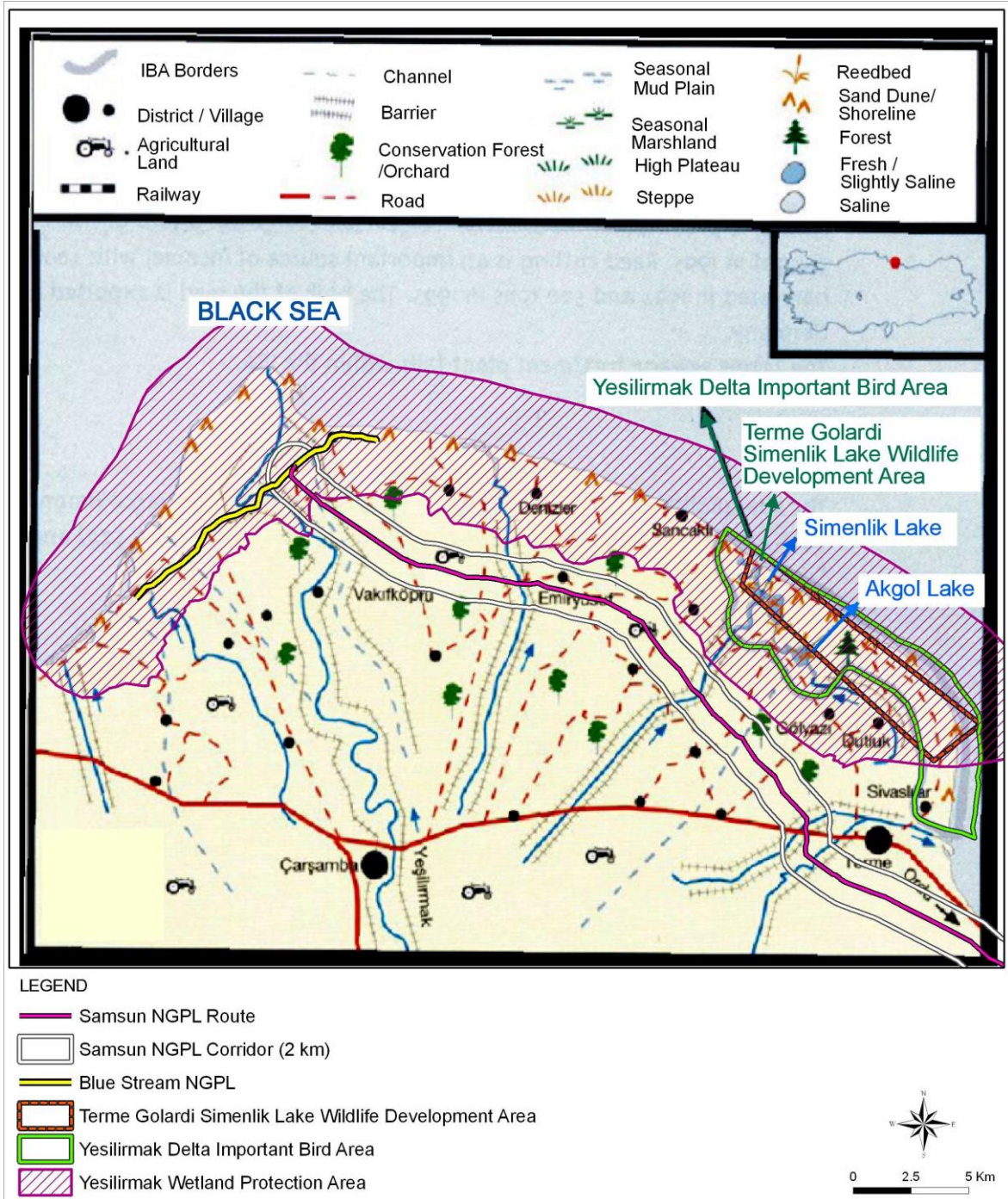


Figure IV.19: Project Area and Surrounding Protection Areas

**c) Impacts on The Protection Areas and Measures To Be Taken Within the Works and Procedures To Be Carried Out Within the Scope of the Project (land preparation, construction, operating and after operating)**

Any impacts on the protection areas shall be available within the scope of works and procedures to be carried out within the scope of the project.

IV.1.10 The Land Under Ruling and Possession of Competent Bodies of Government (military prohibited regions, areas assigned for public bodies and institutions for certain purposes, "Restricted Areas" with Decree of Council of Ministers numbered 7/16349 etc)

**a) The Project Area**

In order to finalize the pipeline healthfully, opinions of relevant Organizations and Institutions listed in Appendix-8 have been applied for while studies have been carried out by considering the opinions and considerations received from relevant Organizations and Institutions.

While opinion of Samsun Gendarme Command has been asked about whether any military prohibited region is available throughout the pipeline, relevant letter of the authority is presented in Appendix-8. As can be seen in the letter of the Authority, any military prohibited region is available within the pipeline corridor.

There are irrigation and drainage channels available throughout the pipeline route which should be constructed within the scope of SWA Carsamba Plain Irrigation project. Relevant protocols shall be complied with during crossing of the pipeline through these channels. The considerations which should be complied with as per SWA are given in Appendix-8.

While opinion of General Directorate of Railways, Ports and Airports Construction about the Railway Line project planned to be constructed in the South of the pipeline route has been asked, it has been specified in the received reply that there is no harm in construction of the pipeline in case the crossing will be executed out of the border of railway expropriation. The pipeline crosses out of the aforesaid border of railway line expropriation.

Public bodies and institutions applied to during EIA process and route determination studies within the scope of the project and letters received from these authorities are presented in Appendix-8.

**b) Project Impact Area**

No other considerations are available other than the areas mentioned above within the natural gas pipeline impact area.

**c) Impacts and Measures to be Taken Within the scope of Works and procedures Carried Out within the scope of the Project (land preparation, construction, operating and after operating)**

As described in the previous chapters, there are irrigation and drainage channels constructed and planned to be constructed by SWA within the pipeline route available. Measures which should be taken in this subject are described in Chapter IV.1.4.

## **IV.2 Assessment of the Area To Be Sold Off In The Project Place**

IV.2.1 Type and Number of Trees to be Cut Off During the Project, Forest Fires and Measures to be Taken.

In consideration of determination of forestry areas within the 17 m working corridor of the planned pipeline route, Amasya Regional Directorate of Forestry has been applied to while area of 53.536 m<sup>2</sup> is regarded as forestry area as per the Examination and Assessment Report prepared

by the Institution. Required measures related to the possibility of forestry fires and extinguishing shall be taken and during these studies; required coordination with Forestry Operation Directorate of Samsun, Carsamba and Terme that are affiliated to Amasya Regional Directorate of Forestry shall be assured. Besides, fire shall not be lighted in the forest during the project and relevant forestry operation directorates shall be enabled to assess the tress to be cut off.

#### IV.2.2 Size of the Agricultural Areas To Be SOld Off, Land Usage Ability

Corn, hazelnut and paddy areas have been corsed throughout the route. When it is considered that the construction Works shall be carried out within the 17 m (6 m + 11 m) of corridor, natural plant cover shall change in an area of 85,6 ha. Land usage abilities within the corridor are presented. Size of agricultural areas to be sold off during expropriation studies shall be calculated in detail.

#### IV.2.3 Natural Plant Types To be Impacted and In How Much Wide Area These Works Shall be Carried Out

Only negative impact in terms of the plant types at construction stage is the removal of the vegetable soil cover in the parts which will be crossed by the line and excavation of the earth. The soil to be removed shall be used in the backfill following the installation of the pipeline. Accordingly, impact in this matter is also considerably low.

Besides, other than the agricultural area, in the forestry part crossed by the route, cutting off the trees shall be in question. For the parts of the line which will cross the forestry area, required permissions shall be acquired from the General Directorate of Forestry in accordance with the Law of Forestry numbered 6831. Additionally, required measures related to the possibility of forest fires and extinguishing shall be taken and during these Works; required coordination with Forestry Operation Directorate of Samsun, Carsamba and Terme that are affiliated to Amasya Regional Directorate of Forestry shall be assured. Besides, fire shall not be lighted in the forest during the project and relevant forestry operation directorates shall be enabled to assess the tress to be cut off.

#### IV.2.4 Condition of The Cultural and Natural Properties in The Project Area

Samsun Directorate of Museum has been applied for determination of the condition of cultural and natural properties within the corridor of natural gas pipeline while a field study has been conducted with the museum staff. In the field study and literature scan, any protected area has been determined within the project area and impact area. But if any findings shall be discovered during the construction Works of the project, construction shall be stopped and closest Directorate of the Museum shall be informed. Opinions of Samsun Directorate of Museum in consideration of the subject and list of immovable cultural properties in Carsamba and Terme Districts are presented in Appendix-8.

#### IV.2.5 Impacts and Measures to be Taken Within the Scope of Works and Procedures to be Carried Out Within the Scope of the Project (land preparation, construction, operating and after operating)

In general, while the environmental impacts originated from pipeline projects are limited with the construction stage, all of these impacts are temporary impacts. At the top of these impacts, changing of land usage in the areas crossed by the pipeline route.

The lands which will be sold off within the scope of the planned natural gas pipeline project will generally be agricultural lands. By expropriating the areas that will be crossed by the pipeline, land values shall be paid to their owners. Thus region people shall not have any economical losses to be originated from the project.

Cultivation of seasonal plants in the places crossed by the pipeline shall be continued providing that no obstacles will be available for the line, but any housing shall be permitted throughout the route and no rooted plants shall be planted.

In addition to these impacts, the dust emission which also will be limited with construction stage, noise, liquid and solid waste originated from the personnel, waste composition originated from equipment and installations are available. Wastes to be composed and measures to be taken are examined in Chapter V in detail. As can be understood from this chapter, impacts to be composed are temporary. All these temporary impacts also shall be removed by complying with the related legislation and taking required measures.

Below mentioned impact reducing measures shall be implemented in order to reduce the risks in special crossings:

- Pipe wall thickness shall be increased,
- Depth of embedment shall be executed towards opinions of the Institution related to the structure to be crossed (drainage channel, highway, railway etc),
- The pipe shall be concrete coated in river crossings executed by open cut, crossings shall be executed within the casing pipe in boring method.

With the purpose of carrying out the activities required for the construction stage of the project, storage of pipe, equipment and machinery and accommodation of the personnel, a construction site shall be established. Below factors have been considered in selection of the construction site to be established:

- Proximity to the highway,
- Proximity to the construction area,
- Topography,
- Land usage.

When all these factors are assessed, an plain area of 250 m x 250 m which is at around 27th km of the 50 km pipeline which is almost in the middle, in the northwest of Terme District, approximately 1,5-2,0 km away from the highway has been planned to be used temporarily with the purpose of a construction site.

Any personnel shall be employed at the operating stage of the project as well environmental impact composition is not in question. While the pipeline shall take place under the earth, as the surface facilities (pigging station, BVS station and MS station) shall be surrounded with a wire fence, they bear any risks in terms of human and animal health. Alongside with this, after the completion of the pipeline construction, the areas crossed by it shall be restored both in terms of visually and ecologically.



On the other hand, in the after operating period of the natural gas pipeline, the surface facilities mentioned in the above paragraph shall be dismantled and removed but before the removal these facilities shall be used for discharging the gas left in the pipeline. Following this procedure, the land shall be restored and in order to prevent any second impacts in land usage, the line which has been discharged and cleared off gas shall not be dismantled but both two ends of it shall be blanked and left under earth.

Discharging and clearing off gas of the line procedure primarily shall start with closing of the take-off valve on the pipeline, than disconnection of it with Blue Stream Natural Gas Pipe Line than stopping of the gas flow. Later on, the line shall be discharged with a vacuum pump and a negative pressure to be composed by this pump, the gas sucked from the line shall be released to the atmosphere in a controlled manner. At this stage, when it is considered that the natural gas is not toxic and lighter than the air, releasing the gas in a controlled manner shall not constitute any risks. The vacuum pump primarily shall suck from the block valve station (BVS) and during this procedure take-off valve Group and the by-pass valves in the MS Station shall be open in order to provide air inlet. Later, the vacuum pump shall be installed in the MS Station and same procedure shall be repeated. At this stage, the by-pass valves at the beginning of the line and at BVS shall be kept open in order to let the air in. In order to be sure that no natural gas has been left in the line, a methane detector shall be used. While this procedure has given as an example, other methods which shall not constitute problems technically and/or developed in time may be used for gas discharging.

#### **IV.3 Other Considerations**

No other considerations are available to be mentioned within this scope.

---

**V. ASSESSMENT OF ACTIVITIES WITHIN THE SCOPE OF THE PROJECT (REQUIRED ASSESSMENT SHALL BE MADE WITHIN THE SCOPE OF RELEVANT REGULATIONS.)****V.1 Determination and assessment of impacts originated from activities within the scope of the project (comparison of the assessment with relevant regulations and specifying the measures to be taken)****V.1.1 Emission (dust and gas ) Calculations (land preparation, construction, operating and after operating)****Land preparation and construction stage**

The most important emissions which has been expected to be oscillated atmosphere within the scope of the project construction-origin dust emissions and exhaust emissions which has been originated from the vehicles that will be used with the purpose of both excavation and transportations during works.

The dust emissions to be composed shall change as per the activity to be made during construction. The activities to be made during construction are given below:

- Removal of Top vegetable soil
- Excavation works
- Restoring works
- Exhaust emissions originated from the vehicles

Before commencement of construction Works, vegetable soil shall be removed and stored in an area which is not used in the field and separate from other excavation materials. During this storage, the soil mass shall be covered with nylon clothes and their bottom shall be covered in order to keep it away from water. Thus, soil loss depending on rains might be prevented. At the end of construction stage, this soil which is very rich in terms of minerals might be used for landscaping purposes.

At construction stage; nitrogen oxides ( $\text{NO}_x$ ), carbon monoxides (CO), sulphur dioxide ( $\text{SO}_2$ ), hydrocarbons (HC) and particulate materials (PM) emissions originated from the fuel oil to be used by the heavy machinery to be operated shall be available. But emission amounts originated from these heavy machinery shall stay under the limit values given in RCIOAP as they are many in number (see Table II.12). With the purpose of keeping exhaust emissions at the minimum level, unnecessary operating of the vehicles shall be prevented, usage of quality fuel oil shall be assured, periodical maintenance of the vehicles shall be performed regularly, required maintenance, oil change etc shall be executed on time. Besides exhaust emission controls shall be executed regularly. Accordingly, any negative impacts which would be originated from these sources are expected.

***The equipments to be used at construction stage***

During the construction of the project; approximately 10 pieces of Excavators, approximately 10 pieces of Side booms, 2 pieces of Cranes, 20 pieces of welding machines or 6 pieces of paywelders, approximately 20 pieces of Trailer Trucks, 15 pieces of trucks, pick-ups or small vehicles in numerous numbers, diesel or electrical pumps for hydrotesting, generator etc vehicle and equipments shall be used.

Excavation Works shall be carried out for pipeline and pigging station and BVS which are surface structures. During these Works, the excavation Works to be carried out at preparation and construction stages, dust shall compose. Dust comes out more in alluvium grounds and less in compacted grounds. In order to keep the dusting to be composed at the minimum level, especially the route which has been used by the vehicles in hot and dry weathers shall be made wet, vehicles which transport excavations shall be covered. All these Works shall be carried out in accordance with "Regulations for Industry Origin Air Pollution Control" which has become effective by being published in the Official Gazette dated 03.07.2009 and numbered 26236 together with the provisions of "Regulations for Air Quality Assessment and Management" which has become effective by being published in the Official Gazette dated 06.06.2008 and numbered 26898.

The dust to be composed during land preparation and units construction stages shall be limited with the surrounding of the site. In order to reduce the impacts of dust emissions the working field shall be kept wet. Due to the working area is located in Carsamba Plain, being humid constantly of the region shall provide an advantage in this case. Thus, the impact which would arise from dust emissions shall be at very low levels. With the purpose of calculation of emissions to be arisen, the emission factors given in Regulations for Industry Origin Air Pollution Control Table 12.6 has been used.

**Table V.1: Dust Calculations Emission factors**

Activity	Emission Factor
Blasting	0,080 kg/ton
Dismounting	0,025 kg/ton
Loading	0,010 kg/ton
Transportation (round trip total distance)	0,7 kg/km-vehicle
Unloading	0,010 kg/ton
Storing	5,8 kg dust/ ha day

***Vegetable soil and dust amount to be removed throughout a 1 km line***

Working area of the pipeline is 17 m (6 m +11 m). Accordingly the construction shall be executed only in the corridor within these distances.

The area from which the vegetable soil shall be removed for the natural gas pipeline has been calculated as follows by providing that total pipeline width is 17 m;

$$17 \text{ m} \times 1 \text{ m} = 17 \text{ m}^2.$$

By taking vegetable soil thickness as 0,10 m in average, soil volume to be removed throughout the 1 m route has been calculated as follows;

$$17 \text{ m}^2 \times 0,10 \text{ m} = 1,7 \text{ m}^3.$$

Dust output to be arisen from soil removal by having a 1 m progress throughout the line has been calculated as follows;

$$\begin{aligned} \text{Soil density} &= 1,7 \text{ ton} / \text{m}^3 \\ 1,7 \text{ m}^3 \times 1,7 \text{ ton/m}^3 \times 0,01 \text{ kg/ton} &= 0,028 \text{ kg.} \end{aligned}$$

Accepting that removal of the soil, 1 hour progress is 25 m according to the past experiences, dust amount to be arisen in 1 hour has been calculated as **0,722 kg/hour**.

***Dust amounts to be arisen as a result of 1 m progress in the pipeline (excavation and backfill);***

Channel width: 1,50 m

Channel depth: 120 cm(Over-pipe backfill)+60,96 cm(Pipe diameter 24")+20 cm(Pipe padding) = 231,44= 200,96 cm

Unit volume: 2,1 m x 1,50 m x 1 m = 3,15 m<sup>3</sup>

Average density of the excavated material = 1,7 ton / m<sup>3</sup>

- Dust amount in a 1 m excavation has been calculated as follows by accepting the dust emission factor 0.010 kg/ton during excavation;

$$3,15 \text{ m}^3 \times 1,7 \text{ ton/m}^3 \times 0.010 \text{ kg/ton} = 0.053.$$

-Dust amount in a 1 m backfill has been calculated as follows by accepting the dust emission factor during backfill 0.010 kg/ton;

$$3,15 \text{ m}^3 \times 1,7 \text{ ton/m}^3 \times 0.010 \text{ kg/ton} = 0.053 \text{ kg}.$$

With an assumption of 1 hour excavation distance as 3 m; dust amount to be arisen has been calculated as **0,016 kg/hour**

With an assumption of 1 hour backfill distance as 20 m; dust amount to be arisen has been calculated as **0,11 kg/hour**.

1-hour progressing results accepted during calculations have been accepted as average by considering the ground type and line width.

No blasting shall be executed during construction works.

During the construction Works, primarily the vegetable soil is removed and after the completion of this process, excavation Works are performed. After installing the pipes in the excavated channels, their tops have been filled up. As none of these Works are executed at the same time, total dustiness could not have been calculated.

V.1.2 Water Usage and Disposal (supply resources in land preparation construction, operating and after operating, water amounts, amounts as per potable and domestic water and other intended uses, amount and disposal of waste water to be arisen from usage)

Construction Stage

While 300 people shall be employed at land preparation and construction stages within the scope of the project, required potable water shall be supplied from the local market in

dispensers. It has been planned to meet the water requirement at usage and construction stage from the underground wells and drainage channels that have been currently opened and used.

In order to minimize the dusting to be arisen at land preparation and construction stage, the land shall be required to be irrigated in dry season. In these irrigations, it has been accepted that approximately 5 m<sup>3</sup> water shall be used daily and it has been planned to supply this water from the current drainage channels in the region.

During calculation of potable and domestic water to be required for the workers, daily water amount requirement for one person has been taken as 150 L/day. Thus, daily water requirement amount of the personnel shall be approximately 3 m<sup>3</sup> (300 people × 0,15 m<sup>3</sup>/person-day= 45 m<sup>3</sup>). In this sense, the waste water to be arisen; providing that %100 of 3 m<sup>3</sup>/day water which will be required for the personnel to be employed will be waste water; shall be 45 m<sup>3</sup>/day.

It has been stipulated that after treatment of these waste water in the package waste water treatment facility to be established in the site, they shall be discharged to the closest receiver environment as per the provisions of Regulations for Water Pollution Control which has become effective by being published in the Official Gazette dated 31.12.2004 and numbered 25687 . In case the water will be used with irrigation purpose after treatment, considerations specified under the heading "Usage of Treated Waste Water in Irrigation" of Chapter 7 of Technical Procedures Notice of Regulations of Water Pollution Control which has become effective by being published in the Official Gazette dated 07.01.1991 and numbered 2078 shall be complies with. Meanwhile, required permissions for discharging shall be acquired. General information regarding the package waste water treatment facility to be used in the site is presented in Appendix-5. Project approval within the scope of Waste Water Treatment Facilities Project Approval Circular numbered 2005/5 shall be acquired for the treatment facility to be established.

#### Pressure Tests To Be Conducted During Construction

A completed part of the pipeline is required to be closed in order to assess its integrity via a hydrostatic testing. This will include filling of the whole pipeline with water, giving pressure with a pump and closing it with end covers tested previously and which includes various installations in order to ease the pressure and temperature measurements. After welding the test ends, part of the pipe which should be tested shall be filled up with water and pressure will be given for 24 hours. During the test procedure, this part of the pipe shall be tracked for leakages. Determined leakages shall be investigated and required repairs shall be carried out after pressure is given in the relevant part of the pipe. When the repair Works are over, testing procedure shall be repeated. After the test has been completed successfully, water in the line shall be discharged and test ends shall be dismantled.

While the hydrostatic test shall be executed on previously determined parts, throughout the length of the pipeline, whole of it shall be subjected to hydrostatic testing.

While the testing parts shall be prepared and approved for any testing procedure, it has been described in the testing procedure. Criteria regarding the length and place of the testing points are given below:

- Place of suitable water resources;
- Place of disposal facilities;

- Acceptable pipe length of the parts; and
- Acceptable elevation differences.

Length of pipeline which will have hydrostatic testing shall be determined in accordance with the Technical Specifications of BOTAS. Maximum length of the pipe which shall be tested has been specified as 20 km in the relevant BOTAS Technical Specifications while volume of it has been specified as 12.500 m<sup>3</sup>. The hydrostatic testing for the pipeline planned to be constructed shall be executed in 3 stages (17 km) providing that it will comply with these conditions.

The construction contractor shall be liable with arrangement of a detailed Hydrostatic Testing Implementation Plan which includes amount and quality of the required water, chemical wastes proposed to use, assessment of suitable water resources in relevant regions and suggested water drawing points together with a suitable discharging proposition and related information. This plan shall be submitted for the approval of SWA before the commencement of the hydrostatic testing.

Volume of the water which is required to have the 17 km part of the pipe to be subjected to hydrotesting has been anticipated as 4.800 m<sup>3</sup>. In possible maximum level, the water shall be transmitted to the other testing section from the current testing section and following minimization of the water volume required to be drawn and completion of the testing consequently, it shall be filled in required places in order to minimize the discharging volume.

Before filling the line with water, it should be cleaned completely with a cleaning pig and including the over-welding penetration and notches, checked against an internal damage. This damage assessment shall be carried out with a measurement pig equipped with an aluminum measurement plate and to be moved throughout the pipeline with compressed air or water.

For hydrotesting the pipes shall be filled up with water in a way that the pipes would drive the air from the pipe completely. This part to be subjected to test are filled from the lower point to the highest point. When test pressure is reached, this part will be separated and so the pressure will be protected and will be kept under observation for a period of 24 hours. In case of an occurrence of any leakage during testing, the point will be determined, the pressure will be converted into environment pressure and the defect will be repaired. Later on testing process shall be repeated.

After the completion of pressure testing, the water in the pipe shall be discharged by operating the pigs a couple of times and shall be dried out with foam pigs. Following drying the pipe, testing parts shall be connected each other with tie-in's.

Depending on the quality of the water resources selected for drawing, below mentioned additive materials may be required in the hydrotesting water:

- Oxygen scavengers;
- corrosion inhibitors; and/or
- biocides

In case of using additives, test procedure and procedures to be used in treatment of used hydrotesting water before discharging after the completion of the test shall be specified clearly in

the Hydrostatic Testing Plan. The discharge shall be disposed in accordance with the Turkish legislation and international legislation.

After the hydrotesting, it has been expected for the color of the whole water which will be discharged from the pipeline to be changed/discolored. Despite it is visible, concentrations of the pollutants are very low normally and they can generally be discharged into the environment in this way safely (irrigation or into the direct water resources). Iron level in the discharge water shall be determined and in case it is higher than the water quality parameters approved by SWA, one of the following two action shall be taken:

- the hydrotesting water shall be diluted before discharging process; and/or
- by implementing precipitation or filtering methods before the discharging, discharging of any particles that would arisen from the pipe into the receiving environment shall be assured. Along with this, every kinds of measures shall be taken (rip-rap, silt cage, sandbags, hay bale etc) in order to prevent decrease in the water quality by ventilating the erosion and sedimentation by a water jet at the discharging point of the testing water.

#### V.1.3 Wastes (land preparation, construction, operating and after operating waste types, their amounts and treatment)

##### **Solid Wastes**

Collecting, storage and disposal of domestic solid wastes to be arisen at construction stage of the project shall be performed in accordance with the relevant articles specified in "Regulations for Solid Wastes Control" (which has become effective by being published in the Official Gazette dated 05.04.2005 and numbered 25777 with the amendments) which has become effective by being published in the Official Gazette dated 14.03.1991 and numbered 20814.

With the acceptance of daily solid waste production for one person as 1,34 kg; the solid waste amount to be arisen from 300 workers who will be employed has been calculated as follows;

$$Q = q \times N$$

Q = Total solid waste amount for one day

q = Total solid waste amount to be arisen from one person

N = Total number of workers employed

$$Q = 1,34 \times 30 = 400,2 \text{ kg/da.}$$

Packing wastes to be arisen at construction stage of the project (paper, cartoon, metal, glass, rubber elastic, textile, plastic etc) shall be collected separately from other wastes, shall be stored in separate locations and shall be given to institutions with license towards the provisions of "Regulations for Packing Wastes Control" which has become effective by being published in the Official Gazette dated 24.06.2007 and numbered 26562 for their disposal.

The excavation wastes to be arisen at the construction stage of the prescribed project shall be disposed in an area which will be pointed by Terme Municipality towards the provisions of "Regulations for Excavation Earth, Construction and Wreckage Wastes Control" which has become effective by being published in the Official Gazette dated 18.03.2004 and numbered 25406. As for the vegetable soil shall be used with landscaping purposes.

The waste oils, vegetable waste oils and waste batteries and accumulators which would arise during construction stage shall be disposed respectively towards provisions of “Regulations for Waste Oils Control” which has become effective by being published in the Official Gazette dated 30.07.2008 and numbered 26952; “Regulations for Waste Oils Control” which has become effective by being published in the Official Gazette dated 19.04.2005 and numbered 25791 and “Regulations for Waste Battery and Accumulators Control” which has become effective by being published in the Official Gazette dated 31.08.2004 and numbered 25569.

Besides medical wastes which would arise and the wastes that have been described as dangerous wastes according to Appendix-11A of the “Regulations for Dangerous Wastes Control” which has become effective by being published in the Official Gazette dated 14.03.2005 numbered 25755 shall be disposed respectively towards the provisions of “Regulations for Medical Wastes Control” which has become effective by being published in the Official Gazette dated 22.07.2005 and numbered 25883 and “Regulations for Dangerous Wastes Control” which has become effective by being published in the Official Gazette numbered 25755.

Maintenance-repairs of the vehicles used during construction and operating shall be made in the gas stations with filter and oil changing license.

#### V.1.4 Noise sources, levels and vibration

Noise sources which would constitute within the scope of the aforesaid project is seen as heavy machinery, equipments and vehicles which will be operated during land preparation and excavation.

The results obtained from the noise calculations to be performed for construction stage of the project shall be assessed within the framework of Appendix-VIII of “Regulations for Environmental Noise Assessment and Management (2002/49/EC)” Table 5 which has become effective by being published in the Official Gazette dated 07.03.2008 and numbered 26809 (see Table V.2).

**Table V.2:** Environmental Noise Limit Values for The Construction Site

Type of Activity (Construction, Demolishment, Repair)	L <sub>day</sub> (dBA)
Building	70
Road	75
Other Resources	70

While the noise to be arise at the construction stage of the project shall be local and temporary, it shall end with the completion of the construction. During this stage, in order to protect the employees and the people who will stay in the noise interaction area, “Regulations for Environmental Noise Assessment and Management (2002/49/EC)” which has become effective by being published in the Official Gazette dated 07.03.2008 and numbered 26809 together with the provision of “Work Health and Safety Regulations” numbered 25311 which has become effective by being published in the Official Gazette dated 09.12.2003 and numbered 25311 shall be complied with. According to this, in order to assure the workers not to be affected from the noise, they will be given suitable personnel protective materials such as helmet, headset or ear plugs. Besides



maintenance of the machinery and vehicles to be used regularly so that noise level shall be assured to be lower.

**Table V.3:** Environmental Noise Limit Values for Industrial Facilities

Areas	L <sub>day</sub> (dBA)	L <sub>evening</sub> (dBA)	L <sub>night</sub> (dBA)
Out of the noise-sensitive usages; education, cultural and health areas together with the areas with intensive seaside resorts and camping areas	60	55	50
Out of the areas in which commercial structures and noise-sensitive usages are together, areas with intensive housing estates	65	60	55
Out of the areas in which commercial structures and noise-sensitive usages are together, areas with intensive business places	68	63	58
For each facility within Organized Industrial Site or Specialized Industrial Site	70	65	60

By making an assessment as per the sound power levels of the machinery to be used in the facility, the noise level to be arisen from the facility has been calculated. The machinery which will make noise during construction and maximum noise levels during the operating of them have been examined in accordance with the values in Table V.4 as per Regulations For The Noise Emission in the Environment Arisen From the Equipment Used in Open Area (2000/14/AT) which was published in the Official Gazette dated 30.December.2006 and numbered 26392.

**Table V.4** Allowed Sound Power Level dB/1 pW

Type of The Equipment	Net installed power P (kW), Electric power P <sub>el</sub> (kW), Implementation Mass m (kg), Cutoff Width L (cm)	Allowed Sound Power Level dB/1 pW	
		From 3rd of July,2004 I. Stage	From 3rd of January, 2006 II. Stage
Caterpillar Bulldozers, track loaders, crawler excavator loaders	$P \leq 55$	106	103
	$P > 55$	$87 + 11 \log P$	$84 + 11 \log P$
Wheel Bulldozers, Wheel loaders, Wheel excavator Loaders, Dumper Trucks, Graders, Loader Type Soil Loader Compactors, Internal Combustion Engine Driven Counter Balances Hydraulic Lifted Trucks, Mobile Cranes, Compactor Machinery (non-vibrating rollers), paving calendars, Hydraulic Power Constituting Machinery	$P \leq 55$	104	101
	$P > 55$	$85 + 11 \log P$	$82 + 11 \log P$
Source and power Generators	$P_{el} \leq 2$	$97 + \log P_{el}$	$95 + \log P_{el}$
	$2 < P_{el} \leq 10$	$98 + \log P_{el}$	$96 + \log P_{el}$
	$P_{el} > 10$	$97 + \log P_{el}$	$95 + \log P_{el}$
	$P > 15$	$97 + 2 \log P$	$95 + 2 \log P$

Sound power levels of each heavy machine to be used in the project are given in Table V.5.

Operating of the machinery shall not be constant but in short periods. By considering the worse possibilities in calculations, it has been anticipated that all machinery Works at the same time and in the same place. But in the construction site, all heavy machinery shall be operated at the same time in the same place. Accordingly calculated noise levels are the maximum values to be felt at construction stage of the project. Noise levels of heavy machinery which will be available at the same time and in the same place and the machinery which will be constituted of transportation vehicles are given below.

**Table V.5** Heavy machinery to be Used in The Construction of the Project and Their Sound Power Levels

Source of Noise	Quantity	Sound Power Level of Each Equipment (dB)
Excavator	10	105
Crane	2	105
Welding Machine	20	65
Trailer Truck	20	65
Truck	15	65

The sound power levels ( $L_{WT}$ ) to be used in the construction site and total sound pressure level ( $L_{PT}$ ) are calculated via below formulas:

$$L_{Wt} = 10 \log \sum_{i=1}^n 10^{\frac{L_{wi}}{10}}$$

$$L_p = L_w + 10 \times \log(Q/4\pi r^2)$$

- Q = Orientation coefficient  
(hemispherical distribution of the sound source at ground level, Q=2)
- r = distance from the source (m)
- $L_p$  = Sound pressure level

Calculated total sound power level ( $L_{WT}$ ) has been distributed equally in equivalent noise level calculations by considering that all machinery contribute in each frequency equally. As moved away the activity area, equivalent noise level ( $L_{eq}$ ) also declines.

$$\sum L_{eq} = L_{PT} - A_{atm}$$

$$A_{atm} = 7,4 \times 10^{-8} (f2r/\phi)$$
 can be calculated with the help of this formula

- $A_{atm}$  = Atmospheric absorption (dB)
- f = frequency of transmitted sound
- r = distance from the source (m)
- $\phi$  = relative humidity of the air (Samsun province % 75)

**r = 100 m:**  
for f=500 Hz

$$L_{WT} = 10 \log (10 \times 10^{10.5} + 2 \times 10^{10.5} + 20 \times 10^{6.5} + 20 \times 10^{6.5} + 15 \times 10^{6.5})$$

$$L_{WT} = 115.79$$

for

$$r = 100 \text{ m}$$

$$L_p = L_w + 10 \times \log(Q/4\pi r^2)$$

$$L_p = 115.79 + 10 \log (2/(4 \times 3,14 \times 100^2))$$

$$L_p = 67.8$$

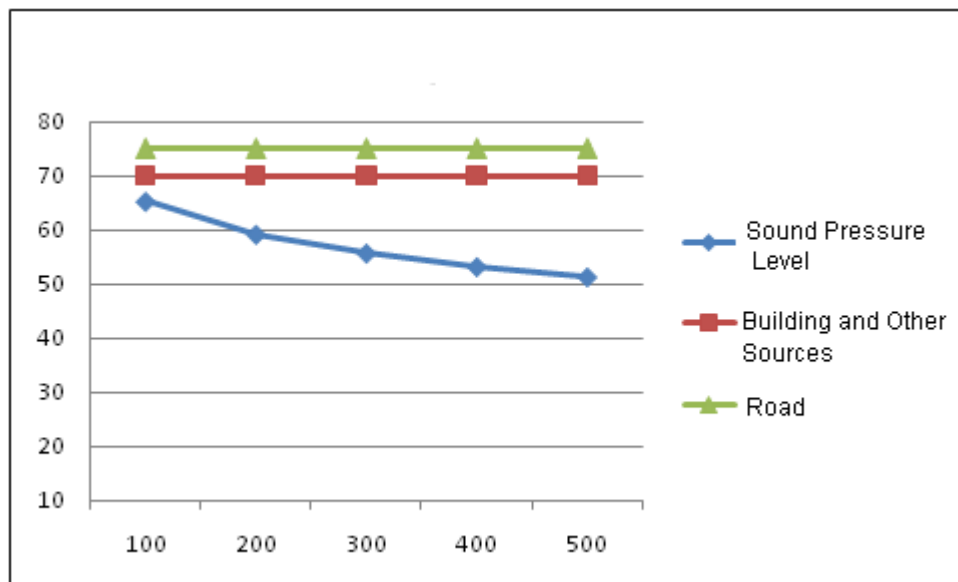
$$A_{Atm} = 7,4 \times 10^{-8} \times (f^2 \times r/q) = 7,4 \times 10^{-8} \times ((500^2 \times 100/0.75)) = 2,5 \text{ dB}$$

$$L_{eq} = 67.8 - 2,5 = 65.3$$

Above calculations have been made separately for 100m, 200 m, 300 m, 400 m and 500 m and 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz and their results are presented in the below Table.

**Table V.6** Distribution of Noise Levels As Per Distance and Frequency

Distance/ Noise Source	500 Hz	1000 Hz	2000 Hz	4000 Hz
100	65.3	67.8	66.8	66.8
200	59.2	61.7	60.7	60.7
300	55.7	58.2	57.2	57.2
400	53.2	55.7	54.7	54.7
500	51.3	53.8	52.8	52.8



**Figure V.1** Distribution of Sound Pressure Level As Per Distances

Assessment of the Values Obtained As A Result of Calculation Within The Framework of 23th Article of Regulations for ENAM

As can be seen in Table V.6 and Figure V.1, the noise level to be arisen from during construction declines under 70 Dba after 80 m even in the worse conditions which means all the equipments work at the same time in the same place. Accordingly, 70 dBA limit which is given in

RENAM Table 5 (see Table V.2) is assured after 80 m. In this sense, even Akcay District which is the closest settlement with 221 m distance shall not be affected from the noise.

#### V.1.5 Health Protection Strip Distances

Within the scope of the project, by taking the impacts and polluting factors of the enterprises on environment and public health into consideration by the inspection boards specified in the provisions of "Regulations for Business and Working License", suitable opinion shall be taken from R.T. Ministry of Health and by determination of health protection strip distances in accordance with the procedure, principle and reference distances to be determined by the same Ministry, the health protection strip approved by the competent authority shall be entered into the construction plan and these distances shall be kept under protection by the relevant Directorate of Construction or relevant institution.

Health protection strip cannot be determined out of the property borders and within this area housing for residence or human accommodation cannot be permitted. But suitable agricultural activities may be carried out. The health protection strip are determined by considering the harmful impacts and polluting factors of the facilities on environment and public health. Within this scope, the health protection strip is a definition of a geographical border in which the impacts described in EIA Report decreased under a level that would not create any risks for human and environment health.

#### V.1.6 Recycling Studies and Works

Protection of the soil and their usage in restoring stage is a subject which bears importance in mitigation of environmental impacts to be arisen from the pipeline construction.

During construction, topsoil shall be removed down to a 15-30 cm depth (or in a depth suitable for local conditions) carefully and in a way that would not be pressed by the vehicles or would not mix with other materials, it shall be stored separately from the subsoil. The subsoil shall be removed in a way that enables avoiding from over-erosion.

Following the construction, these soils shall be restored in the following way:

The subsoil shall be jammed in order to bring it in a condition similar with the neighboring areas which has not been damaged after putting in to the channel.

Topsoil shall be laid on the depth with similar level and shall be in accordance with the ground on both two sides of the working width.

The building contractor shall carry out the required maintenance (irrigation, additional fertilizer implementation, re-planting etc) in order to perform a successful planting and shall track the bio-restoration development regularly.

#### Riverside Restoration

The backfill on the pipeline shall be resistant to abrasion as well as the original river bed and the damaged sections of the river beds shall be restored as far as possible in the condition before construction. The side of rivers shall be restored according to their original conditions and contours.

Erosion and sediment control tools shall be fitted and shall be kept in the site until the re-planting Works give sufficient results

#### V.1.7 Risk analysis

##### **a)** Analysis of Project Area

During the Works related to excavation of the pipeline and installation of the pipes, risks for both environment and human health and safety are limited with work accidents possible to be met in such construction works. Activities such as welding of the pipes, canalization or pipe installation do not threaten the environment, human health and safety as the required measures are taken. In this sense, the project owner shall comply with work safety procedures and assure the sub-contractors to comply with them in order to assure the safety of the construction site for all workers and assure the safety of excavation, scaffolding together with heavy construction equipments (for ins cranes). All activities to be carried out within the scope of the project shall be performed in accordance with Law of Work numbered 4857 which has become effective by being published in the Official Gazette dated 10.06.2003 and numbered 25134 and the provisions of relevant regulations.

As for at operating stage, as no activities shall be available in surface facilities, only during maintenance Works risky activities regarding human health and safety may occur. Aforementioned Law of Work and relevant regulation provisions alongside with safety and security procedures approved by BOTAS shall be complied with for all of the activities to be carried out within this scope.

##### **b)** Project Impact Area Analysis

Construction Works of the pipeline which has been planned to be constructed shall be executed within the 17 m corridor while any other activities shall be available other than this area.

Wall thickness of the 24" pipes to be used for transporting the natural gas within the scope of the project shall be 7,9-11,1-17,48 mm as given in Table II.2. These thicknesses have been calculated according to the gas pressure within the pipe and the distance of the line to the settlements. Normally; in regions which cross closely to the settlements thick-walled pipes shall be used.

On the other hand, while the pipe shall be installed down to 2,00 m depth in normal conditions; in special crossings this depth may be deep end down to 5,0 m. Within this scope also, risk of damage which may occur on pipelines due to human mistake or possible fires shall stay at minimum level.

##### **c)** Measures To Be Taken In Cases of Risk Within The Scope of Works and Proceedings To Be Carried Out Within the Scope of the Project (land preparation, construction, operating and after operating)

Below impact reducing measures shall be implemented in order to decrease the environmental impact risk in water structure and wetland crossings at land preparation and construction stages of the project:

- In places in which the sensitivity of the underground water is classified as “high” or “very high”, pipe wall thickness shall be more than the thickness specified by the hydraulic design requirements.
- Pipe embedment depth in these areas shall be made towards the opinion given by SWA.
- In case considered necessary as a result of the calculations, the pipe shall be concrete covered in order to keep the buoyancy force of the pipe under control.
- Other impact reducing measures are cathodic protection, underground warning strip which is laid on the pipe and surface pipeline signs.

Against a possibility of any accident and sabotage which may occur on the route, the pipeline shall be kept under control regularly during all operating stage. BVS which will take place on the line shall be remote controlled in any extraordinary circumstances and shall be closed.

#### V.1.8 Risky and Dangerous Activities In Terms of Human Health and Environment

Within the scope of Samsun Natural Gas Pipeline Project construction activities, risks which would occur intending for human health and safety are related with the accidents that are possible to be met in such construction works. In this sense, the contractor company which will carry out the construction activities shall practice upon information and experience alongside with worldwide accepted safety rules in order to assure the site to be safe for all workers and assure the safety of excavation, scaffolding together with heavy construction equipments (cranes etc). Workers shall be assured to use personal protective materials (helmet, goggles, gloves, belt etc).

As the usage of dangerous chemicals at the construction stage of the project shall be at minimum level; any risks would be available during transportation, storage and usage of these materials. Besides, protective measures required to minimize the potential environment pollution risks shall be taken by the contractor company. All activities to be carried out within the scope of the project shall be performed in accordance with the relevant provisions of Regulations for Work Health and Work Safety which has become effective by being published in the Official Gazette dated 09.12.2003 and numbered 25311.

#### **V.2 Impacts of the Project on Socio-Economical Environment:**

The expected income increases; employment opportunities to be created, population movements.

It has been planned that 300 people will work during the construction stage of the project. The personnel other than the qualified personnel (engineer, welder, operator etc) shall be procured from the region public. Besides the requirements of the personnel coming out of the region which is required for maintaining their vital activities shall be supplied from the markets in the region. Number of personnel who will come out of the region at construction stage of the project shall be limited during the construction.

It has been planned that important part of the materials and serviced required at site preparation, construction and operating stages of the project shall be met within the region. A part of the total project cost shall contribute in the regional economy as fees to be paid for labor force, accommodation, equipment leasing, fuel oil, and services to be supplied from local business.

## **Social Services and Infrastructure**

### **Region Economy**

Needs which generally arisen from large scaled projects can increase the current social service and infrastructure load in the region. On the other hand, due to the increase in total tax amount paid in the region in the aforesaid project, new funds would be created in order to improve these services.

### **Education Services**

In case this project is executed, coming of the people from surrounding district and villages to the region in order to be employed in the job branches to be opened during the pipeline construction Works may be in question. In order to make the personnel to be employed qualified, relevant classes (welding class etc) may be opened in the region, by giving training to the personnel in health, quality and environment subjects during construction Works, their personnel improvement shall be assured.

### **Health Services**

Responses to small scale accident and health problems which would occur during the construction Works of the pipeline shall be performed by the current health units in the surrounding settlements. In case of heavy accidents, it has been anticipated that health institutions in Terme and Carsamba Districts together with Samsun Province shall be used. At construction and operating stage, in order not to increase the load of current hospitals and health units and not to create a negative impact on local health services, work safety and worker's health rules shall be complied with at maximum level.

### **Technical Infrastructure Services**

#### **Fire Fighting**

The pipeline shall have the required hardware for protection from the fire and for fire extinguishing during construction works. Accordingly, any negative and additional impact of the proposed activity on local fire department services.

#### **Transportation**

The construction activities shall lead to a small scale additional load on the regional transportation network. As Samsun-Ordu highway shall be used during transportation, because the highway is considerably loaded already and construction activities are temporary, construction Works are not expected to create an important negative impact on Samsun-Ordu highway.

#### **Communication**

The telephone system required for the proposed facility shall be supplied by Turk Telecom. Within this scope, negative impacts in large dimensions over current telephone services during the activity have not been expected.

## **V.3 Other Considerations**

No other considerations are available to be mentioned in this subject.

## **VI. IMPACTS POSSIBLE TO OCCUR AFTER THE TERMINATION OF ACTIVITY OF THE OPERATING AND ONGOING IMPACTS AND MEASURES TO BE TAKEN AGAINST THESE IMPACTS**

As specified in the above parts, the pipeline primarily shall supply gas for Natural Gas Combined Cycle Plant to be constructed. Along with this BOTAS may procure gas from this pipeline as per the possible gas supply in the future. Accordingly, even the Natural Gas Combined Cycle Plant is closed, natural gas pipeline shall be kept on using. But when such demand is not in question and the pipeline completes its economical life-time, it shall be closed for operating. In this case, as described in Chapter IV.2.5, by disconnecting the line from Blue Stream Natural Gas Pipeline, the gas flow shall be stopped and by discharging the line, it shall be cleared of gas via a vacuum pump and both ends shall be blanked and left under earth. After this operation, surface facilities shall be dismantled and removed and the land shall be restored for use again. As a result, after the completion of the activity, there will be no ongoing impacts available.

### **VI.1 Reclamation Works**

When the pipeline is in question, the facilities to be considered within the scope of reclamation Works are;

- Pigging Station
- Natural Gas Pipe
- Block Valve Station and
- MS Station.

Out of these structures, the MS Station to be used for natural gas measurement is located within the Plant Field and its reclamation shall be executed together with the Plant. On the other hand, connection of the pipeline which will be left under soil with Blue Stream Natural Gas Pipeline shall be disconnected with the closure of take-off valve Group and shall be discharged by taking required measures. The remaining gas in the line shall be eliminated by firing the gas. Within this scope, air pumping into the line by means of a compressor may bring to agenda and it shall be assured that no natural gas is left in the line.

The pigging station and the block valve station which has a connection to the pipeline shall be dismantled and removed by taking safety measures. The areas used for these stations shall be restored and then left, rehabilitation studies suitable for climate and soil characteristics around the aforesaid area shall be carried out.

### **VI.2 Land Development**

Throughout the pipeline, any special land development work shall be required. Because the area in which the line sits in is relatively smaller than the construction corridor while it shall be started to use immediately after the completion of construction Works for activities carried out around this area such as agriculture, meadow. After the termination of activity of the pipeline, no permanent impact shall be available in the land.

### **VI.3 Impacts on Current Water Resources**

After the termination of activity of the pipeline, it will have no impact on the current water resources in the region.



## **VII. MONITORING PROGRAM**

### **VII.1 Monitoring Program Proposed for The Construction of the Project, Monitoring Program Proposed for Operating and After Operating of the Project and Emergency Response Plan**

With purpose of monitoring the environmental impacts which would occur after land preparation-construction, operating and facility activities within the scope of Samsun Natural Gas Pipeline Project an environmental monitoring program has been arranged. Aforesaid environmental monitoring program depends on the environmental resources and exposure level of them from the proposed project which would arisen from the negativities.

In addition to this, information related to the project form the commencement of the investment (construction period) to start-up of operating shall be communicated to R.T. Ministry of Environment and Forestry in periods deemed suitable by the Ministry via "Final EIA Report Monitoring Reports Form" which takes place in Appendix-4 of Certificate of Competency Notice of R.T. Ministry of Environment and Forestry which has become effective by being published in the Official Gazette dated 08.08.2008 and numbered 26961.

Information related to the monitoring program specified under three main headings as land preparation, operating and after operating within the scope of the project is given below.

With the purpose of keeping impacts that would occur on the environment at the minimum level, execution of Works in the field in accordance with the relevant regulations and by-laws of environment legislation starting from the construction activities of the project as long as the construction period should be supervised by a professional environment team assigned by the Provincial Directorate of Environment and Forestry.

Whether the storage of the vegetable soil to be removed during line Works and the environment al planning Works after construction have carried out in accordance with the project and the future intended use shall be controlled, in case of discovery of a trouble, required warnings shall be made.

The equipments to be used during construction stage shall be checked regularly while in order to assure the minimum level noise development, required maintenance shall be carried out. In addition to this, in order to determine the noise arisen from the project , periodically (for ins. Every month for three days constantly) noise measurement shall be carried out. In case the noise exceeds the limit values specified in RENAM (Regulations For Environmental Noise Assessment and Management), usage of protective equipments related to the subject shall be assured. Measurement results shall be kept in the construction site and at the project owner and shall be revealed upon request of the authorities.

Dust emissions which is possible to occur at construction stage shall be measured regularly. Within this scope, the period in which excavation Works are the most intensive and the meteorological conditions are the most arid. The values to be obtained out of the dust emission measurement study which will be carried out for one week time approximately shall be compared with the borders specified in RAQAM (Regulations for Air Quality Assessment and Management) Appendix-IA.

### **Emergency Response Plans**

The most important aim of Emergency response plans (ERP) is to describe the actions to be taken in an emergency. Natural disasters, accidents, faults arisen from the project or natural gas leakage as a result of improper operating within the scope of the project have been described as “emergency”. The measures taken for forewarning the population under threat in case of a danger constitute the most important of ERP. Alongside with this, below mentioned considerations also shall be taken into consideration by BORASCO during arrangement of ERP.

- In order to be able to response extraordinary circumstances such as earthquake, explosion, sabotage, fire, accident and natural disaster, an emergency response team shall be organized. Mission definition of emergency response plan shall be made. The key staff also shall be trained in this subject.
- Against accidents possible to occur at the construction stage of the project, primarily training and briefing of the workers shall be assured.
- Tools and materials required in order to be able to response instantly in an emergency case shall be determined and kept in a separate place. Among such tools and materials; digging tools, face masks, protective goggles, gloves, various pumps, electric motors which do not allow explosion, wireless and similar equipments shall be available.
- How heavy construction machinery such as clamshell, front-end loader and dozer will response in an emergency shall be planned beforehand and park lots of work machinery shall be selected by means of taking this aspect into consideration.
- The ERP’s should include the list of emergency response teams, places of safety tools and materials, exit ways and procedures.
- The ERP’s shall be checked constantly and periodical maintenance and inspections of related all equipments shall be carried out regularly.
- Against the circumstance of workers to be affected from possible accidents, all first aid materials required in the temporary building to be constructed for the personnel within the site shall be kept handy. At the instant of the accident, the transportation of the accident victim to the closest health Group shall be assured.
- Night and day watchmen shall be kept available against possible sabotages at construction stage. Required trainings in protection of their own life safety in possible earthquake circumstances shall be given to the workers. Every structure to be constructed within the facility shall be built in accordance with Regulations of Earthquake.
- Required warning and information signs shall be hung in all units in the facility. In the buildings, emergency exit doors stairs and fire fighting equipments shall be kept available.

### **VII.2 The Program Related to Performing The Considerations That Take Place Within The Scope of 9th Article of “Liabilities of The Organizations/Institutions Which Received Certificate of Competency” Heading in Notice of Competency In Case EIA Positive Certificate is Given.**

After receiving the “EIA Positive” certificate within the scope of the project, realization of the commitments which take place in the Final EIA Reports within the time slice passed from the commencement of the investment until the commissioning shall be monitored in 3 months period via “*Final EIA Monitoring Reports Form*” partaking in R.T. Ministry of Environment and Forestry Notice of Competency Appendix-4 and which was given in Appendix-9 of this Report.

## VIII. PARTICIPATION OF THE PUBLIC

(How and with which methods the public who will probably be affected from the project have been informed, reflecting opinions of the public related to the project and relevant statements into the EIA Report.)

### Description of the Region Public Who Will Probably Be Affected From the Project

Construction of the project has been stipulated by BORASCO Electricity Generation Inc. In this sense, region public who will be probably affected from the project are the residents of Carsamba and Terme Districts of Samsun.

### Methods Used For Participation of the Public In EIA Process

In order to inform the public about Samsun Natural Gas Pipeline activity to be constructed by BORASCO Electricity Generation Inc., to receive their opinions and suggestions;

- a) In accordance with the 9th Article of EIA Regulations which has become effective by being published in the Official Gazette dated 17.07.2008 and numbered 26939, a place to which participation of the whole public who is concerned with the project shall be provided easily in order to inform the public about the investment, to receive their opinions and suggestions regarding the project has been determined. An advertisement which determined date, hour, place and subject of the meeting has been arranged before the meeting and has been announced at least 10 days before the meeting in a newspaper published in national level together with a local newspaper.
- b) Before the Public Availability Session, announcements have been made with loudspeakers via Municipality, publication texts have been publicized at places that are in sight of the public.
- c) Opinions and suggestions of members of Scope Determination and Examination Assessment Commission had been assessed separately by the activity owner about Public Availability Session.

Related to the project, for the purpose of public availability, a Public Availability Session has been held in the Meeting Hall of Public Education Center in Subprovincial Special Administration Building which is located in Terme District on the date of 1.04.2010. Representatives of region public and public bodies and institutions have delivered their opinions and suggestions relating to the project in the meeting.

Besides leaflets which have been arranged in order to provide a briefing for the region public before the meeting have been distributed (see Figure VIII.2-Figure VIII.3).

Detailed information has been given about the selection of place and technology to the region public who has expressed their concerns about the the place of the project field and the technology to be used. In respect thereof, format of the EIA report has been prepared by taking opinions and suggestions of the public into consideration also. Besides, concerns and assessments brought into question by the local public during Public Availability Session have also been mentioned in the relevant parts of this report.



**Photo VIII.1** Public Availability Session -1



**Photo VIII.2** Public Availability Session-2



Photo VIII.3 Public Availability Session-3



Figure VIII.1: Public Participation Meeting National Newspaper Advertisement

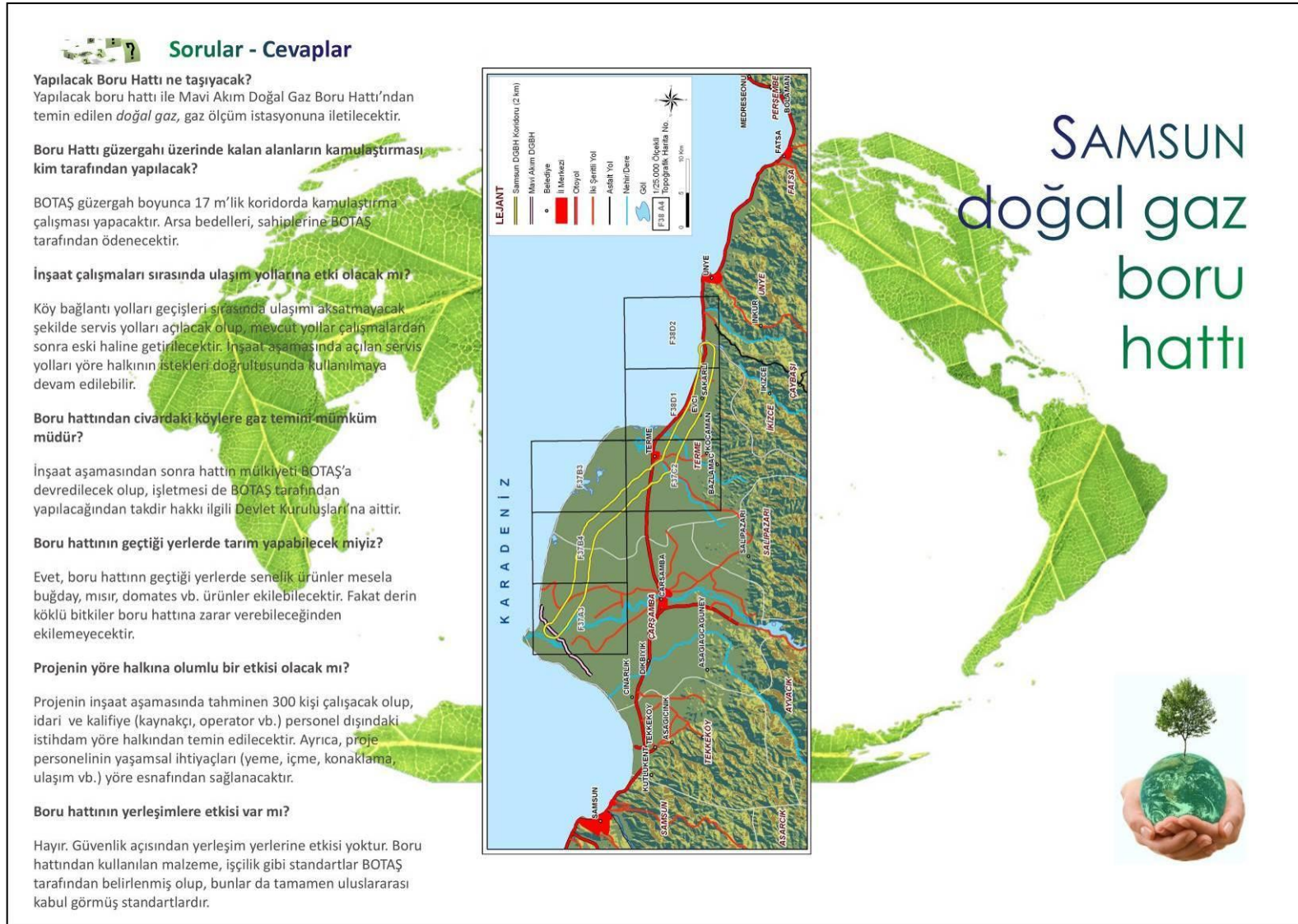


Figure VIII.2 Pipeline Information Leaflet Front Page



Figure VIII.3 Pipeline Information Leaflet Back Page

## IX. CONCLUSIONS

(A summary of all descriptions above, a general overview in which essential environmental impacts of the project are sorted and to what extent success may be gained in prevention of negative impacts of the project and explanations have been made related to health protection)

- ✓ It has been planned to construct a 24" natural gas pipeline at a length of approximately 51 km (50+952 m) within the borders of Carsamba and Terme Districts by BORASCO Electricity Generation Inc.
- ✓ It has been planned to procure the natural gas to be used within the scope of the project from the line which is located at approximately 45 km west of the Plant and used by Petroleum Pipeline Corporation (BOTAS) within the scope of Blue Stream Project. Aim of the project is the construction of the pipeline which will transfer the natural gas to be procured from Blue Stream Pipeline to Samsun Natural Gas Combined Cycle Plant. Collective studies have been conducted regarding pipeline route and gas procurement by also receiving the opinion of BOTAS. It has been planned to engage the pipeline at the end of October, 2011 and life-time of the pipeline has been anticipated as 30 years.
- ✓ The project area is located within the borders of Samsun Province Carsamba and Terme Districts. Besides, while the area takes place in 1/25.000 scaled map sections of Samsun F34.a3, F37.b4, F37.b3, F37.c2, F38.d1 and F38.d2, it has an approximate size of 85,6 ha (51 km line length × 17 m working corridor). The project field is at approximately 30 km east of Samsun Town Center, at 12 km northeast of Carsamba Town Center, and approximately 2 km away from Terme Town Center (see Figure II.1 and Appendix-1).
- ✓ When the 1/100.000 scaled Environment plan (EP) which was prepared by R.T. Ministry of Environment and Forestry for Samsun Province is considered, The field proposed for Samsun Natural Gas Pipeline (NGPL) generally covers the land which has been determined as "qualified agricultural lands". Besides, in some parts throughout the route, some forestry areas also have been crossed.
- ✓ The capacity of the pipeline shall be 240.000 m<sup>3</sup>/hour.
- ✓ The units to be established within the scope of the project are as follows:
  - Pigging station,
  - Natural Gas Pipe,
  - Block Valve Station,
  - MS Station.
- ✓ Throughout Samsun NGPL, various special crossings with each of them requiring different methods have been met. These special crossings could be classified as follows:
  - River, creek and other stream crossings,
  - Road crossings,
  - Railway crossings,
  - Drying channel crossings,
  - Energy transmission line crossings,



- Fault crossings and
  - Other crossings (communication line, potable water line etc.).
- ✓ Special crossings within the scope of the project and their crossing coordinates have been described in detail in Chapter II.1.2.2.
- ✓ Impact area of the project at construction and operating stages is the 17 m (6 m + 11 m) which is also an expropriation area. No improved areas have been crossed within the scope of the project. But due to dispersed settlement in the region, in some cases some rural settlement areas have been crossed closely by taking minimum safety conditions into consideration. The settlements situated within the pipeline corridor and the distances to these settlements is given in Table II.11.
- ✓ The life-time of the pipeline of which construction has been planned shall be approximately 30 years. It has been estimated that 300 people will work at construction stage. As needs of the personnel who will work such as food, beverage etc will be met in the region, it will have a positive impact on the economy.
- ✓ Within the scope of construction activities of Samsun Natural Gas Pipeline Project, risks which would occur intended for human health and safety are related with accidents that are possible to meet in such construction works. In this sense, the contractor company which will carry out the construction activities shall practice upon worldwide accepted safety rules alongside with knowledge and experience in order to make the field safe for all workers and assure the safety of excavation, scaffoldings together with heavy construction equipments (cranes etc). The employees shall be assured to use personal protective materials (helmet, goggles, gloves, belt etc.).
- ✓ It has been planned to employ 300 people during construction stage of the project. The personnel other than qualified personnel (engineer, welder, operator etc.) shall be procured among the region people. Besides the requirements to maintain vital activities of the personnel coming out of the region shall be supplied from the markets within the region. Number of the personnel who will come out of the region at construction stage of the project shall be limited during the construction.
- ✓ Map of important soil groups observed throughout the pipeline route is given in Appendix-6 while length and rates of soil groups observed throughout Samsun NGPL route are given in Table IV.1.
- ✓ The erosion levels of the lands situated throughout the pipeline can be seen in the maps given in Appendix-6. Rates of lengths in terms of erosion levels throughout the pipeline are given in Table IV.2.
- ✓ Agricultural lands are available on the route of the pipeline which has been planned to construct. When it is considered that a 17 m working corridor shall be used during the construction of the pipeline, current land usage will change on the parts which correspond with agricultural lands. But following the completion of the construction areas within the working corridor shall be immediately rehabilitated and restored. Seasonal products also shall be cultivated in parts crossed by the route providing that no rooted plants are planted.

- 
- ✓ The project area has been constituted of quaternary old alluviums as geological structure. An alluvial stocking in which the intensity of generally silt, clay, sand and gravel materials changes in lateral direction and which has been constituted of cross beddings is available.
  - ✓ No endemic or an under-protection plant type has been met in the project field. For this reason other the considerations which should be general paid attention regarding protection of plant types no other special measures that should be taken has been proposed.
  - ✓ During every kinds of activities to be carried out in the project field, especially measures given above related to wild animal types that are included in Appendix-II and Appendix-III of Bern Convention shall be precisely executed.
  - ✓ Throughout pipeline route, there are irrigation and drainage channels which should be constructed within the scope of SWA Carsamba Plain Irrigation project. During crossing of the pipeline over these channels, relevant protocols shall be complied with. The considerations which should be complied with according to SWA are given in Appendix-8.
  - ✓ Opinion of General Directorate of Railways, Ports and Airports Construction has been asked for in consideration of Railway Line project which has been planned to be constructed in the South of the pipeline route while received opinion has specified that there is no harm in construction of the pipeline in case crossing will be executed out of the border of railway expropriation. The pipeline crosses out of the aforesaid railway line expropriation border.
  - ✓ For determination of cultural and natural properties within the natural has pipeline corridor, Samsun Directorate of Museum has been applied to while a field study has conducted together with the museum staff. In the field study and literature scanning, no protected area or an archeological area has been determined within the project area and impact area. But if any finding shall be met during the construction Works of the project, closest Directorate of Museum shall be informed and the construction shall be stopped. Opinions of Samsun Directorate of Museum in consideration of the subject and list of immovable cultural properties in Carsamba and Terme Districts are given in Appendix-8.
  - ✓ Waste amounts and types to be arisen from the project that has been planned to be constructed are described in detail in Chapter V.
  - ✓ By taking the impacts of the enterprises to environment and public health and pollutant factors into consideration by the inspection boards specified in the provisions of “Regulations Regarding The Licenses of Business Commencement and Working” within the scope of the project, suitable opinion of R.T. Ministry of Health shall be acquired and by determination of health protection strip distances in accordance with the principles, procedures and reference distances to be determined by again the same Ministry, the health protection strip approved by the competent authority shall be entered into the construction plan and these distances shall be protected by the relevant Directorate of Construction or relevant institution.

- ✓ The pipeline shall be closed for operating when the life-time is completed. In this case, as described in Chapter IV.2.5, the gas flow shall be stopped by disconnecting the line from Blue Stream Natural Gas Pipeline and the line will be discharged and it will be cleared of gas via a vacuum pump, then both ends shall be blanked and left under earth. After this operation, surface facilities shall be dismantled and removed and the land shall be restored and used.
  
- ✓ Required Works and proceedings shall be carried out after receiving EIA Positive decision and arrangement of the implementation construction related to the project within the framework of related regulations.