Part III Environment

1. Policy and Regulations on Environment in Turkey

1.1 General

Turkey is in a stage of rapid and is dynamic change and thus confronted with the challenge of harmonizing a rather unprecedented development program with environmental concerns. The country's economy is not only expanding but also undergoing major restructuring. These trends generate pollution and accentuate pressures on natural resources.

In particular, significant steps have been taken towards environmental progress within the last decade. In this regard, a number of legislative and regulatory measures have been adopted and important projects concerning rational and environmentally-sound management of natural resources have been launched. Investment in sanitation and waste disposal have increased significantly and rehabilitation of human settlements, in particular, inner cities, have started.

Since the 1980's Turkey has been implementing her national policies in line with development targets taking into account the interaction between development and the environment. In particular, the sixth and seventh Five Year development Plans emphasize policies of sustainable development aiming at economic, social and ecological equilibrium.

1.2 Institutional Background

In August 1991, the Undersecretariat for Environment was promoted to the rank of Ministry of Environment (MOE). As its main task, the MOE sets and upgrades the frame work of the national environmental policy. In this regard, the MOE prepares environmental legislation towards protection of the environment as well as reduction or prevention of pollution. The MOE is also expected to cooperate with other ministries and agencies as required to ensure sound environmental management.

Besides the MOE, there are a number of other institutions with various different functions. Typical examples of other ministries and major agencies involved in

environmental issues are summarized in Table 1.2.1.

TABLE 1.2.1 Other Institutions and Functions Related to Environmental Legislation

Institutions	Functions
State Planning Organization	• Five year development plans, annual implementation programs for all sectors of economic activity
Ministry of Energy & Natural Resources	• Control of sustainable production and consumption of energy and other resources
Ministry of Agriculture and Rural Affairs	• Projects related to environmental management, sanitation services and irrigation networks in rural areas • Protection of coastal and inland waters suitable for the production of aquatic products
Ministry of Forestry	• Projects related to air, water and soil pollution control • Identification, protection and management of national parks, nature reserves and similar sensitive areas
Ministry of Health	• Public health network(monitoring air quality in major cities) • Regulatory issues concerning protection of air, water and soil resources
Ministry of Public Works and Settlement	• Prevention of damage to surface and ground waters and for the quality of these waters depending on their uses

1.3 Regulatory Background

"Environment Law" gives general guidelines for the protection of the environment. The Law authorizes and gives responsibility to different ministries and governmental organizations to prepare and issue detailed rules and regulations for preservation of different compartments of the environment. Article 10 of the Law requires the preparation of an environmental impact assessment (EIA) report to evaluate the potential impacts on the environment that arise from a project. This article states:

> "Institutions, foundations and administrations which may create environmental impacts as a result of their planned activities must prepare an Environmental Impact Assessment Report. This report is to take into construction all the possible impacts on the environment, the methods to dispose of waste and residues without impacting the environment and identify

preventive measures that should be taken to prevent or mitigate impacts. The type of projects for which an Environmental Impact Assessment Report will be required, the subjects that should be included in the reports and the authorities to approve the reports are determined by means of a regulation."

Another example, Article 11 of the Environment Law states:

"All planned establishments are required to construct and operate treatment facilities as per required by the relevant legislation. An operation permit for an establishment is not granted unless its treatment facilities are completed and fully operative".

Article 10 of the Turkish Environment Law requires an EIA report for those investment projects which may create adverse environmental effects as a result of their planned activities. The types of projects for which an EIA report will be required and the specific topics that should be covered for different cases are described in the EIA Regulation issued by the MOE. In this context, preparation of an EIA report is mandatory for development projects related to ports servicing ships with a capacity larger than 1,350 tons. The ships involved in the preparation of an EIA report and the associated review process are outlined below:

- Within two weeks following an application by the activity owner, the MOE issues a special format to be used as the basis of the EIA report.

- After submission of the EIA report, the MOE reviews the report for conformity to the previously issued format and other principles within two weeks.

- If found appropriate, the EIA report is then sent to the members of the so-called "evaluation commission" together with a letter setting the date of the first meeting of the commission. The commission is formed by the MOE and consists of representatives of various governmental and local institutions as deemed necessary by the MOE, the activity owner and the representative of the institution that prepared the EIA report together with representatives of the MOE.

- Under normal circumstances, the commission evaluates the EIA report for twelve weeks and reaches a definite opinion on its completeness and appropriateness. This

final opinion of the commission is determined with a protocol and serves as the basis for the so-called "EIA Positive" or "EIA Negative" certificate to be issued by the MOE.

- If the commission decides that the EIA report has certain deficiencies, it can request a "revised EIA report" and the evaluation period is extended accordingly. Afterwards, within two weeks following the submission of the "final EIA report" to the MOE, an "EIA Positive" or "EIA Negative" certificate shall be issued by the MOE.

- Further, the EIA Regulation requests public participation in the permitting process through a public meeting to be held within the evaluation period. Public views expressed at that meeting are taken into consideration by the evaluation commision.

- In addition to obtaining an "EIA Positive Certificate" as a prerequisite for construction and mining operations to start, there are numerous other permit requirements for a gold mining operation (for instance, those stipulated by the pertinent legislation on water pollution control and preservation of air quality). Some of these additional permits repeat and duplicate to a large extent the procedures required for the EIA process under the current EIA Regulation; but, fall under a different jurisdiction. It is important to note that all such additional permits can only be obtained after the EIA procedure has been completed and the so-called "EIA Positive" certificate has been issued by the MOE.

2. Present Conditions

This chapter of the report, describes the existing (baseline) environmental quality of the proposed site and its immediate vicinity in terms of selected physical, biological and socio-economical characteristics. The study area (SA) for the Marmara Port Development Project is selected as the area which radiaetes a few km's from the proposed port site situated at about 30 km from the District Center of Marmara Ereglisi towards the Tekirdag Province Center. The selection of the SA boundaries was based on potential for interaction between the proposed development and the receiving physical, biological, economic and social environment. Therefore, when deemed necessary, the SA was modified to confine within or extend beyond the above-mentioned hypothetical boundaries. As an example, for the socio-economic studies, the SA was extended to cover the five districts surrounding the project area.

The aim of this chapter is to present a general overview of the current state of the environment in and around the port site of choice so that the future impacts of the proposed development could be evaluated properly. With this intention, relevant physical, chemical, biological and socio-economic data are being compiled through site visits, literature information and field measurements.

In terms of information drawn from the literature, theoretical material and previous environmental impact assessment (EIA) studies served as valuable sources. In addition, published or unpublished government documents obtained from several organizations that are responsible for the delivery of technical and social services to the area were also benefited from. The assessment of the socio-economic situation is mostly based on the work of State Statistics Institute. Also, local officials and residents were interviewed when specific background information was not available at the required level of detail.

In terms of field measurements, as reported in the relevant subsections below, extensive field surveys are to be undertaken for the determination of local air, water and soil quality, as well as biological characteristics and historical/cultural assets.

2.1 Water Quality

2.1.1 Sea Water

This section of the report covers a generalized description of the existing (baseline) characteristics of the Sea of Marmara near the project site without loss of generality with respect to the integral behavior of the sea. Within the boundaries of the project area and its surroundings, the Sea of Marmara has a rather limited use and it is mainly used for commercial awell as recreational fishing and other similar purposes (see Section 4.2).

(1) General Characteristics

The Sea of Marmara is a relatively small water body of about 11,500 km^2. The total volume of the sea is estimated to be 3,378 km^3. It is connected to Black Sea via the Bosphorus and to the Aegean Sea via the Dardanelles. These two long narrow water passes provide the water circulation in the Sea of Marmara and hence are of primary importance. The water transfer between the Sea of Marmara and the Black Sea is provided via the 31 km long Bosphorus. This passage has a width of 0.7 to 3.5 km and an average depth of about 35 m. The Dardanelles, which connects the Sea of Marmara to the Aegean Sea is a 62 km long water pass. It has a width of 1.2 to 7 km and an average depth of about 55 m.

The Sea of Marmara has three distinct water layers on the vertical axis. The upper layer originates due to the intrusion of low salinity Black Sea waters and reflects the characteristics of the Black Sea. The bottom layer, on the other hand, has a salinity of 38.5 ppt and exhibits the characteristics of Aegean Sea. The third layer is the intermediate layer between the upper and lower strata and forms a barrier preventing large seasonal variations due to the transmission of the upper waters to bottom.

The upper-layer temperature of the Marmara and Black Sea waters are almost identical. The lowest and highest temperatures of the upper layer are 8 ℃ in February and 24 ℃ in August, respectively. The bottom layer has a uniform temperature of 14.5 ℃.

Salinity values in the Sea of Marmara are highly variable. The upper layer salinity is 30 ppt in winter and 24 ppt in summer. On the other hand, the upper layer salinity is 18 ppt in the Black Sea entrance of the Bosphorus and rises to 22 ppt in the Sea of Marmara entrance. A similar pattern is valid for the Dardanelles and salinity rises to 32 ppt in the entrance to the Aegean Sea. Moreover, the bottom layer salinity of the Marmara is relatively higher with an average value of 38.5 ppt.

In the upper layers of the Sea of Marmara, the oceanographic density values (s+) varies between 15 and 2.3; however, the bottom layer density remains constant and has a value of 28.5.

(2) Field Surveys to be Conducted

The physical, chemical and biological characteristics of the sea water within the SA will later be surveyed in detail. According to the current plans, sampling will be carried out for two days in six designated places. At these sampling stations a total of 60 samples will be collected at two different depths (surface and bottom layers). In order to characterize the

quality of the sea water, a series of chemical and biological analyses will be conducted on the collected samples. The analyses will include pH chemical oxygen demand (COD), suspended solids (SS), dissolved oxygen (DO), surface active agents (SAA), oil and grease, tar residue and phenols as well as total coliform and focal coliform tests.

(3) Sea Water and River Water Quality Measurements

Sea and river water surveys were carried out in two steps. Certain parameters were measured in-situ whereas most of the water quality parameters were analyzed in the central laboratory in Ankara in collected samples.

Both in-situ measurements and sample collection was performed in March 1, 1997 from a 7.5 m long fishing boat hired for that purpose.

1) In-situ measurements

The sea water measurements were conducted at six stations. Approximate positions of the sampling stations are given in Figure 2.1.1 The stations 1, 2, 3, 4, 5 and 6 were 5.2, 5.0, 5.3, 50, 52 and 51 m deep, respectively.

In addition to water quality parameters, depth, air temperature, water temperature, color, odor, taste, transparency and pH were measured in each sampling station prior to sampling.

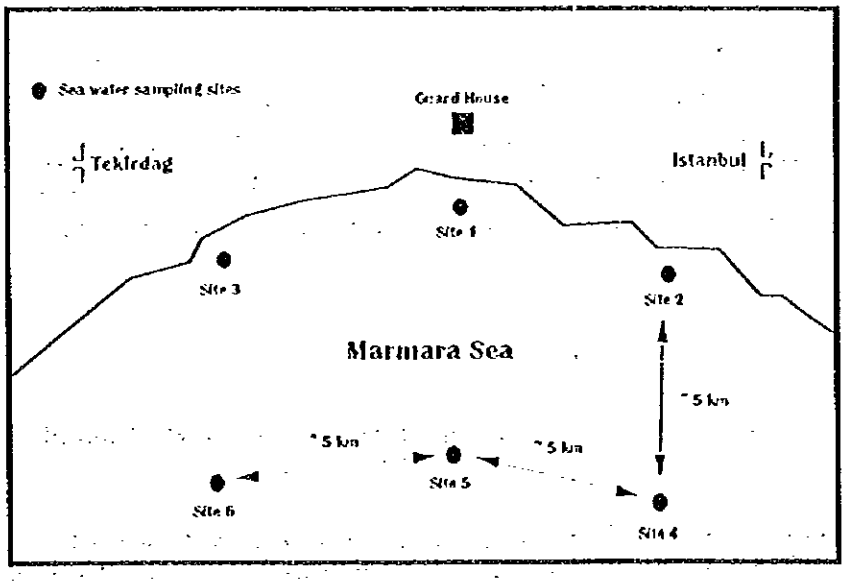

FIGURE 2.1.1 Approximate Positions of Sea Water Sampling Stations

The air temperature and water temperature at the surface were measured with a regular thermometer, whereas water temperature at the bottom and middle layers were measured using a reversing thermometer.

Color was measured using the procedure 2120 given in the Standard Methods for the Examination of Water and Waste Water[1].

The taste and odor were determined using the procedures 2160 and 2150 in the Standard Methods for the Examination of Water and Waste Water, respectively.

The transparency was measured using the "secchi disc" method.

The pH of the collected sample was measured using the Radiometer Model PHM 80, pH meter.

2) Collection of sea water Samples

Water samples were collected at the surface and bottom layers in stations 1, 2 and 3 which were approximately 5 m deep. Samples were collected from 3 different layers (surface, bottom and middle) in stations 4, 5 and 6 which were approximately 50 m deep.

In each of the layers that were sampled, a 10-L composite sample was first prepared by collecting 2 L water sample from the required depth using a Cole-Palmer nansen sampler[2] The procedure was repeated for 5 times to prepare a 10-L composite sample. The composite sample which was prepared in a 20 L capacity polyethylene container was mixed thoroughly and divided into 1L sample bottles each of which contain different preservation solution for different parameters to be analyzed. Two separate composite samples were prepared at each depth. Thus 2 samples for each parameter were collected at each station and at each sampling depth. A total of 30 sea water samples were collected for each parameter. The type of bottles, preservation solution used, sample volume needed for each analysis are given in Table 1.

3) Collection of river water samples

The river water samples were collected at the point where Hacimuratli Stream flowed

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[1] American Public Health Association, Standard Methods for the examination of water and waste water, Clescery L. S., Greenberg A. E., Trussell R. R. (eds), Published jointly by American Public Health Association, American Water Works Association and Water Pollution Control Federation, Washington DC (1989)

[2] The sampler was lowered to the required depth both ends open. Both ends were closed at the sampling depth by sending a messenger, thus confining the water sample from that particular depth in the sampler.

to the Marmara Sea. A 10-L composite sample was collected by extracting 2 L samples at 5 points across the stream[3]. The composite sample formed is mixed thoroughly in a 20 L capacity polyethylene container and divided into individual 1 L capacity sample bottles each containing different preservation solutions for different parameters to be determined. The composite sample was formed twice and hence two samples were collected for each parameter.

The flow of the stream was determined by constructing the bottom topography of the stream by measuring depth at every 50 cm interval. Then the water flow was measured at every 50 cm and at three depths using a flowmeter. The flow of the stream was determined by combining the average flow at each column which is 50 cm wide. Although the method is fairly straightforward and proved reliable in our previous studies, the uncertainty of flow measured in this study is expected to be high due to very low level of water and very slow flow of the stream. In such cases, the surface flow can be determined by the highly viable wind speed and can even be negative.

TABLE 2.1.2 Summary of Methods Used in Analysis of Sea and River Water Samples

	Preservation	Sample volume used (mL)	Method Reference
Color	4°C	25	SMA No2120
COD	H_2SO_4, 4°C	50	SMA No5220
Suspended solids	4°C	150	SMA No 2540
Total Coliform	sterilization, 4°C	100	SMA No9215
Fecal Coliform	Sterilization, 4°C	100	SMA No9215
Surface active agents	4°C	10	SMA No5540C
Oil and Petrolum	H_2SO_4, 4°C	500	SMA No5520
Phenols	$CuSO_4$ + H_2SO_4, 4°C	500	SMA No5530
Total-N	H_2SO_4, 4°C	500	SMA No4500-N
Total-P	H_2SO_4, 4°C	50	SMA No4500-P

SMA: Standard Methods for the examination of water and waste water, Clescery L. S., Greenberg A. E., Trussell R. R. (eds), Published jointly by American Public Health Association, American Water Works Association and Water Pollution Control Federation, Washington DC (1989)

Although the sampling in the steam was supposed to be twice during the study period, we were able to conduct river sampling only once as it did not rain during the field studies.

[3] Although normally the composite sample should form by collecting 2L water samples at three points across the stream and at three different depths at each point, samples in this study were collected only from the surface as the water level in the stream was only 20 - 38 cm deep.

Sea water samples were analyzed for COD, Suspended solids, Dissolved oxygen, number of coliform group, number of fecal coliform group, surface active agents (that react with methylene blue), oil and petroleum, phenol and residual substance from tar.

River water samples were analyzed for: BOD, COD, suspended solids, total nitrogen and total phosphorous.

Samples were analyzed for the indicated water quality parameters using the Standard Methods for the Examination of Water and Waste Water (1989). Since the procedures used for the analysis can be found in the indicated reference, they will not be described in this report.

4) Water quality in the study area

The results of the sea water analysis are given in APPENDIX 2.

The quality of the marine environment in the study area is obtained by comparing measured concentrations of parameters with the sea water standards currently effective in Turkey. The water quality regulation currently effective in Turkey requires several measurements throughout the year. Since measurements were made in one day only, the comparison presented below can provide some information on the level of pollutants in the region, but do not have any regulatory significance.

The Water Quality Regulation defines two sets of standards for marine environment. One of these standards were for the general quality of the sea water and the second one for the coastal sea water which is being used for recreational purposes. Since the coastal waters in the study area are being used for recreation, comparison with standards developed for recreational waters is more appropriate. However, recreational water standards are not available for all parameters measured in this study. Because of this some of the parameters are compared with standards for general sea water quality. This comparison is presented in Figure 2.1.2~2.1.7 for selected parameters.

The acceptable range for the *pH* of the sea water is between 6.0 and 9.0. Measured pH in collected samples change between 7.94 and 8.19 all of which are well within the range.

The *dissolved oxygen* levels in all of the collected samples comply with the standard which requires that the DO should be higher than 80% of the saturation value.

Transparency measured by secchi disk reading change between 2 and 3.7 m. The

standrad requires transparency higher than 2.0 m in the sea water. The measured transparencies are around 2 m in the stations close to the coast and 3.0 m and higher in the open stations (stations 4, 5 and 6.) Although the measured transparencies are fairly close to standard in the shallow stations, it is due to resuspended sediments and do not imply pollution. The transparencies measured in the deeper stations are safely higher than minimum transparency required by the regulation.

Color, *odor* and taste measured in this study were all in natural levels which agrees with the standard given in the regulation.

The water quality standard for *total coliform groups* is 1000 per 100 mL. The measured populations in all stations were substantially lower than the standard. Only in the two surface samples collected in site-1 total coliform groups were higher than the populations found in other samples. But even these values which were around 200 per 100 mL were significantly lower than the existing standard.

Fecal coliform groups were not detected in most of the stations. Only in surface samples collected at stations 3 and 5, 1 - 2 per 100 mL were measured.

The measured values for *the surface active agents which react with methylene blue* changes between 0.2 and 1.7. The standard for recreational water is 0.3 mg L^{-1}. Most of the values measured values for surface active substances are either comparable or higher than existing standard for recreational sea water.

FIGURE 2.1.2

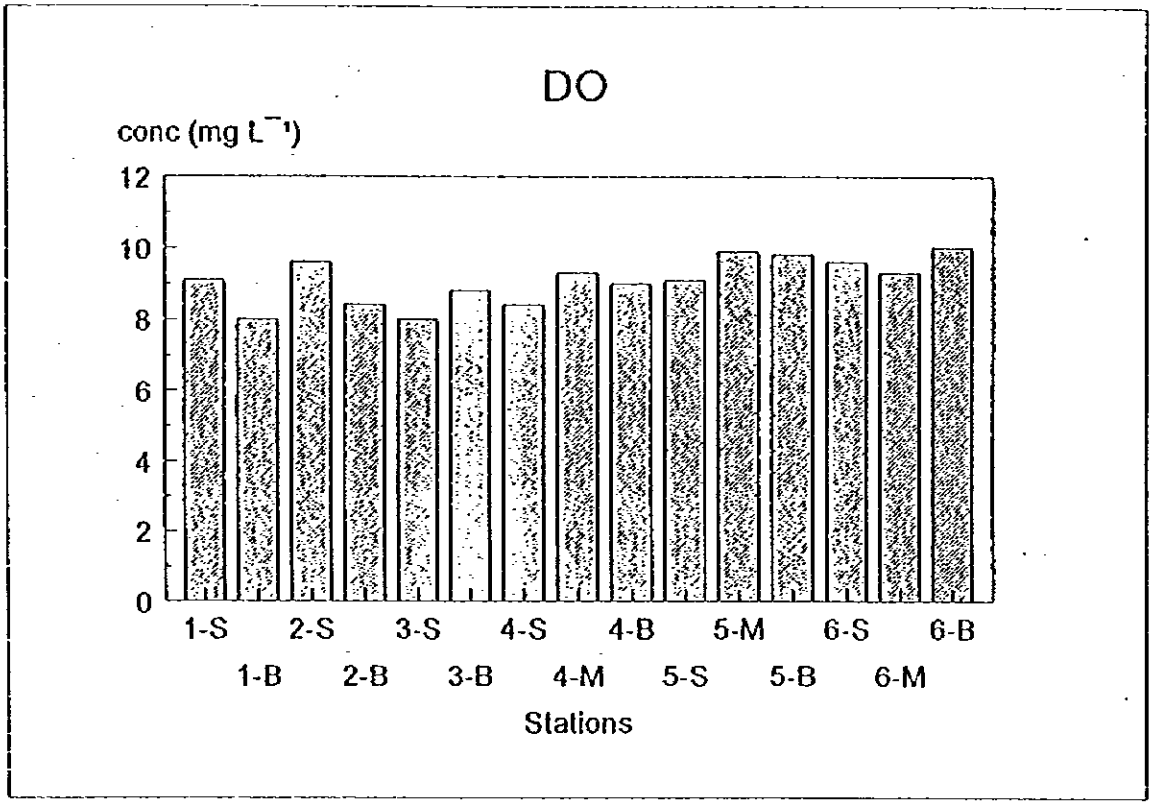
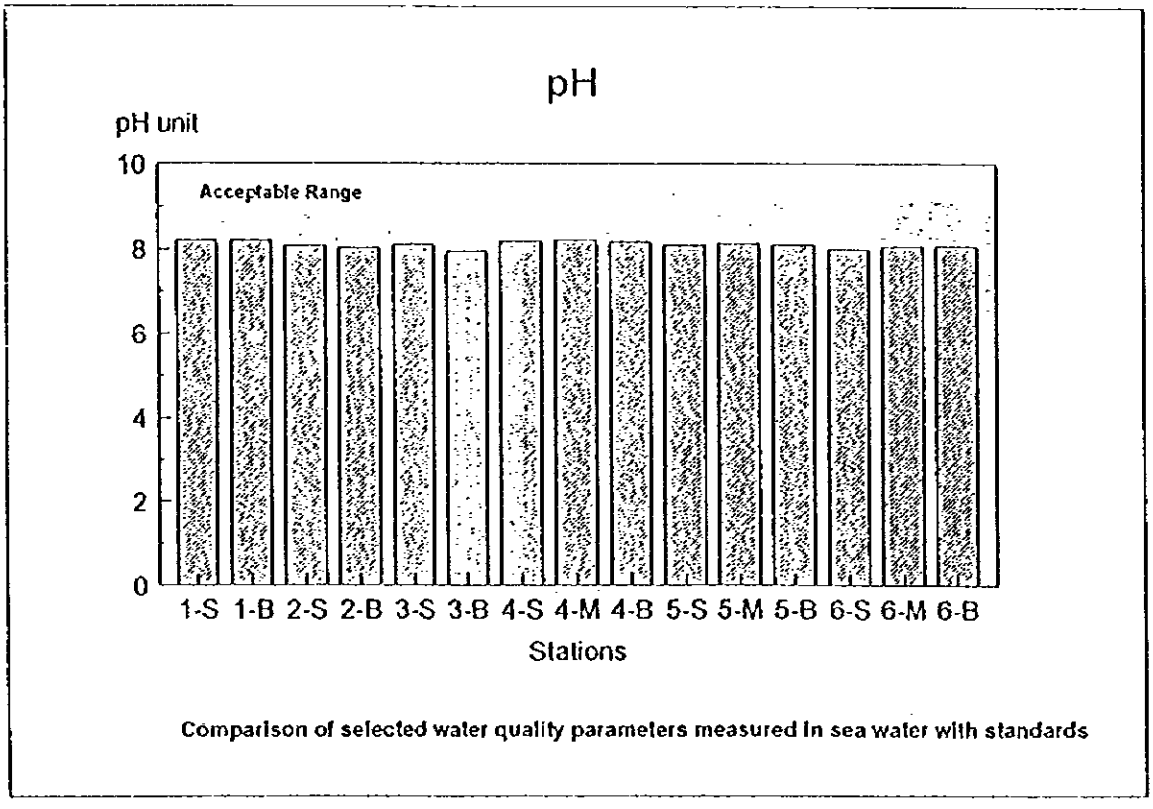


FIGURE 2.1.3



Comparison of selected water quality parameters measured in sea water with standards

FIGURE 2.1.4

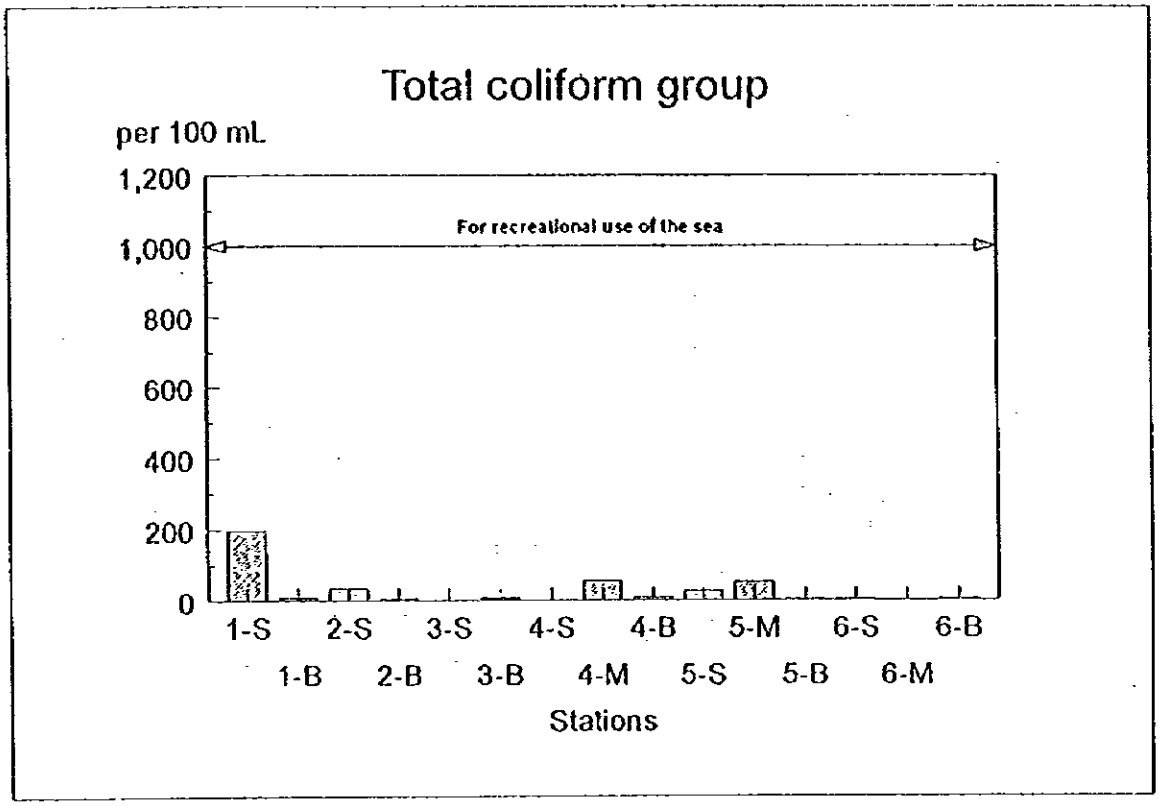


FIGURE 2.1.5

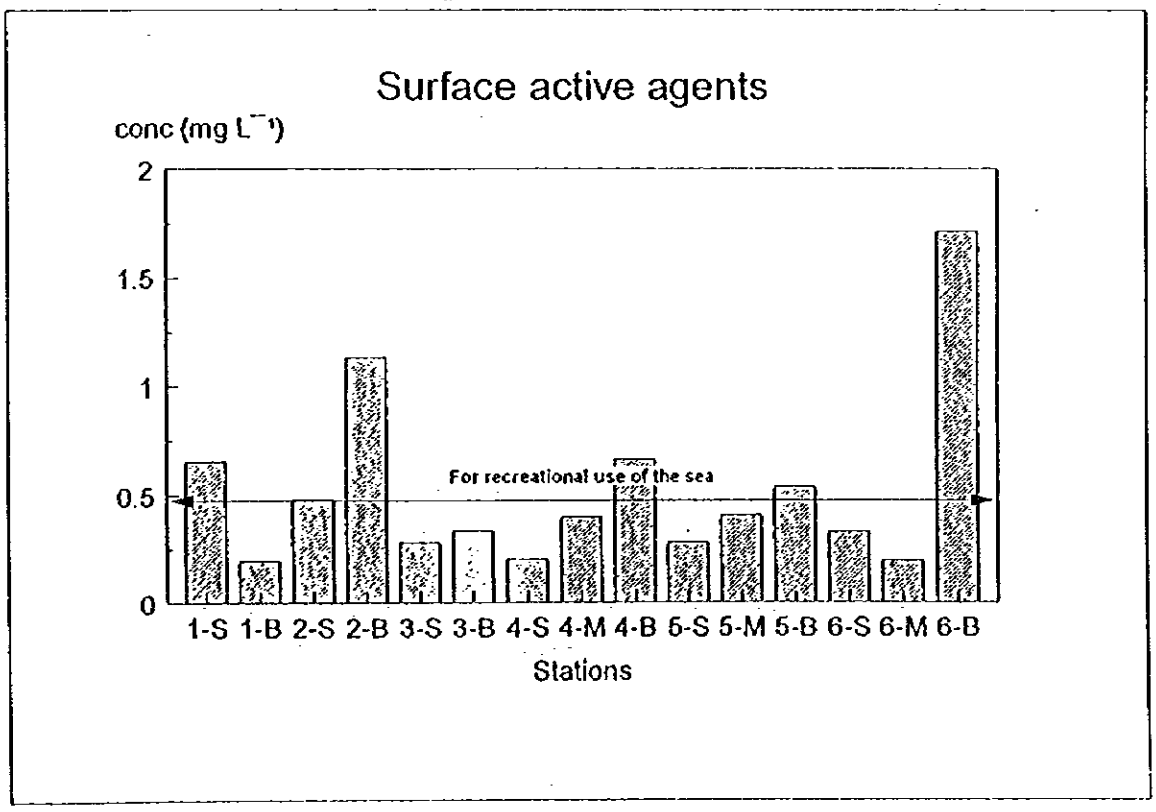


FIGURE 2.1.6

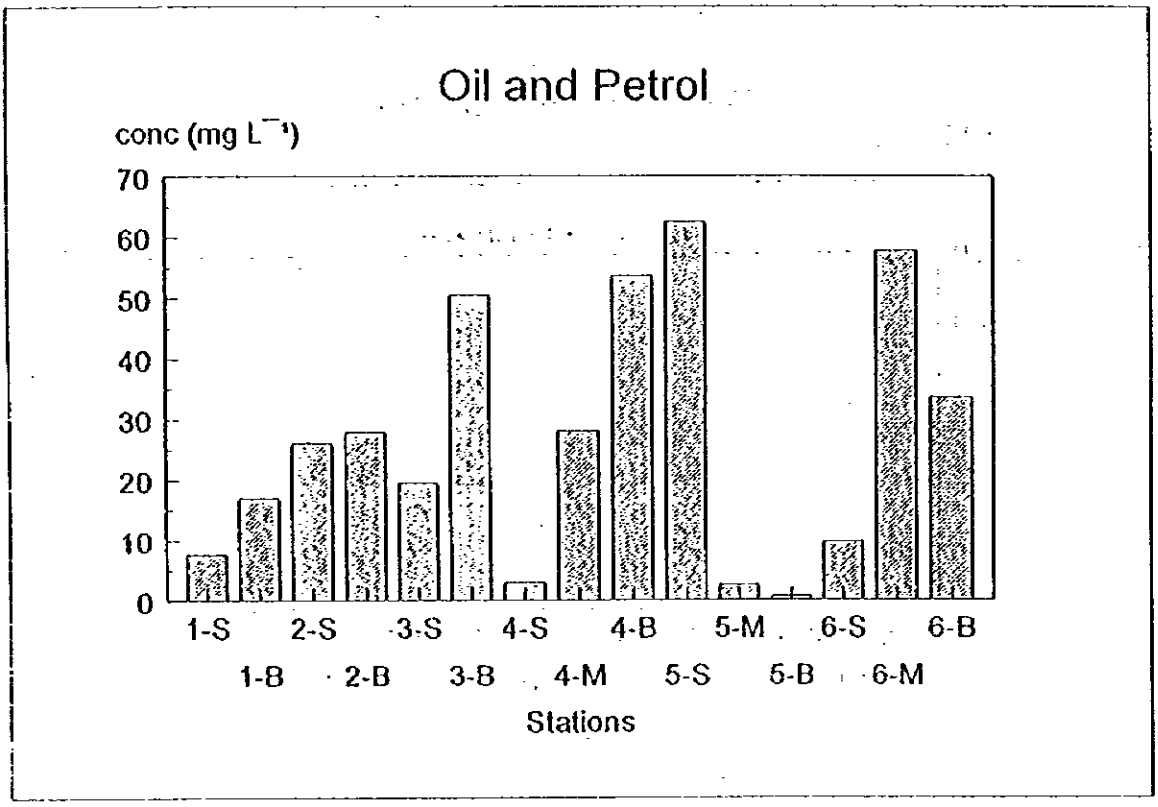
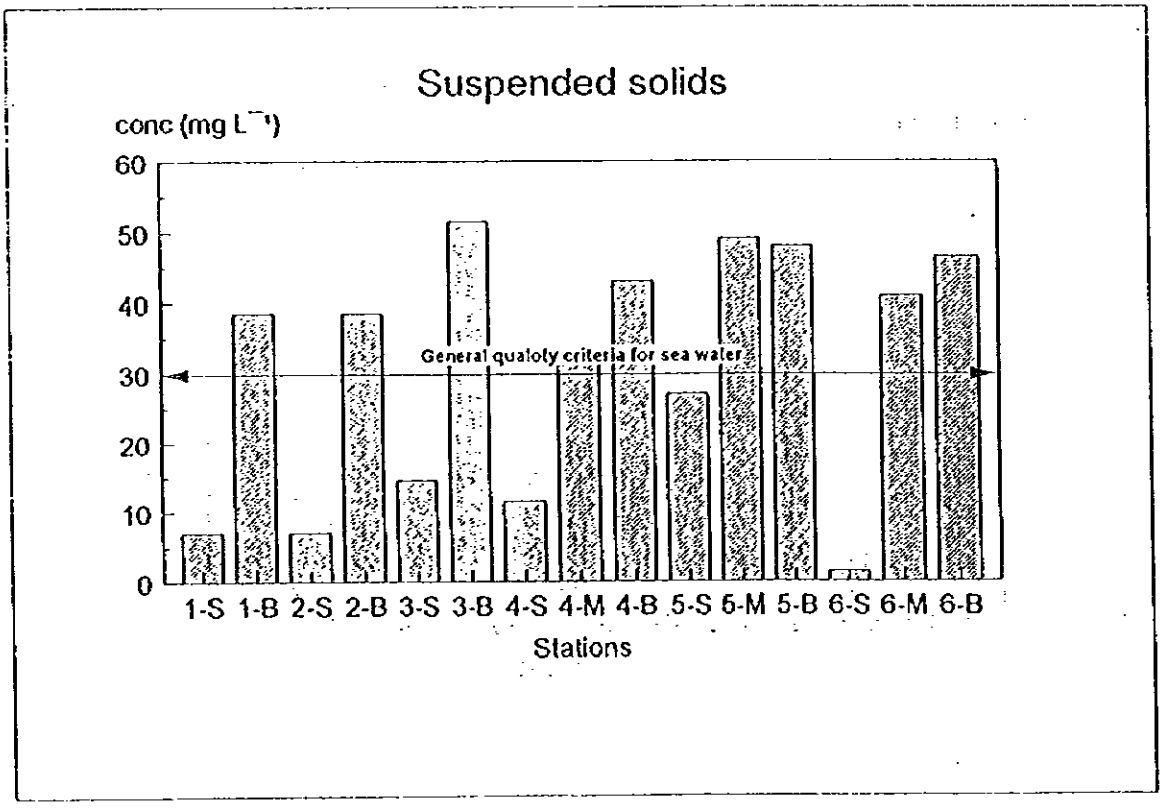


FIGURE 2.1.7



Measured *suspended solids* in the stations change between 1and 59 mg L^{-1}, whereas the standard for the sea water is 30 mg L^{-1}. The suspended solid concentrations at the surface samples are lower than this standard, but concentrations at the bottom or in the middle of the water column are higher than 30 mg L^{-1}. The suspended solids are contributed mostly by the resuspended sediments and do not indicate pollution.

The recreational sea water quality standard for phenol is 0.005 mg L^{-1}. Phenol is not detected in most of the collected samples, implying that the concentration is less than 0.001 mg L^{-1} which is the detection limit of the method used. In the samples where phenol is detected concentrations vary between 0.0016 and 0.0059 mg L^{-1}. These measured values are with few exceptions are below the existing standard, but the margin between measured values and the standard is not large indicating that the phenol concentrations if measured over a longer period may violate the standard.

The *tar residues* were not detected in any of the samples collected.

5) River water quality

The concentrations of parameters measured in the two samples taken from the Hacimuratli stream are given in Table 2.1.3 along with existing standards for inland water.

TABLE 2.1.3 Concentrations of Parameters in Hacimuratli Stream and Corresponding Water Quality Standards

PARAMETERS		SAMPLE 1	SAMPLE 2	STANDARDS Class I	Class II	Class III	Clas IV
BOD	(mg/L)	23.6	24.4	4	8	20	>2(
COD	(mg/L)	72	88	25	50	70	>7(
SS	(mg/L)	27	26	5[1]	15[1]		
TKN	(mg/L)	11.01	10.8	0.5	1.5	5	>5
T-P	(mg/L)	8.261	7.897	0.02	0.16	0.65	>0.6
Flow rate	(m/s)	0.625					
pH		7.44		6.5-8.5	6.5-8.5	6.5-9.0	
Water temp	(C)	4.7					
Air temp	(C)	2					

Standards for lake water

The Water Quality Regulation describes 4 different quality of water and defined standards for each of them. Class I water is defined as the high quality water. Class II water is slightly polluted water. Class III water is polluted water and Class IV water is defined as the heavily polluted water.

Class I water can be used as drinking water after disinfecting, can be used for recreational purposes, for fish farming etc. Class II water can be used as drinking water after extensive treatment, for recreational purposes and for fish farming. Class III water can only be used as industrial water after appropriate treatment. Class IV water should not be used.

The table shows that most of the parameters measured in this study exceeds standards for Class I, Class II and Class III water standards, clearly demonstrating that the Hacimuratli stream is a heavily polluted water body.

One should note that the measurements were done at a time when water level and flow in the stream is very low. Since concentrations of pollutants in the stream depends on the water discharge, these concentrations values measured in the stream can be lower during the times of high water discharge.

2.1.2 Surface Water Resources

There are no major natural and man-made waterways reaching the Sea of Marmara within the project area and its immediate surroundings. Further, there are no significant wetland areas in the region of interest. In other words, there is no significant inland surface water body (i.e., lake, stream or river) that can be utilized for electrical energy production, potable water supply, transportation and recreational activities exist in the project area and its immediate vicinity.

(1) General Characteristics

The only inland surface water bodies within the surroundings of the proposed site area are a few small and seasonal creeks. Among these creeks, the so-called Hacimurath Creek is the only one which carries a relatively small amount of water throughout the year. As also mentioned in Section 4.2, Hacimurath Creek receives some domestic, agricultural and industrial pollution load.

(2) Field Surveys to be Conducted

The existing environmental quality and pollution load of the Hacimurath Creek will be identified through detailed field surveys and measurements. The sampling will be carried out at the mouth of the Hacimurath Creek in two different periods (twice in both rainy and dry seasons). The laboratory analyses to be carried out to characterize the chemical and biological quality of the Hacumurath Creek will include pH COD, biochemical oxygen

demand (BOD), SS, total nitrogen (TN) and total phosphorus (TP).

2.1.3 Groundwater Resources

According to the hydrogeological survey reports of the General Directorate of State Hydraulic Works (DSH), the only area which has a groundwater potential along the entire coastline between Silivri and the border with Greece is the vicinity of Enez district to the west of Saroz Bay. In other parts of the coastal area between Silivri and the Saroz Bay, groundwater can only be found in shallow alluvial formations along stream beds or in deep wells (150-200 m) in marn or shale formations from the Miosen. Other Eosen, Oligosen and Pliosen formations do not carry groundwater.

The main formation of the coastal area near the proposed site is the Oligosen aged Osmaneik Formation. Therefore, there are no major aquifers in or near the project area for the proposed port facility.

2.2 Sewage Discharge

2.2.1 Domestic Wastewater Discharges

In general, the coastal zones of Tekirdag between Silivri and the outskirts of Marmara Ereglisi towards the Province Center are densely occupied by private summer houses. There are also a few tourist facilities mostly serving local residents and visitors from nearby areas. However, the coastal area near the Tekirdag Province Center which includes the proposed project site is much more sparsely utilized as compared to the other parts of the coastline. In particular, the proposed site has not been subjected to any kind of development or planning decision since it is allocated as a Military Security Zone. The summer houses near the proposed site mostly has septic tanks and therefore there is no direct sewage discharge into the marine environment. However, it is being suspected that the Hacimurath Creek carries domestic effluents from the settlements located upstream.

2.2.2 Agricultural Pollution

(1) General Characteristics

In general, soils of the Tekirdag Province are suitable for agriculture. Climatological and meteorological conditions within the province also favor agricultural production. On the other hand, soil erosion and use of agricultural land for other purposes are the major problems of agriculture in the province. In particular, productive lands near the shoreline are occupied with settlements and primarily utilized for summer-house construction. Besides, in the recent years, industrial developments rapidly increased mainly in the inland region between Çorlu and Çerkezköy.

Under these circumstances, the total amount of cultivated land of the province is approximately 3.5 million decares (da). In general, the agriculture in the province is rain-fed. Only an estimated total of 151,728 da of land is irrigated. Even though cereal (mainly wheat) and sunflower are the main agricultural crops of the province, the pattern of agricultural products mostly depends on the socio-economic preferences of the producers.

In general, in the Province of Tekirdag, the production efficiencies for various products are higher than the national averages. For instance, wheat production efficiency of the Tekirdag Province is about 4,000 kg/ha which is considerably higher than the national average of about 2,000 kg/ha. In addition to wheat and sunflower, sugar beet and green onion are other important products of the province. Similarly, the production efficiencies of these crops are also about two times higher than the national averages. It must be noted that about 50% of the national green onion production is supplied from the Tekirdag Province. Grape production has an important place in the region. In this regard, even though only about 1.3% of the total vineyards of the country are located in Tekirdağ, the province is among the predominant wine producing provinces of the country. Vegetable and fruit production are also important agricultural activities of the province.

(2) Proposed Site

As discussed in Section 4.2.1, there is no agricultural activity in the proposed project site. However, there is some agricultural activity in the areas to the north of the proposed site and available portions of land in this area are being utilized for crop production without irrigation. Further, it has been reported that all regional soils are subject to mild water erosion when irrigated. Under these circumstances, it is being suspected that the Hacimurath Creek, which drains the area to the north of the project site, may carry agricultural pollutants especially during the rainy season.

2.2.3 Industrial Pollution

Over the years, the increase in agricultural production resulted in an increase in the total income of the inhabitants and a local capital has accumulated in the region. This capital is partly spent for the development of industry within the province boundaries. In this regard, various agricultural based industrial facilities are established in the region in the last 20 years, and the share of industrial activities in the regional economy has increased markedly. As an example, numerous seed oil refineries within the boundaries of the province constitute an important industrial sector.

There are a number of industrial establishments planned (such as two natural-gas-fired thermal power plants) or already constructed (such as the BOTAS LNG terminal) along the coastal area surrounding the shores of Marmara Ereglisi. In particular terms of the proposed site, there is a seed oil refinery along the banks of the Hacimurath Creek. It is being suspected that the Hacimurath Creek receives industrial effluents from this establishment.

2.3 Road Traffic and Air Quality

2.3.1 Existing Road System

The Province of Tekirdag is an important junction to Europe with respect to its location in Thrace. The most important roads within the province are the Trans European Motorway (TEM) as well as the E-84 and E-80 (formerly E-5) state highways. The portion of the state highway takes the name of Route 110 within the boundaries of Tekirdag, and land transportation to the project area is mainly provided via this highway between Tekirdag and Istanbul.

Excluding the TEM, there exists 387 km of state highway, 282 km of main road (provincial road) giving a total of 669 km within the Province of Tekirdag. Of the state highways, 207 km is asphalt and 173 km is surface paved. The main provincial roads comprise of 2 km asphalt concrete, 228 km surface paved and 26 km stabilized road. The estimated traffic load on these roads are given in Table 2.3.1.

TABLE 2.3.1 Average Daily Traffic Load in the Roads of Tekirdag

Route	Length of road (km)	Traffic Volume as of 1993					% Heavy Vehicles
		Automobiles	Bus	Trucks	Trailer	Total	
100-03,1	23	4,915	1,087	2,214	211	8,427	29
100-03,2	15	4,915	1,087	2,214	211	8,427	29
100-03,3	2	4,915	1,087	2,214	211	8,427	29
100-04,1	11	4,915	1,087	2,214	211	8,427	29
100-04,2	12	8,083	1,313	5,075	156	14,627	36
100-03,5	7	2,764	239	1,203	116	4,322	31
110-04,1	8	3,642	377	1,276	68	5,363	25
110-04,2	34	3,642	377	1,276	68	5,363	25
110-04,3	9	3,642	377	1,276	68	5,363	25
110-05	9	3,642	377	1,276	68	5,363	25
565-04,1	11	1,768	202	924	40	2,934	33
565-04,2	21	1,768	202	924	40	2,934	33
567-03	14	1,776	534	1,355	271	3,736	44
567-04	1	0	0	0	0	0	0

Source: TCK, 1994.

In short, the location of the province is favourable in terms of transportation. However, there is room and need for further development in the existing transportation network. With the implementation of the proposed project, the province will beceome an important center for trade and industry.

2.3.2 Air Quality

It is important to determine the ambient pollutant conceentrations in or near the proposed site to assess the potential impact of emissions associated with the operration of the proposed port facility. Then, the predicted pollutant concentrations can be added to the existing ambient pollutant levels to assess the air quality impact of the proposed port. For this purposed, gathering ambient data from an existing monitoring station would be favorable. However, there is no recorded long or short-term data available for the project area. Thus, a special field monitoring study will be conducted to measure the concentration of pollutants that may be emitted during the operation of the proposed port facility.

(1) General Characteristics

The study area is far from any known major emission sources. Thus, the ambient concentrations of various air pollutants are expected to be quite low in the proposed site. In

this regard, the results obtained from a short-term measurement programme, conducted near the BOTAS LNG Terminal during the April of 1994, revealed that the ambient concentrations of No_x (NO and NO_2), suspended particulate matter (SPM) and SO_2 are at least an order-of-magnitude smaller than short and long-term standards specified in the Turkish Regulation on Preservation of Air Quality (Official Gazette, #19269 dated 02.11.1986).

(2) Field Survey to be Conducted

In general to estimate the current levels of various air pollutants, the Turkish Regulation on Preservation of Air Quality requires a one-year long measurement programme for the calculation of the so-called "long and short-term values". In other words, under ideal conditions, the "long and short-term values", computed from measurement programs which are not shorter than one year, are to be compared with the relevant ambient air quality standards. However, shorter measurement programmes have been utilized in many cases where the expected levels of the ambient concentrations are not particularly high.

In such cases, one-week long ambient air measurement programmes are accepted to be sufficient due to the fact that even a factor of two or three increase in ambient concentrations would not alter conclusions of an air quality impact assessment if the baseline concentrations are considerably low in an air-shed.

Therefore, a short-term sampling and analysis programme of two sets of daily measuremnts has been planned for the proposed project. In this regard, sampling shall be performed in three designated places along the borderline of the proposed port facility. The parameters to be analyzed include SO_2, CO, NO, NO_2, O_3, Cl_2, HC, Hcl, Cl, HF, F, H_2S, SPM as well as Pb and Cd contents in both SPM and sedimentary dust.

(3) Air Quality Measurements

1) Sampling and measurement location

Samples were collected and in-situ measurements were conducted at the sampling location which is old NATO proposed port site, located approximately 15 km to the north of the Tekirdag, between February 28 and March 7, 1997.

Approximate positions of sampling and measurement points are depicted in Figure 1. Field studies were started in Site 1 at February 28, 1800 hours and continued until March 2, 1200 hours. Eight samples and measurements were conducted in this site at 1800, 2400 hours in February 28, 0600 hours, 1200 hours, 1800 hours and 2400 hours in March 1 and 0600 hours and 1200 hours in March 2. After the sampling and measurements were completed, the

equipment were moved to site 2. Sampling and measurements in this site were conducted at 1200 hours, 1800 hours, 2400 hours in March 3, 0600 hours, 1800 hours and 2400 hours in March 4 and 0600 hours and 1200 hours in March 5. After the measurements and sampling in site 2was completed the mobile laboratory, together with equipment were moved to site 3 where the sampling and measurements were conducted at 1800 hours and 2400 hours in March 5, 0600 hours, 1200 hours, 1800 hours and 2400 hours in March 6 and 0600 hours and 1200 hours in March 7.

Most of the air quality survey, except for measurements done at site 1 was conducted in the mobile laboratory taken to the study area from Ankara. Power to the sampling equipment and measurement devices were supplied from a 2.5 kW capacity generator. However, there was a building at site 1 and instruments were installed to the building at site 1 and instruments were installed to the building during the studies in this station.

Two types of measurement approaches were employed in the determination of the air quality in the study area.

a) The parameters, SO2, CO, NO2, NO, O3, HC were measured in situ using automated instruments.

b) Concentrations of F^-, Cl^-, HCl, HF, CL_2, H_2S, particulate-Pb, particulate-Cd, setting-Pd and setting-Cd were determined by collecting samples and analyzing collected samples for these analyses in the central laboratories and Ankara

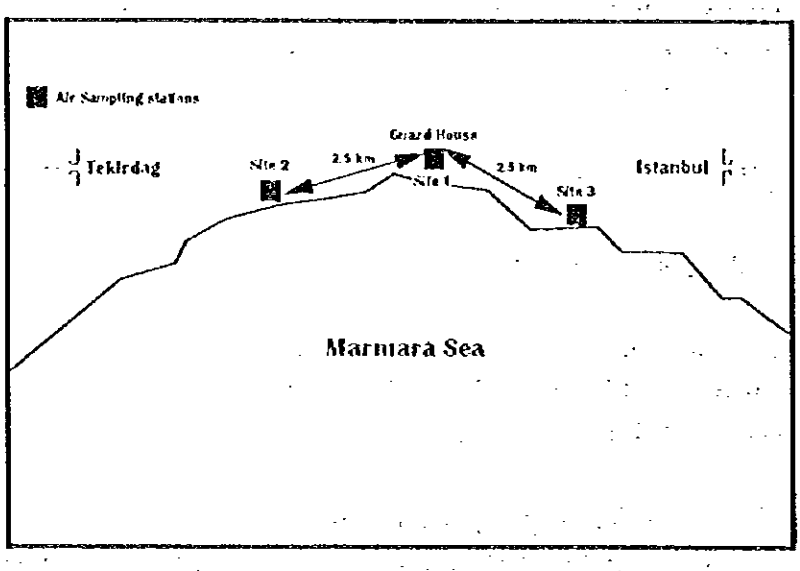


FIGURE 2.3.1 Approximate Positions of Air Quality Survey Stations

2) In-situ measurements

The SO_2 measurements were performed using and an ENVIRONMENT AS, Model AF 21M monitor. The instrument is fully automated and based on UV fluorescence principle. The detection limit is 1 ppb (2.9 $\mu g\ m^3$) and measurement interval can be adjusted from 15 min to 24 hr. SO_2 concentrations were measured on an hourly basis in this study[4].

The NO and NO_2 measurements were performed using an ENVIRONMENT AS, Model AC31M monitor. The instrument is fully automated and based on chemiluminescent principle. The instrument consists of two channels. In one of the channels NO is measured directly and in the second NO_2 is first reduced to NO using a Mo reducing chamber and then NO produced is measured with the same principle. The detection limit is 0.3 ppb (0.6 and 0.4 $\mu g\ m^3$ for NO_2 and NO, respectively) and measurement interval can be adjusted from 15 min to 24 hr. Like SO_2, NO and NO_2 measurements were also conducted on an hourly bases in this study.

Ozone measurements were conducted using an ENVIRONMENT, model $O_3$41M O_3 analyzer. The instrument were based on UV absorption principle an was fully automated like SO_2 and No_x analyzers. The detection limit is 1 ppb (2.2 0.4 $\mu g\ m^3$) which is perfectly sufficient for the measurements made in this study. The measurements were made on an hourly basis, as in the case of SO_2 and No_x.

CO measurements were done using ENVIRONMENT AS, model CO11M automated CO monitor. The detection limit of the instrument was 50 ppb and measurements were conducted only four times in a day (0600, 1200, 1800 and 2400 hours).

The HC measurements were done in-situ using an ENVIRONMENT, Model HC51M hydrocarbon and total VOC monitor which has a detection limit of 1 $\mu g\ m^{-3}$.

3) Sample collection

a) Collection of suspended particle samples (<10 μm)

Suspended particle samples for Cd and Pd were collected using ANDERSEN, high-volume sampler which is equipped with a preimpactor with a cut-point of 10 μm which prevents particles with aerodynamic diameters larger than 10 μm reaching to the filter. Air flow rate through the filter was 60 $m^3\ h^{-1}$. Particles were collected on cellulose (Whatman-

[4] Although hourly data are available, only measurement results corresponding to measurement periods - namely 0600, 1200, 1800 and 2400 hours were included in Appendix-1 where results are presented.

41) filters which were preweighted in a constant humidity chamber in the laboratory before they were shipped to the field. The volume of air that is passed through the filter during the sampling period was determined using a high-volume dry gas meter. Sampling was performed four times in a day between 0600 - 1200, 1200 - 1800, 1800 - 2400 and 2400 - 0600 hours. In the beginning of the sampling period, a preweighted filter was loaded to the cassette in the mobile laboratory and carried to the sampler. At the end of each sampling period, filter-cassette containing collected sample was carried to the filed laboratory where the filter was removed from the cassette and heat-sealed in a clean (acid-washed) polyethylene bag together with the record sheet that contained information on the dry gas-meter readings (before and after sampling), the chart showing the flow rate through the filter during sampling and observations of atmospheric conditions during the sampling period. The cassette, was then cleaned, loaded with a fresh filter, carried to the sampler and a new sampling period was started. Eight particulate samples were collected during 2-day sampling at each site.

b) Collection of dry deposition (setting-dust) samples

Dry deposition samples were collected on 10-cm diameter polyethylene slides, four times in a day (between 0600-1200, 1200-1800, 1800-2400 and 2400-1200 hours.) Eight setting-dust samples were collected at each site. After each sampling period, slides containing setting-dust samples were covered, sealed and stored until they were transferred tot he central laboratory in Ankara at the end of the study period.

4) Analysis

a) Analysis of F^-, Cl^-, HCl, HF and H_2S

Since automated instruments were not available for the measurement of F^-, Cl^-, HCl, HF and H_2S, their measurements were performed by manual methods which include collection of indicated parameter in an appropriate absorbing solution or on an filter impregnated with appropriate absorbing solution and subsequent analysis in the laboratory. The ASTM standard methods of analysis were used in the determination of all these parameters with the exception of HCl which was analyzed by a stack-filter technique that is well described in the literature.

The H_2S was determined using the ASTM D 2725-87 procedure. In this method, a measured sample of the gas was bubbled through zinc acetate solution. N,N-dimethyl-p-phenylenediamin in acid solution and ferric chloride were added to the zinc acetate solution and react with the zinc sulfide to form the dye methylene blue. The methylene blue was determined spectrophotometrically at 745 nm.

The particulate and gaseous fluorides were determined using the ASTM method D 3266 - 91. Where the air was pulled through a stack-filter unit where it first passed through a Teflon filter to remove particulate matter which contain fluoride, then through alkali-treated cellulose filter to capture gaseous fluoride. After collection filters containing particulate and gaseous fluoride were taken to the central laboratory where the fluoride on filters were solubilized and determined spectrophotometrically.

The HCl and gaseous chlorides were also determined with a similar stack filter system. The air was first passed through a Teflon filter where particulate chloride was removed and then passed through a nylon filter which is well known for its high efficiency for collecting HCl and gaseous chloride species. Teflon and nylon filters containing samples were brought to the central laboratory in Ankara where the chloride was dissolved and determined by ion chromatography.

b) Analysis of suspended particles and setting dust

At the end of the study, filters containing suspended particles samples were taken to the central laboratory in Ankara for analysis of mass, Cd and Pb in them. In the central laboratory samples were taken out of their polyethylene bags in a class-100 clean area. The filters were weighted in constant humidity chamber and divided into 4 quarters. Each quarter was weighted to calculate air volume associated with each filter section.

One of the quarter filters were subjected to digestion using HNO_3 - HF mixture, in Teflon breakers, using the procedure developed in our laboratories. The Pb and Cd concentrations in the digests were measured using a Perkin-Elmer 1100B atomic absorption spectrophotometer coupled to a HGA 700 graphite furnace atomizer. The analytical conditions such as wavelength, slit with and position of the atomizer were optimized before analysis. Method of standard additions was employed in all analysis. The quality of the standards used in the AAS analysis were routinely checked using NIST standard reference material river sediment (SRM 2704).

One field blank was prepared in every day during sample collection and the blank filters were analyzed along with samples in the laboratory. Field blanks were prepared by installing a clean preweighted filter to the sampler, like a sample. But, air was pulled through the filter for only 30 sec. After 30 sec, sampler was stopped and blank-filter was treated and analyzed exactly as the sample filter.

In Ankara, setting dust slides were opened in the class-100 clean area and deposits were transferred to Teflon beakers with a minimum amount of water. In the Teflon beakers

they were digested with HNO_3 - HF mixture. The digests were analyzed for Tl, Pb and Cd by AAS using the procedures described previously for the analysis of Pb and Cd in suspended particles.

5) Result and discussion

a) Existing air quality

Data generated in the study are given in APPENDIX 1.

Existing air quality in the region can be determined by comparing concentrations of measured parameters with the available standards. The long and short term standards for the parameters that were measured in this study are given in Table 2.3.2. In the National Air Quality Regulation, long-term standard is defined as the value which should not be exceeded by the annual average of the data generated in the air quality survey. Short-term standard, on the other hand, is defined as the value which should not be exceeded by the daily averages or 95 percentile of the data generated in the survey. Based on these definitions, the values generated in this study is more comparable with the short term standards.

Although, the air quality in the region will be evaluated based on the comparison with short-term standards given in the Air Quality Regulation, it should be noted that low values measured in the study do not necessarily indicate compliance with the standards, because the measurement program performed in the survey does not comply with the duration and frequency of sampling given by the regulation. The Air Quality Regulation requires a minimum of 6 months for the measurements (continuous or periodic). Only values generated at the end of 6 month long monitoring can be compared with the short and long term standards given in the regulation. Since the survey performed in this study was one week-long, the results obtained do not have any legal significance. However, the results of the air quality survey can provide at least some information on the current air quality in the region.

The parameters measured in this study are compared with the short and long term standards effective in Turkey in Figure 2.3.2~2.3.17. As mentioned previously, short term standards are more comparable to measured parameters than long term standards which requires an annual average for comparison which is not available.

FIGURE 2.3.2

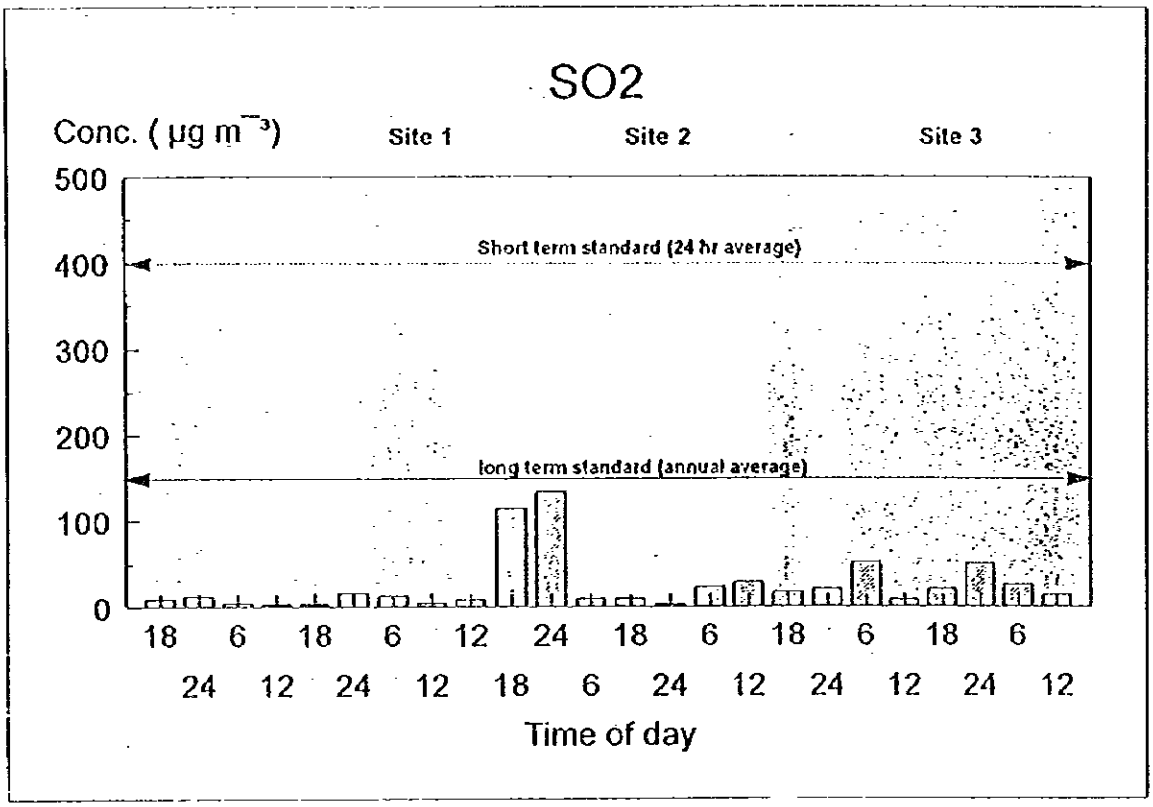
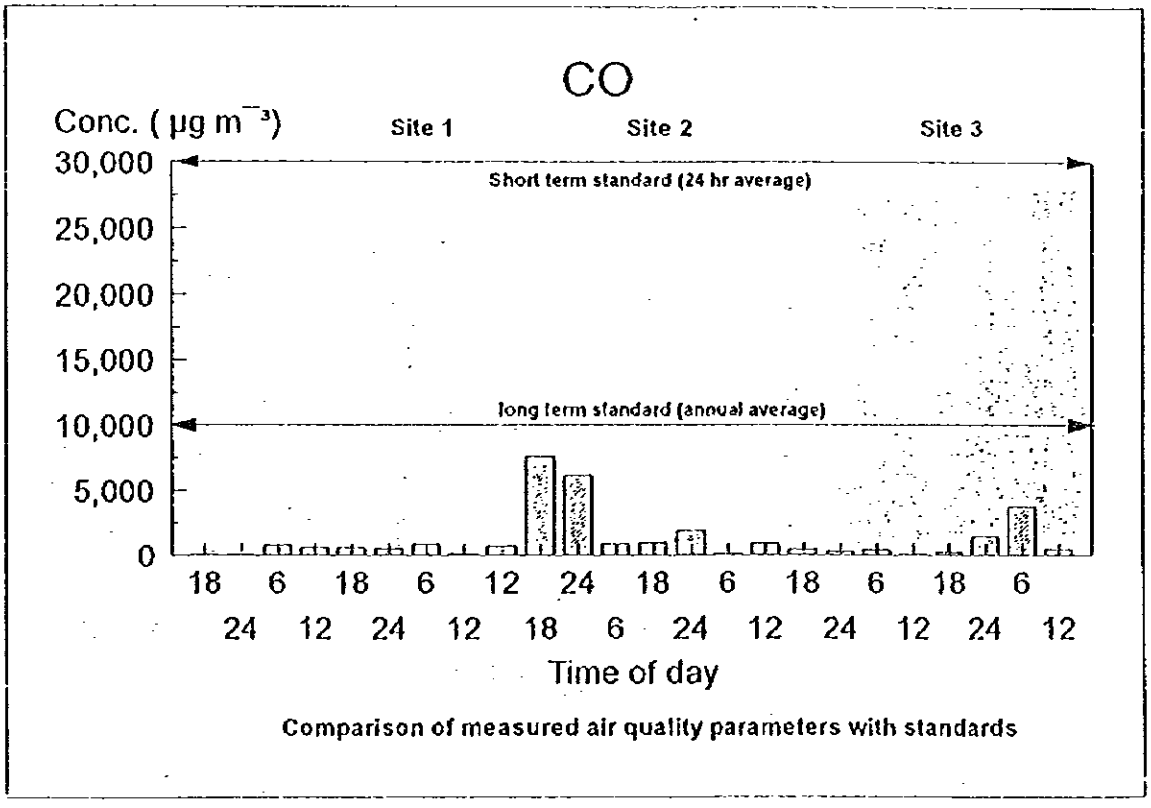


FIGURE 2.3.3



Comparison of measured air quality parameters with standards

FIGURE 2.3.4

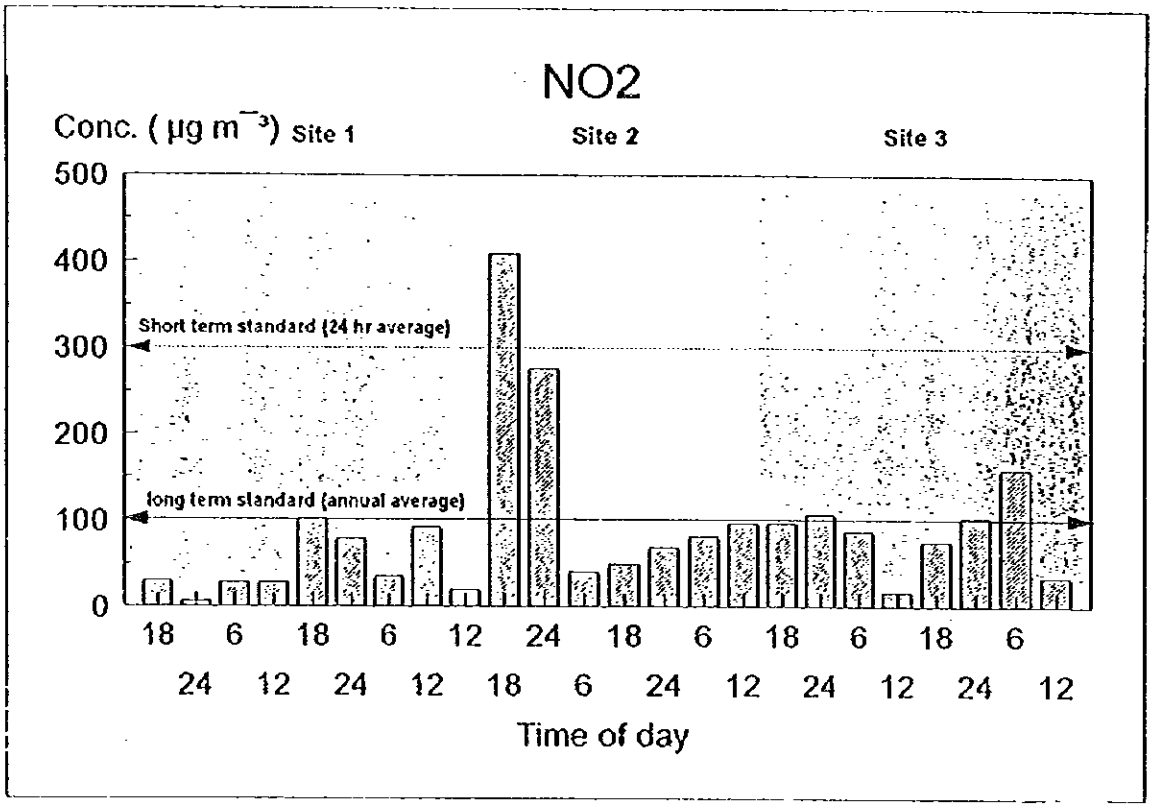


FIGURE 2.3.5

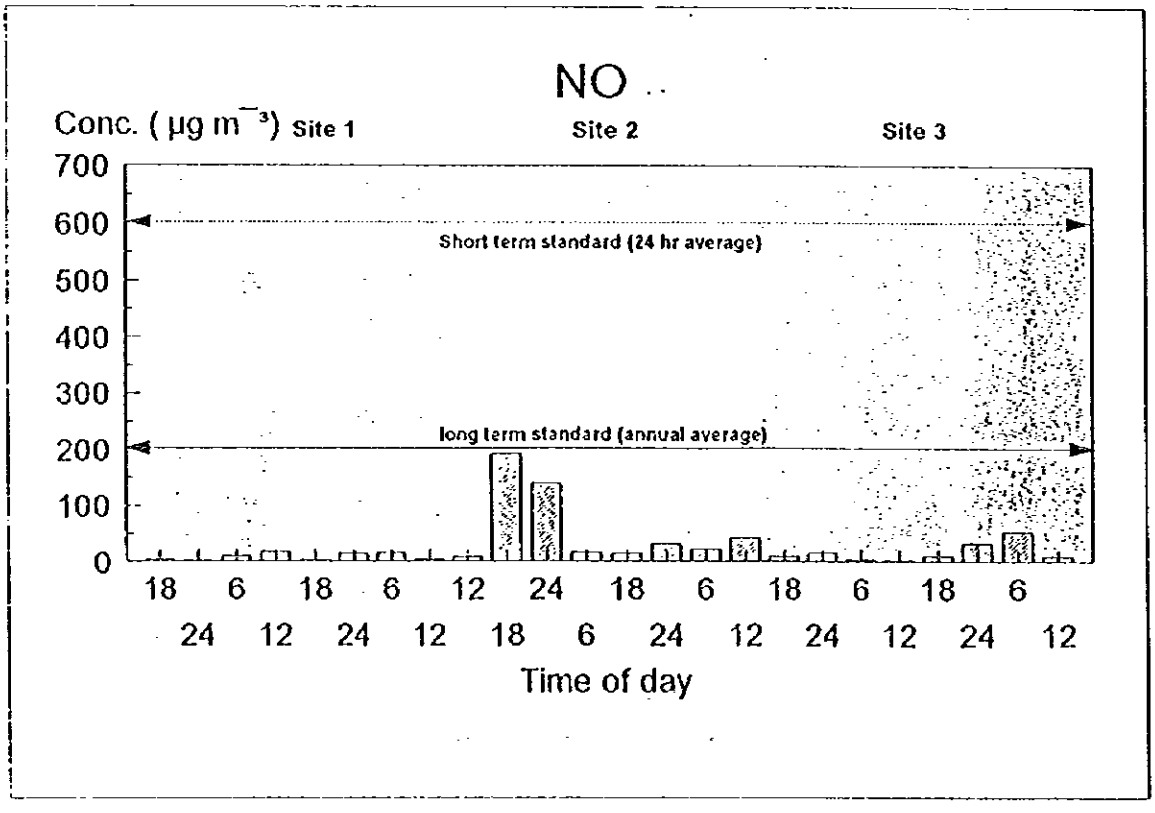


FIGURE 2.3.6

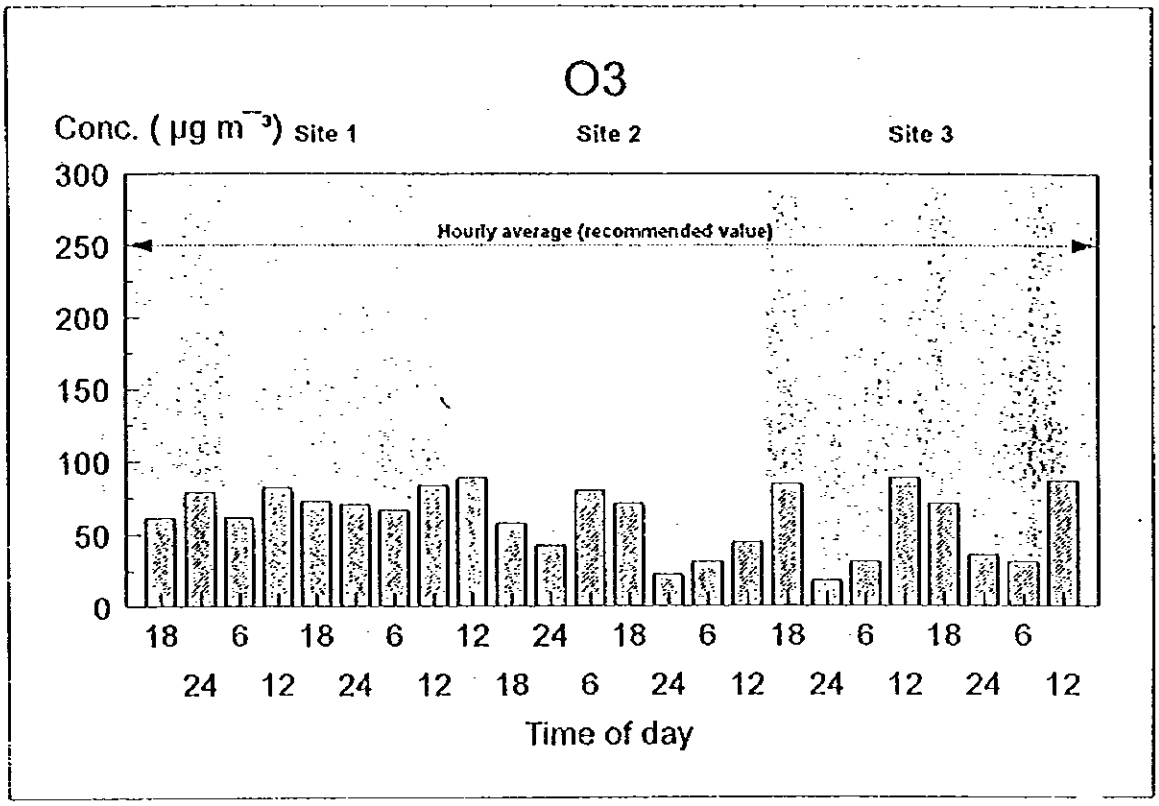


FIGURE 2.3.7

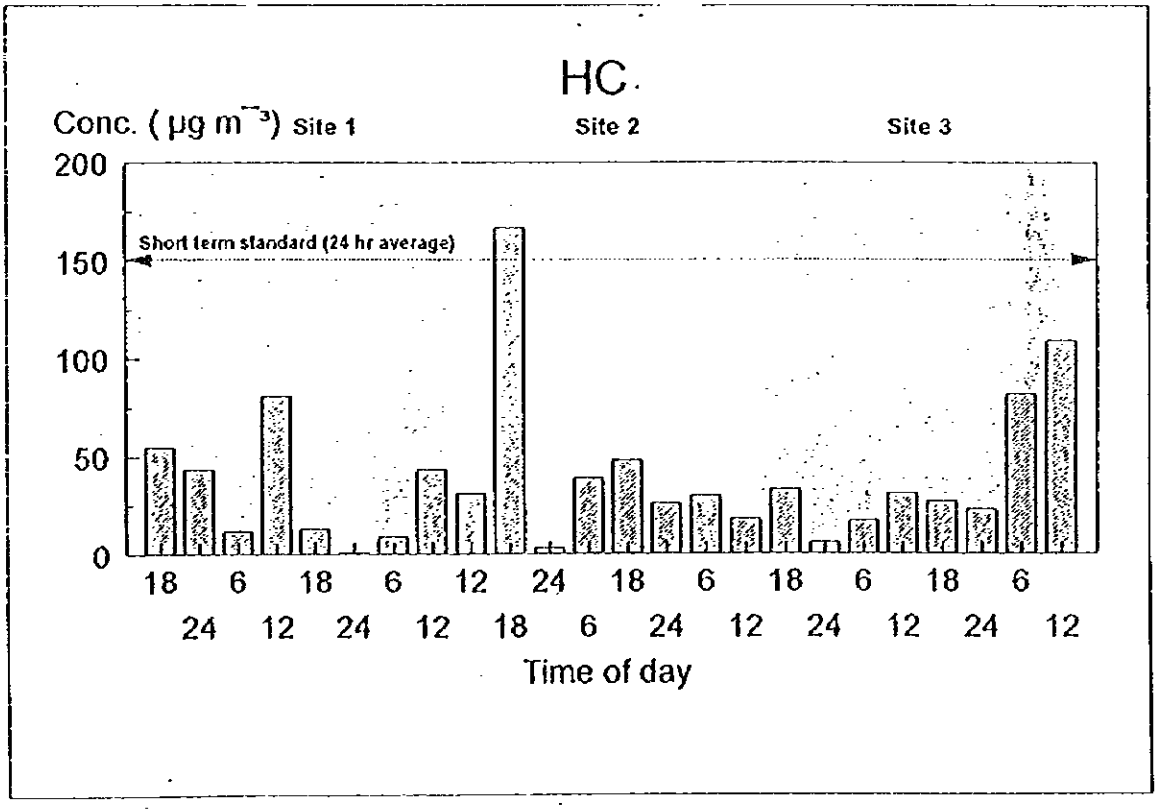


FIGURE 2.3.8

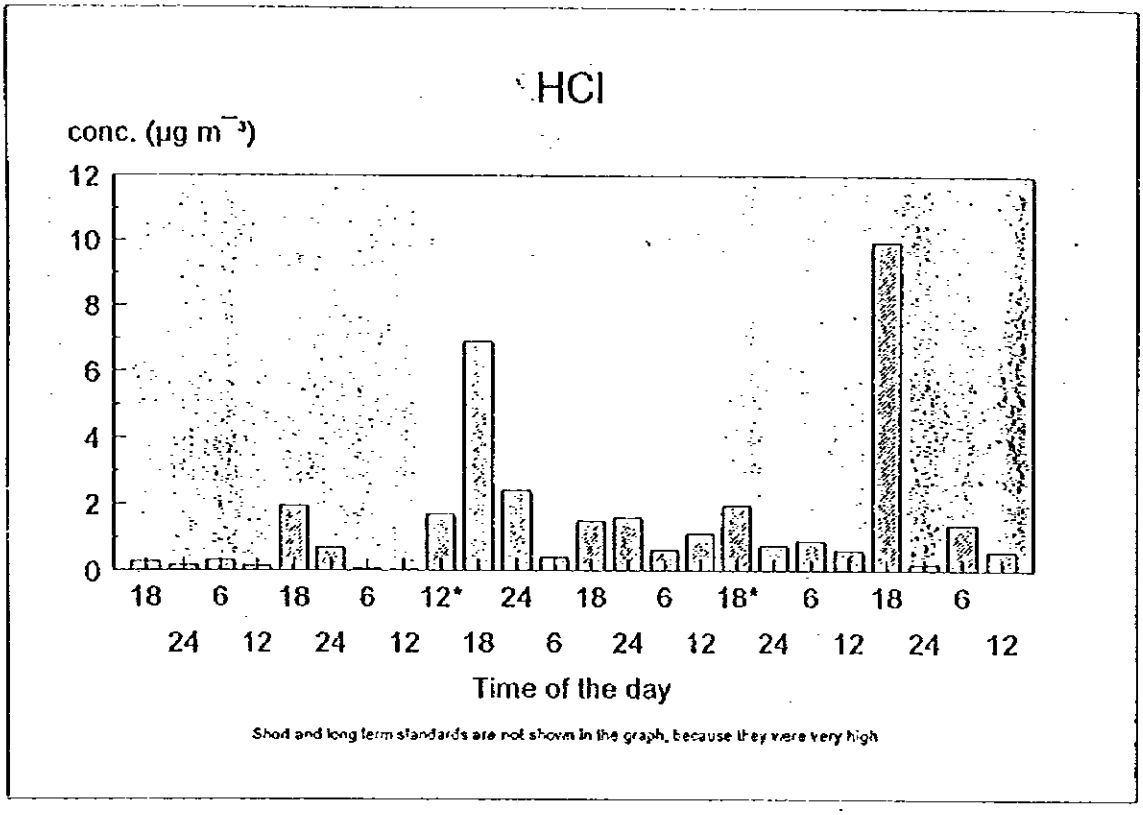


FIGURE 2.3.9

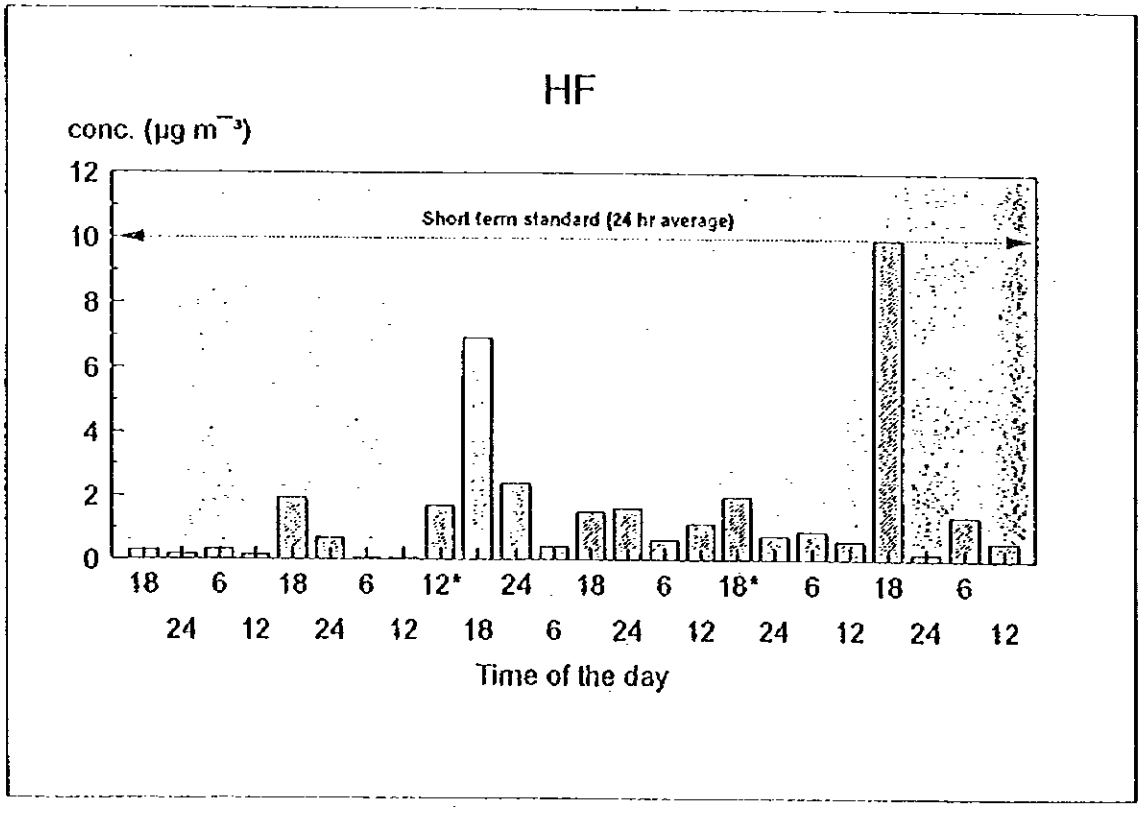


FIGURE 2.3.10

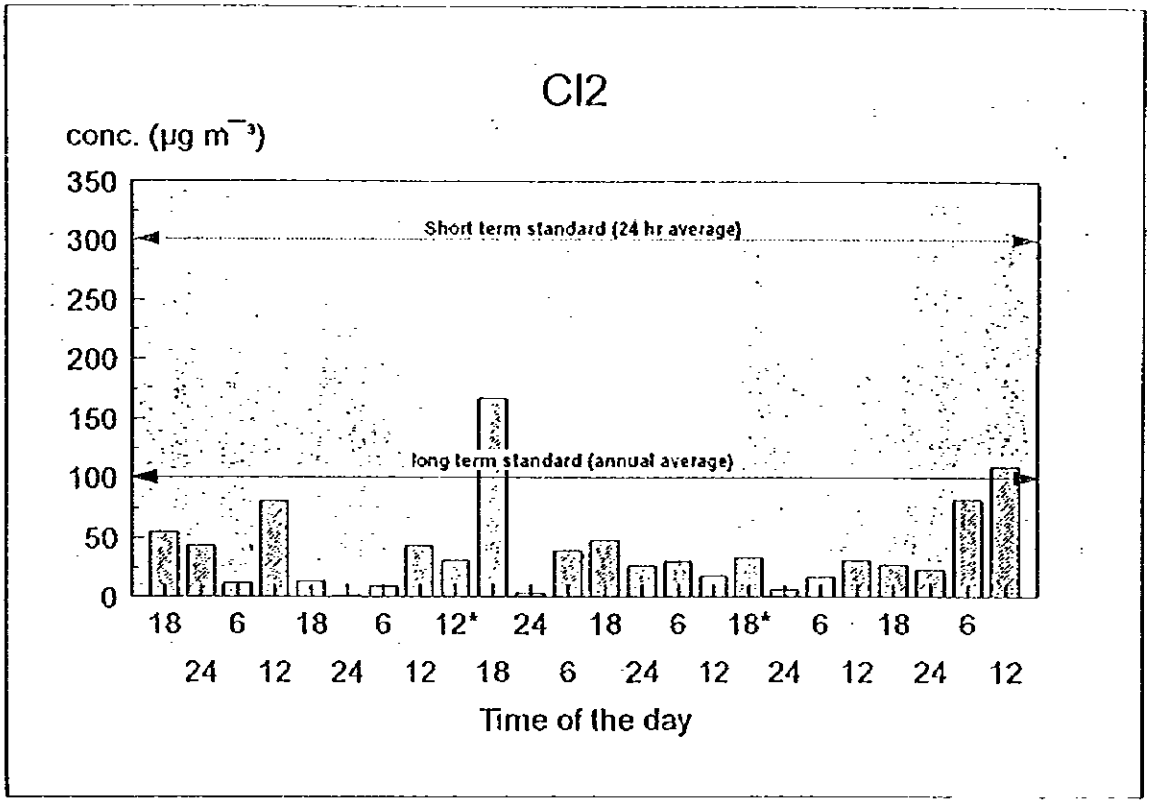


FIGURE 2.3.11

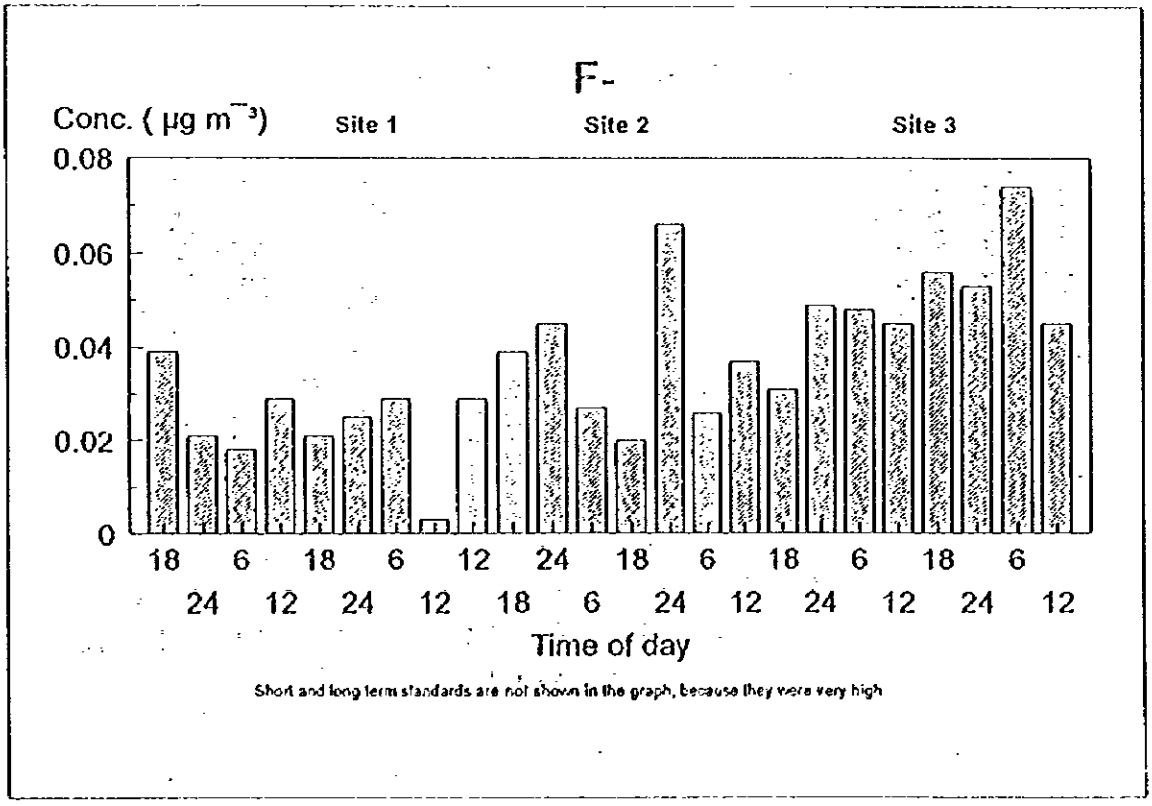


FIGURE 2.3.12

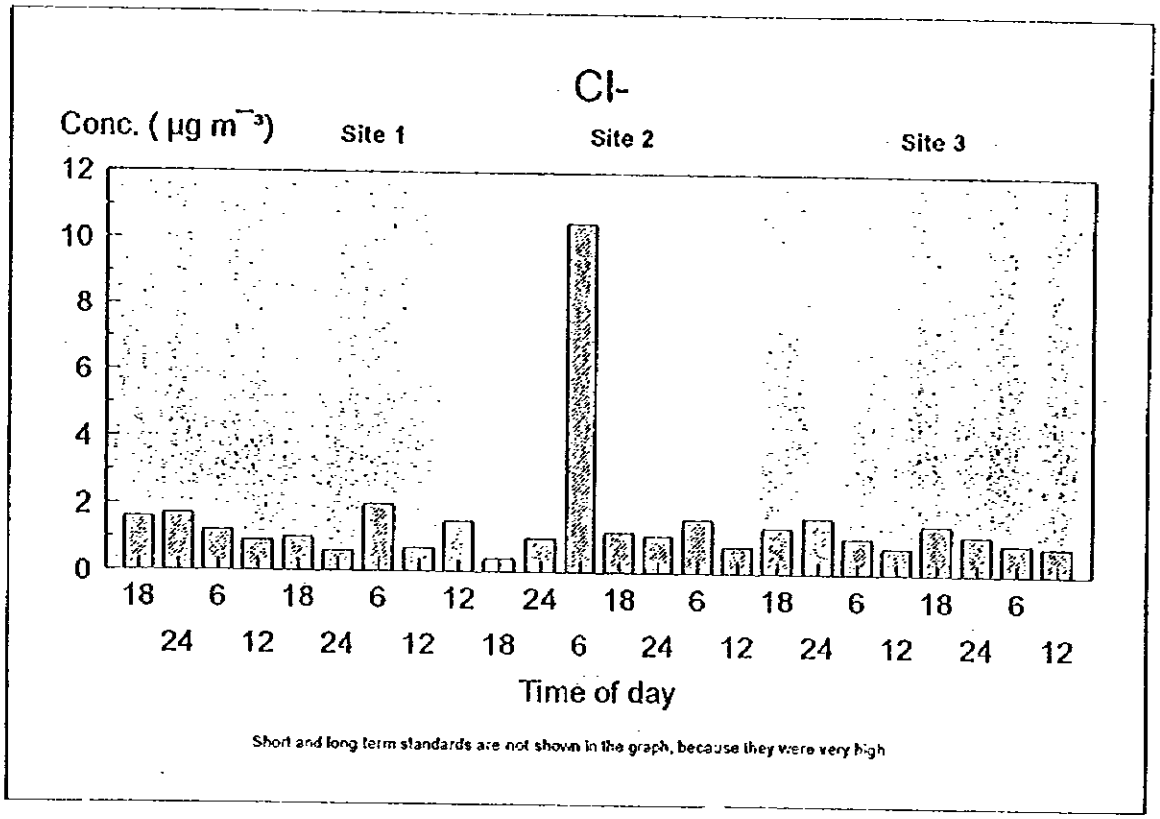


FIGURE 2.3.13

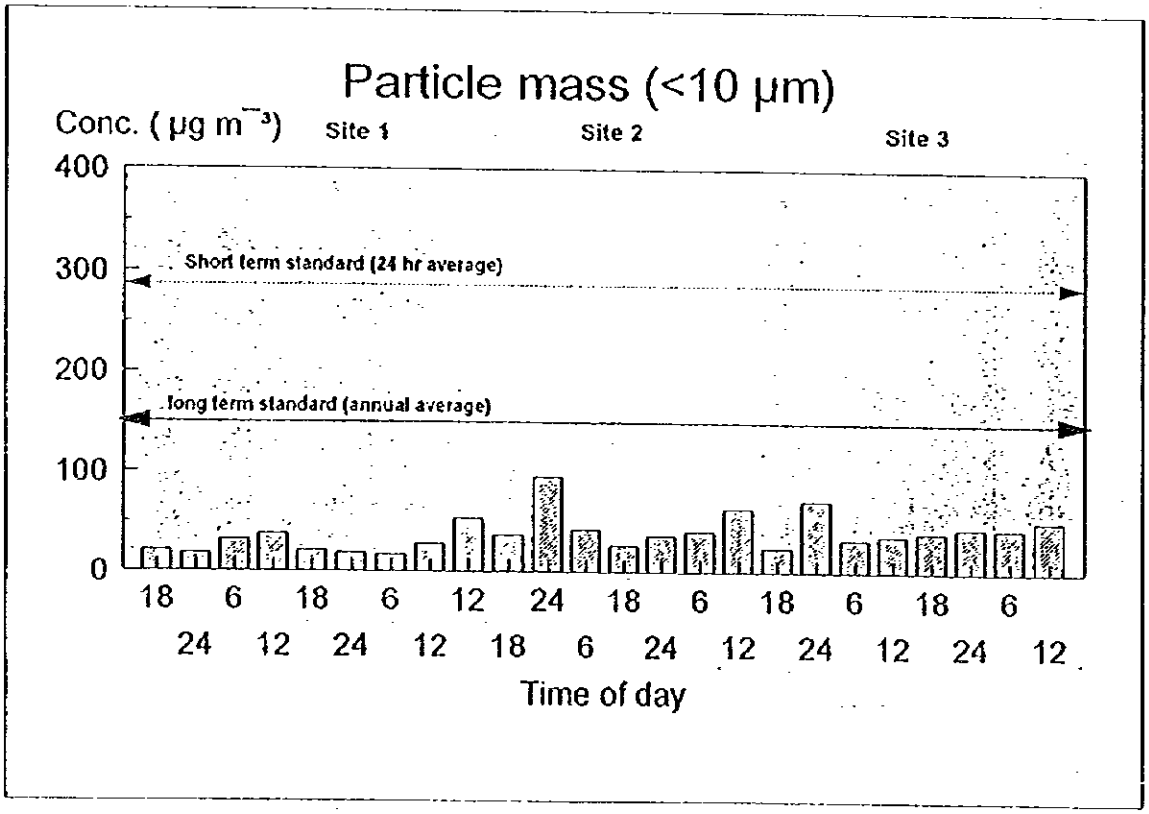


FIGURE 2.3.14

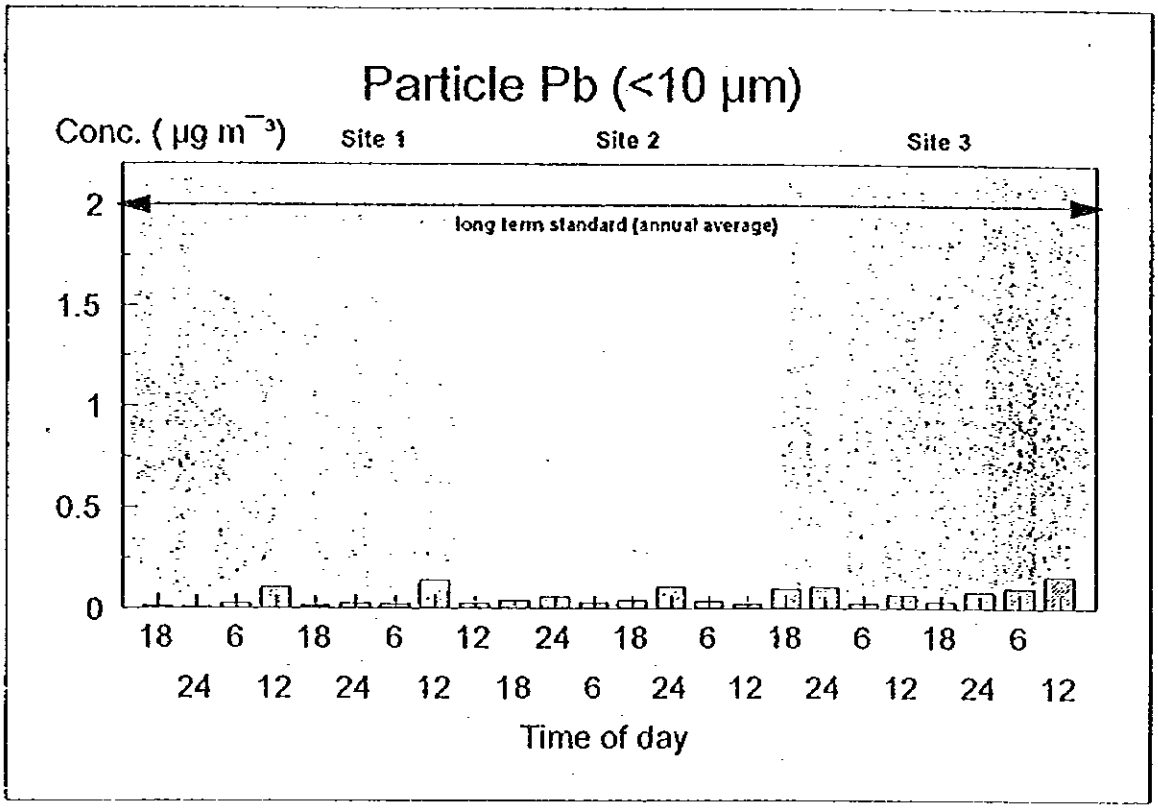


FIGURE 2.3.15

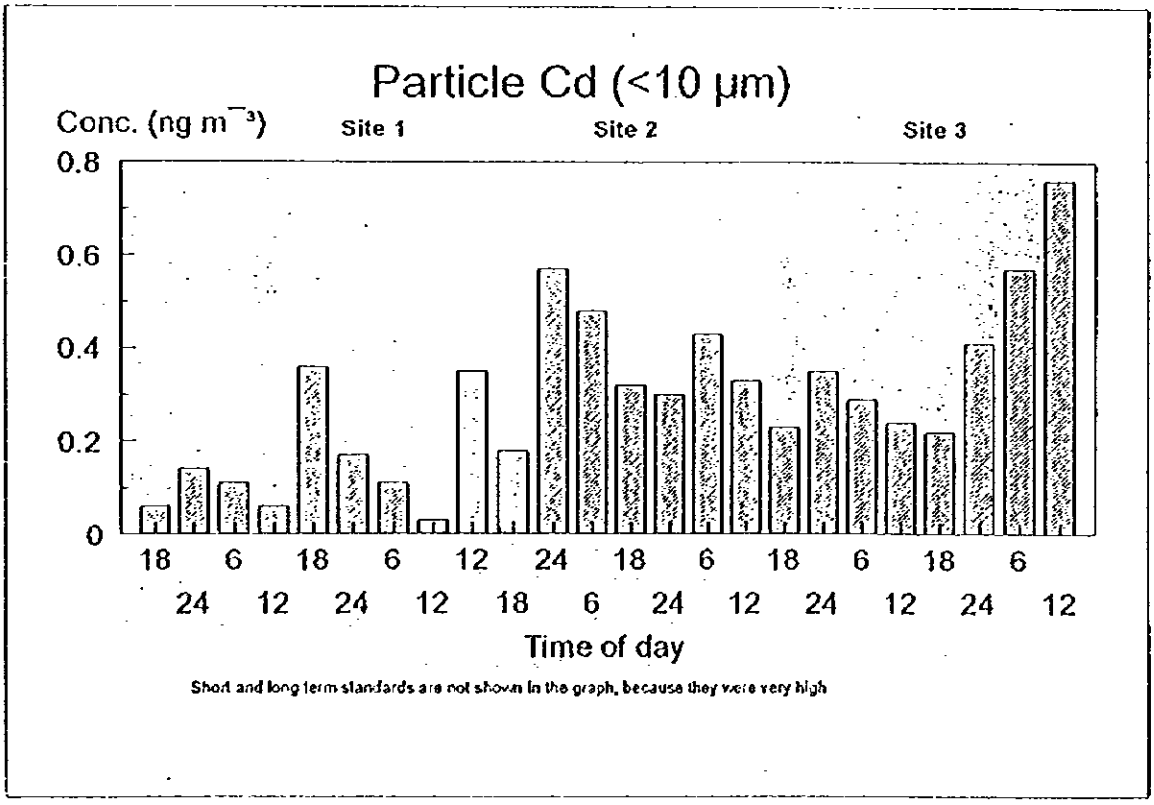


FIGURE 2.3:16

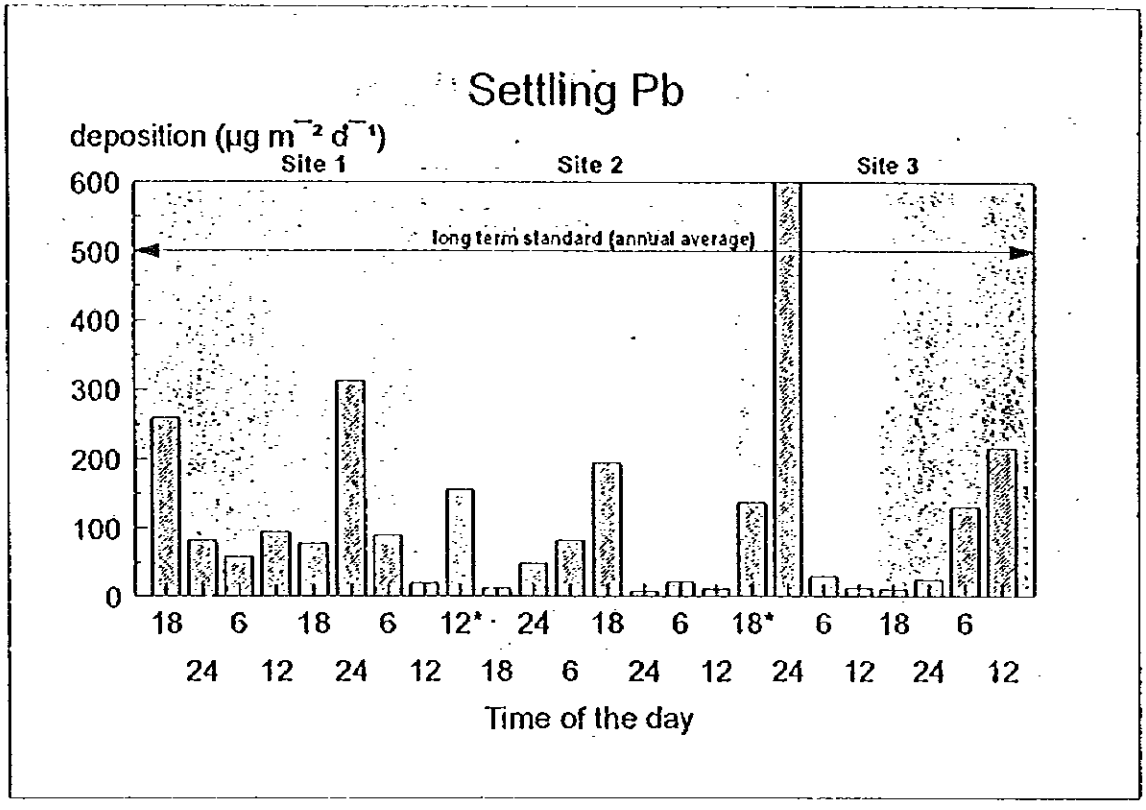


FIGURE 2.3.17

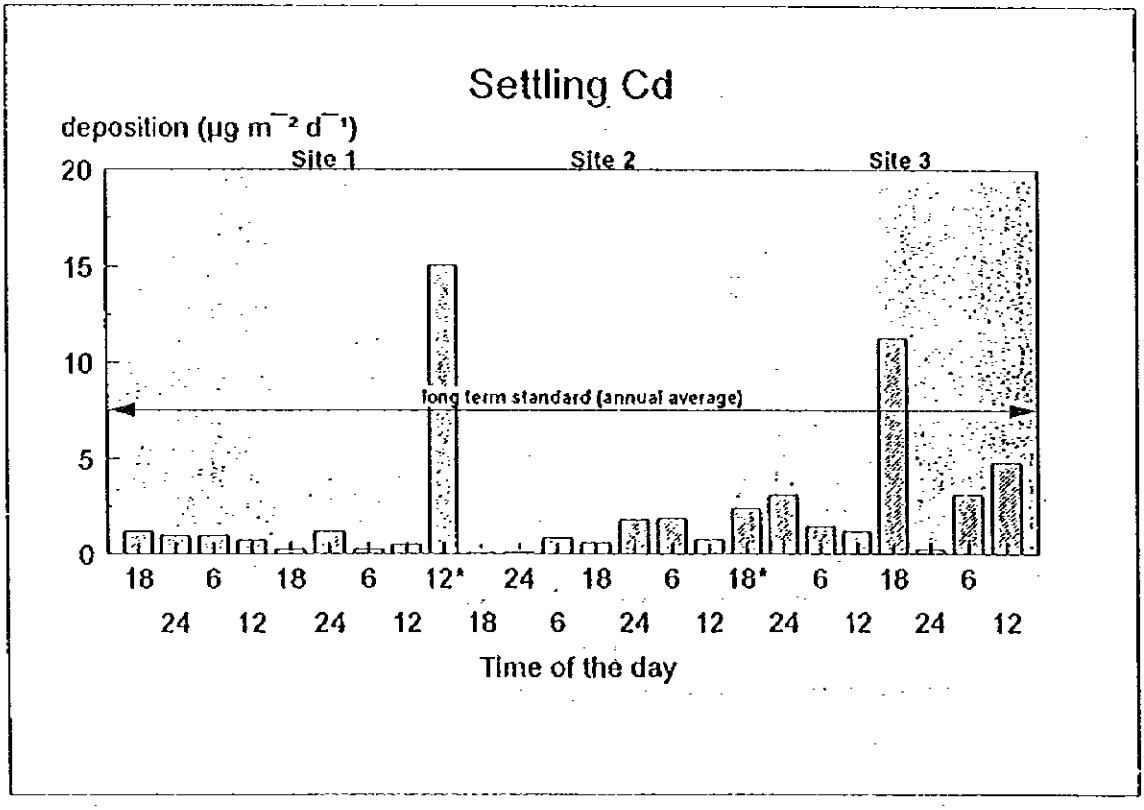


TABLE 2.3.2 Long and Short Term Air Quality Standards

Parameter	Unit	Standard	
		Long Term	Short Term
SO_2	$\mu g\ m^{-3}$	150	400
CO	$\mu g\ m^{-3}$	10,000	30,000
NO_2	$\mu g\ m^{-3}$	100	300
NO	$\mu g\ m^{-3}$	200	600
O_3	$\mu g\ m^{-3}$		(240)[1]
Cl_2	$\mu g\ m^{-3}$	100	300
HC	$\mu g\ m^{-3}$		140
HCl & Cl	$\mu g\ m^{-3}$	100	300
HF & F	$\mu g\ m^{-3}$		10
H_2S	$\mu g\ m^{-3}$		40
Supended particle mass (<10 μm)	$\mu g\ m^{-3}$	150	300
Particulate Pb	$\mu g\ m^{-3}$	2	
Particulate Cd	$\mu g\ m^{-3}$	0.04	
Setting dust mass (<10 μm)	$mg\ m^{-2}\ d^{-1}$	350	650
Setting Pb	$mg\ m^{-2}\ d^{-1}$	500	
Setting Cd	$mg\ m^{-2}\ d^{-1}$	7.5	
Setting Tl	$mg\ m^{-2}\ d^{-1}$	10	

The comparison shown in the figure clearly demonstrate that none of the parameters measured in gaseous phase, in suspended particles and setting dust consistently exceed short term standards. Although measured concentrations of most parameters are fairly close to long term standard, it is not meaningful to compared concentrations representing 8 hour period with standard value designed to be compared with annual averages. The closeness of measured parameters to long term standard is normal and do not indicate any pollution.

Although measured values are generally smaller than short term standard, they can be separated into two groups based on such comparison. Measured atmospheric concentrations of SO_2, CO, NO, O_3, HCl, Cl_2, Cl^-, F^-, suspended particle mass (<10 μm), Pb in suspended particles (<10 μm), Cd in suspended particles (<10 μm), Pb in setting dust (>10 μm), and Cd in setting dust (>10 μm), are significantly smaller than the short term standard corresponding to these parameters, indicating that if the measures were for a longer period such as 6 months or one year, these parameters would comply with the standards.

However, one has to be careful about this statement for parameters emitted from motor vehicles (Pb, NO and HC), parameters which has contribution from local soil and ozone. The measurements were done in the period of the year when traffic density in the region is fairly low. The density of motor vehicles can be factors of 3 - 5 higher during summer as the region is much more crowded with people spending their summer holidays.

This implies a significantly higher concentrations of parameters such as, NO and Pb in summer season.

Since the measurements were done in a time when the surface soil was damp, atmospheric loading of soil particles were low. Soil particles in the atmosphere increase in summer season when the surface soil becomes completely dry which can effect SPM concentrations.

The ozone mixing ratio in the summer can also be a factor of two higher due to higher solar flux which is instrumental for the ozone generation in the atmosphere.

Measured atmospheric concentrations of remaining parameters, namely NO_2, HF and HC's are relatively close to (but not above) short-term standards. Considering short period of the study, annual average concentrations of these parameters can be lower or higher than long-term standard, if the measurements were done for a longer period time.

2.4 Sea Bottom Biota

2.4.1 General Characteristics

In the last 20 years, the sea bed of the Marmara has been significantly polluted as indicated by many studies. For instance, in a recent study, the sea bed in the vicinity of the proposed port facility was reported to be of silt with occasional sand (Unsal and Unsal, 1994). In the same study, 126 sites were examined for the effects of pollution on sea bed macrofauna. Of these 46 showed significant signs of pollution, having a low species diversity, though with high number of individuals (in particular certain species), *echinolds*' (sea urchin) and *polychaete* (worms).

2.4.2 Field Surveys to be Conducted

A short-term sampling and analysis programme will be conducted at six different locations in order to determine the quality of the sea bed material near the proposed site. The parameters to be analyzed include Pb, Cd, Cu, Cr, Ni, Zn, Hg, As and NH_3. Upon obtaining the results of these analyses, it will be possible to assess the potential impacts on sea bed biota.

2.4.3 Sediment (Seabed Material) Survey

(1) Collection of Sediment (Seabed Material) Samples

Sediment samples were collected at 6 locations. The approximate positions of the sediment sampling stations are given in Figure 2.4.1. At each location approximately 500 - 1,000 gr sediment sample was extracted from the bottom using an EKMAN sampler[5].

Sediment samples collected at each site is placed in a precleaned polyethylene bag and stored at +4°C until it was taken to the central laboratory in Ankara. Sediment samples were transported to the central laboratory at the end of the field studies.

(2) Analysis of Sediment (Seabed Material) Samples

Once the samples were received in the laboratory, it was taken out of its polyethylene bag, outer layer of the sediment was removed and discarded to avoid contamination from the sampler, the sample is placed on a polyethylene sheet and dried in an oven at 60°C. After two days of drying, samples are crushed and homogenized using an agate homogenizer and approximately 1 g was weighted for analysis of trace elements.

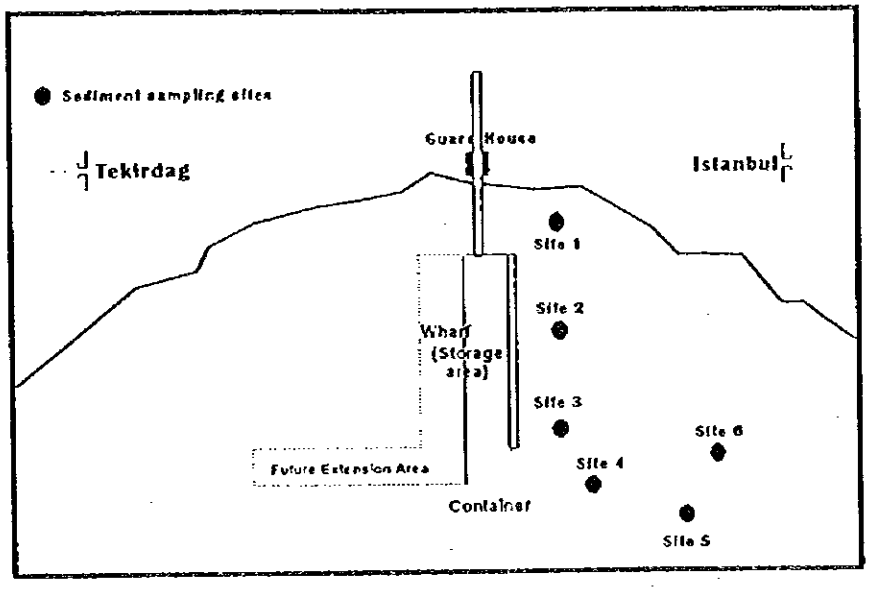


FIGURE 2.4.1 Approximate Positions of Sediment Sampling Stations

[5] The EKMAN sampler goes to the bottom of the sea with its bottom open. Two lids that can close the bottom of the sampler, is kept open by two strong stainless steel springs. When the sampler is rested on the sea bottom, a messenger is sent which releases the springs and closes the bottom of the sampler, enclosing a 0.5 - 1.0 kg of the sediment on which it rests.

The separated sample was digested using the procedure described in Tuncer et al. (1994)[6]. And digests were analyzed by atomic absorption spectrometry using a PERKIN ELMER Model 1100B spectrophotometer coupled to HGA 700 electrothermal atomizer. The method of standard additions were employed for the analysis of elements and standards were routinely checked using NIST standard reference material Eastuarine Sediment. The AAS operating parameters for the elements analyzed are given in Table 2.4.1.

TABLE 2.4.1 Operating AAS Parameters Used for Trace Element Analysis in Collected Sediment Samples

	Cr	Cd	Cu	Zn	As	Hg
Mode of atomization	GFA	GFA	GFA	FA	HG	CV
Wavelength (nm)	357.8	228.7	324.8	213.9	193.7	253.7
Slit (nm)	0.7	0.7	0.7	0.7	0.6	0.5
Sample volume (µL)	20	50	20	cont		5000

(3) Quality of the Seabed Material

The concentrations of trace elements measured in the collected sediment samples are given in Table 2.4.2. Since there is no standards for the sediments, the approach adopted in the previous sections where measured concentrations in sea water, river water and atmosphere were compared with the standards can not be employed in this case. One way to assess the significance of the measured concentrations in sediments is to compare concentrations of trace elements measured in this study with the concentrations measured in other parts of the Mediterranean Sea.

TABLE 2.4.2 Trace Element Concentrations Measured in Sediment Samples

		Med Baseline	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6
Cr	$\mu g\ g^{-1}$	15	1,130	562	249	435	299	267
Cd	$\mu g\ g^{-1}$	0.15	0.12	0.10	0.12	0.13	0.10	0.09
Cu	$\mu g\ g^{-1}$	15	2.6	1.4	46	14	11	21
Zn	$\mu g\ g^{-1}$	50	19	11	28	53	55	52
As	$\mu g\ g^{-1}$	10	2.4	3.7	2.7	3.7	9.3	8.3
Hg	$\mu g\ g^{-1}$	0.1	0.085	0.19	0.16	0.032	0.17	0.021

State of the trace elements concentrations in the Mediterranean Sea sediments was

[6] Tuncer G. T., Tuncel S. G., Tuncel G., Balkas T. I., Metal Pollution in the Golden Horn, Turkey: Contribution of natural and anthropogenic components since 1913. Water Sci. Technol., 28, 59-64 (1994)

evaluated by Jeftic et al. (1990)[7] authors reviewing extensive data set have generated the baseline concentrations of selected trace elements in the Mediterranean region. These values are included in Table 2.4.2.

When measured concentrations were compared with the baseline concentrations given in the table, it can be concluded that the concentrations of Cd, Cu, Zn, Hg and As are comparable and even lower than the baseline concentrations suggested for the Mediterranean region, indicating that the sediments is not polluted by these elements.

Concentrations of Cr on the other hand are significantly higher than suggested baseline concentration. However, these high concentrations do not necessarily indicate a pollution. High concentrations of Cr, comparable to the values measured in this study were reported in the studies conducted in different parts of Turkey. The reason is believed to the unusual Cr composition of soil. Consequently, baseline concentrations suggested for Cr in the Mediterranean may not be suitable for comparison with the values measured in this study.

2.5 Biological Conditions

2.5.1 Forest Vegetation

Based on the survey of forestry management plans obtained from the Ministry of Forestry, Tekirdag Province generally displays characteristics of the Black Sea Region in the north and Mediterranean characteristics in the south. The entire central Thrace which is also named as the Ergene Basin, as well as inner portions of Tekirdag, is an antropogen steppe where it is difficult to encounter natural steppe vegetation due to the domination of agricultural lands. In the areas where agriculture is not practiced, very limited oak tree-hornbeam mixed forests can be observed together with natural steppe vegataion.

Preliminary field observations revealed that there exists no forest vegetation in the proposed project area and its immediate vicinity.

2.5.2 Dunes and Dune Movements

In general, the dune vegetation of the project area is not different from those in other similar parts of Turkey. However, the dunes observed on the coastline near the project area

[7] Jeftic L., M. Bernhard, A. Demetropoulous, F. Fernex, G. P. Gabrielides, F. Gasparovic, Y. Halim, D. Orhon and L. J. Saliba, State of the marine environment in the Mediterranean region. UNEP Regional Seas Reports and Studies No. 132. MAP Technical Report Series No. 28 (1990)

are jhighly deteriorated as a result of antropogenic impacts and extensive settlements. Generally speaking, the dominant species of dune vegetation varies depending on the distance from the seashore. Usually, *Juncus heldreichianus* ssp. *heldreichianus* can be dominant in the stable areas which do not immerse in water throughout the year. At a distance of about 50 m to the seashore and in areas that may occasionally be exposed to immersion, *Bulboschoerrus maritimus* may also exist together with *Junchus* communities. In areas closer to the coastline, where the dune is usually not stable, *Ammophila arenaria* groups can develop as the dominant species with a low coverage ratio of about 5 to 10%.

2.5.3 Terrestrial Flora and Fauna

The existing ecological characteristics of the project area and its vicinity will be investigated in detail by means of field surveys and literature studies. In this regard, all the terrestrial flora (plant) and fauna (animal) species living on or near the project area are being determined and appropriately recorded as separate lists. The field studies related to the identification of both terrestrial and off-shore flora and fauna species will be conducted according to the standards accepted by the international ecology community. In this regard, the project area will be divided into sampling plots and flora and fauna species collected from the survey area will be taken to the laboratory for further identification and vertification. The flora and fauna species which inhabit the project area (land and off-shore) will also be correlated with the general ecological characteristics of the area and verified against officially documented records.

In the course of land surveys, endemic species; wildlife species and biotopes; population and habitats of game animals (birds etc.); species under protection by national and international agreements; rare and endangered species and their habitats, as well as protection decisions for these species are being specifically emphasized.

(1) Flora and Fauna Survey

Considering the topographical, climatological and phytogeographical characteristics of the region, the study area (SA) for the flora and fauna survey was extended to Tekirdag at the west, Silivri to the east and Çorlu to the north. The flora and fauna inventories of the SA were prepared based on field surveys as well as literature information.

The flora inventory of the SA is given in Appendix 1. Among these, the endemic flora types are presented in Section 1.5 together with their corresponding risk categories. Similarly, the fauna inventory of the SA is given in Appendix 2 with the corresponding risk categories. It should be noted that the risk categories of some fauna species could not be

identified due to lack of information. The bird inventory of the SA is classified to Kiziroglu (1993) and presented in Appendix 3.

1) Flora

The flora of the SA is determined based directly on field studies. In this regard, plant specimens collected from the SA are dried by pressing under proper conditions. Then, in light of the pertinent literature, the species were identified in the laboratory. For the identification of the species, the main reference was the Flora of Turkey and the East Aegean Islands, Volumes 1-10 (Davis, 1965-1988) which is also the reference of species' authors. In addition, the studies performed during the preparation of the Final Environmental Impact Assessment (EIA) Study for the Marmara Power Plant (1994) were also used. These studies were conducted within a large area which includes Tekidag at the west, Silivri at the east and Çorlu at the north. Moreover, the surveys carried out within the frame of the North Marmara Natural Gas Production Project EIA Study (1996) and Marmara Ereglisi - Istanbul Energy Transmission Line EIA Report (1995) which were executed in the same region were also referred to.

The flora inventory (in alphabetic order) prepared through field, laboratory and literature studies is presented in Appendix 1. All species in the flora list are given with biotope characteristics, phytogeographical characteristics, spread in Turkey and relative abundance. Further, the risk categories of the rare and endemic species are identified according to the internationally accepted criteria (IUCN, 1994). The abbreviations and scales used in the flora list are given under the following subheadings.

a) Biotope characteristics

In general, natural biotopes or habitats of the SA are damaged due to dense industrialization and land reclamation and flattening activities for agricultural purposes. Under these circumstances, nine habitat classes were identified inside the SA boundaries. These biotopes are indicated in the habitats column of the flora list in Appendix-1 with the coding system given below. The local study area where a detailed biotope analysis was performed has a radius of 5 km around the proposed facilities site.

i) Crop fields; the most common biotope within the SA and its vicinity where mainly wheat and sunflower are grown.

Banks of roads; typical biotope for species which are resistant to exhaust gases and drought.

i) Bushes; this biotope is seen on the Neogen-aged rocks near seaside in the SA. Some oak-tree and hornbeam mixed forests are observed at distant inner parts.

ii) Meadows; a rather uncommon biotope in the SA, which consists mostly of Gramineae, Leguminosae and Compositae families.

iii) Dry and open areas; this biotope covers the areas with loose vegetation, dry soil and long period of sun bath.

iv) Marshlands; an uncommon biotope which exists at the deltas of nearby creeks. Salty marshes are included in this class.

v) Beach sands; a noticeable biotope within the SA and its vicinity.

vi) Wetlands; an uncommon biotope which consists of species living in water in nearby creeks.

vii) Rocky and stony areas, garden walls, and ruins; this biotopes are generally at the beach.

The species which are cultivated plants are defined with a "+" sign in the second column ("*") of the flora list.

b) Phytogeographical characteristics

Phytogeography is a branch of science not only dealing with the spreading area of species, but also interrelated with sciences such as geomorphology, geology, Stratigraphy, paleonthology, petrography, climatology, and edaphology, as well as biological sciences like taxonomy, physiology, biocrology, ecology, and biogenetics. In this regard, it is essential that the phytogeographical characteristics of the SA of choice be taken into account in all phases of an EIA study (inventory preparation, impact assessment and determination of risk categories).

Turkey is located at the intersection are of three phytogeographic regions (von Regel, 1963; Davis, 1965). These flora regions are Euro-Siberian region covering Northern Turkey, Mediterranean region covering West and South Anatolia, and Irano-Turanian region covering Central, Eastern and Southern Anatolia. Therefore, in Turkey, there is no homogeneous biologic environment which become dense in certain regions.

The SA is located in the Euro-Siberian flora region, and known as the "Trachea Provence". Typically, the northern and southeastern parts of the region have climatological

properties of Black Sea and Mediterranean, respectively, and displays the relevant vegetation. On the other hand, central part of the region, known as the "Ergene Basin", has continental climate characteristics, and its vegetation is called "andropogenic steppe". However, the studies shows that the vegetation of Tekirdag and its vicinity is comprised of oak-tree and hornbeam mixed forests. And, forest area has been cleared for agricultural activities, at a great extent, so that natural forest vegetation is seen among agricultural fields as scene of little islands. In the SA, generally, there exist crop fields and plant species peculiar to fallow lands. The dominant species are not stable, and differ with respect to the seasons. These species with a lifetime of one or two years are not dominant in spring, but specially in summer they are so. For this reason, any study related to the plant sociology could not have been performed.

The abbreviations used in the flora region column of the inventory given in Appendix-1 are defined as follows.

Medit.	:	Mediterranean flora region
E Medi.	:	East Mediterranean provence
Euro-Sib.	:	Euro-Siberian flora region
Ir.-Tur.	:	Irano-Turanian region
Eux.	:	Euxine provence

c) General spread in turkey

The spread of flora species in Turkey is given in the spread in Turkey column of the list. The abbreviations used in this column are given below.

Wide	:	The species spread almost all over Turkey
Tr.	:	Turkey
N	:	Northern parts
S	:	Southern parts
E	:	Eastern parts
W	:	Western parts
NW	:	Northwestern parts
SW	:	Southwestern parts
Mid.	:	Middle parts
Out	:	Outer parts (coastal areas)

According to this notation, the abbreviation W Tr. Denotes western parts of Turkey, and the abbreviation W, SW, Mid. Tr. Represents the western, southwestern and middle parts of Turkey. Similarly, the abbreviation Out Tr. Matches with the outer parts of Turkey.

d) Relative abundance

Relative abundance (based on observation frequency) of the species in the inventory is given in the relative abundance column of the flora list in five different categories. The categories identified in the list are given below.

1 : very rare species
2 : rare species
3 : relatively wide species
4 : very wide species
5 : the species existing as pure populations

e) Endemism status

Endemic species belong to a high risk group due to their limited spread. And, most of the endemics are not able to form a dense population. For this reason, they have special importance in terms of biological diversity. In the case of endemic species that are relatives of culture plants, this importance is amplified, so that areas where these plants grow should be put under absolute protection as "biogenetic reserve area".

Although there exist some inventory studies on the rare and endemic plants of Turkey, the prepared lists are not at desired levels (Ekim and *et. Al.*, 1989). Besides, the classification of the endemics in Turkey in accordance with the risk categories defined by IUCN (World Conservation Union) has not been achieved yet. Nevertheless, in this study, the rare and endemic plants of the SA were categorized based on the IUCN (1994) criteria. The basic risk categories mentioned in the inventories are as follows:

(EW) : "Extinct in the Wild". These taxa survive in cultivation or in captivity or as naturalized population.

(CR) : "Critically Endangered". They are facing an extremely high risk of extinction in the wild in the immediate future.

(EN) : "Endangered". They are not critically jeopardized but are facing a very high risk of extinction in the near future.

(VU) : "Vulnerable". They are not critically endangered but are facing a high risk of extinction in the wild in the medium-term future.

(LR) : "Lower Risk". Taxa that do not satisfy the criteria for any of the categories above. They can be separated into three subcategories.

(cd) : "Conservation Dependent". Taxa which are the focus of a conservation program, the cessation of which would result in the taxon to qualify for

one of the threatened categories above within a period of five years.

(nt) : "Near Threatened". Taxa which do not qualify for conservation dependent, but are close to qualifying for vulnerable.

(lc) : "Least Concern". Taxa which do not qualify for conservation dependent or near threatened.

Thrace region is very poor in terms of endemic plant species. And, endemism ratio is quite low in the defined biotopes (Gemici and Sik, 1992). Consequently, one five endemic species, namely *Taraxacum pseudobrachglossum, Knautia byzantina, Taraxacum aznavouri, Ballota nigra* ssp. *Anatolica* and *Stachys cretica* ssp. *Smyrnaea*, were identified through the field surveys. Two of these species, *Ballota nigra* ssp. *Anatolica* and *Stachys cretica* ssp. *Smyrnaea*, are under low risk (LR-lc) according to the IUCN Red List Categories (1994). Other endemic species, *Taraxacum pseudobrachyglossum, Knautia byzantina* ve *Taraxacum aznavouri*, are included in the vulnerable (VU) category (IUCN, 1994).

f) Exotic trees and shrubs

In the residential areas of the SA and its vicinity, and in the secondary summer settlements on the coastal zone, many species of trees and shrubs, which are unnatural for the region, are cultivated. The species, which are not natural for Turkey, are utilized for landscaping. These trees and shrub species are listed below (Gemici and *et.al*, 1992).

- *Acer negundo* L. (ash-leaved maple)
- *Ailanthus altissima* Miller (tree of heaven)
- *Cedrus libani* A. Richard (Lebanon cedar)
- *Chamerops humilis* L. (European farm-palm)
- *Eriobotrya japonica* (Thunb.) Lindley (loguat)
- *Lagerstromia indica* L. (crape myrtle)
- *Ligustrum ovalifolium* Hasskn (California privet)
- *Maclura pomifera* Rafin, C. K. Schneider (osage orange)
- *Morus alba* L. (white mulberry)
- *Nerium oleander* L. (oleander)
- *Picea excelsa* (Lam.) Link (Norway spruce)
- *Pittosporum tobira* Ait. (Japanese Pittosporum)
- *Pinus brutia* Ten. (reddish pine)
- *Pinus pinea* L. (stone pine)
- *Platanus orientalis* L. (oriental plane)
- *Populus nigra* L. (black poplar)
- *Robinia pseudoacacia* L. (false acacia)
- *Rosa* ssp. (rose)

- *Salix babylonica* L. (Napoleon's willow)

g) General assessment

The flora of the SA consists of totally 439 vascular taxon in terms of species, sub-species and varieties.[1] The families which contain the highest number of taxon in Turkey are given below (only the families with more than 20 taxon are included).

Compositae	: 59 taxon
Gramineae	: 39 taxon
Leguminosae	: 38 taxon
Umbelliferae	: 23 taxon
Labiatae	: 23 taxon
Cruciferae	: 22 taxon

Since a considerable portion of the SA is agricultural land, taxon families Gramineae, Umbelliferae and Cruciferae, which can grow in cultivated areas, are dominant in the region. As a portion of the natural vegetation within the SA has been converted into agricultural land, the total number of taxa seems to be smaller than expected. The phytogeographical analysis of identified taxon can be summarized as follows:

Mediterranean flora region	: 54 taxon
East Mediterranean provence	: 22 taxon
Euro-Siberian flora region	: 52 taxon
Irano-Turanian region	: 6 taxon
Euxine provence	: 3 taxon

East Mediterranean flora elements, which includes species of Mediterranean basin and West-South Anatolia, are dominant, constituting 17.6% of the total. These species are followed by the Euro-Siberian and Euxine flora elements, which are found in Black Sea region. They make up of 13.0% of the total. This situation illustrates that the SA is located at Mediterranean-Black Sea transition zone with the dominance of the Mediterranean flora. On the other hand, percentage of species found in Irano-Turanian flora region, which covers Central Anatolia, East Anatolia and Southeast Anatolia, is very low (1.6%).

Most of the plant species in the SA are widespread in Turkey and the region is very poor in terms of endemic species. In other words, vegetation of SA resemble the vegetation

[1] Although the term "flora" includes conceptually all the plants, traditionally it is used only for the vascular plants all over the world. Excluding a few exceptions, vascular plants do not have any importance in inventory and impact assessment studies.

seen at similar biotopes in Turkey and the observed taxa are registered at many localities apart from the SA. Further, the endemism ratio is almost negligible (0.92%)[2]. Five endemic species, three species vulnerable and two species under low risk, exist in the region. This situation shows that these species are not critically endangered yet, but that if no conservation is considered, they could face a higher risk of extinction in future (medium-term).

2) Fauna

In this section, the vertebrate fauna of the SA are presented together with their important biological and ecological properties (e.g. breeding and biotope characteristics), spread in Turkey, relative abundance and risk categories in accordance with the format stipulated by the EIA Regulation.[3]

It is clear that the fauna inventory of the SA cannot be exactly determined through a short-term study, regarding the facts that the fauna shows seasonal changes, and that a study based on field counting and observations takes several years even in a small area. Thus, the fauna species of the SA were not determined only through field studies. In this regard, besides consultation with local residents, factors such as phytogeographical properties and biotope characteristics of the SA were taken into account during the preparation of a more complete fauna list. With this intention, species which could not be observed during the study period but are highly likely to inhabit the region (according to the literature records) are also included in the list.

However, it should also be noted that the number regional fauna surveys are not as much the flora surveys (THF, 1990). For this reason, it's more difficult to determine the spreading areas and population densities of the existing fauna species. However, regional fauna studies specially on frogs and reptiles have been accelerated since 1990. The main references used in determination of the fauna of the SA are Geldiay and Balik (1988), Basoglu and Özeti (1973) for amphibians, Baran (1976) and Basoglu and Baran (1978 and 1980) for reptiles, Kiziroglu (1989 to 1993) for birds, and Demirsoy (1992) for mammals. Additionally, due to the similarity of Europe's and Turkey's fauna, numerous foreign sources and scientific articles, most of which are cited in reference books (TEF, 1990) were also used.

Since there are no large lakes, rivers and wetlands to be mentioned as inland waters in the SA, except the Hacimuratli Creek and other similar seasonal streams, the aquatic species associated with these creeks are given within the context of the terrestrial lists, not under a

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[2] Average of endemic species in Turkey is approximately 30%.

[3] EIA studies regard mostly the vertebrate fauna due the fact that endangered species mostly belong to the vertebrates, and the most important component of the invertebrate fauna, insecta, has almost 1 million defined species as members.

separate heading.

The heavy destruction of the area has affected the fauna as well as the flora. Depending on the loss of habitats, many species have already left the region, and individual numbers in populations of many species have significantly decreased. Another important reason is the use of fertilizer and pesticides in agricultural activities. These chemicals which also pollute the water bodies are great risk factors for the fauna.

a) Freshwater fishes

In the SA, a total of ten freshwater fish (*Anguilla anguilla, Leuciscus cephalus, Cyprinus caprio, Alburnus alburnus, Cobitis taenia, Gobio gobio, Nemachelius angorae, Rhodeus sericeus amarus, Scardinius erythrophthalmus* and *Vimba vimba*) species were identified. The basic characteristics of these species are described in Appendix 4. All fish species given in the list are under low risk (LR-lc) with regard to IUCN Red List Categories.

b) Amphibians

In the SA, as two tailed frog (*Triturus cristatus* and *Triturus vulgaris*) and six tailless frog (*Bombina bombina, Pelobates syriacus, Bufo bufo, Bufo viridis, Hyla arborea* and *Rana ridibunda*), totally eight amphibian species are defined. The basic characteristics (breeding biology, spread in Turkey, observation frequency and risk category) of these species are described in Appendix 4. The shore areas have generally been identified within the distribution range of one of the key species for the Council of Europe, the so-called fire bellied toad (*Bombina bombina*).

c) Reptiles

In the SA, four turtle (*Emys orbicularis, Mauremys caspica, Testuda graeca* and *Testuda hermanni*), 12 lizard (*Cyrtodactylus kotschyi, Hemidactylus turcicus, Anguis fragilis, Lacerta muralis, Lacerta trilineata, Lacerta praticola, Lacerta tauria, Lacerta viridis, Ophisops elegans, Ablepharus kitaibeli* and *Mabuya aurata*) and 9 snake (*Coluber caspius, Coronella austriaca, Natrix natrix, Thyplops vermicularis, Natrix tessellata, Coluber rubriceps, Elaphe situla, Telescopus fallax* and *Vipera ammodytes*), totally 25 reptile species are defined. The basic characteristics of these species are described in Appendix-II. However, since the studies regarding reptiles in the region are inadequate, the observation frequencies and risk categories of these species are undetermined, and could not be given.

d) Birds

The bird species that do exist and are probable to exist in the SA are listed in Appendix 5 based on the field studies, experiences of the local residents inthe region and literature surveys[4] . The bird inventory was prepared with regard to the studies conducted by Kiziroglu (1989) as the species were arranged systematically and the spreading areas were determined. Likewise, the studies on the biotope properties, nest location and number of eggs performed by Demirsoy (1992) were also helpful in the preparation of the inventory. For the determination of risk categories of species, studies conducted by Kiziroglu (1989 and 1993) and Demirsoy (1992) were used. There are totally 189 species in the list, and the abbreviations used in the list are described below.

i) Risk categories

The risk level of each specie is determined in the bird inventory prepared for SA (Kiziroglu, 1993). These risk levels are described below. But, since there is limited number of studies on birds of Turkey, these risk levels should be considered carefully. In this regard, observed individual numbers of some species are greater than the numbers corresponding risk categories identified in literature.

A1 : Species under extinction and endangered species
A11 : Species under extinction
A12 : Species which are low in number (1-25couples in Turkey)
A2 : Species which are under a certain level of risk and have a population in between 26-50 couples.
A3 : Species with a population in between 51-200 (500) couples.
A4 : Species which are currently grouped as endangered species but they may experience a certain risk level in the future.
B : Species which temporarily visit Turkey and are under extinction
B1 : Species dwelling for the winter but not breeding in Anatolia.
B2-B3 : Species passing through Anatolia or species dwelling for the winter in Anatolia and having a lower risk level.

In accordance with the additional list of Bern Agreement, the species except *Larus argentatus, Columba palumbus, Passer domesticus, Sturnus vulgaris, Pica pica, corvus monedula and Curves corone* are under protection. But as mentioned earlier, these type of declarations should be viewed with care, due to lack of specific studies for Turkey.

[4] There is not enough survey on biology and ecology of bird species in Turkey. A wide list of the achieved survey related with "Birds of Turkey" is given by Demirsoy (1992). These surveys most of which are done by foreign researchers are in the way of identification of species.

ii) Location of bird species and spread in Turkey

The abbreviations used in Appendix 5 related to the location of species and spread in Turkey are defined as follows:

L (Local)	: species observed in every season
I (Immigrant)	: species breeding generally in summer
W	: species observed only in winter but not breeding
T	: species passing transit
Ma	: Marmara Region
Bl	: Black Sea Region
A	: Aegean Region
M	: Mediterranean Region
C	: Central Anatolia Region
E	: East Anatolia Region
SE	: Southeast Anatolia Region
AR	: All Regions

In the case of insufficient information, "(?)" is used in the list. And, for the nest places and egg number of birds not breeding in Turkey "(-)" is used in the list. A "(-) mark in the column of risk indicates that the specie is not under risk. The "(+)" mark put next to a specie name in the list indicates the existence of the specie in the region.

e) Mammals

In the SA, totally 14 mammal species (*Crocidura suaveolens, Rattus rattus, Rattus norvegicus, Apodemus mystacinus, Erinaceus concolor drozdovskii, Mus musculus, Mustella nivalis, Rhinolophus hipposideros, Spalax leucodon, Talpa europaea, Canis vulpes (=Vulpes vulpes), Lepus europaeus, Mertes mertes* and *Meles meles*), four (*Canis vulpes (=Vulpes vulpes), Lepus europaeus, , Mertes mertes* and *Meles meles*) of which have very low observation frequency, are defined. The basic characteristics of these species are described in the fauna inventory in Appendix 4.

The species given in the inventory, except hedgehog, have high observation frequency, and low risk category (LR-lc). Hedgehog, on the other hand, has a moderate observation frequency, and a relatively high risk category (LR-nt). In addition, rabbit, marten and badger are under risk (probably VU category) all over Turkey due to excessive hunting. There appears no risk for other mammal species yet.

f) Species living in the sea

The sea of Marmara is under the conservation provisions of the Mediterranean Action Plan, and the Blue Plan of UNEP and IUCN. These require programmes to reduce pollution and assess socio-economic issues relating to population, natural resources, and development in order to protect and preserve habitat and individuals of threatened species. However, there are no records for EC Corine project biotypes nor biosphere reserves in the area of investigation, though some data are in preparation.

Even though the shore areas of Marmara have generally been identified within the distribution range of the fire bellied toad (*Bombina bombina*) this is not a very critical specie for Turkey. There are no known turtle coastal nesting sites nor feeding areas in the Marmara Sea. Similarly, the Mediterranean Monk Seal, *Monachus monachus*, which is protected under the Mediterranean Action Plan, have no sitings in the Marmara Sea after 1990, and the main area of interest is focused on the Kapidag peninsula more than 50 km SW.

In general, the surface zooplankton of the Marmara have been significantly affected in recent years due to a drastic invasion of the Ctenophore invader, *Mnemiopsis leidyi*. This predatory Ctenophore is believed to have travelled from the Black Sea where it was introduced in the ballast water of tankers. In two years it disastrously altered the pelagic communities of the Black Sea and appears to about to do the same in the Sea of Marmara (WSA, 1996)

Heavy exploitation of fish stocks has resulted in significant depletions in catches. The registers in Istanbul Fish Market and figures of the State Statistical Institute show dramatic reductions in the numbers of species caught. Important species of fish recorded are given in Table 2.5.1.

TABLE 2.5.1 Important Fish Species Recorded from the Sea of Marmara

Species	Common Name	Species	Common Name
Scrranus heparus	Rock cod	*Arnogloccus baterna*	Scald fish
Gobius niger	Goby	*Trachurus trachurus*	Horse Eackerel
Trigla lucerna	Gurnard	*Gaidropsarus mediterraneus*	Rockling
Merluccius merluccius	Hake	*Raja clavata*	Thornback ray
Callionymus lyra	Dragonet	*Sprallus sprallus*	Sprat
Mullus barbatus	Red Eullet	*Pagellus erytrynus*	Bream
Trachurus mediterruncus	Horse Eackerel	*Zeus faber*	John Dory
Pomatomus saltatrix		*Trachiraus draco*	Greater Weaver
Merlangus merlangus		*Spicara simaris*	
Butrigla gumardus	Gurnard	*Blennius ocellaris*	Butterfly blenny
Lepidotrigla cavillone		*Trigle lyra*	Gurnard
Cepola rubenscens	Snake fish	*Soles soles*	Dover sole
Myliobatis aquila	Eagle ray	*Squalus scanctioes*	Dogfish
Oxynocus contrina			

Source: WS Atkinson, North Marmara Gas Field Preliminary EIS, 1996.

g) General assessment

The fauna of SA consists of 10 freshwater fish, 8 frog, 4 turtle, 12 lizard, 9 snake, 189 bird and 14 mammal, totally 246 species (this number includes the species that are probable to exist but excludes marine fish). Generally, regarding the biotope concept as the habitats or microhabitats which are the feeding, sheltering and breeding areas of the species, it is clear that SA could not be a permanent habitat for most fauna species due to excessive destruction of the nearby agricultural fields where they live to look for food (this is especially the case for many bird species).

According to the additional lists of the Bern Agreement, a great portion of the vertebrate fauna of Turkey is under protection. However, this statement does not reflect the true situation in Turkey. Based on a classification with regard to the IUCN Red List Categories (1994), it can be stated that none of the fauna species within the SA and its vicinity would face a risk in the near future. On the other hand, the extinction risk of the species would definitely increase as long as the habitats continuously disappear especially due to excessive housing in the region.

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2.5.4 Marine and Aquatic Species

All the species living in sea environment (e.g., fish and sea plants) as well as in the inland water bodies (e.g., river and fishing weirs) will be determined and appropriately recorded. In the course of these surveys whose main aspects are described above, natural characteristics of the species; their reproduction, feeding, sheltering and survival habitats and protection decisions for these habitats; species that are under protection by national and international agreements; species that will be extinct or affected due to activities in the sea environment as well as their habitats and natural characteristics will be specifically emphasized.

2.5.5 Areas with High Landscape Value

(1) Regional Characteristics

The coastline (Black Sea and Marmara Sea) and the forested areas constitute the major recreational sites of the Tekirdag Province. The province has a long coastline along the Marmara Sea where there exist natural beaches particularly along the western shores towards Kumbag and Sarköy. The main recreational activites along the coastline are swimming fishing, watersports and sea-side camping. Other than private summer houses, relatively small accommodation facilities like motels, pensions and campings are present along the Marmara coastline. There are also larger hotels and tourist facilities (e.g., restaurants) located in the inner regions of the province. The distribution of the registered tourist facilities is given in Table 2.5.2.

TABLE 2.5.2 Number of Municipality Registered Facilities in Tekirdag

Facility Type	1991	1992
Hotels/Motels	26	37
Pensions	88	90
Restaurants	52	52
Rest Areas (Gas Stations)	16	16
Picnic Areas	2	2
Public Beach	5	5
Camping	6	6
Total	195	208

Source: Tekirdag Provinces Tourism Master Plan, 1992

The forests of the province also serve as recreational areas especially for the local inhabitants of Tekirdag. In general, forests along the northern coast of Black Sea and those bordering the Province of Çanakkale are the ones which attract larger numbers of citizens. In

addition, some limited oak tree forests exist in the center of the province. Major forest facilities for recreation are locate in Kumbag; Barbaros, Karaevli, Çorlu and Marmara Ereglisi districts. Among these, the most common one is the Kumbag in-forest resort. In addition, the so-called "Atatürk Forest" and the thermal spring of Avsar Çesmesi are also used for recreational purposes; however, these are local areas and are not common in terms of national use.

(2) Proposed Site

Compared to many other parts of the country, the site proposed for the port development project and its environs do not possess a high landscape value and there are no recreational facility in the immediate vicinity of the project area.

2.6 Residents, Buildings and Cultural Assets

This section of the report provides a generalized socio-economic description of the study area and its surroundings presented in order to establish a basis for assessing the potential socio-economic impacts of the proposed port development.

2.6.1 Regional Demographic Trends

According to the results of the 1990 census, the population of the Tekirdag Province Center is 117,455. Including some neighboring districts the total population of the project area and its immediate vicinity sums up to 302,805. The populations of the districts in the immediate vicinity of the project area are given in Table 2.6.1

TABLE 2.6.1 The Urban and Rural Populations of the Districts

DISTRICTS	Urban		Rural		TOTAL
	Population	Percentage	Population	Percentage	
Province Center	80,442	68.5	37,013	31.5	117,455
Marmara Ereglisi	5,957	47.8	6,498	52.2	12,455
Çorlu	74,681	71.6	29,622	28.4	104,303
Murath	13,192	57.5	9,760	42.5	22,952
Hayrabolu	16,923	37.1	28,717	62.9	45,640
TOTAL	191,195	-	111,610	-	302,805

Source: SIS, 1990

According to the last three population census results, the rate of urbanization increases within the province primarily due to migration. Of the total 302,805 people living

in the project area and its immediate vicinity, about 63% (191,195 people) live in urban areas. Highest urbanization rates are observed in the province center (68.5%) and Çorlu (71.6%). On the other hand, Districts of Marmara Ereglisi and Hayrabolu have more people living in the rural areas (see Figure 2.6.1).

A predominant characteristic of the Tekirdag Province is its receiving migration from other cities. The highest rate of migration was observed between 1935 and 1950, mainly from the Balkan countries. Currently, the province keeps receiving domestic migration at a considerably slower rate from the neighboring cities, including Çanakkale and Kirklareli as well as Istanbul and other Anatolian (especially Black Sea) provinces. For instance, the rate of net migration to the province was about 1% between 1980 and 1985.

The number of people born outside Tekirdag constitutes a significant percentage of the local population. The results of 1990 population census indicate that the percentage of population born outside the province is 36.3%. The migrated population usually settles in the suburban areas of the province center.

Primarily due to suitable socio-economic conditions and migration, the population growth rate of the Province of Tekirdag is high when compared to the nation-wide average. The latest population growth rate of the province is calculated to be 16.4% in the period of 1985-1990. This figure is higher than the nation-wide average of 11.5%. The rate of population increase for the five districts in the vicinity of the project area are given in Table 2.6.2.

TABLE 2.6.2 Annual Rate of Population Increase

DISTRICTS	1985 Population	1990 Population	Percent Increase (%)
Province Center	99,133	117,455	18.5
Marmara Ereglisi	7,267	12,455	71.4
Çorlu	81,857	104,303	27.4
Murath	19,858	22,952	15.6
Hayrabolu	46,017	45,640	-0.82
Total	254,132	302,805	19.2
Nationwide Total	50,664,458	56,473,035	11.5

Sourcess: SIS, 1990

Population increase is particularly high in Marmara Ereglisi, Çorlu and Tekirdag Province Center where the rate of industrialization is also high. As an example, Çorlu displayed a relatively high population growth between 1960 and 1985 due to industrial investments. Further, the total population of the project area increases considerably during the summer seasons when residents from neighboring residential centers prefer to move to the

coasts of the project area.

The distribution of average household size in the study area is given in Table 2.6.3. As can be seen in this table, the size of an average household in the study area is about 4, which is smaller than the overall average of 5 for Turkey (see Figure 2.6.2).

TABLE 2.6.3 Average Size of Household

Districts	Size of Average Household
Province Center	3.83
Marmara Ereglisi	3.91
Çorlu	3.99
Murath	4.05
Hayrabolu	4.46
Project Area Average	4.05
Nationwide Average	4.97

Source: SIS, 1990

The distributions of age groups in the districts surrounding the project area are given in Figures 2.6.3 through 2.6.7. According to the 1990 census, in the District of Marmara Ereglisi, approximately 35% of the total population is in the 15-29 age group, with 20-24 age group having the highest percentage (14%). In general, the percentage of the very young population (0-14 age group) of the project area is lower than the nation-wide average.

According to the latest census data, the population density of the project area is 83 capita/km^2 which is higher than the national average of 73 capita/km^2. This is mainly because the boundaries of the project area cover coastal and industrialized areas. Population density of the province center has the highest value of 114 capita/km^2 which is considerably higher than the averages for both the project area and the entire nation. The population densities of the districts within the project area are presented in Table 2.6.4.

TABLE 2.6.4 Population Density in the Project Area and Its Immediate Vicinity

Districts	Population	Area (km^2)	Population Density (capita/km^2)
Province Center	117,455	1,033	114
Marmara Ereglisi	12,455	183	68
Çorlu	104,305	949	110
Murath	22,952	407	56
Hayrabolu	45,640	1,035	44
Project Area Total	302,805	3,607	84
Nationwide Total	56,473,035	774,815	73

** Lakes are excluded from the areas.*

According to the results of 1990 census, the respective ratios of female to male population are 0.88, 0.97, 0.78, 0.73, and 0.95 in the Districts of Tekirdag Province Center, Murath, Çorlu, Marmara Ereglisi and Hayrabolu, respectively. Average female to male ratio of Turkey is 0.97, and that of the study area is 0.86. Although the ratio calculated for the project area is smaller than nation-wide average, there is a balanced distribution of female to male populations.

Birth and fercility ratios for the district centers in the project area are given in Table 2.6.5.[1] The overall fertility ratio for Turkey is 0.208 whereas it is 0.137 for the project area and its immediate vicinity. In other words, there are about 14 children of ages 0 to 4 for every 100 adult of ages 15-49. Similarly, the birth ratio for the project area is 0.130 (i.e., there are 13 infants for every 100 women between 15 and 49 years old). The average birth ratio of the study area and its immediate vicinity is also smaller than that of the Nation-wide average of 0.151.

TABLE 2.6.5 Birth and Fertility Ratios

Districts	Male to Total Ratio	Female to Total Ratio	Fertility Ratio	Birth Ratio	Female to Male Ratio
Province Center	0.53	0.47	0.138	0.127	0.88
Marmara Ereglisi	0.58	0.42	0.113	0.121	0.73
Çorlu	0.56	0.44	0.126	0.125	0.78
Murath	0.51	0.49	0.151	0.137	0.97
Hayrabolu	0.51	0.49	0.157	0.138	0.95
Project Area Total	0.54	0.46	0.137	0.130	0.86
Nationwide Total	0.51	0.49	0.208	0.151	0.97

Population projections for urban and rural areas can be made by using various techniques. It should also be noted that population projection methods are not capable of predicting sharp population changes which may occur as a result of drastic socio-economic changes that are not reflected by the past data. In particular, for the case of the study area, deviations from predicted populations may occur due to such unpredictable factors as migration of people from other cities and countries.

For Tekirdag, population projections were made using four different techniques. Then, projections made for 1990 were compared with the actual population obtained in the October 1990 census. As exemplified in Table 2.6.6, the method used by the Provincial

[1] *Fertility ratio, by definition is the ratio of population of 0 to 4 age group divided by the population of 15 to 49 age group. Birth ratio, on the other hand, is the ratio of population of 0 to 1 age group divided by the female population between 15 and 49 years old.*

FIGURE 2.6.1 Percentages of Urban and Rural Populations in the Project Area

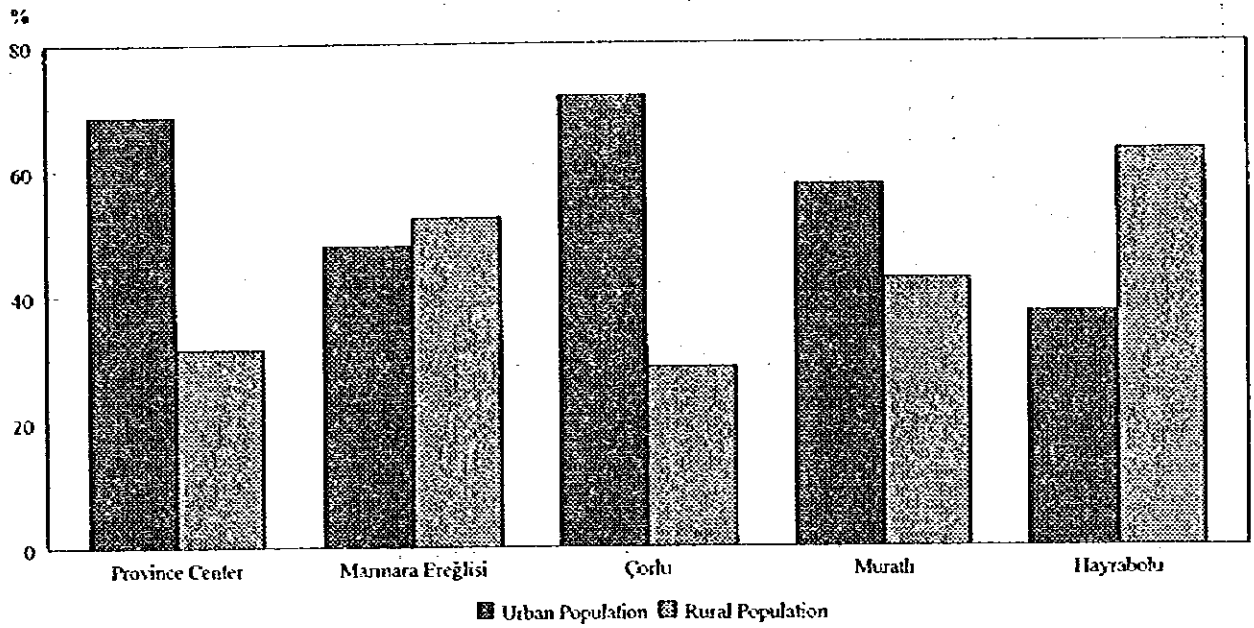


FIGURE 2.6.2 Average Size of Household in the Project Area

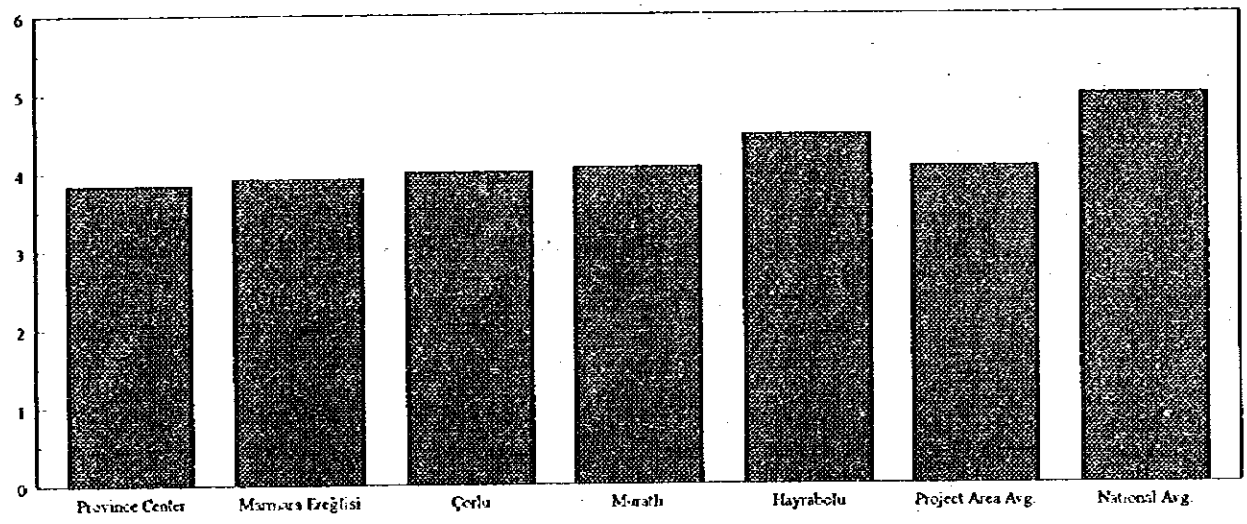


FIGURE 2.6.3 Age Distribution in the Province Center

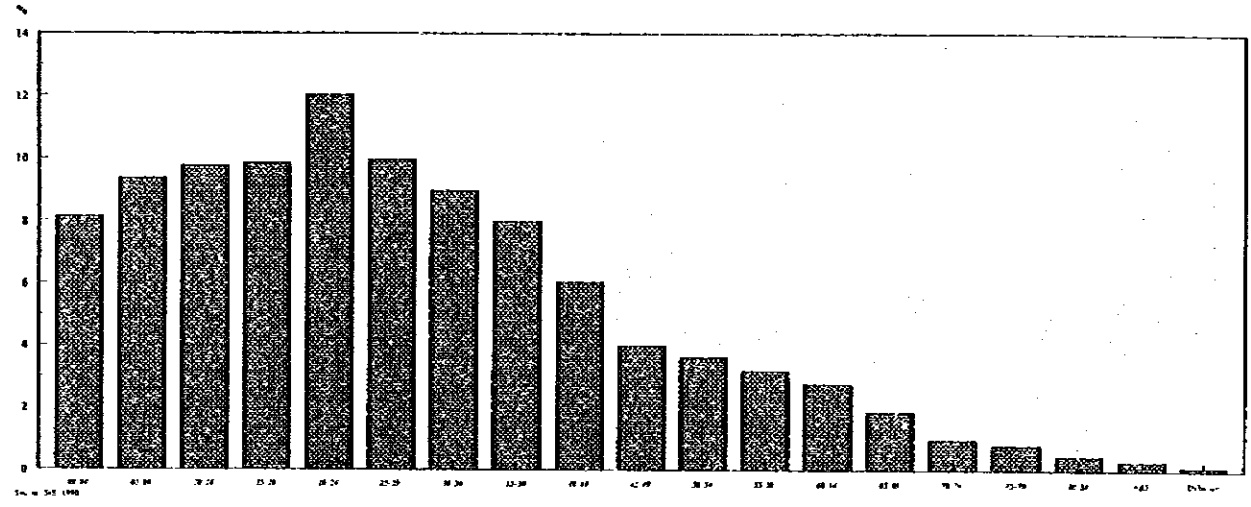


FIGURE 2.6.4 Age Distribution in the District of Marmara Ereğlisi

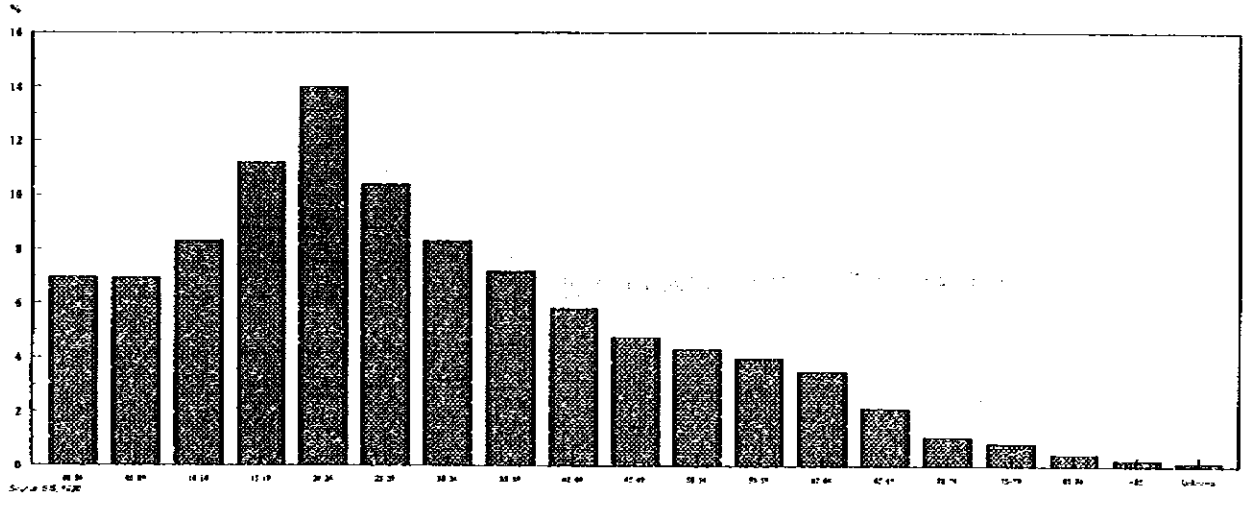


FIGURE 2.6.5 Age Distribution in the District of Çorlu

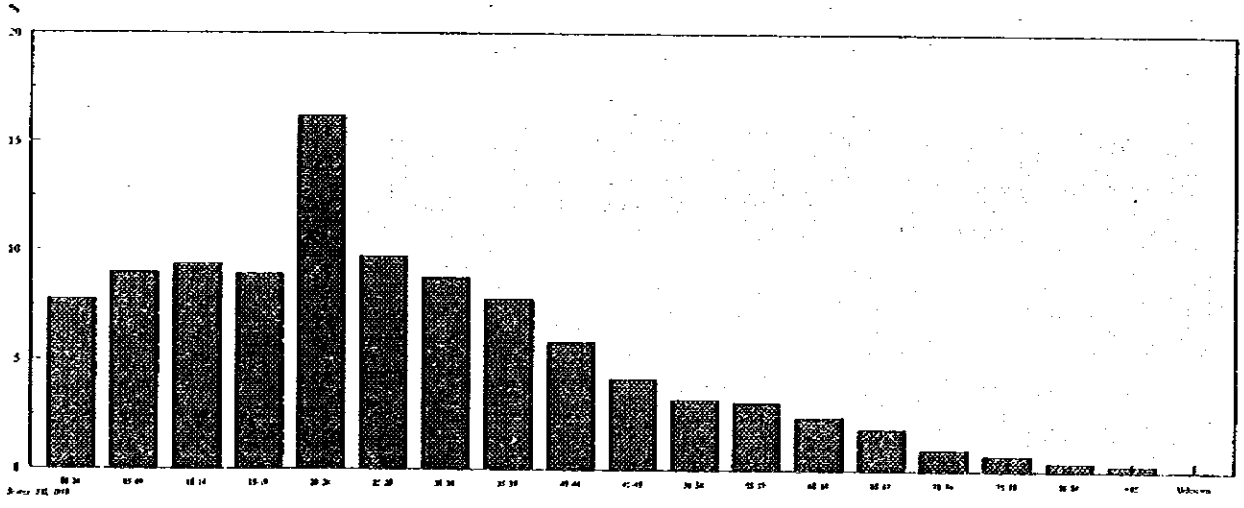


FIGURE 2.6.6 Age Distibution in the District of Muratli

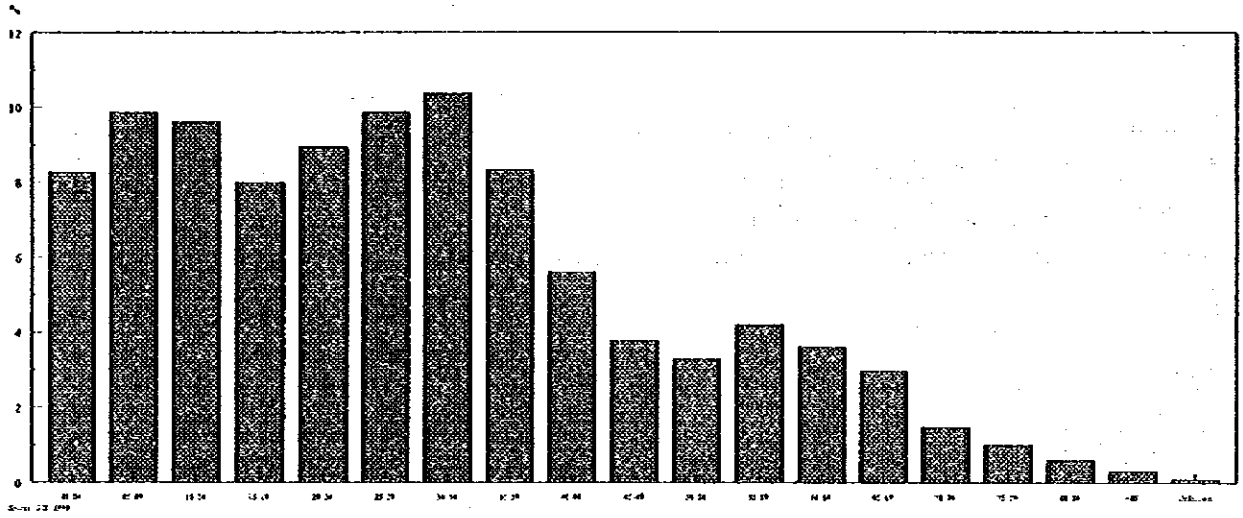
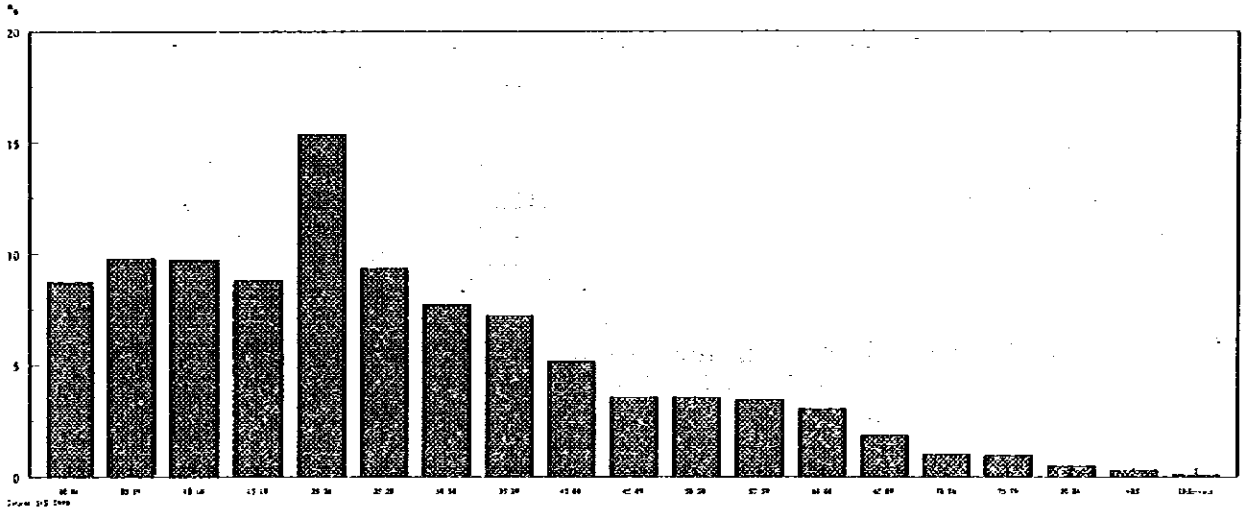


FIGURE 2.6.7 Age Distibution in the district of Hayrabolu



October 1990 census. As exemplified in Table 2.6.6, the method used by the Provincial Bank of Turkey (PB) gives the best estimate of the population. Table 2.6.7, compares the 1995 and 2000 population estimations for the project area and its immediate vicinity with those of the State Institute of Statistics (SIS) for the Province of Tekirdag. As can be seen from the table, the estimates of SIS and PB are remarkably close to each other. Based on this discussion, the PB method was selected for the estimation of the populations of the five districts within the project area and its immediate vicinity. The results of the 1985 and 1990 populations census together with predictions for 1995, 2000 and 2015 are presented in Table 2.6.8.

TABLE 2.6.6 Population Estimations for the Province of Tekirdag for 1990

Linear Regression	389,420
Arithmetic Method	404,610
Geometric Method	417,020
PB Method	484,807
1990 Population Census	468,842

TABLE 2.6.7 Comparison of Methods and SIS Predictions

Year	1995	2000
Linear Regression	462,193	490,777
Arithmetic Method	499,952	531,062
Geometric Method	512,594	560,429
PB Method	543,516	630,084
SIS Prediction	540,700	629,500

TABLE 2.6.8 Population Projections for the Project Area and its Immediate Vicinity

District	1985 Population Census	1990 Population Census	1995 Predicted Population	2000 Predicted Population	2015 Predicted Population
Province Center	99,133	117,455	136,163	157,850	245,925
Marmara Ereglisi	7,267	12,455	14,439	16,738	26,078
Çorlu	81,857	104,303	120,916	140,175	218,387
Murath	12,858	22,952	26,608	30,846	48,056
Hayrabolu*	46,017	45,640	47,968	50,415	58,530
Project Area Total	254,132	302,805	346,094	396,024	596,976

** The applicability of PB Method to this district (with a decreasing population) is questionable.*

2.6.2 Regional Economic Characteristics

The Economy of the Province of Tekirdag is centered primarily around various commercial and industrial activities followed by agriculture. In particular, tourism based activities have long been important in the region, especially along the coastal line.

In terms of agriculture, which is one of the most important economic activities of the province, the predominant products are wheat and sunflower. Over the years, the increase in agricultural production resulted in an increase in the total income of the inhabitants and a local capital has accumulated in the region. This capital is mostly spent for the development of industry within the province boundaries. In this regard, various agricultural based industrial facilities are established in the region in the last 20 years. Consequently, the share of industrial activities in the regional economy has increased markedly.

For instance, numerous seed oil refineries within the boundaries of the province constitute an important industrial sector. These various sized establishments mainly produce sunflower oil from the sunflower grown in the province and its immediate vicinity. One of the largest of these establishments is the Trakya Birlik Integrated Oil Factory located some 18 km away from the province center and owned by the so-called "Seed Oil Cooperative". This facility supplies a significant portion of the raw oil demand of the Thrace. Further, the Tekel Tekirdag Wine and Alcoholic Drinks Factory produces the famous Tekirdag wines and raki which are mostly exported to foreign markets. In addition to the above industries, various flour factories and brinck factories are also located in the province.

The proximity of the province to the metropolitan area of Istanbul has also effected industrial development in a positive way. In this regard, organized industrial zones have been established within the province boundaries. Çerkezköy and Çorlu Organized Industrial Zones are the most important of these developments. The Çorlu Industrial Zone is located along the E-80 highway near the border with the Province of Kirklareli. There exists 24 industrial establishments within this establishment most of which are textile factories. Today, the current capacity of the textile industries in the province could sustain the entire national demand. In addition to the textile industry, some tanneries started operation within the Çorlu Organized Industrial Zone following the prohibition of the leader production facilities in Kazlıçesme-Istanbul.

In addition to agriculture and industry, short term domestic and foreign tourism began to be an important economic activity in the recent years. The main tourist attractions of the province are natural and altered beaches as well as historical sources. However, in terms of national tourism policies, the region is ranked far beyond the Mediterranean and Aegean Regions. In this regard, there are far less tourism investments in the province mainly due to a shorter tourism period. Except for some hotels and motels, tourist facilities of the region are mostly in the form of daily recreational facilities serving local residents. The coastal band along the Tekirdag-Istanbul highway (Route 110) has experienced a rapid development in the recent years which resulted in construction of a rather excessive number of private summer houses.

Currently, the contribution of the Tekirdag Province to the Gross Domestic Product (GDP) is about 1.1%. However, in terms of the per capita GDP, Tekirdag ranks fourth among all provinces. In terms of major economic sectors, while agriculture exhibits a decreasing trend, the percentages of industry and service sectors increase considerably in the province. In this regard, according to the latest data, the respective shares of service, industrial and agricultural sectors are 44, 34 and 22%, respectively.

2.6.3 Regional Income

Based on the results of the latest "Household Income and Expenditures Questionnaire" of the State Institute of Statistics, the distribution of income types by sectors in the Province of Tekirdag is expected to be as shown in Figure 2,6,8. As expected from the high level of industrialization, the largest income type is wages and salaries. Table 2.6.9 shows the contribution of various industrial activities in the region to regional and national income.

TABLE 2.6.9 Annual Payments and Value Added by Industry Groups in Tekirdag (x1000 TL)

Industry Groups		Annual Payments	Value Added
Food, beverages and tobacco	Public	3,447,429	39,687,671
	Private	14,391,501	113,420,412
Textile, wearing apparel and leather	Public	-	-
	Private	79,376,282	357,161,810
Wood and wood products	Public	-	-
	Private	2,653,034	9,068,306
Paper and paper products, printing and publishing	Public	-	-
	Private	2,851,443	20,221,704
Non-metallic mineral products except products of	Public	-	-
petroleum and coal	Private	3,464,783	6,930,324
Fabricated metal products, machinery and	Public	-	-
equipment, transport equipment	Private	51,041,875	179,650,487
Provate Total	Public	3,447,429	39,687,671
	Private	4,364,818	688,398,320

Source: State Institute of Statistics, 1987.

By definition, the percentage of economically active people is defined by the summation of persons employed as well as those unemployed but seeking a job. The percentages of economically active males and females residing in the study area and its

environs are given in Table 2.6.10.

TABLE 2.6.10 Economically Active Population (ages 12 and above) in the Project Area (%)

Districts	Male	Female
Province Center	76.09	14.47
Marmara Ereglisi	84.45	20.47
Çorlu	82.84	19.55
Murath	78.84	18.90
Hayrabolu	82.50	8.14
Project Area Average	80.94	16.31
Nationwide Average	78.22	42.76

Source: State Institute of Statistics, 1990.

In Turkey, the averaage percentage of economically active males is 78.22% while that of females is 42.76%. The study area exhibits similar percentages comparable to the nation-wide average for males. However, number of working females are considerably less than the national average. As can be seen from Table 2.6.10, the work force of Marmara Ereglisi is the greatest among the others and the smallest work force is at the Tekirdag Province Center. The distribution of the economically inactive people (12-65+) is given in Table 2.6.11.

TABLE 2.6.11 Economically Inactive Population in the Project Area (%)

Districts	Reurod*		Housewife *	Student*		Other*	
	M	F	F	M	F	M	F
Province Center	30.00	1.50	84.64	53.31	13.35	16.69	0.51
Marmara Ereglisi	39.27	3.05	84.37	48.50	12.39	12.23	0.19
Çorlu	28.09	1.58	85.23	55.51	12.96	16.45	0.23
Murath	30.63	1.29	88.24	44.79	10.01	24.58	0.37
Hayrabolu	25.14	0.69	89.99	49.80	9.11	25.06	0.21
Project Area Average	30.63	1.62	86.49	50.38	11.56	19.00	0.30
Nationwide Average	24.69	1.70	82.11	57.74	14.86	17.57	1.33

**M: Male; F: Female*

Sources: State Institute of Statistics, 1990.

Dependency ratio is an indicator of the working population. For the five district in the SA, the dependency ratios were calculated from the populations of 0-14, 15-64 and 65+ age groups. By definition, age dependency ratio is the number of people in a given age group (0-14 or 65+) to every 100 people between ages 15-64. For instance, dependency ratio of 65+ is defined as the ratio of population aged 65 years and older to thhose aged 15-64,

multiplied by 100 (see Table 2.6.12).

TABLE 2.6.12 Dependency Ratios (DR) in the Project Area

Districts	65+ Population	0-14 Population	15-64 Population	DR Aged 65+ Years	DR Aged 0-14 Years	Total Age DR
Province Center	3,522	21,870	54,952	6.41	39.80	46.21
Marmara	274	1,319	4,357	6.29	30.27	36.56
Çorlu	3,087	19,376	52,184	5.92	37.13	43.05
Murath	834	3,658	8,687	9.60	42.11	51.71
Hayrabolu	764	4,805	11,341	61.74	42.37	49.11
Project Area Average	8,481	51,028	131,511	6.45	38.80	45.25
Nationwide Average	2,417,363	19,745,352	34,265,838	7.06	57.62	64.68

Sources: State Institute of Statistics, 1990

As can be seen from Table 2.6.12, Marmara Ereglisi has the lowest dependency ratio of 36.56%. In other words, approximately a total of 63 out of every 100 persons is from the acceptedworking age group of 15-64. Total age dependency ratio of Murath is 51.71% which is the highest for the study area indicating that only 52% of the total population is from the working age group.

On the average, the total age dependency ratio of Turkey is 64.68%, with the dependency ratio of aged 65+ being 7.06% and the denpendency ratio for 0-14 aged being 57.62%. In general, Turkey has a young population, a significant portion of which belongs to the 0-14 age group. Total age dependency ratio of the study area is 45.25% of which 6.45% being the dependency ratio of aged 65+ and 38.80% being the dependency ratio of 0-14. All districts in the study area have lower total age dependency ratios compared to the national statistics, indicating a high labor force.

2.6.4 Social Infrastructure Services

(1) Education and Cultural Activities

According to 12992 numbers, there are 74 kindergartens, 334 primary schools, 15 primary education schools (combined primary and junior high schools), 38 high schools and training colleges, 9 private tutorial schools, 9 public education centers and 21 special training centers in the Province of Tekirdag (Tekirdag Province Tourism Master Plan, 1992). In the rpovince center, there are 77 primary schools, 28 secondary schools, 1 Faculty of Agriculture and 1 vocational schools at the university level. In the District of Çorlu there are 29 primary, 5 primary education, 3 secondary, 5 high ahnd 1 vocational school at the university level

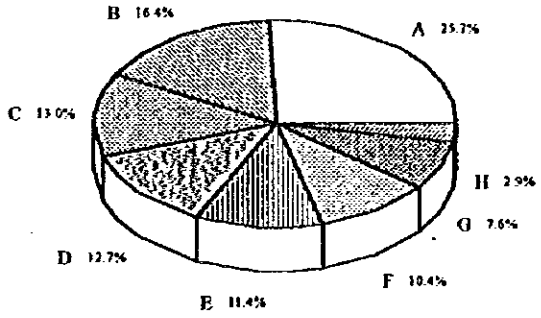
Besides, as the Province of Tekirdag receives imigration, the rate of increase of population is higher than that of the national average. Especially, in Çorlu and Tekirdag Province Center where industrialization is dominant, population increases rapidly. As a result of this , the schools have separate morning and afternoon sessions which affect the quality of education adversely.

According to the data of 1990 census, the average literacy in the project area is 87.92% which is higher than the international average of 80.46%. Table 2.6.13 gives the level of formal education completed in the districts of the study area. As listed in this table, approximately 50% of the population with ages 6 and over are graduated from primary schools. On the other hand, 12.11% of the total population of the project area is literate but without a formal diploma. About 25% of the students graduated from the primary schools register to junior-high schools and nearly all junior-high school graduates attend to a high school. However, about one third of the high school graduates pursue higher education. The percentage of population graduated from higher education is 3.99% which is higher than the national average of 3.79%. Among the 5 districts of the study area, the province center has the highest percentage of higher education graduates (5.32%).

There are several libraries in Tekirdag Province Center (e.g., Namik Kemal and 100. Yu). Further, there exists public libraries in Çorlu and Murath: while Çerkezköy public library is in completion. There is also mobile library services for the rural areas of the Province.

In addition to small art galleries in the Province Center, a multifunctional cultural center for the Province is in the planning stage. And, the relatively well-known Tekirdag Archaeological Museum has recently been restorated.

FIGURE 2.6.8 Distribution of Income Types



A: Wages and Salaries
B: Rents
C: Trade
D: Agriculture
E: Transfers
F: Non-Agricultural Production
G: Services
H: Interest-Dividend

Source: State Institute of Statistics, 1993.

TABLE 2.6.13 Level of Formal Education in the Project Area (age 6 and above)

Level of Education Completedd	Province Center	Marmara Ereglisi	Çorlu	Murath	Hayrabolu	Project Area Total
Total Literate	89.51	91.16	90.12	86.50	82.30	89.79
Miterate	10.49	8.84	9.88	13.50	17.70	10.21
School unattended and incomplete	12.18	9.86	11.65	13.93	12.94	12.11
Primary school	48.13	53.30	48.14	44.43	50.83	48.97
Junior high school	9.92	11.21	12.73	12.37	7.60	10.77
Vocational school at junior high school	0.04	0.07	0.08	0.05	0.01	0.05
High school	8.61	8.29	8.62	8.90	5.99	8.08
Vocational school at high school level	4.49	3.32	4.78	3.93	2.31	3.77
Higher education	5.32	5.07	4.08	2.87	2.59	3.99

Source: SIS, 1990

(2) Health and Health Institutions

No records of endemic deseases were encountered for the project area and its immediate vicinity. Health institutions under the Ministry of Health and Social Aid (MOHSA) in the Province of Tekirdag are listed in Table 2.6.14. According to 1991 numbers, a total of 874 staff beds (755 public and 69 private) and 197 midecal doctors are in service in the Province, and the number of patients per bed is 598 which is higher than Turkey's general averate of 437. However, except a lack of midwives in some rural areas, there is no shortage of health personnel. For instance, Tekirdag averages show that there is one specialist for every 2,439 people (national average is 6,528) and tthere is one medical doctor for every 1,921 people (national average is 2,900) SIS, 1993; Problems of Tekirdag Province by Districts and Villages, 1993). Other health institutions in the province are given in Table 2.6.15.

TABLE 2.6.14 Health Institutions

Institutions	Number of Staff Beds	Number of Medical Doctors	
		Specialist	Practitioner
Tekirdag State Hospital	160	41	10
Tekirdag Breast Diseases Hospital	250	2	5
Çorlu State Hospital	100	27	12
Hayrabolu State Hospital	25	-	1
Malkara State Hospital	50	6	10
Sarkoy State Hospital	50	4	9
Silivti State Hospital	50	14	9
SSK Tekirdag Hospital	50	23	4
SSK Çerkezköy Hospital	70	-	-
Tekirdag Private Valan Hospital	20	3	-
Çorlu Private Valan Hospital	34	4	-
Çorlu Private Sifa Hospital	15	13	-
TOTAL	874	137	60

Source: Yearbook of Treatmetn Institution, 1992

(3) Municipal Services

In Terms of infrastructural activities, municipal water and sewerage services are not adequately provided particularly in the suburban and rural parts of the region. Septic tanks are common in many residential areas of the districts whithin the sutdy area and its environs. In general, the region is in need of new resources for drinking and irrugation water. Further, there exists problems associated witht he water supply system of the Tekirdag Province Center. However, nearly 90% of the villages of the project area has sufficient supply of potable water for daily consumption (Problems of Tekirdag Province by Districts and Villages, 1993).

TABLE 2.6.15 Other Health Institutions

Institution	Number
Tekirdag Mother-Child Health and Family Planning Center	1
Tekirdag Tuberculosis Dispensaries	1
Çorlu Tuberculosis Dispensaries	1
Malkara Tuberculosis Dispensaries	1
Hayrabolu Tuberculosis Dispensaries	1
Mariuine Health Control Center	1
Hygienc Institution, Public Health Laboratory	1
Urban Type Health Center	16
Rural Type Health Center	25
Quarter Health Station	156
Rural Health Station	113
Pharmacy	120
Orphanage	1
Health Vocational School at High School Level	1

Source: Health Statistics Yearbook of Turkey, 1987; Tekirdag Province Tourism Master Plan, 1992: Yearbook of Treatment Institutions, 1992.

The consumption of electricity in the region is high due to the advanced status of industrial activities. Furthermore, in the District of Çorlu, the network for electricity transmission is insufficient to meet the demand of increasing industrilization. For the Province of Tekirdag, the total increase in electricity demand is 8.69% (Tekirdag Province Tourism Master Plan, 1992). In this regard, two natrual gas fired power plants with a total nominal capacity of about 1,000 MW are being planned to be erected near the shores of Marmara Ereglisi.

2.6.5. Urban and Rural Land Use

Land use patterns dominant in the Province of Tekirdag are shown in Figure 2.6.10 As can be seen from this figure, the major portion of the area is utilized as sown area. The proposed project area, however, is a military security zone. Thus, there exist no current or planned utilization of this coastal strip.

In recent year, vacancy ratios in district centers within the study area are decreasing rather rapidly with a rate comparable to the steady increase in population (Tekirdag Province Tourism Master Plan, 1992). Vacancies are particularly low in the Tekirdag Province Center and the Distrist of Marmara Ereglisi. A typical distribution of buildings in the districts within the study area is given in Table 2.6.16. Marmara Ereglisi was not a district center at

the time of this survey; therefore, building statistics do not exist for Marmara Ereglisi. However, the relative distrib ution of building types in this district is also expected to be similar to other towns within the study area.

In general, there exists many governmental and private enterprises, several holiday estates and privately owned houses within the study area. Housing is especially dense near the shoreline and inland residential areas having a municipal administration. Compact summer housing is seen along the shoreline between Marmara Ereglisi and Tekirdag Province Center. This region shows a settlement pattern similar to some parts of the Aegean and Mediterranean coasts with highly developed individual dwellings and holiday estates.

TABLE 2.6.16 Building Statistics

Districts	Province Center	Çorlu	Murath	Hayrabolu
Entirely Residential	7,772	5,731	1,814	2,118
Mostly Residential	635	865	142	274
Entirely Commercial	955	912	195	302
Mostly Commercial	76	176	31	65
Entirely Governmental	36	19	16	18
Entirely Religions	17	7	3	6
Entirely Medical	4	3	1	1
Entirely Education and Cultural	24	19	6	10
Mixed	21	21	22	9
Other	1	-	2	1
Unknown	1	-	-	-
Total	9,542	7,753	2,232	2,804

Source: State Institute of Statistics, 1984.

Up to late 1079's, Tekirdag received the highest inducements for industrial development. During htis time, the increase in manufacturing industries contributed to the rapid population growth and resulted in an increase in the regional income. However, currently incitements for industrial development have been restricted particularly for organized zxones such as Çerkezköy.

The national tourism policy focuses on new and alternative regions for tourism development. In this regard, it is likely that Tekirdag region may attract mroe attention with its potential resources and as a result the rate of investments may increase in the future. At present, however, investment related to tourism and recreation are usually int he form of accommodation facilities targeting local residents. In the study area and its environs, tourist accommodation facilities show a rather slow and steady pattern with limited investments in motels, pensions and comping facilities on the coastal line. Increase in the number of

municipality licensed hotels and restaurants are observed mainly in the Tekirdag Province Center.

In terms of the current fiscal plans, investment funds in the Provicne of Tekirdag and the District of Marmara Ereglisi are mostly allocated for the improvement of the existing transportation and energy supply networks as well as communications, health care and other public services such as drinking water supply systems.

2.6.6 Cultural Assets

The existing characteristics of the project area and its immediate vicinity will be fuly investigated in terms of all existing and potential archaeological, historical and cultural assets by means of field surveys including not only site visits and ground truthing at the project area but also interviews with the related local officials and scholars. In the course of this study, survey of all related official reports and documents: interviews with local officials and related scholars as well as analysis and judgement regarding the presence of historical and cultural assets will be emphasized.

According to preliminary investigations, there exist no natural parks, national preservation areas, biogenetic reserve areas, natural monuments, wetlands and fishing weirs within the project area and its immediate vicinity. However, due to its location as a natural passage connecting Thrace to Anatolia, Tekirdag region has been an important settlement for thousands of years and there are a number of archaeological, historical and cultural sites within Province boundaries. For instance, the District Center of Marmara Ereglisi is designated as a Class-1 site by the Ministry of Culture.

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(1) Historical and Cultural Assets

1) Introduction and location of the site

The investigated project area (PA) is located to the east of Tekirdag, 18 km far from the city center. The PA is composed of two parts. The first part is located between the sea and the Tekirdag - Marmara Ereglisi State Highway. This part measures 2.5 km in length and 800 m in width. The second part is located on the north of the highway, measuring 400 meters in width. Both parts of the PA are surrounded by fences in order to prevent people from entering in. In both parts, there are newly built small buildings which have possibly summer houses is located to the east of the PA.

2) Methodology

Three different sources of information have been used in order to prepare an inventory of the historical and cultural assets in the vicinity of the PA.

a) Official records and documents

These include documents that were obtained from the Directorate of Tekirdag Museum. These documents basically cover the archaeological excavation reports, site surveys and similar other archive material related with the nearby historical sites and settlements.

b) Interviews with local officials

Interviews were conducted with the ***Director of Tekirdag Museum***, Mehmet Akif Isin, as well as his colleagues. Mr. Isin also supervises some of the archaeological excavations executed in the vicinity of the PA.

c) Site visits and ground surveys

In order to investigate possible cultural properties, such as monuments, ruins and archaeological fields, detailed observations have been carried out in the course of site visits to the PA and its vicinity.

3) Definitions

In this report, various terms such as "cultural property" and "site" are used as they are defined in Article:3 of the Law on Preservation of Cultural and Natural Properties (Law No. 2863; Official Gazette No. 18113 dated 23.07.1983). According to this, cultural assets are those historical or pre-historical properties (movable or immovable) related to science, culture, religion or fine arts which are found on the surface, under the ground or in water.

According to the principle decisions of the "High Council for Preservation of Cultural and Natural Properties", construction of any type of building is prohibited in a first degree archaeological site. On the other hand, in order to execute infrastructure facilities (e.g., roads, dams etc.), special permission should be obtained from the nearest "Local Council for Preservation of Cultural and Natural Properties" (i.e., Edirne Council for Preservation of Cultural and Natural Properties in the case of the PA). Similarly, land use decisions regarding third degree archaeological site are given after the preparation of a relevant "Preservation and Development Plan".

4) Historical background

The area between Tekirdag and Marmara Ereglisi, has been settled since the prehistoric periods. Marmara Ereglisi (Perinthos) which is 20 km away from the PA, has been founded during 6th century B.C., and occupied by Hellenistic, Roman and Byzantine civilizations. The town has monumental buildings such as stadion, amphitheater, basilicas etc. dating from those periods. The other archeological sites in the vicinity of PA, were also settled during Calceolithic, Iron, Classical, Hellenistic, Roman and Byzantine ages.

5) Cultural properties in the vicinity of the PA

During the site survey, the cultural properties in the vicinity of the PA were investigated from east to west. The information gathered about these sites is outlined below.

a) Aytepe

The area called Aytepe consists of a ***"tumulus"*** (artificial grave hill) and a small

Roman settlement. The tumulus, is located at 1 km east of the PA; whereas, the small settlement sits between the highway and the sea. The settlement is now occupied by a modern neighborhood. The whole site dates from the Roman era, and grave stones from that period are now exhibited in the Tekirdag Museum. The tumulus is registered as ***"1st degree"*** and the site itself is registered as ***"3rd degree Archaeological Site"***.

b) Unnamed settlement

It takes place at 1.5 km west of the PA. Today, the whole site is occupied by modern houses. According to the Director of Tekirdag Museum, some terra-cota pieces were discovered at the site.

c) Dörttepeler

This site is located at 1.5 km east of the PA. There are four tumuli on the site which have not been investigated until now. This site is also registered as ***"1st degree Archeological Site"***.

d) Heraion

Heraion has been settled from Iron to Byzantine ages and has not been subjected to detailed archaeological excavations until now. It is located to the west of the PA. The west border of the site is established by the so-called Çitlenbik Creek. The area between the highway and sea, which is about 150 m wide, and the area to the north of the highway, which is 100 m wide, are registered as ***"1st degree Archeological Site"***. A second part which lies on the north of the 1st degree site is about 700 m by 700 m and is registered as ***"3rd degree Archaeological Site"***.

e) Tumulus

It is located at about 7 km west on the PA. It has not been subjected to any archaeological excavation until now. This tumulus is also registered as a ***"1st degree Archeological Site"***.

f) Menekse Çatagi

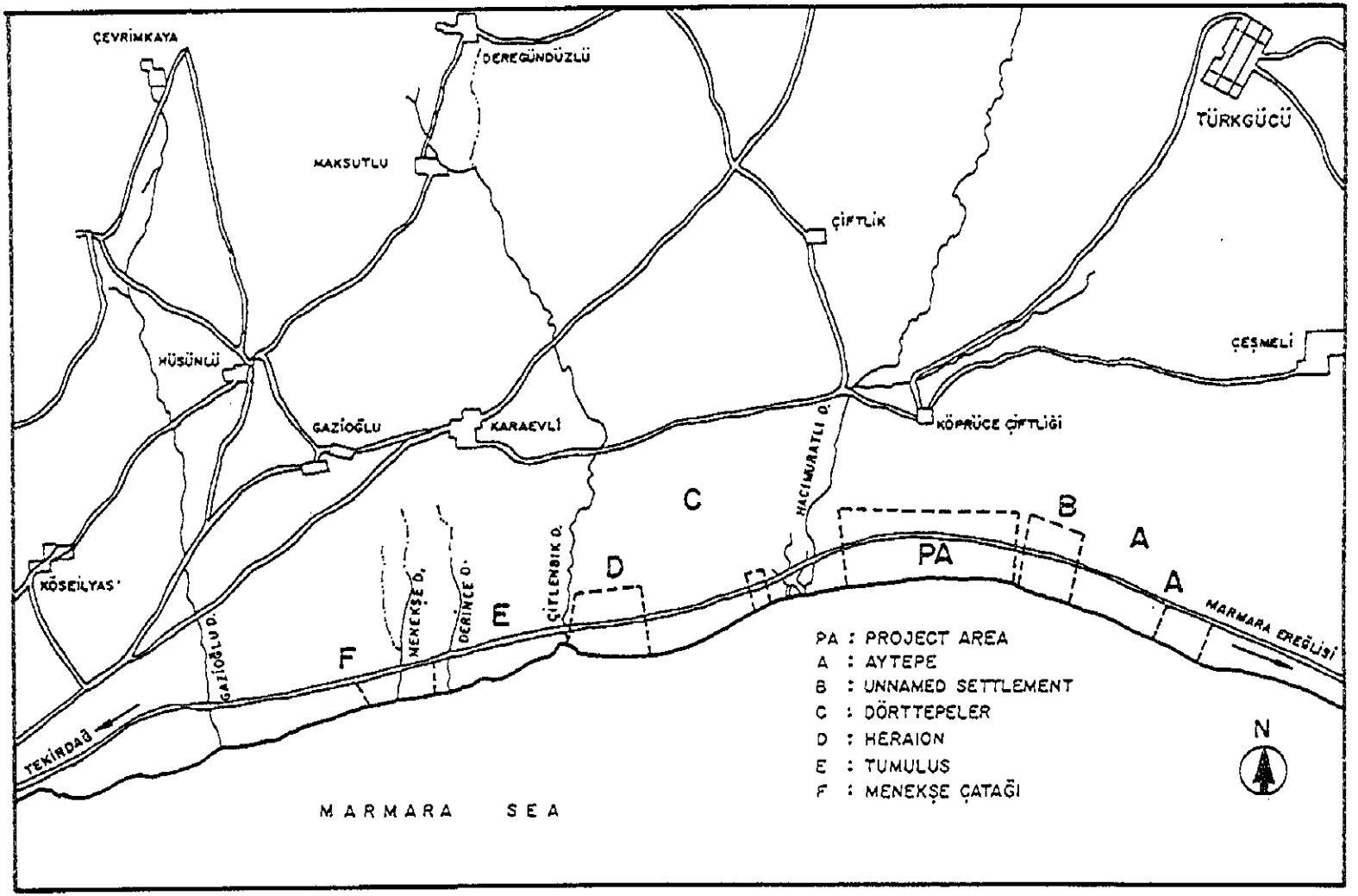
This site has been settled at 7.5 km west of the PA between the highway and the sea. The so-called Menekse Creek divides the site into two equal parts. The length of the whole side is about 600 m. The site is jointly excavated by the experts from both Istanbul University and Tekirdag Museum. The material found during these excavations dates from

Calceolithic and Hellenistic periods. The Menekse Çatagi site is registered as a a *"1st degree Archeological Site"*.

6) Concluding Remarks

There exist no cultural and historical properties within the limited boarders of the PA. However, as listed above and marked on the enclosed map, there are several tumuli and archaeological sites near the PA. These locations must be carefully considered during the design of auxiliary port facilities such as access roads and similar other infrastructural developments.

On the other hand, according to the field observations as well as official records, there are no areas of high landscape or recreational value in the vicinity of the PA.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A : AYTEPE
B : UNNAMED SETTLEMENT
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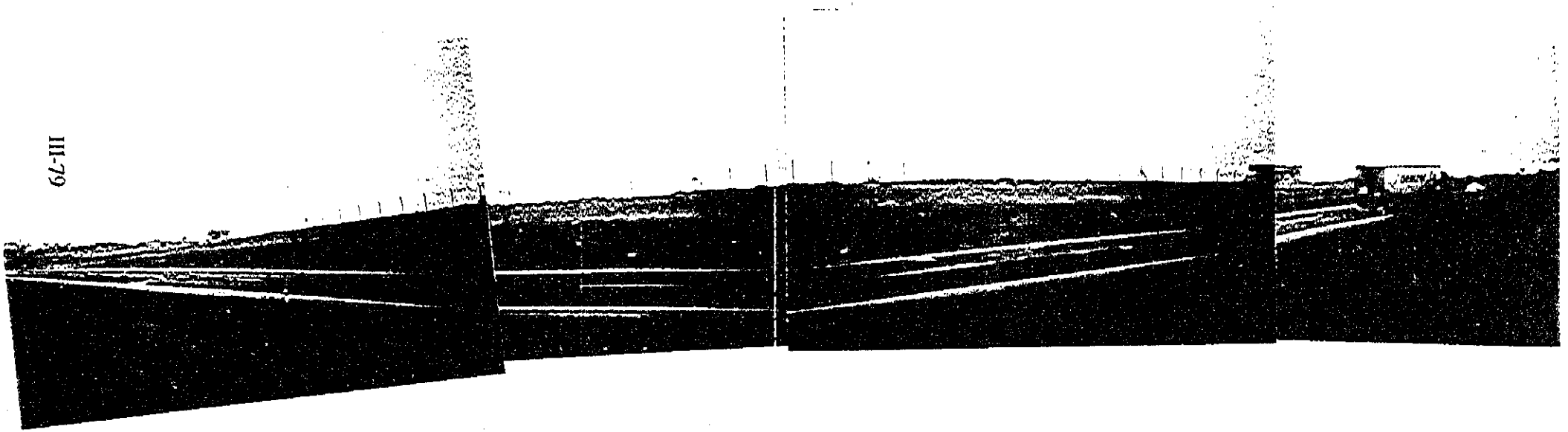
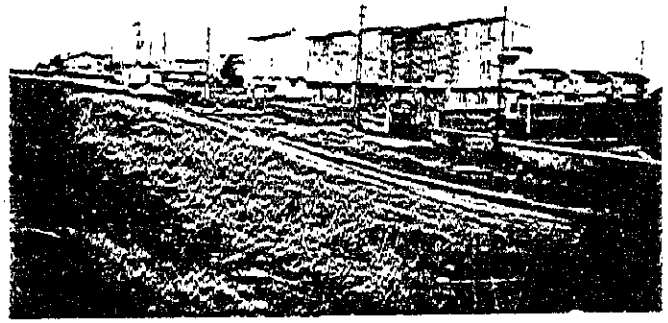
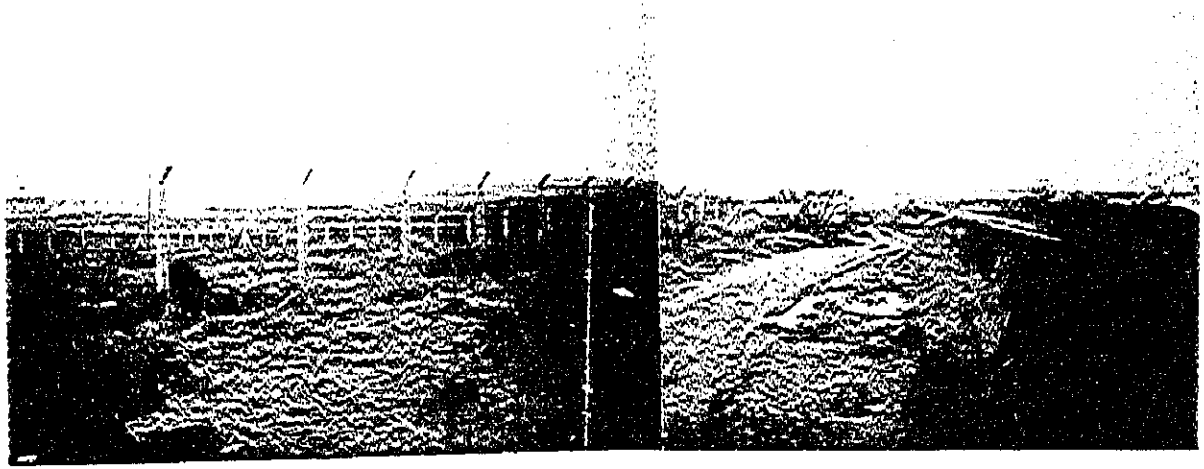


PROJECT AREA PANORAMIC VIEW FROM NORTH

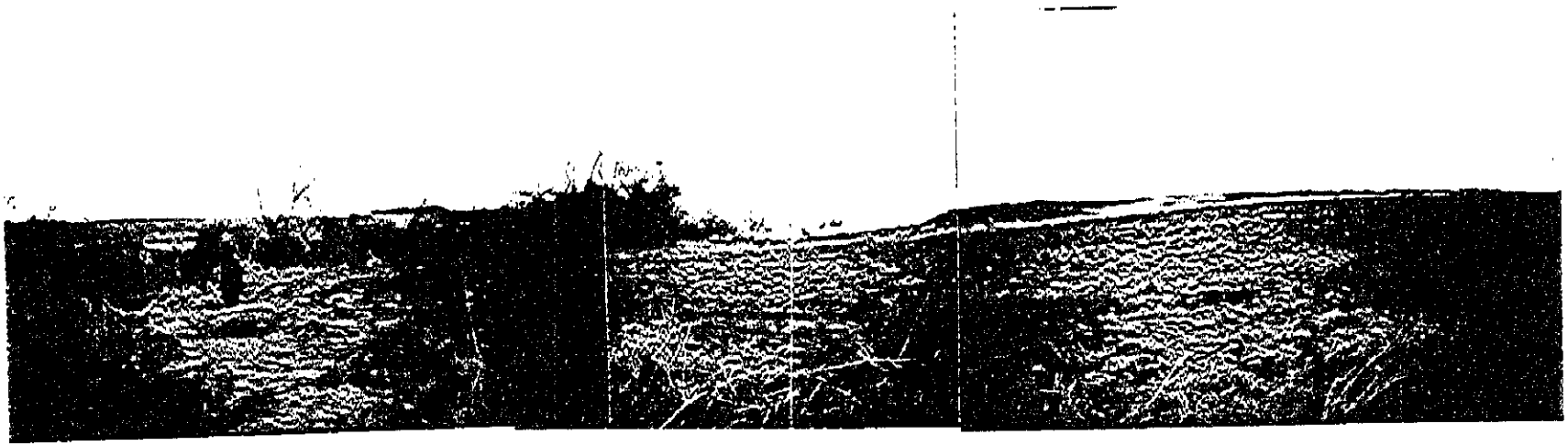


NEW HOUSING DEVELOPMENT
ADJACENT TO THE PROJECT AREA

PROJECT AREA A GENERAL VIEW FROM EAST



PROJECT AREA PANORAMIC VIEW FROM EAST



"MENEKŞE ÇATAĞI" ARCHAEOLOGICAL EXCAVATION AREA