5-3 Field Surveys

5-3-1 General

Some field surveys were planned and fulfilled, in order to obtain engineering informations, during the stage of this feasibility study.

These field surveys consist of topographic survey, bathymetric survey, soil investigation, wave observation and seismic prospecting. They were carried out under the contract with the group (Institute of Marine Science and Technology of Dokuz Eylul University (IMST), Geomarin Inc., Geoteknik Inc. and Temel Surveysing Inc.).

5-3-2 Topographic Survey

(1) In topographic survey, all necessary measurements for the calculation of coordinates were done in tacheometric way. The points were determined in every slope changes like at the top and bottom of the slopes, the edges and curves of the streams, rivers and roads, flat areas with maximum 50m intervals.

Contour lines were plotted according to those points located on critical changes on land.

With this method, it could be much easier to observe and catch the topographic structure of the area.

(2) A polygonation network was also established for detailed survey along the river, roads, etc. The number of those polygons was around 300. Those polygon points and secondary (supplementary) points for detailed survey along the rivers, roads etc. were established and those secondary points were monumented by wooden piles (5 x 5 x 30 cm). Measurement and elevation points was done by AGA (Geotronics) 140 Total Station or AGA 220 EDM + Wild T16 (tacheometer).

(3) Detailed surveys were based on polygonation network mentioned above. The equipment used for detailed survey is Wild T1A or Wild T16 (or for extreme conditions AGA 140 Total Station and AGA 220 EDMs). Along the

rivers and roads, measurements were done in every curve and at 100m intervals along the straight lines.

(4) Control points were established and covered with polygon network. Polygon routes were closed. Measurements were done according to control origination by using three tripods. Angle reading was done with Wild T2 (direct reading with an accuracy of 2^{cc} grad) or AGA 140 Total Station (direct reading with an accuracy of 5^{cc} grad). The sizes of those concrete monuments of control points were 15 x 15 cm at the top, 20 x 20 cm at the bottom and heights were 40 cm. Also, an aluminium plate (10 x 10 cm) was placed at the top of those monuments.

Elevations of all control points and polygon networks were determined by levelling and description of polygon points were compiled.

(5) Topographic map was plotted according to 1/2500 scale mapping law (published in Turkey). The sizes of the drawings were 60 x 80 cm with 0.12mm thickness (Fig. 5-3-1).

5-3-3 Bathymetric Survey

(1) The sounding works were carried out with the below mentioned equipment being available on the board of R/V K. Piri Reis and also R/B Olcen I (which is the small boat used for shore approach bathymetry between the coastline and 10m water depth) or her equivalent.

1) "Racal-Decca Autocarta II System" and connected "Decca Trisponder System" for accurate horizontal positioning.

2) "Atlas-Deso 10" echosounder having a digital recording unit "Atlas-Edig 10" used with R/V K. Piri Reis.

3) "Simrad Skipper" echosounder used with small boat for the shore approach bathymetry.

(2) "Decca Trisponder System" comprises one mobile station on board of the vessel and four remote stations (which were installed at preselected benchmarks) on land. The system provides the location of the mobile

station (consequently the horizontal position of the vessel) in a continuous way.

Positioning data was fed into "Racal-Decca Autocarta II System" which includes a microcomputer as a "Processor", a "Plotter" and a "Data Terminal". On the other hand, water depths were measured by echosounder (either Atlas-Deso 10 or Simrad-Skipper), and were fed simultaneously into computer, as well.

The task of the "Racal-Decca Autocarta II System" is to determine the position of the vessel continuously and accurately with respect to a predetermined route; is to match the measured water depths with simultaneous positioning data; and is to mark all these information on a map during the bathymetric data acquisition cruise.

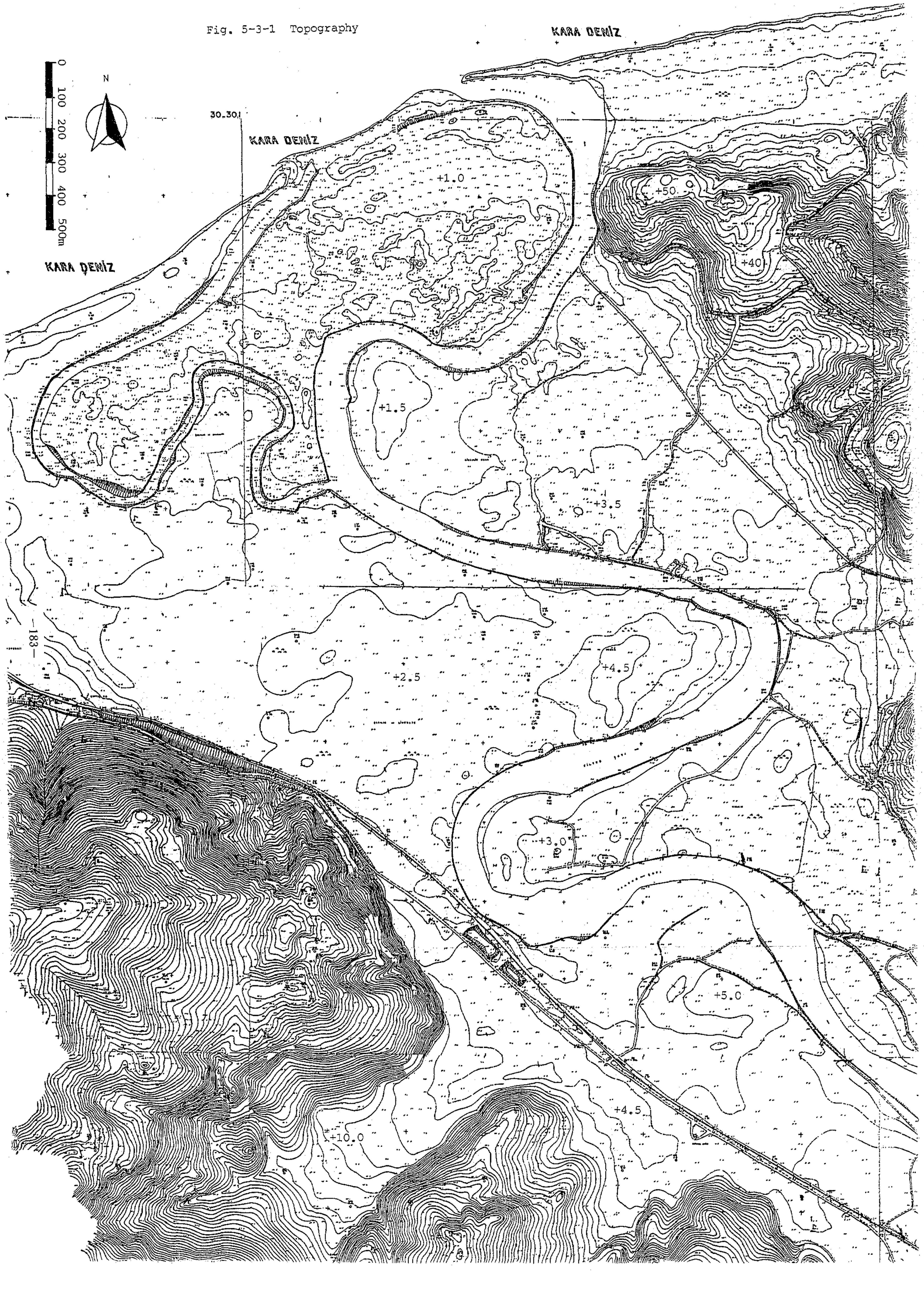
(3) As a better version of the standard configuration, "Racal-Decca Autocarta II System" was linked with IBM PC type computers, and online or offline data were transmitted to IBM computers for future processing.

(4) Following the data acquisition phase, the horizontal position and depth data were evaluated through SURFER (which is a special computer program for mapping), and bathymetric maps showing the equal depth contours were drawn by a Ao size plotter.

(5) In the course of bathymetric measurements, sea level variations were measured by a portable staff type tide gauge to be lowered from the pier (which takes place at the western part of the surveyed area). The most important reason of these masurements is to correct the measured water depths considering the sea level variations.

However, during the survey period, the maximum range (i.e. the difference between the maximum and minimum levels) was about 11 cm with a mean value of -0.4m due to the level system also considered during the preparation of the topographic maps. As the maximum range of sea level variations are below the possible errors of depth measurements, only the mean level has been used to correct the measured water depths, and all measured depths were corrected according to the following equation:

Fig. 5-3-1 Topography



Real water depth = Measured water depth +0.40m

(6) A a result of this application, both topographic and bathymetric maps have been prepared in the same datum system.

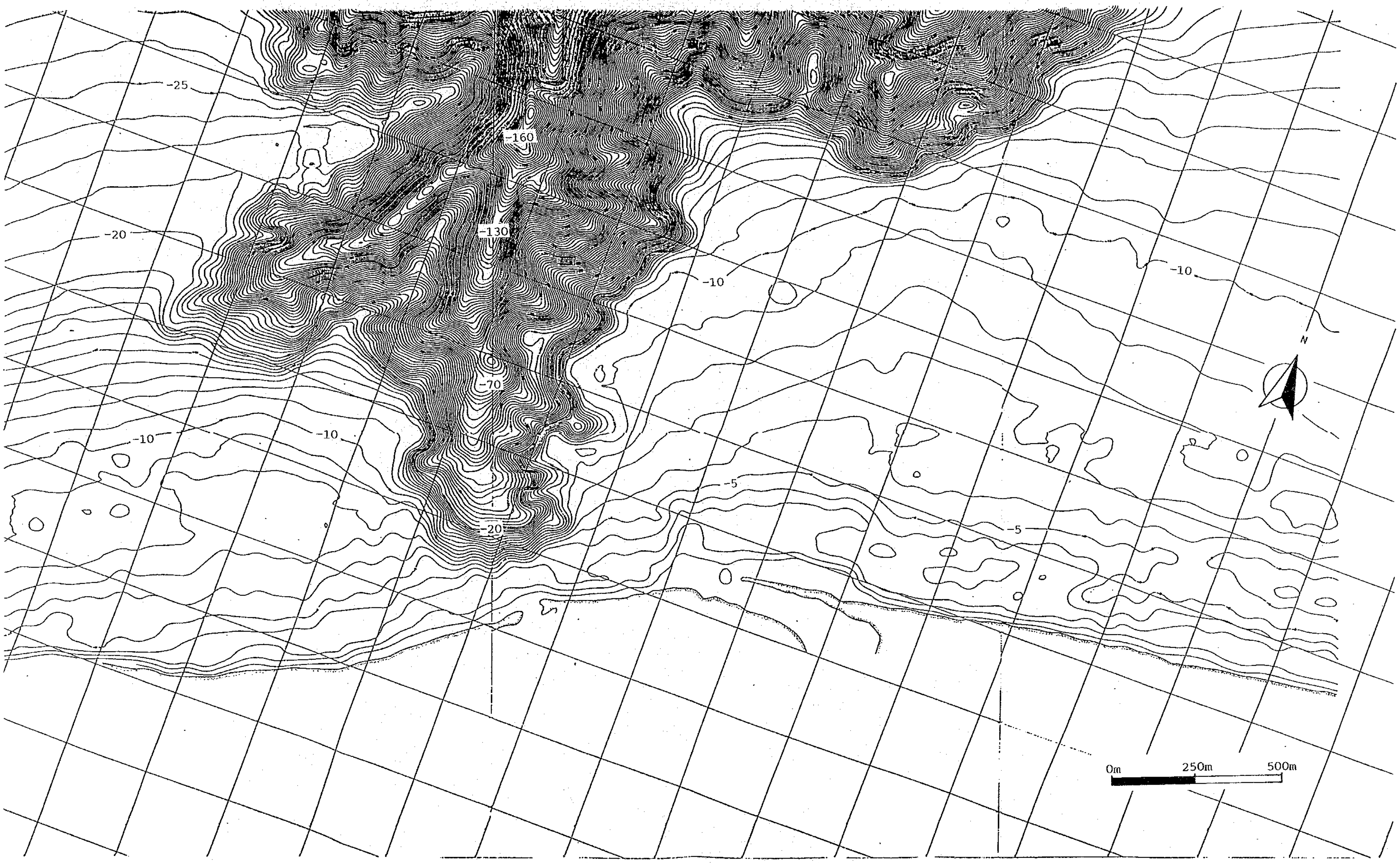
TABLE OF MEASURED SEA LEVELS

Date	Time	Water Level(*)	Time	Water Level(*)
03 FEB 1990	10.00	- 0.40	16.00	- 0.44
04 FEB 1990	10.00	- 0.42	16.00	- 0.45
05 FEB 1990	10.00	- 0.46	16.00	- 0.39
20 FEB 1990	10.00	- 0.36	16.00	- 0.38
26 FEB 1990	10.00	- 0.35	16.00	- 0.36

(*) This is due to the +0.00 of the regional datum system which was accepted as the base level during the preparation of the topographic and bathymetric maps.

(7) Bathymetric map was plotted according to 1/2500 scale mapping (Fig. 5-3-2). The size of drawings was 60 x 80 cm with 0.12 mm thickness.

Fig. 5-3-2 Bathymetry



5-3-4 Soil Investigation

(1) GENERAL

The proposed project site is located at the estuary of the Filyos River and is broadly divided into onshore and offshore areas. A total of nine (9) soil borings were conducted in the present study period to cover the whole site; 6 borings in the onshore area and 3 in the offshore area. According to the data obtained from these soil surveys, the site has the subsoil formations mentioned below.

The proposed site is formed of alluvial deposits discharged from the river upstream, and the stratification varies substantially with location. The top soil of the onshore area consists of sands with thickness of 5 to 10m, and clayey soils underlie this sand layer to the elevation of about -30m. As for the deeper strata, no information and data were obtained except the interpretation of seismic survey results.

Soil formation of the offshore is uniform sandy soil layer or sandy layer interbedded with clayey soils. These two (2) different types of formation are scattered in the offshore area. Soft soil foundation is more noticeable in the direction of the offing, while favorable soil features are seen on the eastern side of the area.

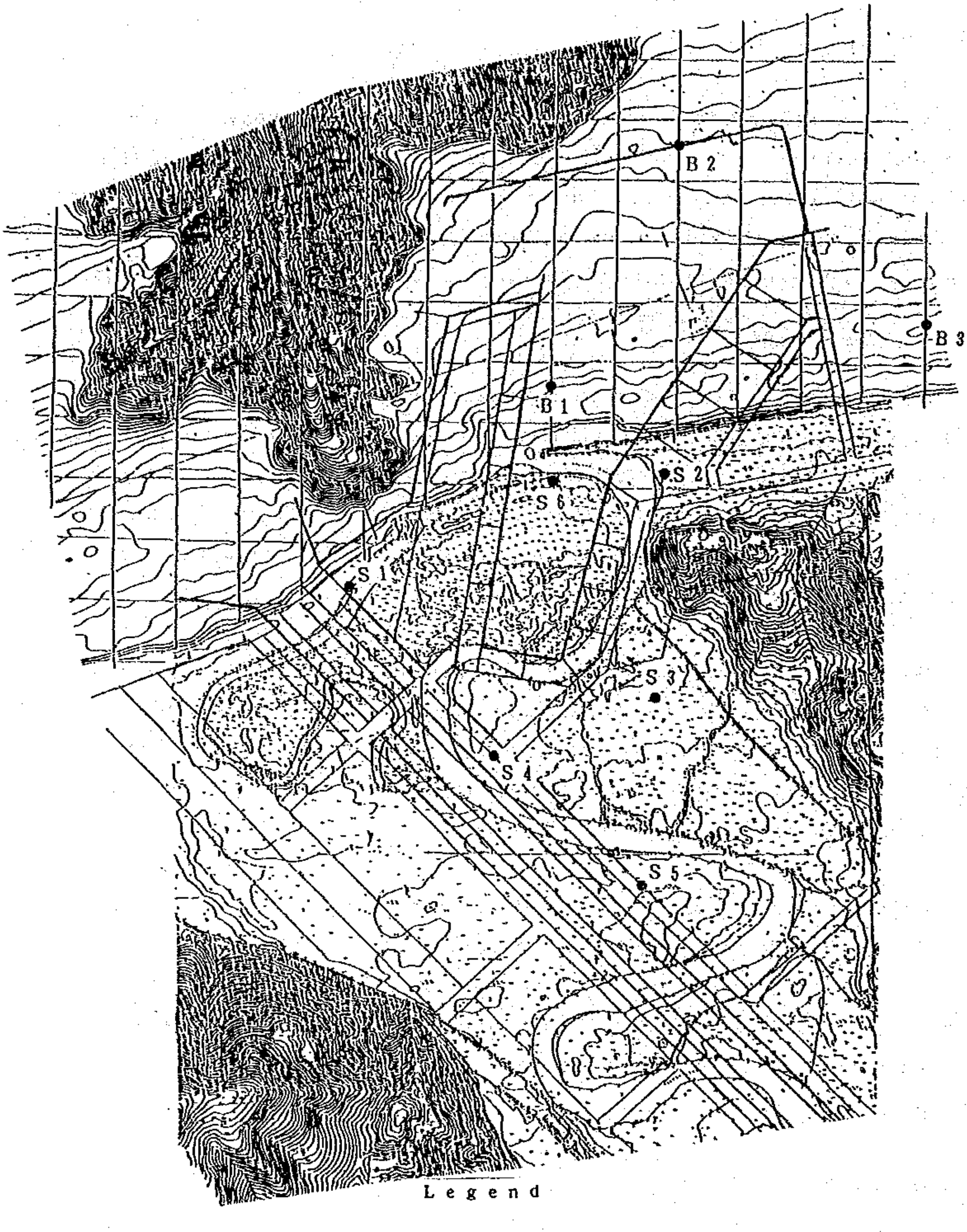
Judging from the present topographic conditions, it is considered that there existed a deep valley in the offshore area in the past. The boring data show that a foundation layer of high strength exists at the elevation of about -40m. However, there is still a possibility that the elevation of the foundation layer varies with location, taking into consideration the complex topographic conditions of the site.

(2) ON-SHORE BORINGS

5 borings totaling 151.35m were drilled, S1: 30.15m, S2: 30.00m, S3: 30.45m, S4: 30.15m, S5: 30.60m respectively, at the locations given in Fig. 5-3-3.

Drilling was performed between the dates 28.01.1990-22.02.1990.

Fig. 5-3-3 Locations of Boring



Legend

Bor S1 S2 S3 S4 S5 } March, ´90
Bor B1

Bor S6 } June, ´90
Bor B2 B3

All these 5 borings could not reach the base rock, and accordingly 1 additional boring was planned to drill down to the depth of 100m at S6. However the base rock was found at the depth of 42m.

Detailed information regarding the on-shore borings is given in Fig. 5-3-4.

(3) OFF-SHORE BORINGS

For performing offshore borings, necessary equipment such as drilling barge, tug boats etc. were mobilized and installed at the site on 11.02.1990.

Due to the very unconvenient weather and sea conditions between 11.02.1990 and 9.03.1990, no borings were performed except one, boring number 1, started on 26.02.1990 and ended on 10.03.1990. B.1 was drilled up to 34.90 m depth.

Offshore-marine borings were stopped because of continuous unconvenient weather and sea conditions at the site on 10.03.1990.

The borings B.2 and B.3 were postponed until 16.05.1990 and completed by 29.06.1990.

(4) GROUND WATER

The ground water levels in the boreholes were measured daily during the field explorations. The results are given in Table 5-3-1.

Table 5-3-1 Ground Water Depths

Boring No.	Ground Elev.(m)	Water Depth (m)
S1	-0.004	0.25
S2	+0.538	0.30
S3	2.112	0.00
S4	1.400	0.80
S5	1.947	1.80

Fig. 5-3-4(a) Soil Profile

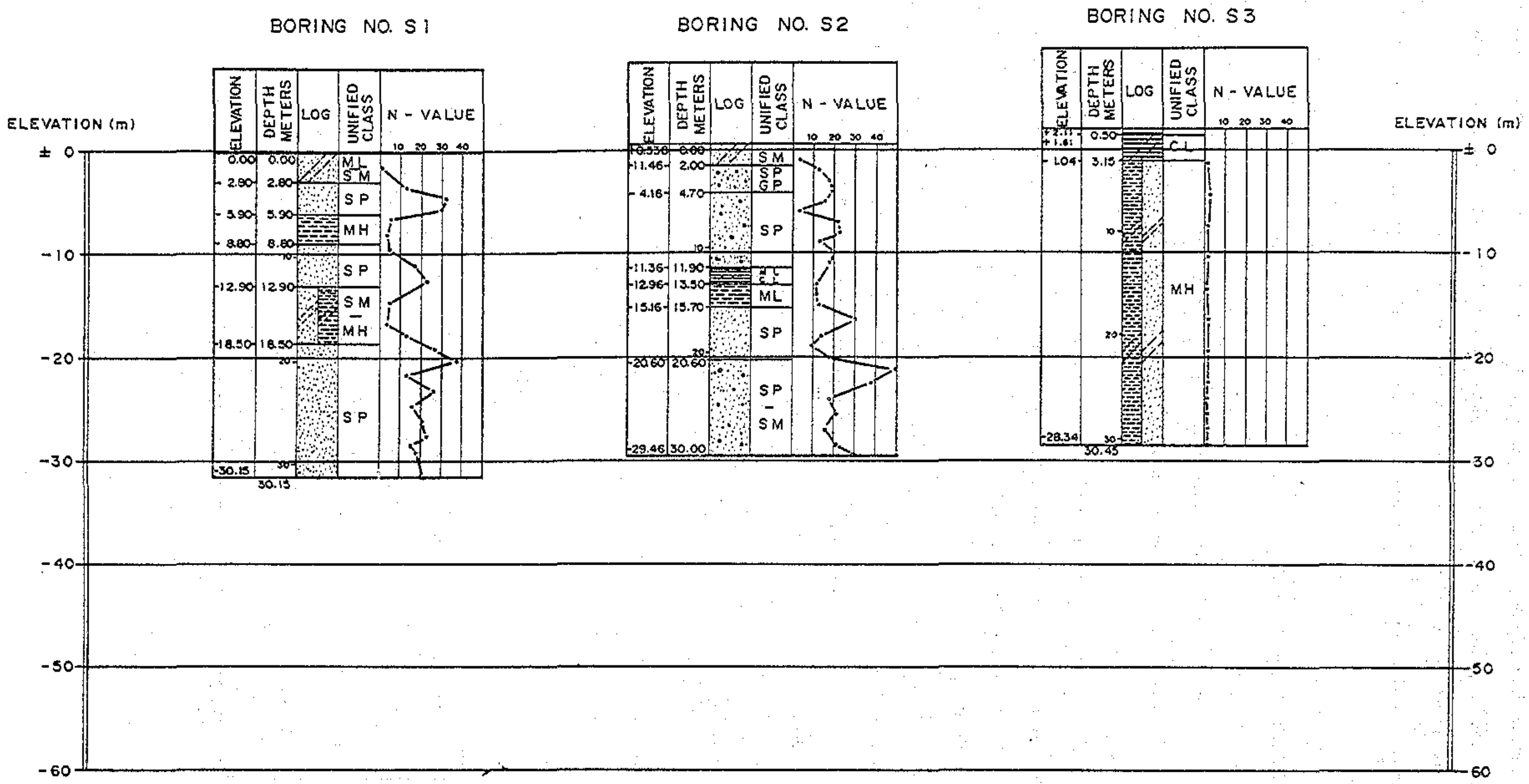


Fig. 5-3-4(b) Soil Profile

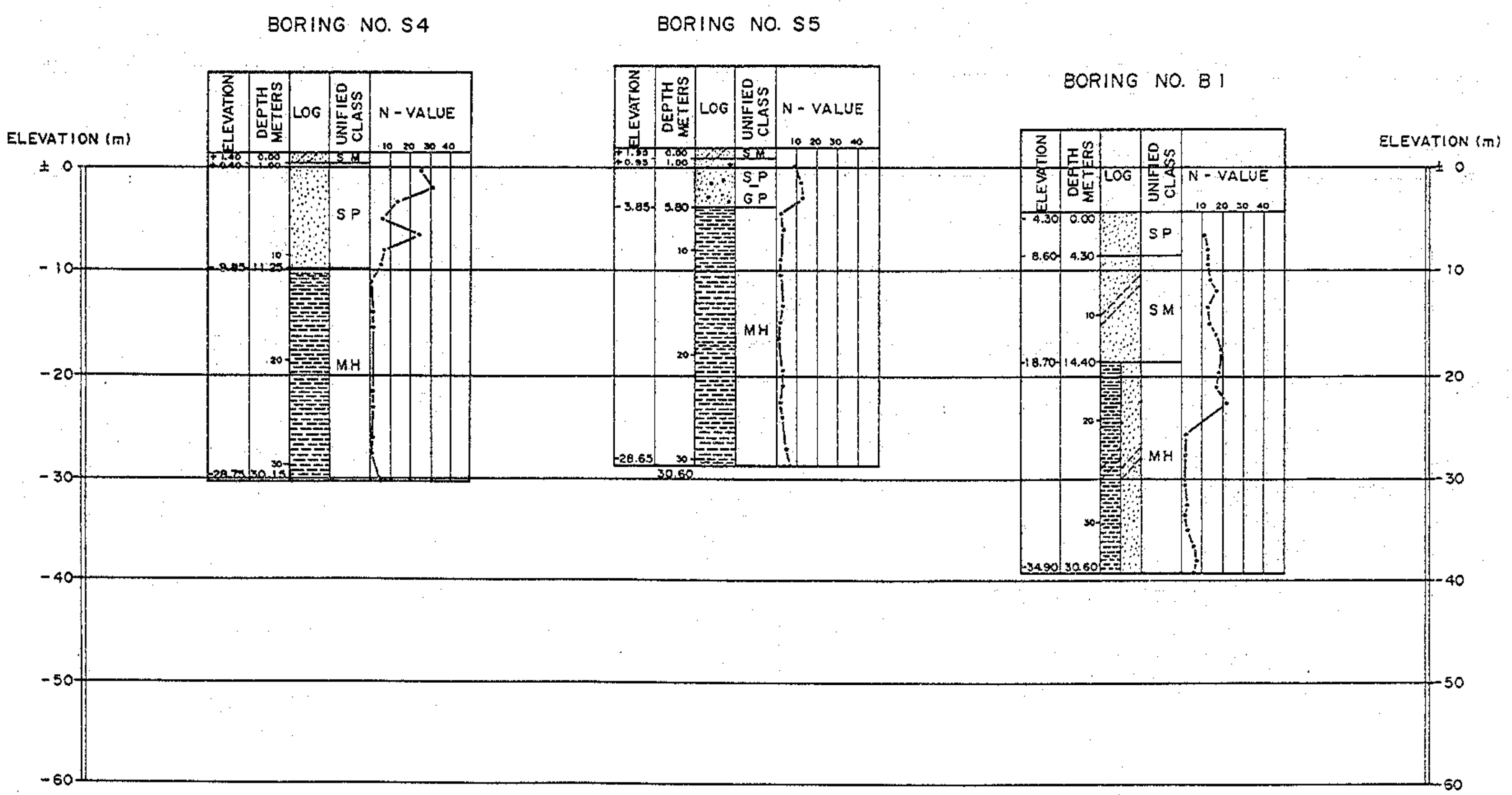
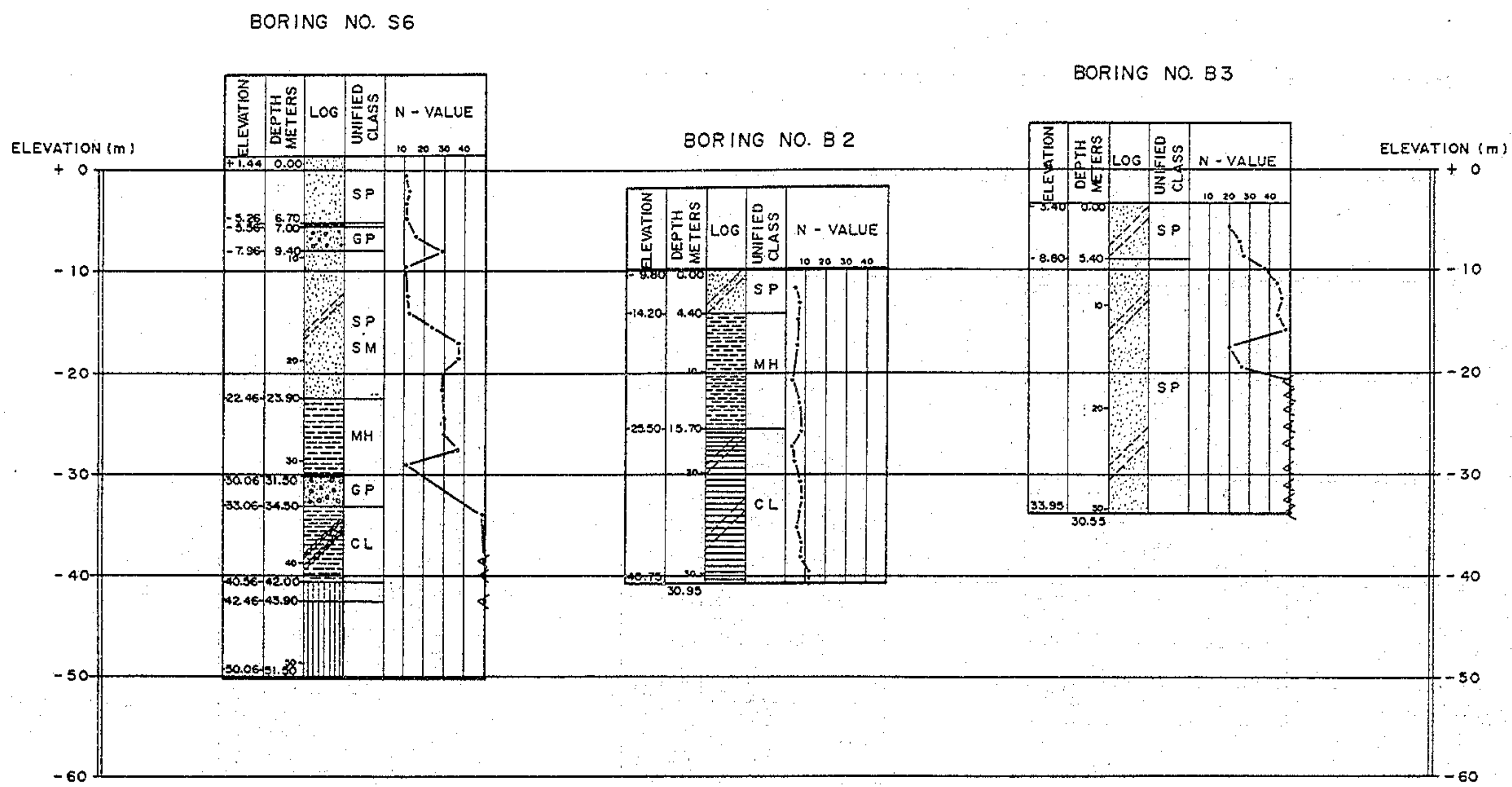


Fig. 5-3-4(c) Soil Profile



(5) LABORATORY TESTS

The disturbed (SPT) and undisturbed (UD) soil samples taken from the boreholes were subjected to laboratory tests, to determine the geotechnical properties of the subsoil. The laboratory tests were carried out to determine the index properties, strength and deformation characteristics of the subsoil. All the laboratory tests were performed in accordance with ASTM standards (Fig. 5-3-5).

(6) GEOLOGY OF THE SITE

The investigation site explored by means of onshore and offshore boreholes locates in the deltaic entry of Filyos River, at the western part of the Black Sea coast. The sea-mouth of the Filyos valley, corresponding to entirely alluvio-deltaic environment characterized by lateral variations of the marine to alluvial deposits, is about 2.5 km wide; the valley considerably narrows upstream. The upstream up-to-date sedimentation process has clearly developed in downstream part of the Filyos River depending on the variation of gradient profile and seasonal hydrological regime where the river bed changes in time via typical meanders and point-bars exhibiting a plaited river pattern and remnant features. The suspended or transported river sediments have actually accumulated in the broad river-plain in accordance with abrupt drop of energy-level via seasonal and flooding variations. Therefore, quite thick, with its estimated thickness could be more than few hundred meters, erratic and heterogeneous sediments indicating marine to alluvial environments composed of the mixture of gravel to clay size soils showing lateral and vertical facies changings in short distance have alternately been deposited in the entry of Filyos River, depending on both the geomorphological evolution of the Black Sea and the river-regime connected to the talweg gradient of the valley. By analysing the shapes of stream plumes on LANDSAT (ERTS) imagery, it is possible to derive the direction and velocities of coastal currents of the Filyos River. The plume of Filyos River is relatively small and extents only 6-7 km from the shoreline. There is no surface evidence of currents, while the plume extents parallel 10-12 km to the coast northeastward, while the deepest sediment were suddenly derived to northward direction.

Fig. 5-3-5(a) Soil Properties (S_1)

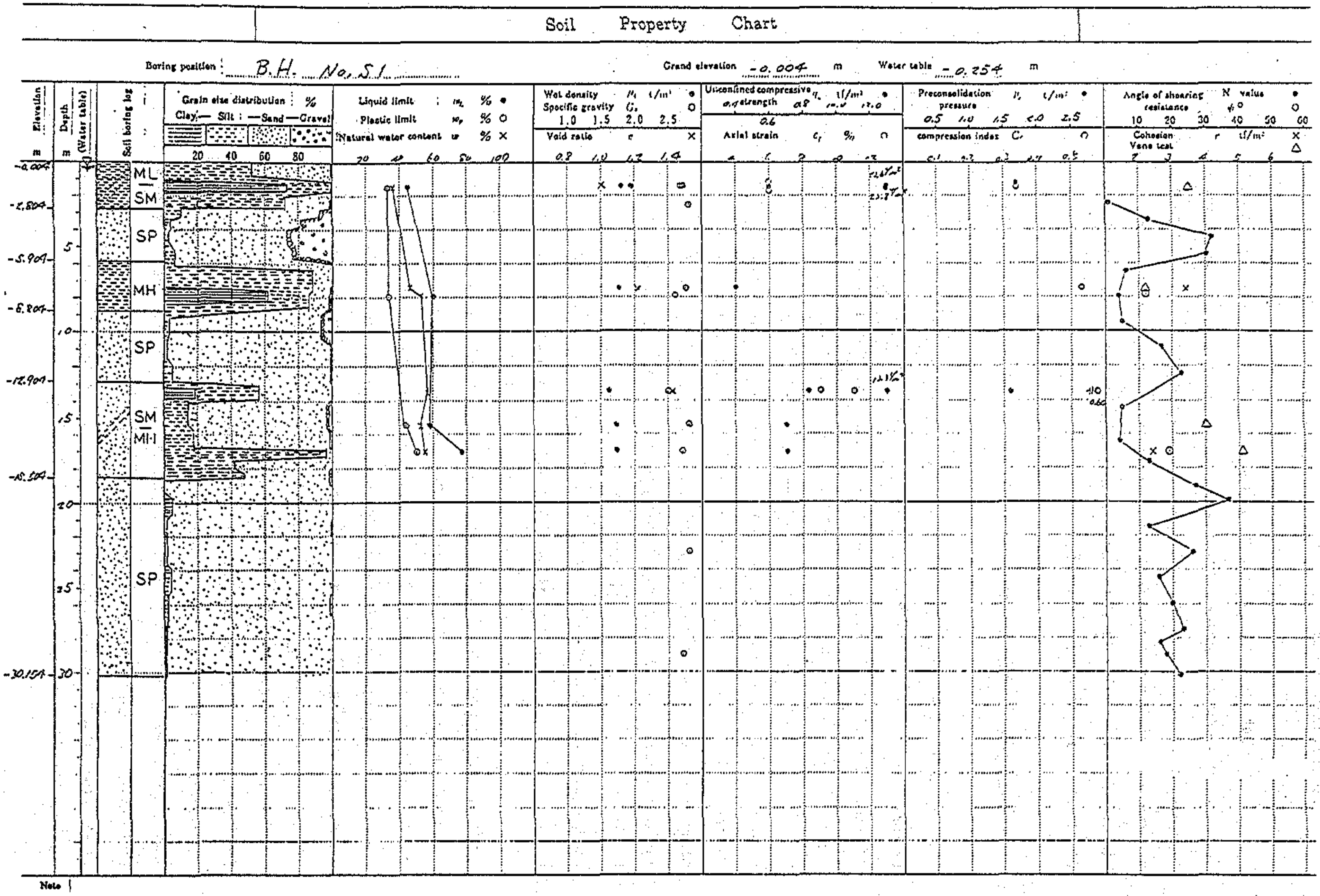


Fig. 5-3-5(b) Soil Properties (S_2)

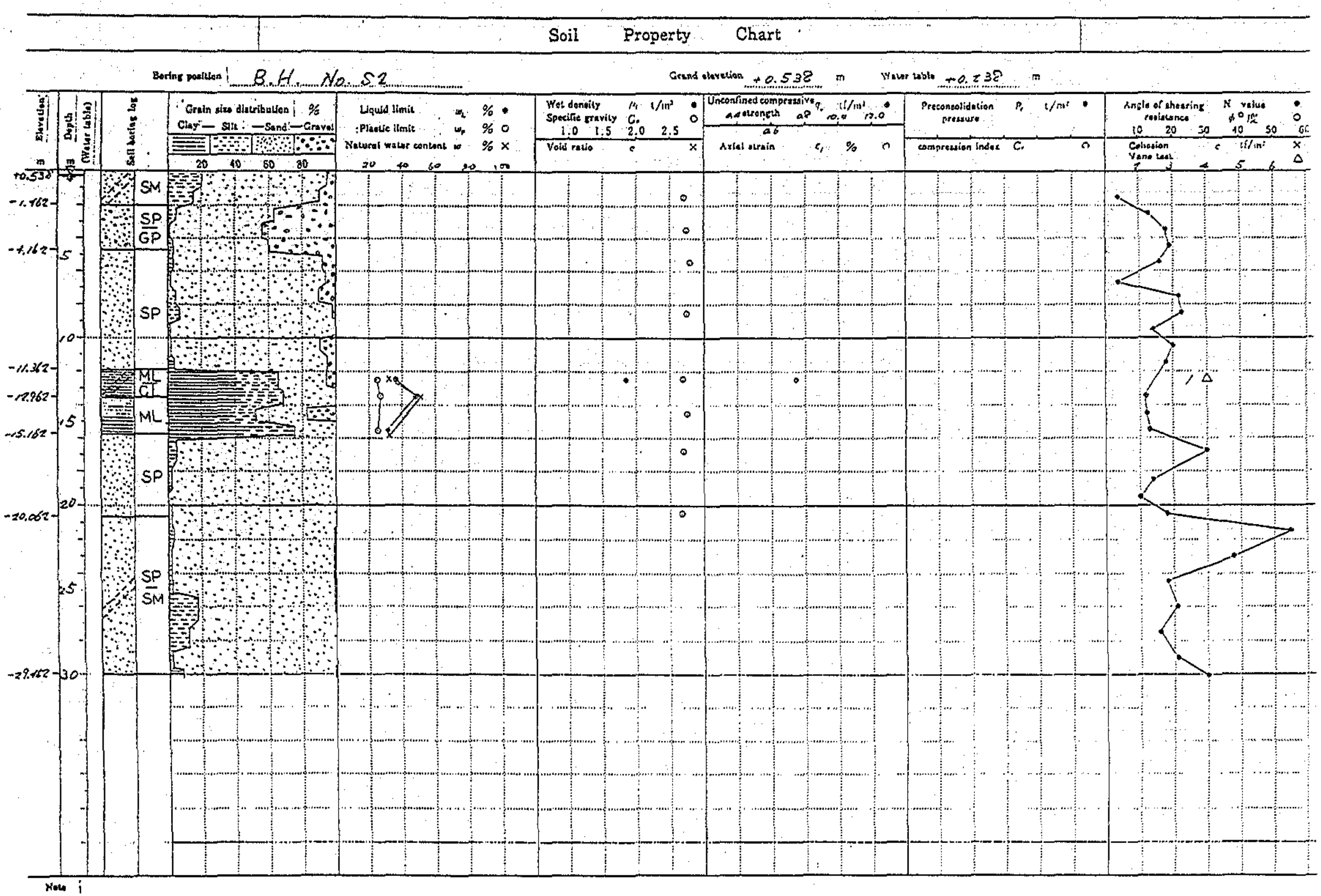


Fig. 5-3-5(c) Soil Properties (S_3)

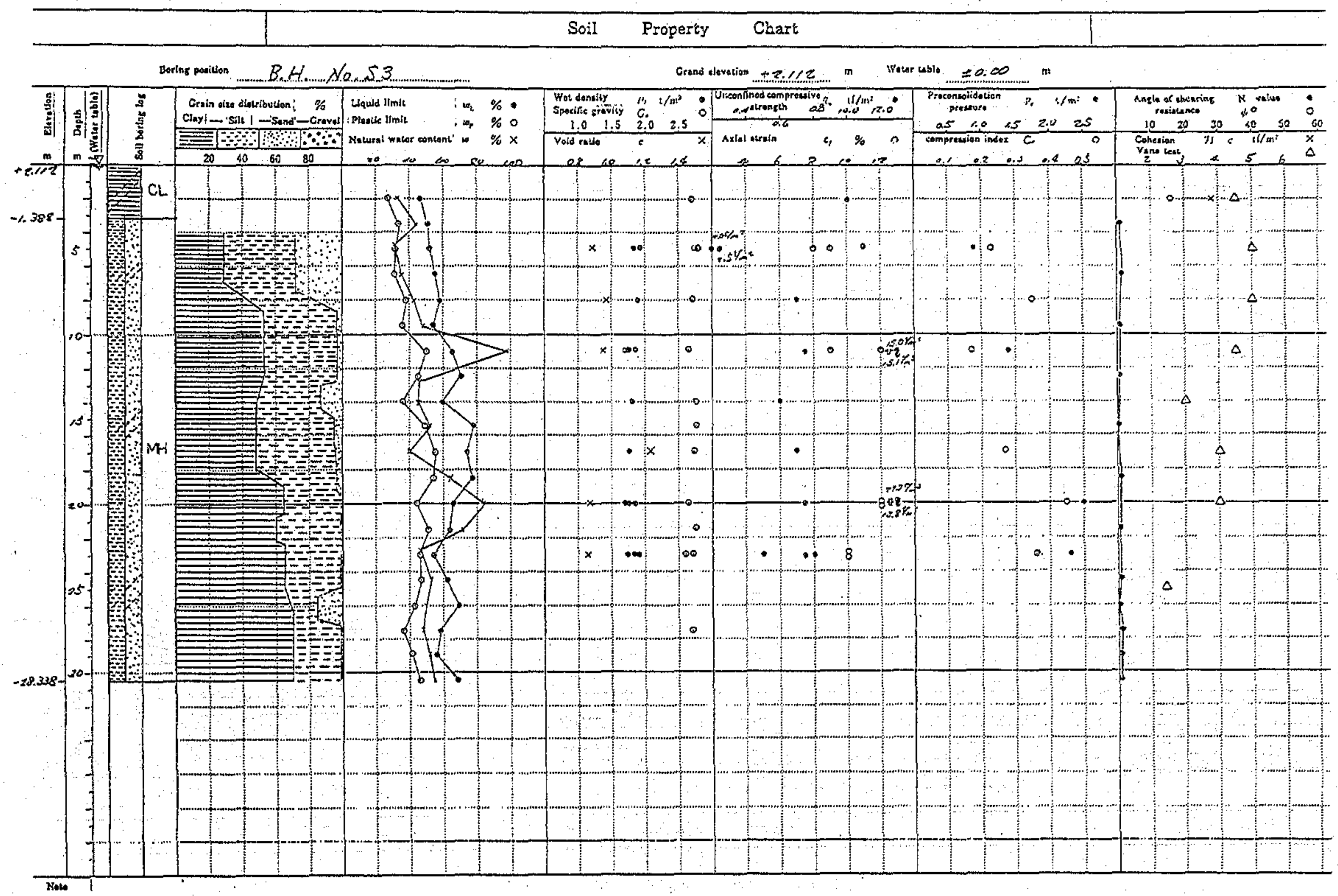


Fig. 5-3-5(d) Soil Properties (S_4)

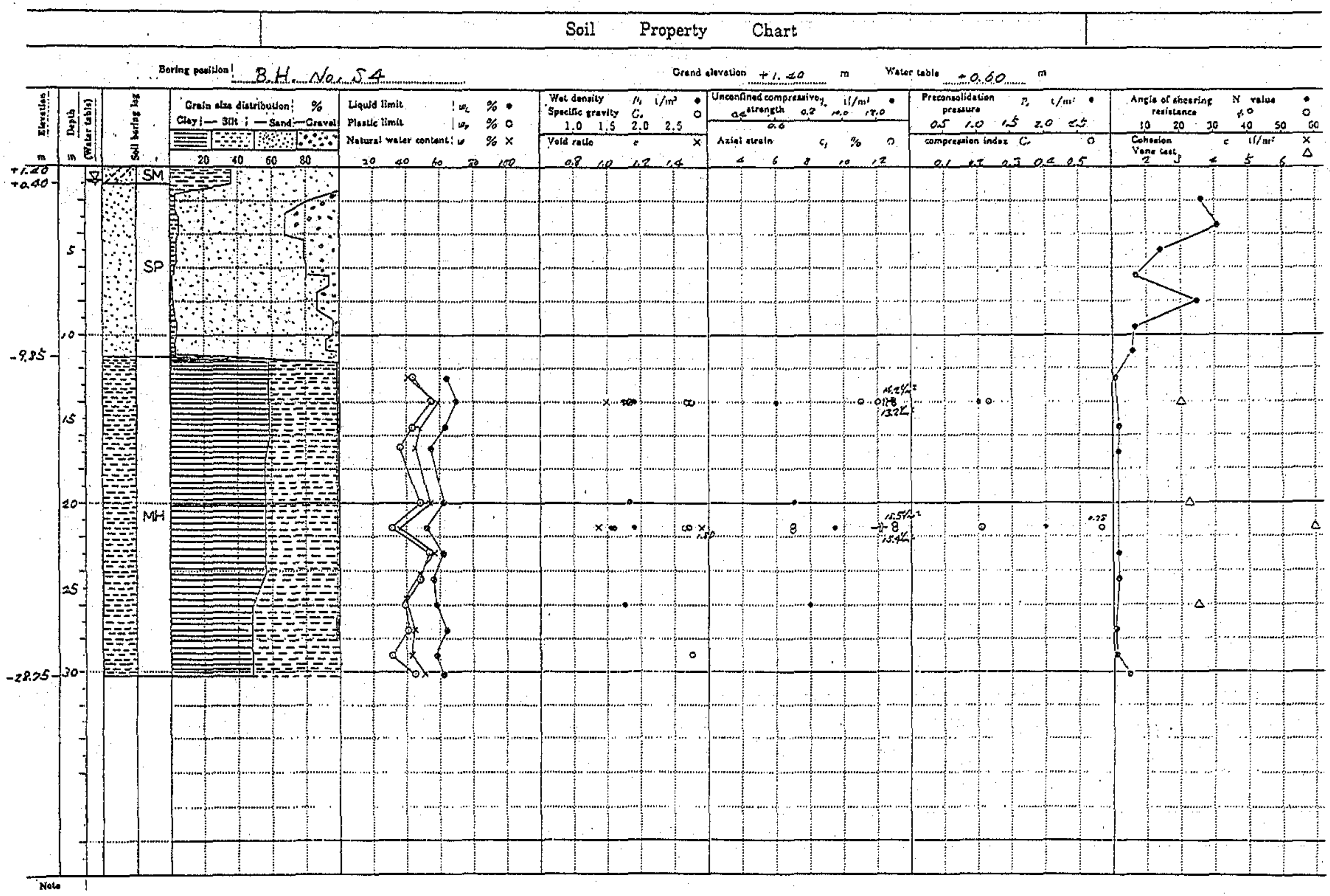


Fig. 5-3-5(e) Soil Properties (S_5)

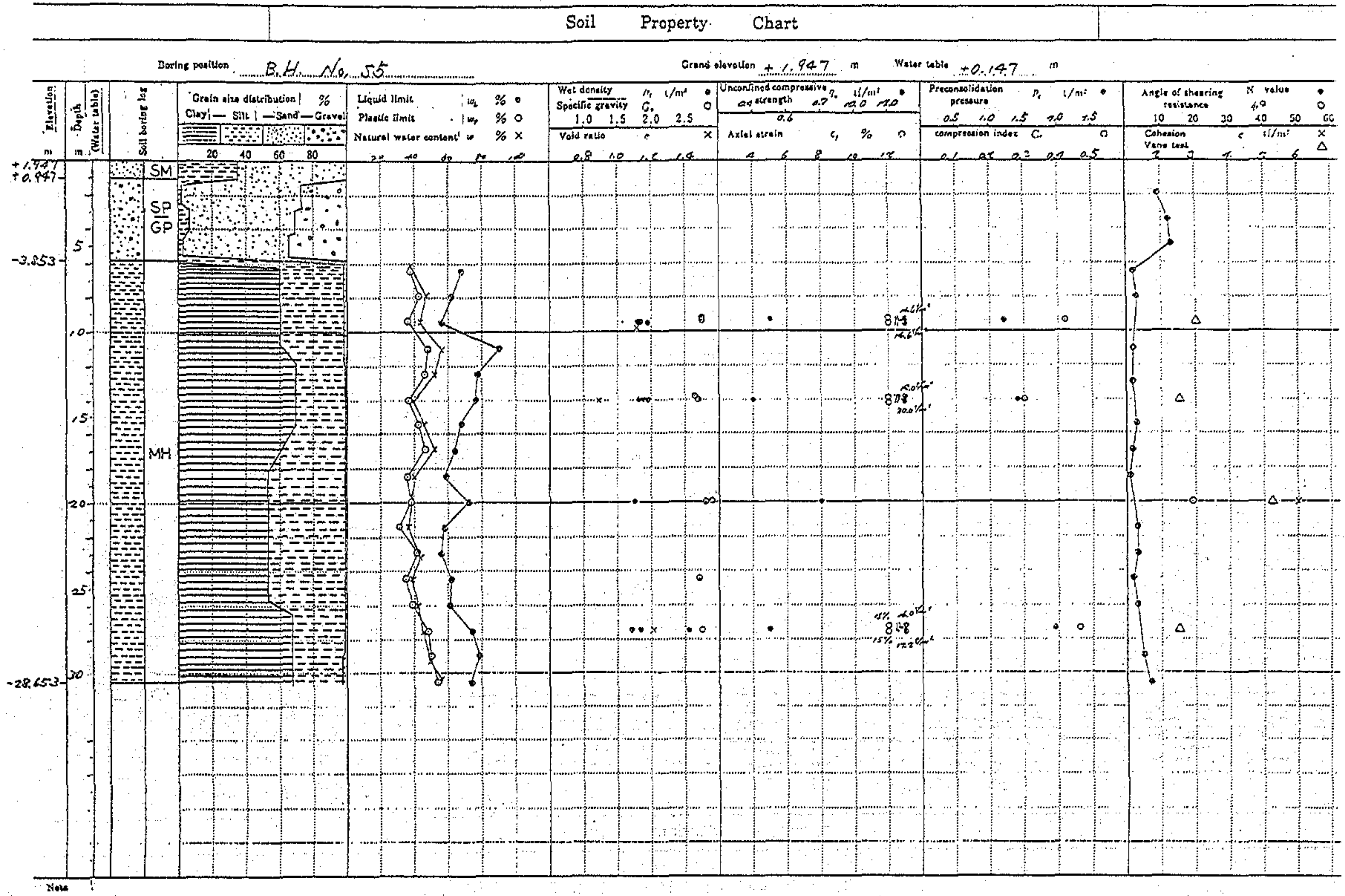


Fig. 5-3-5(f) Soil Properties (S_6)

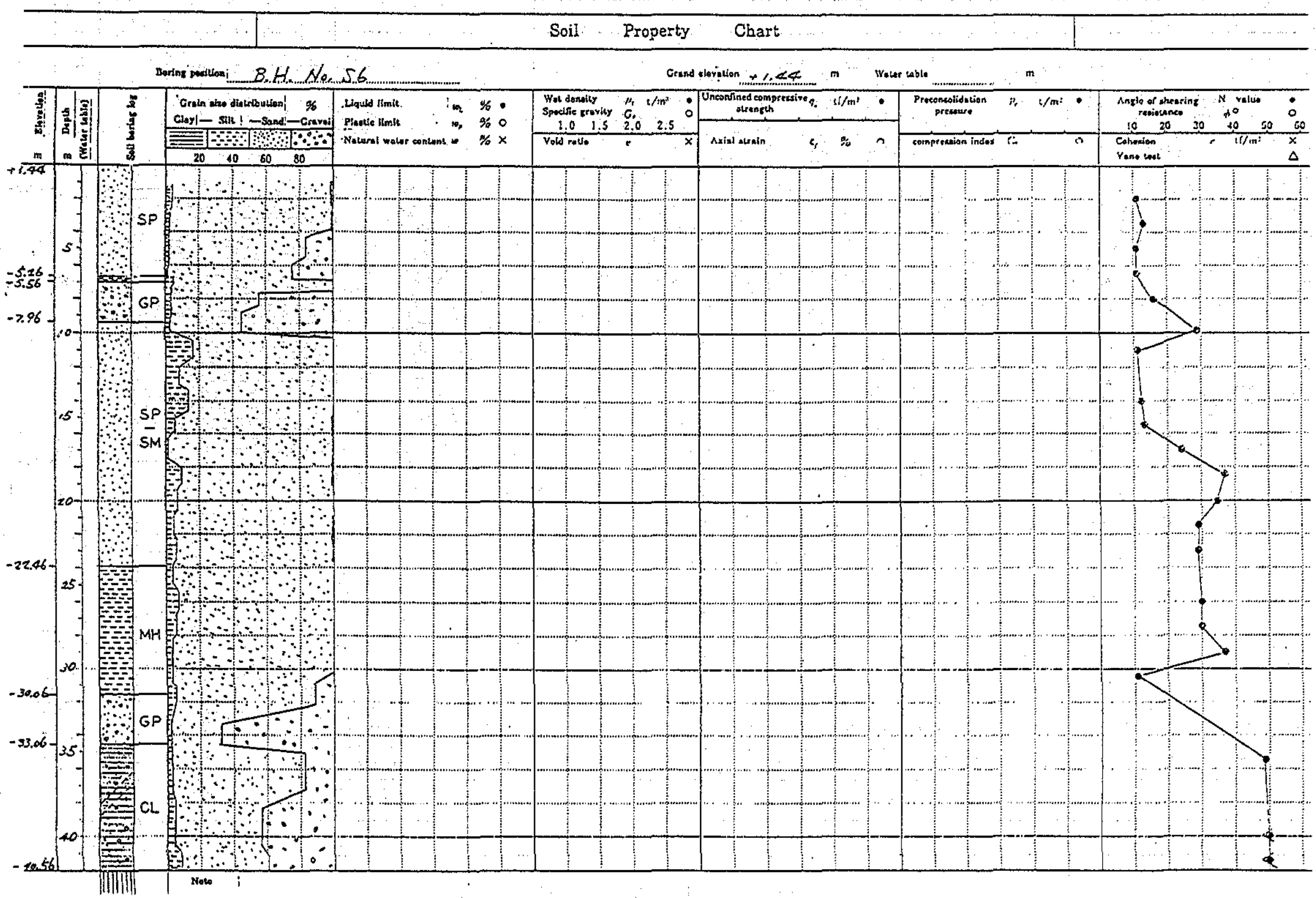


Fig. 5-3-5(g) Soil Properties (B_1)

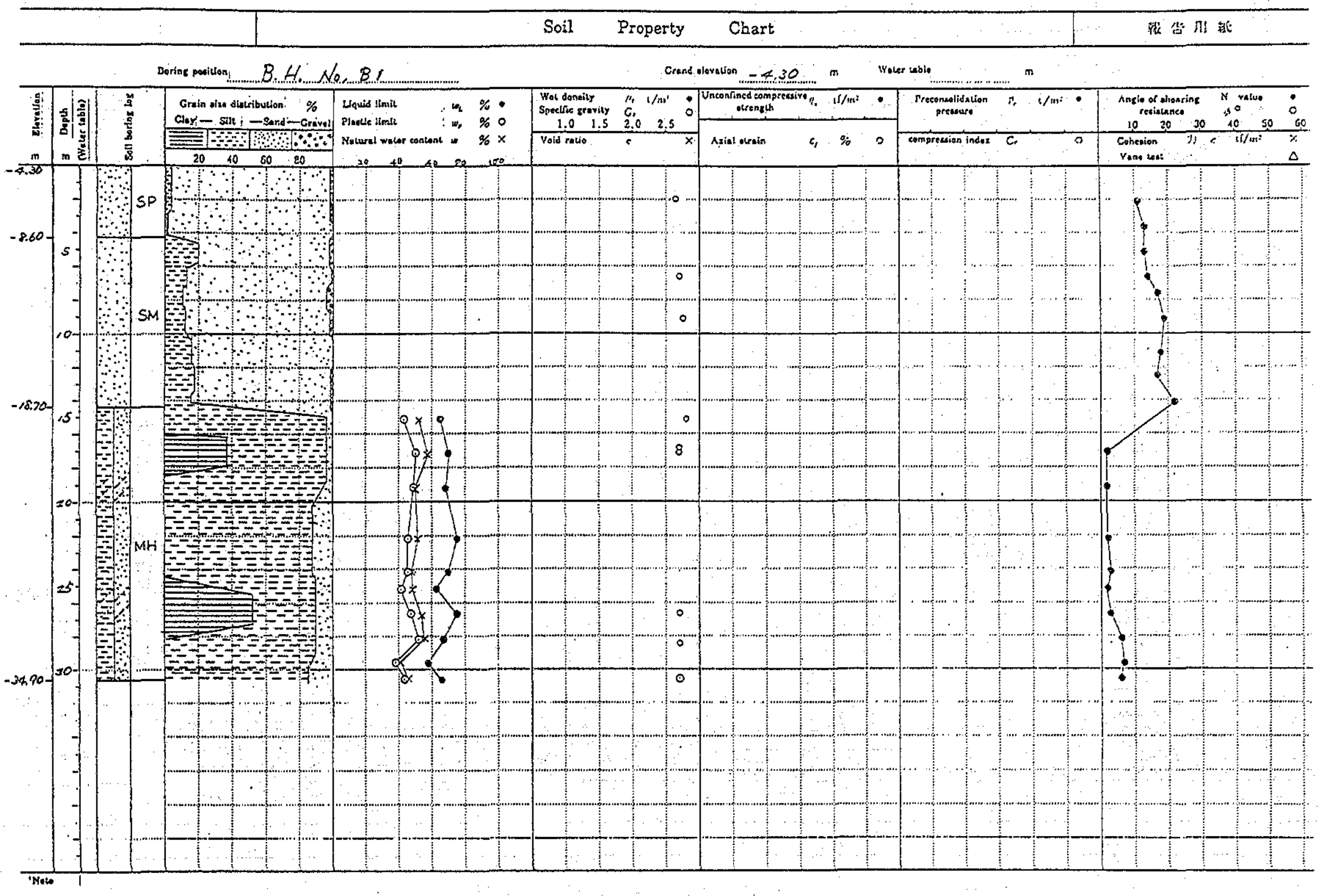


Fig. 5-3-5(h) Soil Properties (B_2)

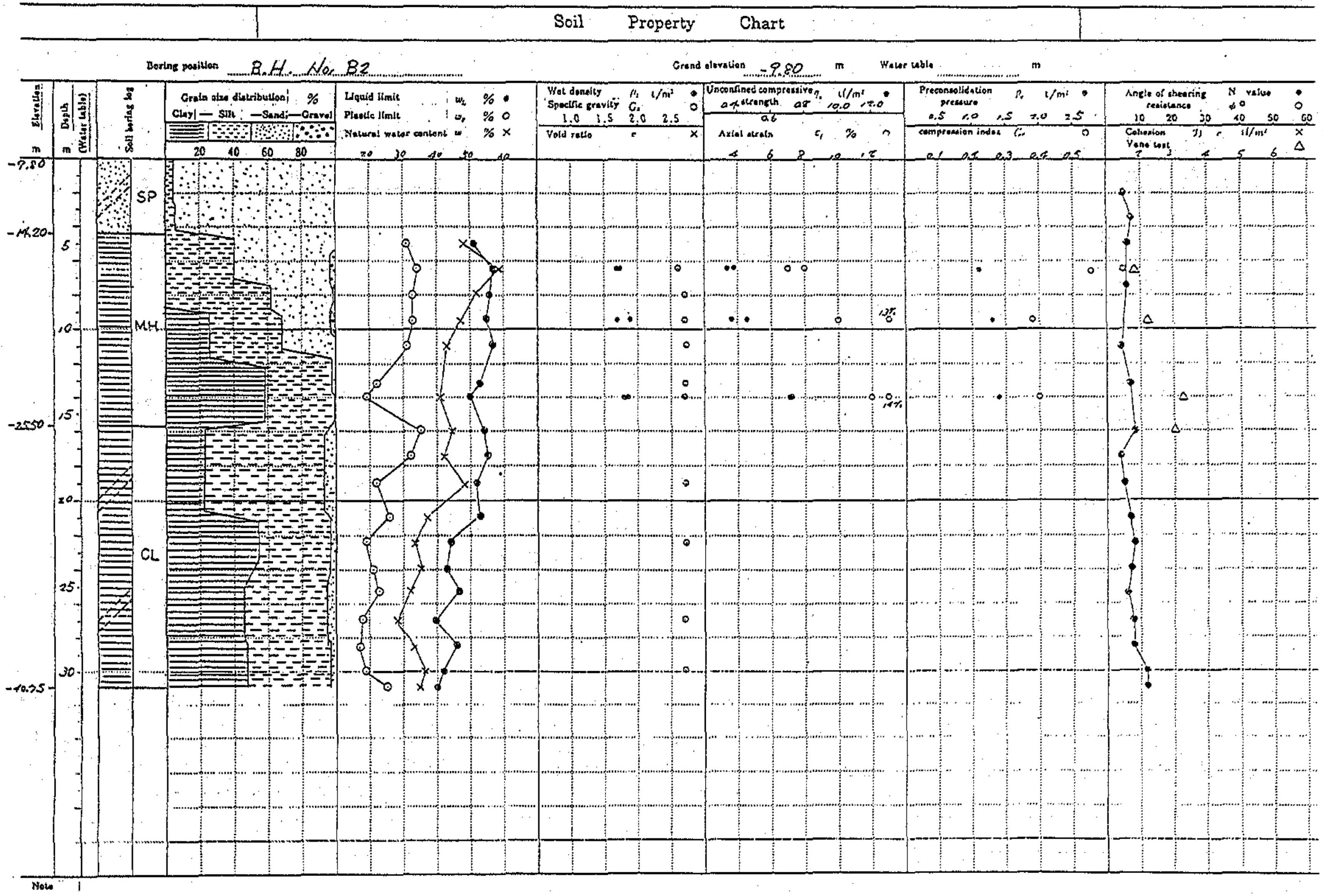
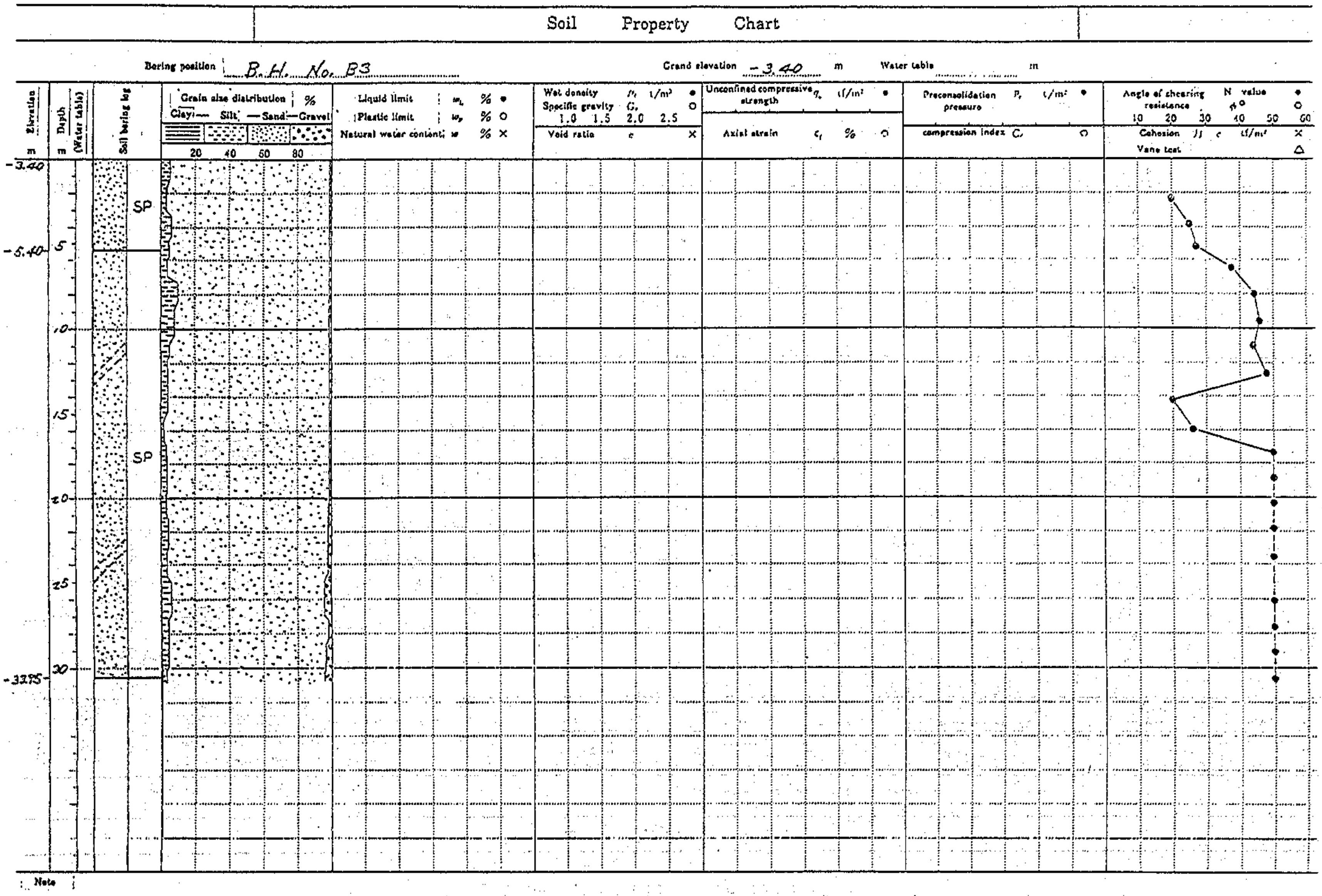


Fig. 5-3-5(j) Soil Properties (B_3)



The western and eastern sides of the Filyos valley are bordered by the relatively high and regularly extended ridges exhibiting locally geomorphological and earth-movement features such as erosional surfaces, cuestas and active-to-potential landslides in place. Both these ridges and deltaic-alluvial valley plain were covered by thick vegetation including bushes and jungle-like forrestial plants.

The bedrock of the valley bottom out-cropping on the surrounding rides, has been consisted of the flysch-type volcano-sedimentary rocks in Upper Cretaceous age, containing the alternance and mixing of green tuffaceous volcanics, andesitic coarse and polygenic agglomerates, andesitic lava flows, basaltic rocks with columnar joints, basaltic pillow lavas, reddish coloured micritic deep-sea mudstones and sedimentary claystones, limy claystones and mudstones. The Upper Cretaceous rocks are extremely folded and highly fractured and have formed high steep cliffs along the sea-shore. The bedrock is relatively reliable and sound formation from the rock-engineering point of view.

5-3-5 Wave Observation

For the planning and designing facilities of Filyos Port, wave observation shall be conducted for at least one year.

Wave height and wave period have been measured for 10 minutes every 2 hours with the waverider wave gauge possessed by the Institute of Marine Science and Technology of Dokuz Eylul University since 4 February 1990 up to the beginning of March 1991.

Wave parameters have been calculated from the digital data recorded onto magnetic cassettes through zero crossing analysis. The meanings of some columns are as follows:

NUMBER OF WAVES: Number of individual waves detected during the zero crossing analysis

MAXIMUM HEIGHT AND PERIOD: Maximum values found in the record, PERIOD OF MAXIMUM WAVE HEIGHT: Period of the individual wave having the heighest height,

SIGNIFICANT WAVE HEIGHT AND PERIOD: The average height of the largest 1/3 waves in the wave record and the mean of the periods corresponding to these largest 1/3 individual waves,

MEAN WAVE HEIGHT AND PERIOD: Average of the heights and periods of the all individual waves in the record,

SPECTRA WIDTH: A parameter which is explained by Silvester, R. (1974).

Due to some digital recording problems, there are few missing values in the file which will be supplied later after the analysis of the analog records.

Some results of wave records are shown in Table 5-3-2.

Finally, a local time has been changed on 25 March 1990, and local time has been adjusted as 3.00 am at 2.00 am. However, all the hours indicated in the file are original (i.e. no adjustment was made after 25 March 1990).

Regretfully we could not analyze wave data covering one full year yet, especially lacking high waves in winter. Generally speaking, waves are high in autumn and winter, and low in spring and summer. Significant wave heights ($H_{1/3}$) higher than 1m occur about one sixth during the observed period, with no distinct semi-diurnal difference between nighttime and daytimes (Table 5-3-3, 4 and A5-3-1 to 3, and Fig. 5-3-6).

However the highest wave ($H_{1/3}$ = 3.11m) occurred in June (Table 5-3-5 and Fig. 5-3-7).

This fact suggests unstable meteorological and oceanographical conditions, surpassing schematic seasonal variation.

Table 5-3-2 An Example of the Results of Wave Measurement

DATE		NUMBER OF	MAXIMUM		PERIOD OF	SIGNIFICANT		MEAN		SPECTRA
YEAR-MM-DD	TIME	WAVES	HEIGHT	PERIOD	MAX.HEIGHT	HEIGHT	PERIOD	HEIGHT	PERIOD	WIDTH
1990-02-04	17:56	141	0.39	6.2	4.2	0.26	4.4	0.17	4.3	0.20361
1990-02-04	19:55	139	0.39	6.4	4.2	0.29	4.3	0.19	4.3	0.15166
1990-02-04	21:56	153	0.36	6.0	4.2	0.23	4.2	0.15	4.0	0.30099
1990-02-05	00:04	145	0.29	6.1	5.9	0.15	4.9	0.10	4.2	0.37718
1990-02-05	01:57	114	0.22	6.4	4.6	0.15	5.2	0.09	5.3	0.65822
1990-02-05	03:55	136	0.22	6.1	5.1	0.12	4.7	0.08	4.5	0.56618
1990-02-05	05:58	212	0.24	5.1	3.7	0.15	3.5	0.09	2.9	0.36833
1990-02-05	07:59	226	0.30	4.7	2.6	0.20	3.0	0.12	2.7	0.22587

Table 5-3-3 (a) Wave Occurrence

FILYOS Fcb - Nov 1990
All directions

period(s) / height(m)	- 0.9	1.0 - 1.9	2.0 - 2.9	3.0 - 3.9	4.0 - 4.9	5.0 - 5.9	6.0 - 6.9	7.0 - 7.9	8.0 - 8.9	9.0 - 9.9	10.0 -10.9	11.0 -11.9	12.0 -12.9	13.0 -13.9	14.0 -14.9	15.0 -15.9	16.0 -16.9	17.0 -	total (0.1%)
- .19	.	9	163	375	164	3	.	1	.	.	.	.	.	.	.	.	.	.	715 (212)
.20- .39	.	.	56	326	379	59	1	.	.	.	.	.	.	.	.	.	.	.	821 (243)
.40- .59	.	.	8	149	305	124	6	.	.	.	.	.	.	.	.	.	.	.	592 (175)
.60- .79	.	.	.	39	167	173	25	.	.	.	.	.	.	.	.	.	.	.	404 (120)
.80- .99	.	.	.	7	91	185	48	.	.	.	.	.	.	.	.	.	.	.	331 (98)
1.00- 1.19	.	.	.	.	44	108	82	3	.	.	.	.	.	.	.	.	.	.	237 (70)
1.20- 1.39	.	.	.	.	7	40	68	9	.	.	.	.	.	.	.	.	.	.	124 (37)
1.40- 1.59	.	.	.	.	1	15	35	5	.	.	.	.	.	.	.	.	.	.	56 (17)
1.60- 1.79	.	.	.	.	.	11	21	14	.	.	.	.	.	.	.	.	.	.	46 (14)
1.80- 1.99	.	.	.	.	.	1	17	6	1	.	.	.	.	.	.	.	.	.	25 (7)
2.00- 2.19	.	.	.	.	.	.	4	7	2	.	.	.	.	.	.	.	.	.	13 (4)
2.20- 2.39	.	.	.	.	.	.	1	2	2	.	.	.	.	.	.	.	.	.	5 (2)
2.40- 2.59	.	.	.	.	.	.	.	2	1	.	.	.	.	.	.	.	.	.	3 (1)
2.60- 2.79	.	.	.	.	.	.	.	2	4	.	.	.	.	.	.	.	.	.	6 (2)
2.80- 2.99	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1 (0)
3.00- 3.19	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1 (0)
3.20- 3.39	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
3.40- 3.59	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
3.60- 3.79	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
3.80- 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
4.00- 4.19	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
4.20- 4.39	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
4.40- 4.59	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
4.60- 4.79	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
4.80-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
total (0.1%)	0 (0)	9 (3)	227 (67)	896 (265)	1158 (343)	719 (213)	308 (91)	51 (15)	12 (4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3380 (1000)

calm 0(0)
recordless 46(13)

Table 5-3-3 (b) Wave Occurrence

FILYOS Feb - Nov 1990 (6 -18h)
All directions

period(s) / height(m)	- 0.9	1.0 - 1.9	2.0 - 2.9	3.0 - 3.9	4.0 - 4.9	5.0 - 5.9	6.0 - 6.9	7.0 - 7.9	8.0 - 8.9	9.0 - 9.9	10.0 -10.9	11.0 -11.9	12.0 -12.9	13.0 -13.9	14.0 -14.9	15.0 -15.9	16.0 -16.9	17.0 -	total (0.1%)
- .19	.	3	90	225	95	1	.	.	.	.	.	.	.	.	.	.	.	.	414 (210)
.20- .39	.	.	40	186	229	30	.	.	.	.	.	.	.	.	.	.	.	.	485 (246)
.40- .59	.	.	8	105	168	64	4	.	.	.	.	.	.	.	.	.	.	.	349 (177)
.60- .79	.	.	.	35	102	76	15	.	.	.	.	.	.	.	.	.	.	.	228 (116)
.80- .99	.	.	.	5	68	103	29	.	.	.	.	.	.	.	.	.	.	.	205 (104)
1.00- 1.19	.	.	.	.	30	69	31	1	.	.	.	.	.	.	.	.	.	.	131 (67)
1.20- 1.39	.	.	.	.	5	24	28	6	.	.	.	.	.	.	.	.	.	.	63 (32)
1.40- 1.59	.	.	.	.	1	11	19	4	.	.	.	.	.	.	.	.	.	.	35 (18)
1.60- 1.79	.	.	.	.	.	11	13	7	.	.	.	.	.	.	.	.	.	.	31 (16)
1.80- 1.99	.	.	.	.	.	.	11	2	.	.	.	.	.	.	.	.	.	.	13 (7)
2.00- 2.19	.	.	.	.	.	.	2	5	2	.	.	.	.	.	.	.	.	.	9 (5)
2.20- 2.39	.	.	.	.	.	.	.	2	2	.	.	.	.	.	.	.	.	.	4 (2)
2.40- 2.59	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	2 (1)
2.60- 2.79	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	2 (1)
2.80- 2.99	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
3.00- 3.19	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
3.20- 3.39	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
3.40- 3.59	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
3.60- 3.79	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
3.80- 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
4.00- 4.19	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
4.20- 4.39	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
4.40- 4.59	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
4.60- 4.79	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
4.80-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
total (0.1%)	0 (0)	3 (2)	138 (70)	556 (282)	698 (354)	389 (197)	152 (77)	29 (15)	6 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1971 (1000)

calm	0	(0)
recordless	27	(14)

Table 5-3-3 (c) Wave Occurrence

FILYOS Feb - Nov 1990 (19- 5h)
All directions

period(s) / height(m)	- 0.9	1.0 - 1.9	2.0 - 2.9	3.0 - 3.9	4.0 - 4.9	5.0 - 5.9	6.0 - 6.9	7.0 - 7.9	8.0 - 8.9	9.0 - 9.9	10.0 -10.9	11.0 -11.9	12.0 -12.9	13.0 -13.9	14.0 -14.9	15.0 -15.9	16.0 -16.9	17.0 -	total (0.1%)
- .19	.	6	73	150	69	2	.	1	.	.	.	.	.	.	.	.	.	.	301 (214)
.20- .39	.	.	16	140	150	29	1	.	.	.	.	.	.	.	.	.	.	.	336 (239)
.40- .59	.	.	.	44	137	60	2	.	.	.	.	.	.	.	.	.	.	.	243 (173)
.60- .79	.	.	.	4	65	97	10	.	.	.	.	.	.	.	.	.	.	.	176 (125)
.80- .99	.	.	.	2	23	82	19	.	.	.	.	.	.	.	.	.	.	.	126 (89)
1.00- 1.19	.	.	.	.	14	39	51	2	.	.	.	.	.	.	.	.	.	.	106 (75)
1.20- 1.39	.	.	.	.	2	16	40	3	.	.	.	.	.	.	.	.	.	.	61 (43)
1.40- 1.59	.	.	.	.	.	4	16	1	.	.	.	.	.	.	.	.	.	.	21 (15)
1.60- 1.79	.	.	.	.	.	.	8	7	.	.	.	.	.	.	.	.	.	.	15 (11)
1.80- 1.99	.	.	.	.	.	1	6	4	1	.	.	.	.	.	.	.	.	.	12 (9)
2.00- 2.19	.	.	.	.	.	.	2	2	.	.	.	.	.	.	.	.	.	.	4 (3)
2.20- 2.39	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	1 (1)
2.40- 2.59	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1 (1)
2.60- 2.79	.	.	.	.	.	.	.	1	3	.	.	.	.	.	.	.	.	.	4 (3)
2.80- 2.99	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1 (1)
3.00- 3.19	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1 (1)
3.20- 3.39	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
3.40- 3.59	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
3.60- 3.79	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
3.80- 3.99	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
4.00- 4.19	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
4.20- 4.39	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
4.40- 4.59	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
4.60- 4.79	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
4.80-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0 (0)
total (0.1%)	0 (0)	6 (4)	89 (63)	340 (241)	460 (327)	330 (234)	156 (111)	22 (16)	6 (4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1409 (1000)

calm	0	(0)
recordless	19	(13)

Table 5-3-4 Wave Occurrence ($H_{1/3}$ ≧1m, %)

month	Feb.	Mar.	Apr.	May	Jan.	Jul.	Aug.	Sep.	Oct.	Nov.	Ave.
all day	18.3	16.3	5.8	14.3	11.4	11.8	11.5	19.8	22.4	32.1	15.4
daytime (6 - 18h)	17.2	14.8	5.7	14.3	11.1	12.6	9.7	18.6	22.1	32.4	14.9
nighttime (19 - 5h)	19.6	18.1	6.0	14.2	12.1	11.2	14.2	21.4	22.6	31.8	16.3

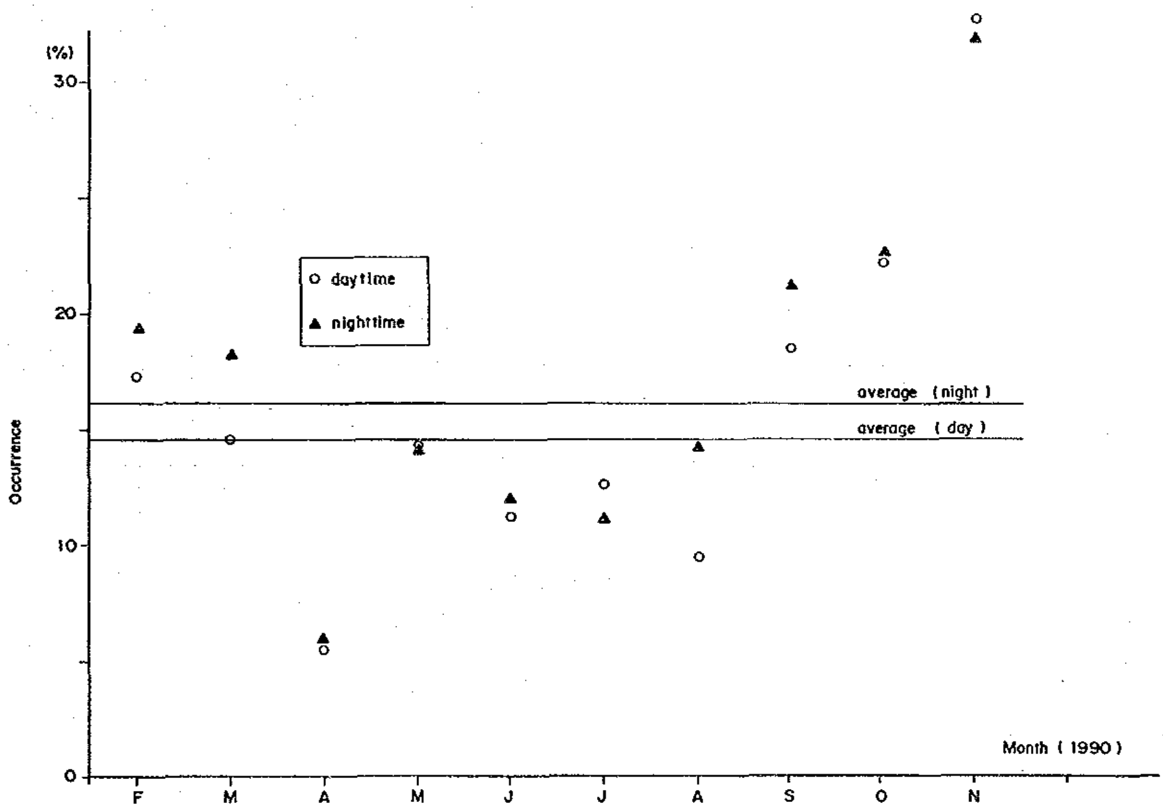


Fig. 5-3-6 Wave Occurrence (H1/3 ≧ 1m)

Table 5-3-5 Monthly Highest Wave

month	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Total	Time
H1/3(m)	1.71	2.61	1.28	1.84	3.11	1.87	1.65	2.76	2.17	2.36	3.11	23h 1 Jun
T1/3(s)	5.70	7.50	6.40	6.20	8.60	6.80	6.50	7.70	6.10	7.40	8.60	1990

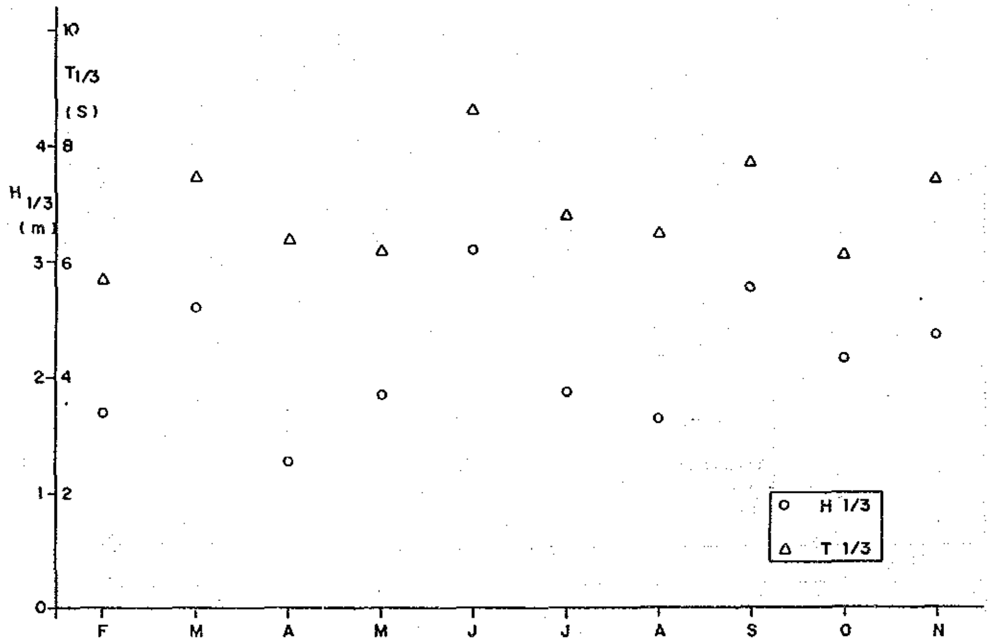


Fig. 5-3-7 Monthly Highest Wave

5-3-6 Seismic Prospecting

(1) GENERAL

Following the soil investigations and bathymetric surveys completed in February - March 1990, seismic prospecting was performed with the purpose of ascertaining the geological structure of the sea bottom at the proposed site of Filyos Port.

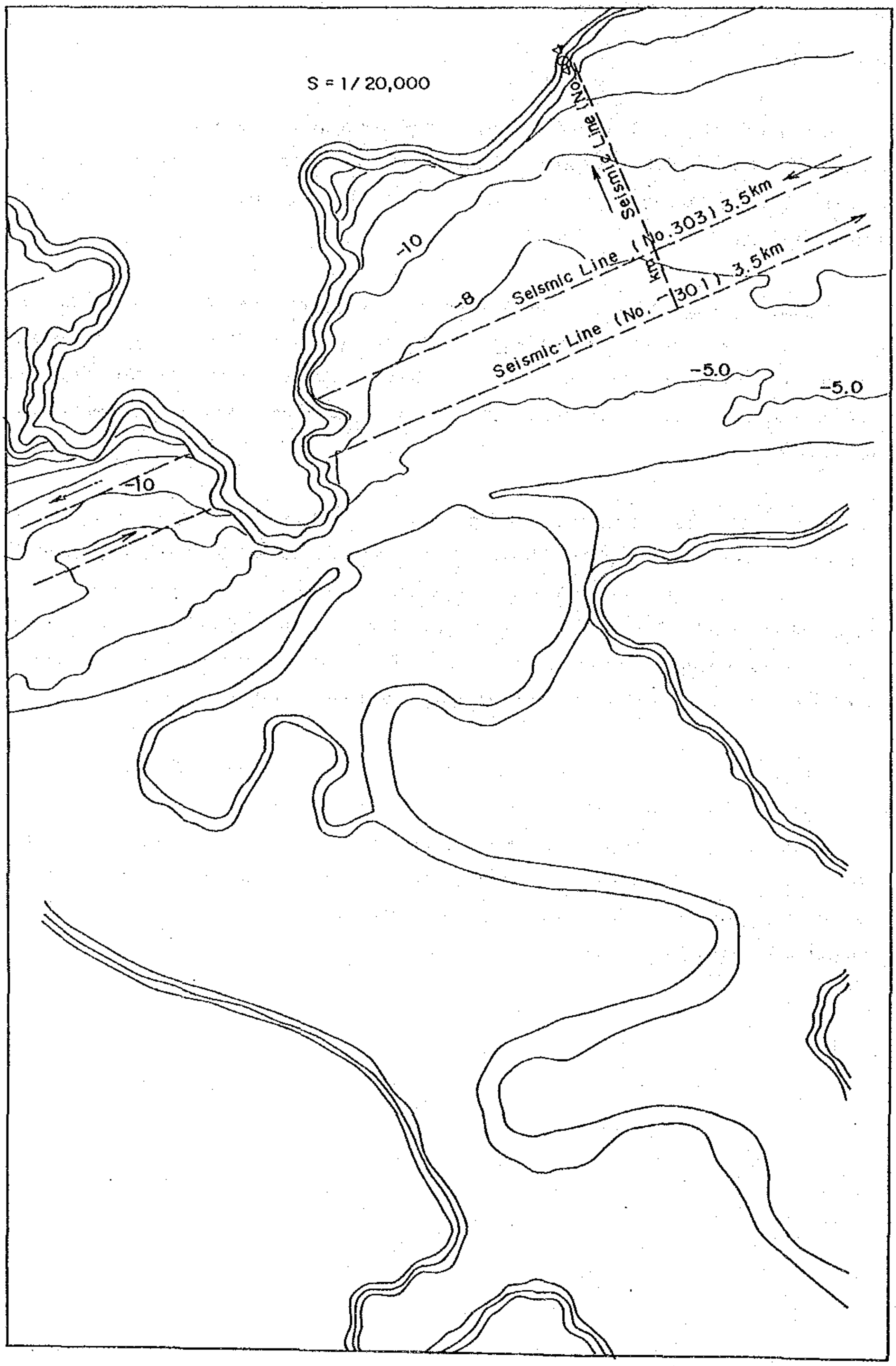
Seismic prospecting was performed (on the profiles shown in Figure 5-3-8) by the Institute's scientific staff, using the R/V K. Piri Reis and equipment belonging to the IMST. These surveys consist of seismic reflection studies to be conducted with different type of geophysical instruments.

During the seismic studies, the horizontal positioning of the R/V K. Piri Reis is provided by the "Racal-Decca Autocarta II System" and "Racal-Decca Trisponder System". For this purpose, three trisponder stations were established on the land, and so, the location of the vessel was determined by three signals. Seismic surveys were also conducted in the local coordinate system to be used during the previous studies.

Here, there are two profiles (approximately 3700m each) parallel to the coast, and one profile (1400m length) perpendicular to them.

However, this scope has been extended during the surveys more than 100% of the original content. This increase occurred as a result of IMST's scientific approach. By this way, the spatial distribution of the seismic properties could have been detected more accurately.

Fig. 5-3-8 Seismic Prospecting



(2) SURVEY EQUIPMENT

These surveys consist of seismic reflection studies, and have been conducted with the following equipment.

1) Horizontal Positioning System

i) RACAL-DECCA Survey AUTOCARTA II System connected with IBM-PC-AT personal computer

10501 Processor
10502 Data Terminal
10503 Remote Navigation Display
DP-3 Plotter

ii) The DECCA Trisponder Survey System consisting of

Transponders DEL NORTE Model 217C/218C
(One mobile & three remote antennas)
Distance Measuring Unit DEL NORTE Model 520

2) Instruments of the Geophysical Surveys

i) Sub-bottom Profiling System O.R.E. Model 1032

Transceiver Model 140
Graphic Recorder Model 3200
Transducer Array Model 137D

ii) Airgun BOLT PAR 600 B & Streamer Hydrophone Arrays BENTHOS Model 460 and/or E.G. & G. Model 265

iii) Band-pass Filter KROHN-HITE CORPORATION Model 3700

iv) Cassette Recorder for the Recording of Seismic Data (TECHNICS RS-B66W)

3) Echosounder ATLAS DESO 10, EDIG 10

(3) DATA OBTAINED FROM THE STUDY

In order to obtain information on the substratum layers of the sea bottom, seismic reflection surveys were carried out. These studies were performed by using two different types of instruments.

The first instrument is sub-bottom profiling system "O.R.E. Model 1032". As it is a high resolution engineering system, the upper layers can be determined quite precisely.

On the other hand, the second instrument is "Airgun & Streamer System" (which is a combination of "Airgun BOLT PAR 600 B & Streamer Hydrophone Arrays BENTHOS Model 460 and/or E.G. & G. Model 265"). This is a high penetration system, and its resolution capacity is more limited than the first one.

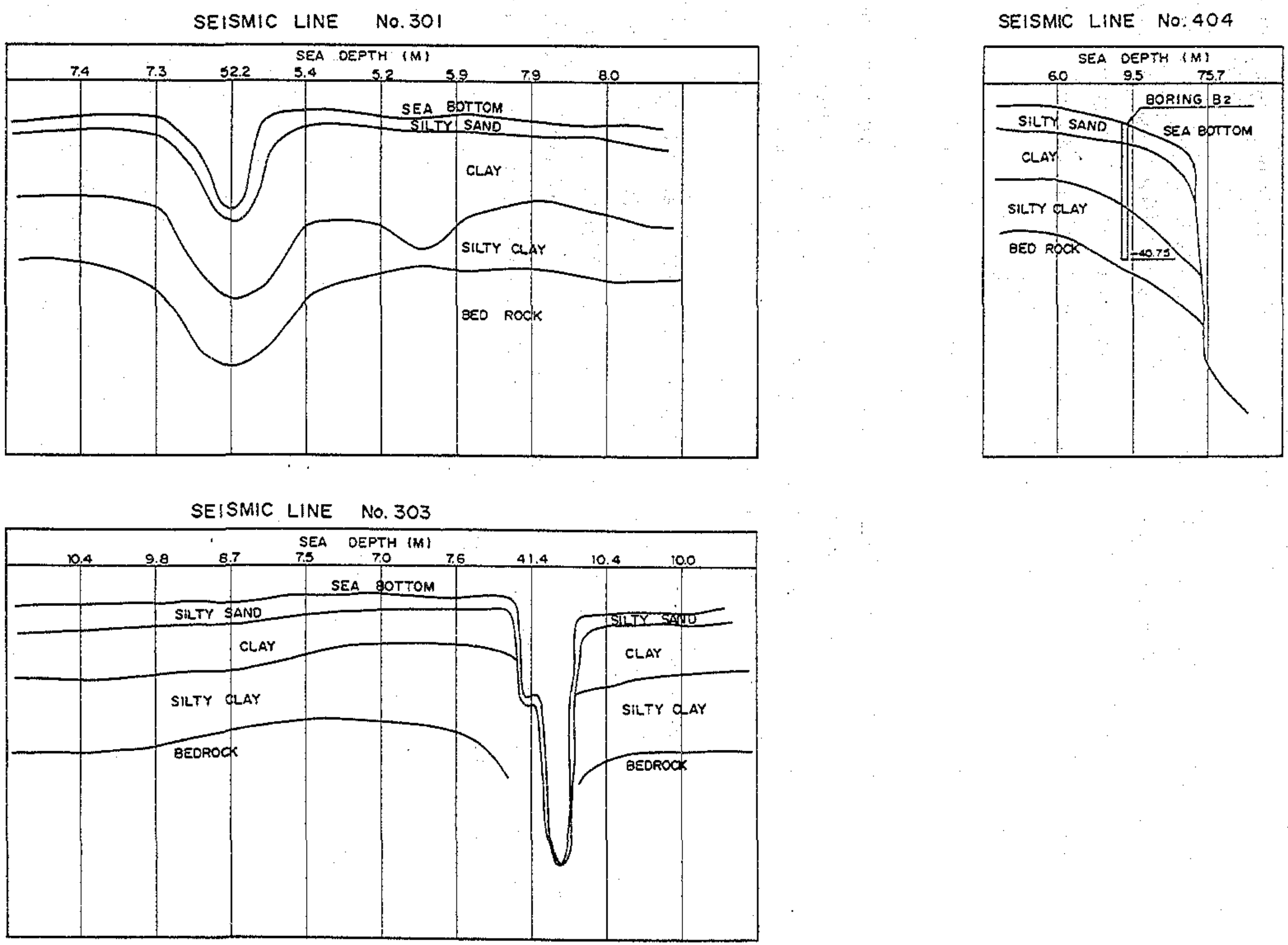
As they have supplementary characteristics, both systems were used together during the surveys. Therefore, high resolution being important for the upper layers (mainly from the engineering point of view) and high penetration required for the detection of deeper layers of the sea bottom (mainly for the geological evaluations) were provided at the same time.

(4) RESULTS

Following the preliminary evaluations, seismic reflection records of above stated systems have been interpreted in a more detailed way, and then, the geological profiles along the three profiles (which include the probable borders between the different soil layers detected at the sea bottom, and also the estimate base rock levels) have been drawn onto the transparent sheets following the above explained procedure (Fig. 5-3-9).

First, the reflections corresponding to different soil stratum have been marked by the interpretation of the all available seismic recordings. Then, these layers were correlated with the "log of boring" belonging to B2 (which is on the perpendicular profile to be tracked during the seismic surveys). Finally, same information have been extended to the parallel profiles through the correlations made at the crossing (joint) points.

Fig. 5-3-9 Seismic Prospecting



On the other hand, the position of the bedrock (which could not be reached during the marine drillings) has been determined from the very clear and definite reflections received under the "Fix number 1" of profile 301, and spatially distributed in the same way as it was described above.

As a result, geological sections were completed, and so, all detected soil stratum have been marked with different colours. Here, the number of fixes, water depths at these locations, crossing (joint) points of the profiles have been also indicated. This information can be used to transfer the seismic findings to the maps.

(5) CONCLUSIONS

Although the limited water depth has created serious problems due to the multiple reflections, almost perfect findings have been obtained as a result of the scientific approaches in the planning of the field works and evaluation of the seismic recordings.

As a conclusion, it can be stated that there is a bedrock laying under the 40-50m thick actual sediments (like silt, clay, sand and gravel). The records have also shown that the upper parts of bedrock may be altered in some locations. However, more reliable information on the lithological and mechanical properties of the bedrock can be obtained through the additional drillings to be planned regarding the results of the seismic surveys.

CHAPTER VI SOCIOECONOMIC FRAMEWORK FOR DEMAND FORECAST

6-1 Hinterland of the Port

The hinterland of Filyos Port is determined based on the analyses on cargo movement, international container traffic and industrialisation.

The summary results of these analyses are reiterated as follows.

(1) Cargo Movement Analysis

Minimum-path solutions of the cargo movement analysis revealed that the hinterland provinces of Filyos Port are Zongludak, Kastamonu, Cankiri, Bolu and Ankara.

(2) Industrial Analysis

Industrial analysis revealed that the area to be examined in the planning of industrial base at Filyos is composed of the provinces of Zongludak, Kastamonu, Cankiri, Ankara and Bolu.

(3) International Container Traffic Analysis

The analysis showed that the introduction of the maritime container service at Filyos Port is justifiable from the viewpoint of the transport economy in catering to the traffic demand to / from the above area including Ankara and it should be promoted for the benefits of the nation's economy.

Based on the above, the hinterland of the Port is determined as indicated in Fig. 6-1-1.

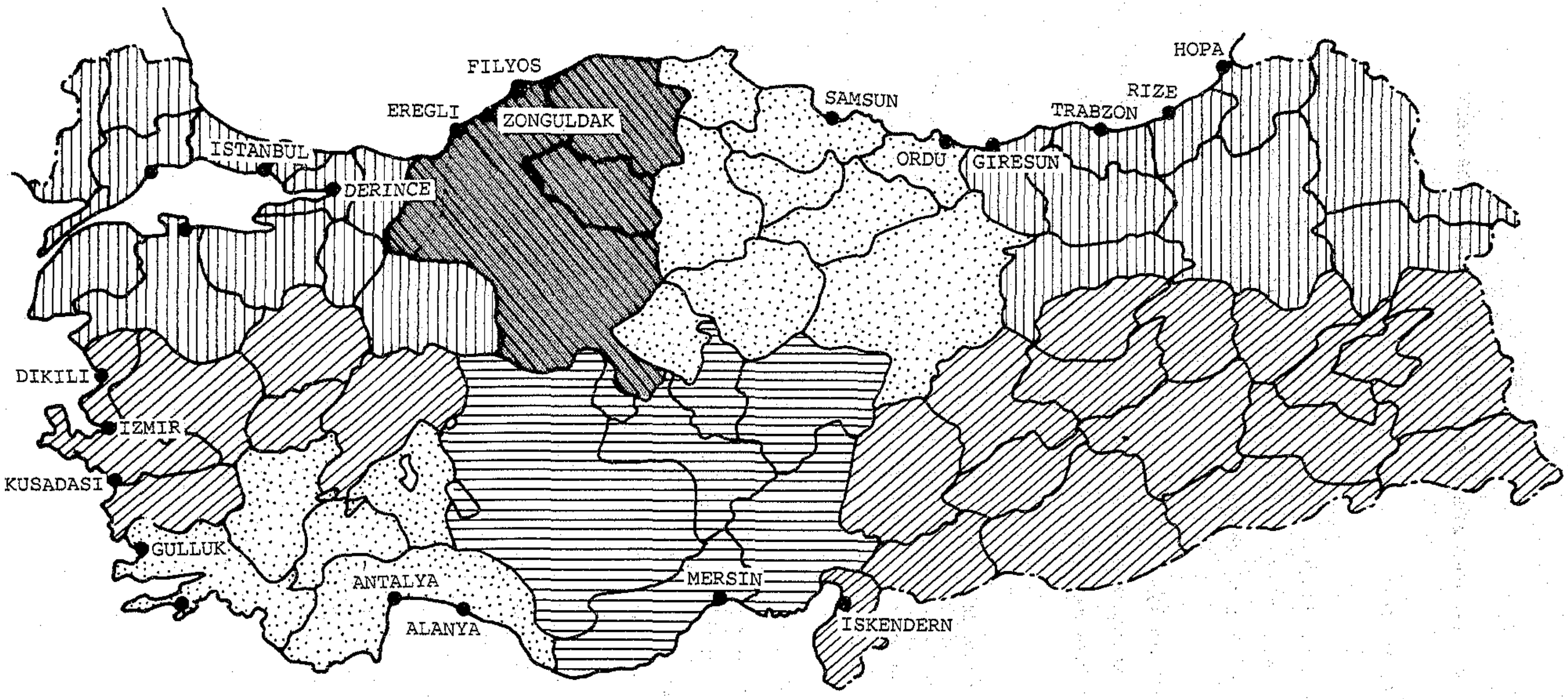


Fig. 6-1-1 Hinterland of Filyos Port

6-2 Future Socioeconomic Framework

6-2-1 Population

(1) National Population

According to the latest census, taken in 1985, the population of Turkey is about 51 million. The future population was estimated by the Social Planning Department of the State Planning Organization in February 1989, which was used as one of the fundamental data for the Sixth Five-Year Development Plan. This projection is indicated as follows in Table 6-2-1 and will be assumed in the Study.

Table 6-2-1 Population Forecast

Item	Alternative	1985 (Actual)		1990		1995		2000		2005		2010
Population (thousand)	high	50,665		56,559		63,276		70,645		78,150		85,701
Rate of Increase(%)	high		2.23		2.27		2.23		2.04		1.86	
"	medium	50,665		56,570		63,019		69,741		76,252		82,364
"	medium		2.23		2.18		2.05		1.80		1.55	
"	low	50,665		56,340		62,277		68,132		73,382		77,684
"	low		2.15		2.02		1.81		1.50		1.15	

Source : Turkish Population Projections for the Sixth Five-Year Development Plan, February 1989. Social Planning Department, SPO

(2) Population in the Hinterland

The Social Planning Department of the SPO has also carried out provincial population projections until the year 2000 based on the medium values of the national population projection which was indicated in the previous section.

Assuming the elasticity of the hinterland population vis-a-vis the national population between 1995-2000 to continue from 2000 onwards, the medium values of the hinterland population in 2005 and 2010 are estimated as indicated in Table 6-2-2. The high-case and low-case projections are also indicated in the same table, which were estimated assuming the same variance ratio of the national population, i.e., high-case/medium-case, low-case/medium-case to the hinterland population.

Table 6-2-2 Hinterland Population Forecast

Item	Alternative	1985 (Actual)		1990		1995		2000		2005		2010
Population (thousand)	high	5,570		6,156		6,837		7,598		8,367		9,138
Rate of Increase(%)	high		2.02		2.12		2.13		1.95		1.78	
"	medium	5,570		6,157		6,810		7,501		8,164		8,782
"	medium		2.06		2.04		1.95		1.71		1.47	
"	low	5,570		6.132		6,729		7,328		7,857		8,283
"	low		1.94		1.88		1.72		1.40		1.06	

Source : "Il Nufus Tahminleri", Sosyal Planlama Baskanligi, Eylul 1989

6-2-2 Economy

(1) Gross National Product (GNP)

1) Past Characteristics

i) 1980 was a turning point of the Turkish economy in that SAS (Structural Adjustment Programme) was introduced in this year. Therefore, the projections of the Team will be based upon the economic data since 1980.

ii) Average growth rate of GNP during 1980-1988 was 5.2% p.a. (at constant pries)

iii) In the same period, the population increased at the rate of 2.44% p.a., implying that the average growth rate of GNP per capita was 2.8%

iv) To see the growth rates in the 5-th Five year Plan period (1984-1989) reveals;

GNP growth rate = 6.0% pa
Population growth rate = 2.5% pa
GNP per capita growth rate = 3.5%
(Note) data = 1984-1988

Table 6-2-3 GNP

(AT 1968 PRICES,IN BILLIONS OF TL.)

1980	1981	1982	1983	1984	1985	1986	1987	1988	1989 (1)	SECTORS
										GPOSS VALUE ADDED
45.3	45.3	48.2	48.1	49.8	51.0	55.1	56,2	60.3	54.0	AGRICULTURE
40.8	43.9	46.0	49.7	54.7	48.1	63.2	69.2	71.9	71.8	INDUSTRY
4.5	4.2	3.9	4.2	4.6	5.1	4.8	5.0	5.4	5.2	Mining
32.7	35.7	37.7	40.9	45.1	47.6	52.2	57.3	58.8	58.4	Manufacturing
3.7	4.0	4.4	4.5	5.0	5.4	6.2	6.9	7.6	8.2	Energy
102.4	106.2	109.9	114.3	120.3	125.1	133.2	142.2	147.9	153.4	SERVICES
12.9	12.9	13.0	13.1	13.3	13.7	14.9	15.9	16.2	16.6	Construction
26.2	28.1	29.4	31.4	33.9	35.5	38.9	42.7	44.2	46.1	Trade
18.5	18.7	19.1	19.7	21.2	22.2	23.2	24.7	25.4	26.0	Transport & Communication
20.5	21.4	22.5	23.5	24.1	24.9	25.8	27.0	28.7	30.7	Public Services
24.3	25.1	25.9	26.6	27.8	28.8	30.4	32.0	33.3	33.9	Other Services
188.5	195.3	204.2	212.1	224.9	234.3	251.4	267.7	280.0	279.2	GDP AT FACTOR COST
2.2	1.8	1.0	0.1	0.6	0.6	0.0	0.1	-0.6	0.5	NET FACTOR INCOME FROM ABROAD
15.4	17.5	19.3	19.7	20.2	23.3	27.6	31.9	30.7	31.8	INDIRECT TAXES-SUBS.
206.1	214.7	224.4	231.9	245.6	258.2	279.0	299.7	310.0	310.5	GNP AT MARKET PRICES

SOURCE : SIS
(1) SIS ESTIMATE DATED SEPTEMBER 1989.

Table 6-2-4 Population

Population and annual increase by years (continued)

Bin - thousand

Year	Population	Absolute Intercensal Increase	Annuil Intercensal Increase %	Midyear Population
1960	27,755			27,509
1961				28,233
1962		3,636	24.62	28,933
1963				29,655
1964				30,394
1965	31,391			31,151
1966				31,934
1967		4,214	25.19	32,750
1968				33,585
1969				34,442
1970	35,605			35,321
1971				36,215
1972		4,743	25.00	37,132
1973				38,072
1974				39,036
1975	40,348			40,078
1976				40,915
1977		4,389	20.65	41,768
1978				42,640
1979				43,530
1980	44,737			44,348
1981				45,540
1982		4,927	24.88	46,688
1983				47,864
1984				49,070
1985	55,664			50,306
1986				51,546
1987				52,845
1988				54,176
1989				55,541

Source:SIS

2) Suggestions by Turkish Government

i) Average growth rate of GNP during the 6-th Five-Year Plan (1990-1994) is determined as 7% p.a.

ii) Suggestions by Long-term Planning Division of SPO

a) Expected annual growth rate during the 6 th Five-year Plan Period is as follows:

1990	1991	1992	1993	1994
5.7%	6.6	7.1	7.6	8.1

on average GNP; 7% p.a.

percapita; 4.6% p.a.

Per capita increase should be 4.5-5.5% p.a., and population increase in the period = 2.5% p.a.

Then, GNP growth rate should not be less than 7%.

b) The long term growth rate will he less than the short or middle-term growth rates (possibly due to trade cycles etc.). Then, during the next 20 years GNP growth rate will be 6-6.5% p.a.

c) 3 different scenarios are;

(high case) 6.5-7.0% p.a.

(medium case) 5-5.5% p.a.

(low case) 4.5% p.a.

iii) President Ozal said at a press conference, quoted;

if the 7% growth target is achieved in 1990, it will continue to be high the rest of the decade.

3) Team's estimate

i) Economic profile targeted in the 6 th Five year Plan is assumed in the Study during the plan period.

ii) Growth rate since 1995 onwards is assumed as;

(high case) 7% p.a.

(medium case) 6% p.a.

(low case) 5% p.a.

Table 6-2-5 Development to Value Added by Main Sectors

(In 1988 prices billion TL.)

SECTORS	1989		1994		Growth of Value Added over the Plan Period		
	Value Added (2)	Share within GDP(%)	Value Added	Share within GDP(%)	Annual Average Percentage Change (1989-1994)	Value Added	Share Within GDP (%)
I. AGRICULTURE	16,469.5	15.8	20,134.2	13.9	4.1	3,664.7	9.0
II. INDUSTRY	36,378.9	36.7	56,612.2	39.0	8.1	18,233.3	44.7
III. SERVICES	49,697.2	47.5	68,057.6	47.1	6.7	18,873.4	46.3
GDP(MP)	104,545.6	100.0	145,317.1	100.0	6.8	40,771.4	100.0
Rest of the World Factor Income	-853.6	-0.8	230.2	0.2	104.9	1,083.8	2.7
GNP (MP)	103,692.0	99.2	145,547.2	100.2	7.0	41,855.2	102.7

(1) Computed in accordance with the National Accounting System of the State Institute of Statistics (SIS)

(2) Preliminary estimate

Source: 6th Plan

The reasons for the estimate are:

a) growth rate 7% p.a. is a target value basd on preferable per capita increase and seems rather optimistic.

b) actual GNP growth has been 5-6%, therefore, 5% p.a. would be pessimistic.

c) 6% p.a. put forwarded here is between the optimistic and pessimistic projections and complies with SPO's view.

d) 6% growth was achieved during the 5 th Plan Period.

(2) Gross Domestic Product (GDP)

1) Relation of growth rates between GNP and GDP

i) 1980-1988 Actual Data

GNP; 5.24% p.a.

GDP; 5.07% p.a. difference = 1.17 = 0.2%

ii) 6 th Five-year Plan

GNP; 7%

GDP; 6.8% difference = 0.2%

iii) therefore a difference of 0.2% is assumed.

2) Estimated growth rate of GDP

	1990-1994	1995-2000	2000-2010
high case	6.8%	6.8%	6.8%
medium case	6.8%	5.8%	5.8%
low case	6.8%	4.8%	4.8%

3) Estimated GDP and its Composition by Sectors.

TL Billion (1988 price)

Case	Sector	Actual	Estimate			
		1989	1994	1995	2000	2010
HIGH	Agriculture	16,470	20,134	20,942	25,446	37,194
	Industry	38,379	56,612	61,149	89,704	191,181
	Services	49,697	68,571	73,108	100,497	187,973
	GDP	104,546	145,317	155,199	215,647	416,348
MEDIUM	Agriculture	16,470 (16%)	20,134 (14%)	20,823 (14%)	25,350 (12%)	35,144 (10%)
	Industry	38,379 (37%)	56,612 (39%)	60,470 (39%)	83,605 (41%)	160,135 (45%)
	Services	49,697 (47%)	68,571 (47%)	72,452 (47%)	94,857 (47%)	162,889 (45%)
	GDP	104,546	145,317	153,745	203,812	358,168
LOW	Agriculture	16,470	20,134	20,697	23,756	31,127
	Industry	38,379	56,612	59,779	78,469	134,483
	Services	49,697	68,571	71,816	90,299	142,068
	GDP	104,546	145,317	152,292	192,524	307,678

(Note)

The same GDP elasticities of the composing sectors are assumed 1995 onwards also as follows:

Sector	high	medium	low
Agriculture (elasticity)	4.1% (0.60)	3.5%	2.9%
Industry (elasticity)	8.1% (1.19)	6.9%	5.7%
Services (elasticity)	6.7% (0.99)	5.7%	4.8%
GDP	6.8%	5.8%	4.8%

(3) Gross Regional Product

Gross Regional Products by province are estimated utilizing available regional data, i.e., Value Added of Industries (Small Scale) and Population. The procedure and estimation results are indicated in Fig 8-2-1 and Table 8-2-6 respectively.

Fig. 6-2-1

PROCEDURE OF THE ESTIMATION OF REGIONAL G.D.P.

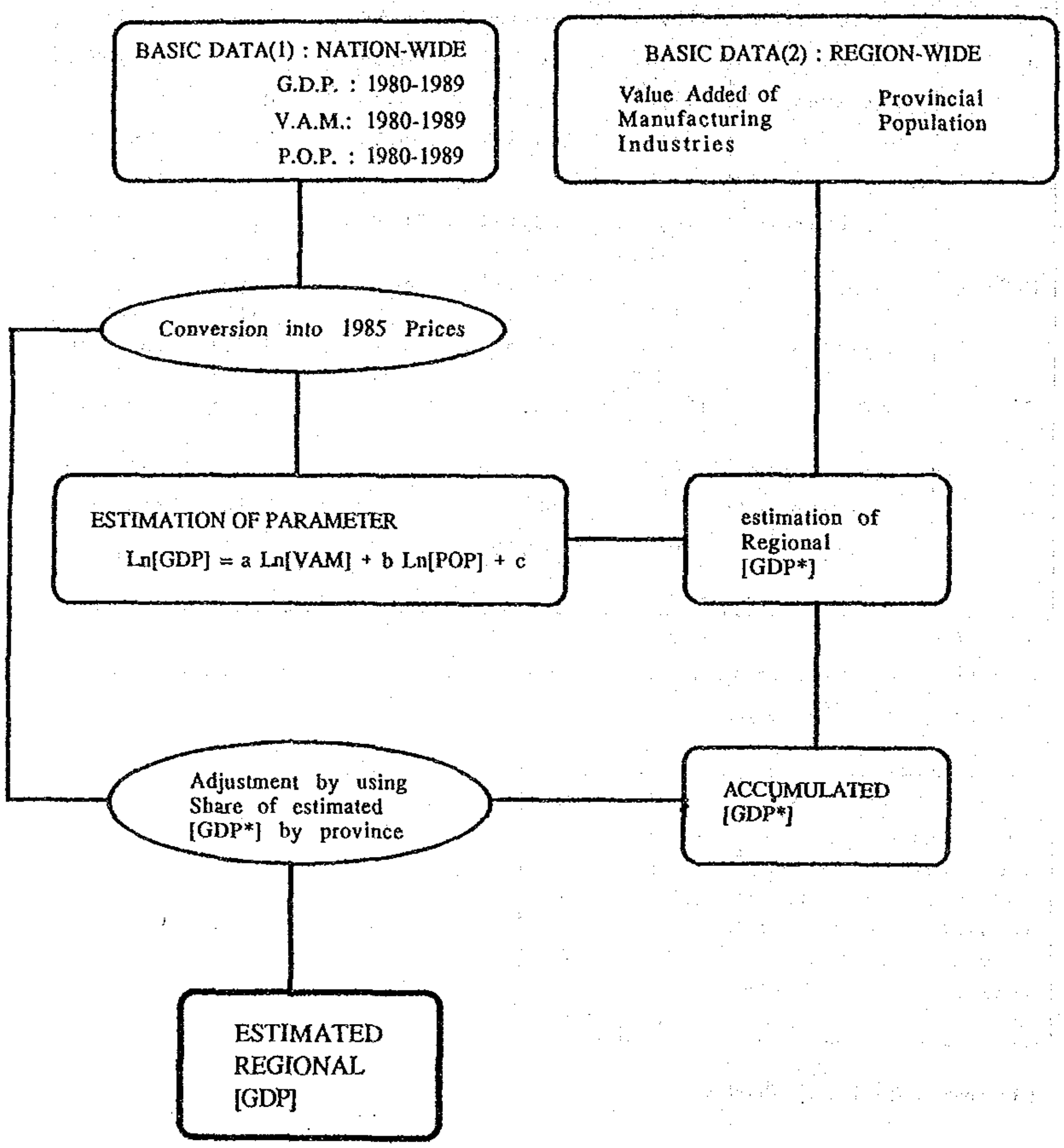


Table 6-2-6 ESTIMATED G.R.P (in billions TL at 1988 prices)

Province	GDP(1989)	Share	GDP(2000)	Share	GDP(2010)	Share
Adana	4,430	4.24%	8,301	4.07%	14,653	4.09%
Adyonman	685	0.66%	1,439	0.71%	2,815	0.79%
Afyon	769	0.74%	1,632	0.80%	3,224	0.90%
Agri	310	0.30%	672	0.33%	1,363	0.38%
Amasya	366	0.35%	737	0.36%	1,390	0.39%
Ankata	9,457	9.05%	16,760	8.22%	28,118	7.85%
Antalya	1,345	1.29%	2,863	1.40%	5,671	1.58%
Artvin	135	0.13%	289	0.13%	467	0.13%
Aydin	1,194	1.14%	2,446	1.20%	4,582	1.31%
Balikesir	1,618	1.55%	3,038	1.49%	5,372	1.60%
Bileoik	236	0.23%	467	0.23%	866	0.24%
Bingol	148	0.14%	293	0.14%	555	0.15%
Bitlia	240	0.23%	530	0.26%	1,083	0.30%
Bolu	559	0.64%	1,299	0.64%	2,370	0.66%
Burdur	277	0.26%	560	0.27%	1,061	0.30%
Bursa	3,437	3.29%	5,398	3.14%	11,225	3.13%
Canakkale	777	0.74%	1,458	0.72%	2,575	0.72%
Canakiri	176	0.17%	348	0.17%	543	0.18%
Corum	671	0.64%	1,351	0.66%	2,544	0.71%
Doenizll	1,091	11.04%	2,180	1.07%	4,078	1.14%
Diyarbakiy	1,471	1.41%	3,156	1.55%	6,297	1.76%
Edrino	419	0.40%	859	0.42%	1,646	0.46%
Elazig	441	0.42%	922	0.45%	1,797	0.50%
Erzincan	211	0.20%	429	0.21%	818	0.23%
Erzutum	910	0.87%	1,861	0.91%	3,554	0.99%
Eskisehir	1,007	0.96%	1,987	0.95%	3,503	0.98%
Gaziantep	2,331	2.23%	4,824	2.37%	9,316	2.60%
Glresun	451	0.43%	907	0.44%	1,705	0.48%
Gumushane	194	0.19%	386	0.19%	718	0.20%
Hakkarl	82	0.08%	182	0.09%	373	0.10%
Hatay	1,965	1.88%	3,993	1.96%	7,585	2.12%
Icel	1,822	1.74%	3,979	1.95%	8,070	2.25%
Isparta	582	0.56%	1,150	0.56%	2,133	0.06%
Istanbul	31,831	30.45%	53,521	26.26%	35,597	23.90%
Izmir	5,567	5.33%	11,328	5.56%	21,547	6.02%
Kars	708	0.68%	1,407	0.69%	2,619	0.73%
Kastsmonu	335	0.32%	649	0.32%	1,179	0.33%
Kayseri	1,252	1.20%	2,509	1.23%	4,705	1.31%
Kirklarell	300	0.29%	603	0.30%	1,136	0.32%
Kirsohir	254	0.24%	525	0.26%	1,013	0.28%
Kocaell	1,300	1.24%	2,877	1.41%	5,906	1.65%
Konya	2,735	2.62%	5,574	2.73%	10,617	2.96%
Kulahya	721	0.69%	1,426	0.70%	2,642	0.74%
Malatya	1,458	1.39%	2,802	1.37%	5,060	1.41%
Manisa	2,597	2.48%	4,599	2.31%	8,032	2.24%
Maras	1,673	1.60%	3,318	1.63%	6,170	1.72%
Mardin	747	0.71%	1,632	0.80%	3,309	0.92%
Mugla	515	0.49%	1,086	0.53%	2,137	0.60%
Mus	176	0.17%	375	0.18%	745	0.21%
Ncvsehir	222	0.21%	459	0.23%	835	0.25%
Nigde	477	0.46%	995	0.49%	1,936	0.54%
Ordu	896	0.86%	1,336	0.90%	3,514	0.98%
Rize	358	0.34%	715	0.35%	1,334	0.37%
Sakarya	1,074	0.03%	2,089	1.03%	3,814	0.06%
Samsun	2,265	2.17%	4,362	2.14%	7,892	2.20%
Siirt	908	2.17%	4,362	2.14%	7,892	2.20%
Sinop	289	0.28%	567	0.28%	1,042	0.29%
Sivas	759	0.73%	1,508	0.74%	2,799	0.78%
Tekirdag	558	0.53%	1,123	0.55%	2,115	0.59%
Tokai	853	0.82%	1,771	0.87%	3,430	0.96%
Trabzon	928	0.89%	1,908	0.94%	3,664	1.02%
Tuncell	90	0.09%	169	0.08%	300	0.08%
Urfa	906	0.87%	2,229	1.09%	5,043	1.41%
Usak	489	0.47%	940	0.46%	1,698	0.47%
Van	440	0.42%	970	0.48%	1,986	0.55%
Yozgat	530	0.51%	1,095	0.54%	2,111	0.59%
Zonguldak	1,679	1.61%	3,324	1.63%	6,168	1.72%
National Total	104,548 (billion TL)	100.00%	203,812 (billion TL)	100.00%	358,168 (billion TL)	100.00%

CHAPTER VII CARGO DEMAND FORECAST AND FORECAST OF VESSEL SIZE

7-1 Methodology of Forecast

The cargo throughput and calling vessels at the Port of Filyos in the target years of the Master Plan and the Short Term Development Plan (for the years 2010 and 2000, respectively) will be estimated on the basis of the following analyses;

1) Analysis on the future trend of the socioeconomic development in Turkey in general and the hinterland area of Filyos Port in particular.

2) Analysis on the relationship between the cargo throughput to be handled at Filyos and the general socioeconomic indicators.

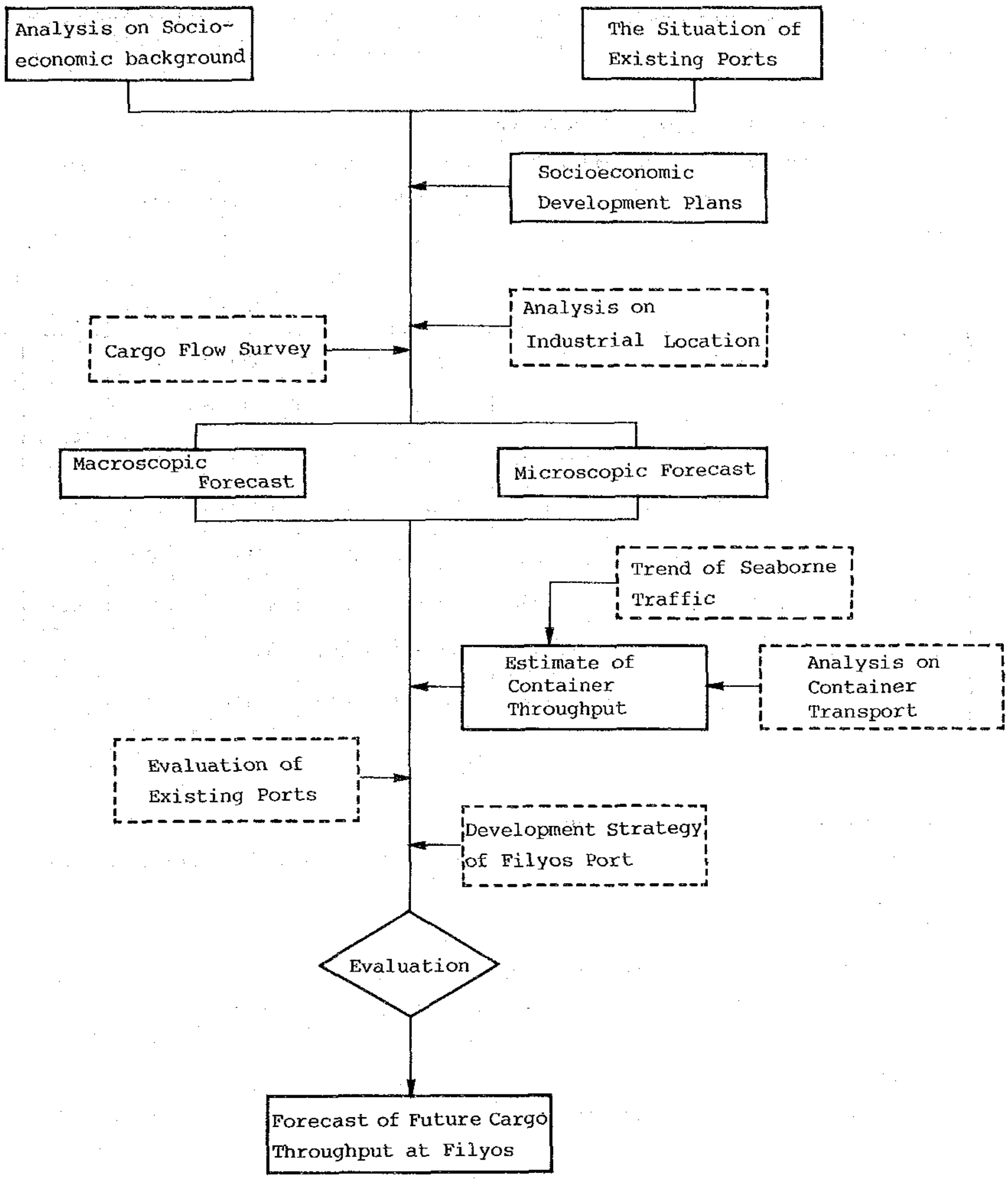
3) Identification of the hinterland area which Filyos Port should cater to and analysis of the potential cargo flow based on the Cargo Flow Survey results.

4) Estimation of the container throughput at Filyos based on the results of Container Transport Study.

5) Estimation of the industrial cargo throughput at Filyos based on the results of Industrial Location and Demand Study.

The working flow-chart of the demand forecast is presented in the following figure.

Fig. 7-1-1 Demand Forecast Methodology



7-2 Macro Projections

Nation-wide cargo throughputs at Turkish ports are estimated through regression analysis with national economic indicators.

7-2-1 Past Trend of Cargo Throughputs

According to the Ge Si Bil Data, the port throughputs at Turkish ports have increased remarkably with the GDP elasticity being more than unity (GDP growth rate in the same period = 5,4% p.a.), as shown in Table 7-2-1.

Table 7-2-1 unit:1000 tons, %

Type of Trade	1982	1983	1984	1985	1986	1987	1988	
								%p.a.
Foreign Trade	30920	33442	39477	39499	43746	48530	52518	9.2
Exports	8255	7588	8439	8244	9667	12942	19708	14.3
Imports	22665	25854	31038	31255	34079	35588	32810	6.4
Domestic Trade	37696	32880	31956	37635	41261	46747	52854	5.8
Total	68616	66322	71433	77134	85007	95277	105372	7.4
Transit	3771	4642	5324	5805	4617	5110	-	6.3

Source : Ge Si Bil, MOT

7-2-2 Macro Projections by Trade

(1) Foreign Trade Composition is forecast through regression analysis based on the past data as follows:

1) Imports

$Y=0.42636\ GDP-2872\ (r=0.856)$

Y:thousand tons, GDP:Billion T.L.(1988prices)

2) Export

Assuming the GDP elasticity is unity

3) Results

Table 7-2-2 unit:1000 tons

Case	2000			2010		
	Import	Export	Total	Import	Export	Total
High	89000	43400	132400	174600	83800	258400
Medium	84000	38800	122800	149800	68100	217900
Low	79200	34600	113800	128300	55300	183600

(Note) excluding Transit Cargoes

(2) Domestic Trade is forecast through regression analysis with GDP based on the past data as follows:

Y=0.67242 GDP-12570 (r=0.934)

Y:1000tons, GDP:Billion T.L. (1988 prices)

Table 7-2-3 unit:1000tons

Case	2000	2010
High	132,400	267,400
Medium	124,500	228,300
Low	116,900	194,300

(3) Total trade forecast (excluding transit cargoes) are summarised in the following table, Table 7-2-4, based on the above.

Table 7-2-4 unit:1000tons

Case	Type of Trade	1988 Actual	2000	2010
High	Foreign Trade	52,518	132,400	258,400
	Imports	32,810	89,000	174,600
	Exports	19,708	43,400	83,800
	Domestic Trade	52,854	132,400	267,400
	Total	105,372	264,800	525,800
Medium	Foreign Trade	-ditto-	122,800	217,900
	Imports		84,000	149,800
	Exports		38,800	68,100
	Domestic Trade		124,500	228,300
	Total		247,300	446,200
Low	Foreign Trade	-ditto-	113,800	183,600
	Imports		79,200	128,300
	Exports		34,600	55,300
	Domestic Trade		116,900	194,300
	Total		230,700	377,900

(Note) cases are according to GDP frameworks

7-3 Micro Projections (National)

7-3-1 Foreign Trade (excluding Transit Cargoes)

(1) General Cargo (Containerisable Goods)

1) According to the data provided by TCDD, the containerisable general cargoes handled at TCDD major ports show a remarkable increasing trend with growth rate of 17.6% p.a. in 1984-1988, as indicated in Table 7-1-1. During the same period, GDP growth rate was 5.9% p.a. implying that the elasticity of the general cargo growth with GDP is 3.0.

Table 7-3-1 General Cargo handled at TCDD Major Ports

Unit:1000tons

Year / Commodity	1984	1985	1986	1987	1988
General Cargo (Containerisable Items)	2856	3744	4326	5394	5356

(Note) (1) General Cargo excluding Fertiliser, and Iron and Steel.

(2) Traffic handled at TCDD major ports such as Hyderpasa, Derince, Samsun, Mersin, Iskendern and Bandirma.

2) On the other hand, Foreign Trade Statistics (SIS, 1987) show the containerisable general cargo at the national level was 6275 thousand M/T in 1986 as the most recent available data, implying around 70 % of the commodity being handled at TCDD major ports. Here, containerisable cargoes are assumed to be the commodities of A group in the Table 3-1-2.

3) In general, the elasticity of general cargo growth with GDP growth tends to be around unity. The elasticity of the Foreign Trade growth in the future is assumed in this forecast. The forecast is thus on the conservative side. Assuming the growth rate of the containerisable cargoes is 7% p.a. (5.8% x 1.2), the future national

Table 7-3-2-1 Containerization Suitability

No.		Commodity Items	Suitability*
0		Food and Live Animals	
	00	Live Animals	C
	01	Meat and Preparations	A
	02	Dairy Products and Bird's Eggs	A
	03	Fish and Preparations	A
	04	Cereals and Preparations	C
	05	Vegetables and Fruit	A
	06	Sugar and Preparations, Honey	C
	07	Coffee, Tea, Cocoa, Spices	A
	08	Feeding stuff	C
	09	Misc. Edible products	A
1		Beverages and Tobacco	
	11	Beverages	A
	12	Tobacco	A
2		Crude Materials (Excl. Fuel)	
	21	Hides, Skins, Furs (Undressed)	B
	22	Oil Seeds, Oleaginous Fruit	B
	23	Crude Rubber	A
	24	Cork and Wood	C
	25	Paper	B
	26	Textile Fibers and Waste	A
	27	Crude Fertilizer Ores, Scrap	C
	28	Metalliferous Ores, Scrap	C
	29	Crude Animal, Vegetable Materials	A
3		Mineral Fuels, etc.	
	31	Coal, Coke and Briquettes	C
	32	Petroleum and Products	C
	33	Gas	C
	34	Electric Power	C
4		Animal, Vegetable Oil	
	41	Animal Oil	C
	42	Vegetable Oil	A
	43	Processed Animal, Vegetable Oil	A

Table 7-3-2-2 Containerization Suitability (Continued)

No.		Commodity Items	Suitability*
5		Chemicals	
	51	Chemical Elements, Compounds	C
	52	Inorganic Chemicals	B
	53	Dyes, Tanning, Color Products	A
	54	Medicine	A
	55	Perfume, Cleaning Products	A
	56	Fertilizer	C
	57	Explosives, Fireworks	C
	58	Plastic Materials	A
	59	Chemical Materials	A
6		Basic Manufactures	
	61	Leather, Dressed Fur	A
	62	Rubber, Manufactures	A
	63	Wood Cork Manufactures	A
	64	Paper, Paperboard and Manufactures	A
	65	Textile Yarn, Fabrics	A
	66	Non Metal Minerals Manufactures	A
	67	Iron and Steel	C
	68	Nonferrous Metals	B
	69	Metal Manufactures	B
7		Machines, Transport Equipment	
	71	Power Generating Equipment	C
	72	machines for Special Industries	A
	73	Metal Working Machinery	C
8		Misc. Manufactured Goods	
	81	Heating, Lighting	A
	82	Furniture	A
	83	Travel Goods, Handbags	A
	84	Clothing	A
	85	Footwear	A
	86	Instruments, Watches	A
	87	Precision Instruments	A
	88	Photo Equipment, Optical Goods	A
	89	Misc. Manufactured Goods	A
9		Special Goods	

* A : Suitable for Containerization
B : Not Suitable for Containerization
C ; Uncontainerizable

throughput is forecast as indicated in Table 7-3-3.

Table 7-3-3 Containerisable General Cargo Forecast

Year	1986 (Actual)	2000	2010
General Cargo (Containerisable)	6,275,000tons	16,180,000tons (7.0% p.a.)	31,829,000tons (7.0% p.a.)

(Note) 1) National Foreign Trade excluding Transit Traffic

2) Import and Export Total

(2) Containers

1) The historical data pvovided by TCDD shows the accelerating trend of containerization in Turkey, as indicated by the average growth rate of cargo tonnages in containers being 31% p.a. during 1984-1988 compared with the 18% p.a. for containerisable cargoes.

2) Historical trend of containerization is indicated in Table 3-1-4 using the data provided by TCDD. In 1988, the ratio of containerisation reached 15%; however, this also shows that containerisation in Turkey is still at a less advanced stage.

Nevertheless, experience in other ports of the world shows that once containerisation is put into operation, the penetration proceeds at an accelerating pace.

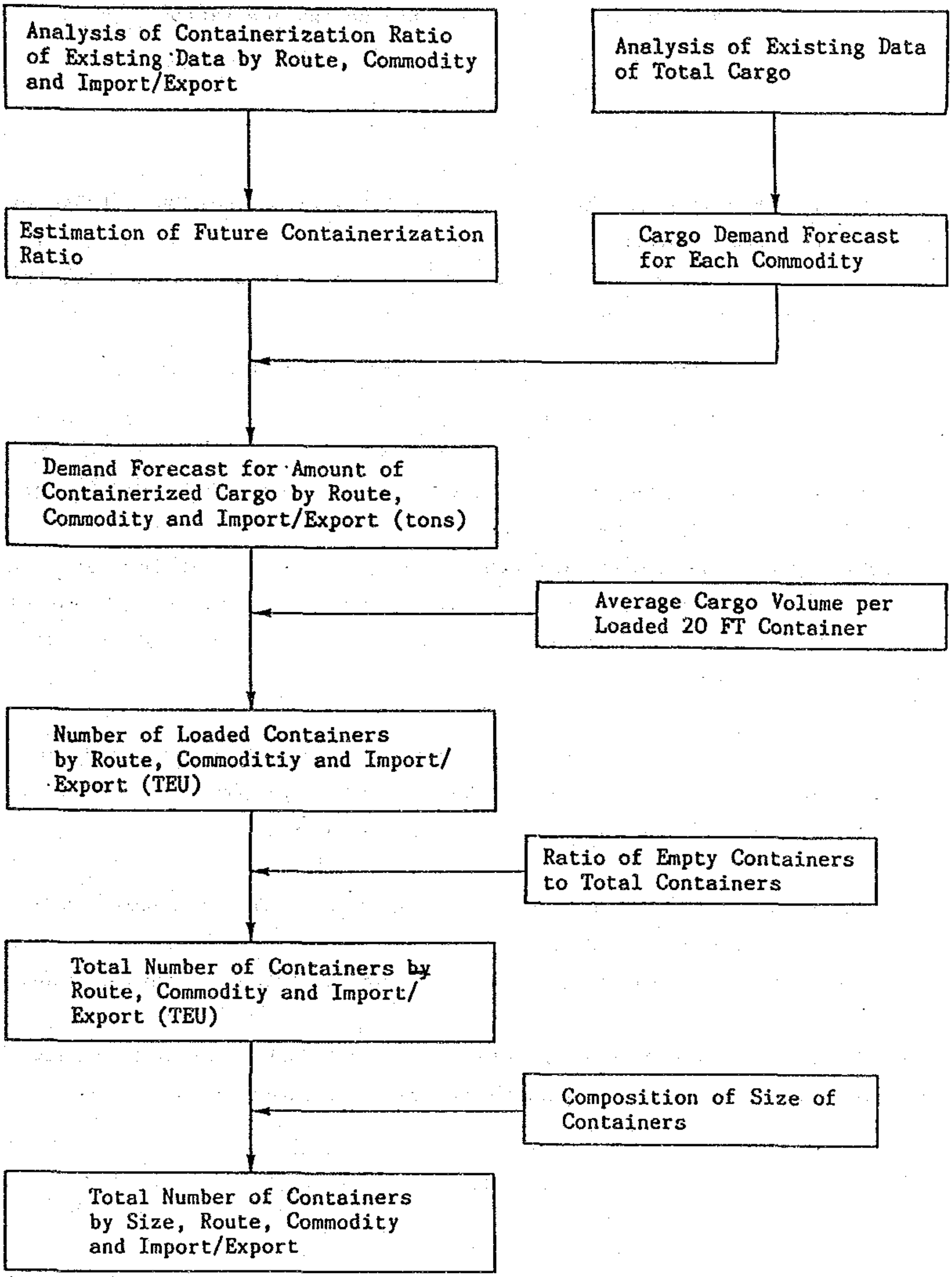
Table 7-3-4 Ratio of Containerisation

Year	Containerisable Cargo (1000M/T)	Containerised Cargo (1000M/T)	Ratio of Containerisation (%)
1984	2856	297	10.4
1985	3744	343	9.2
1986	4326	558	12.9
1987	5394	716	13.3
1988	5356	817	15.3

Note : TCDD Major Ports

(3) The future volume of containerised cargo can be ersimated following the procedure indicated in Fig.7-3-1.

Fig. 7-3-1 Containerized Cargo Forecasting Procedures



Future rate of containerisation is in general forecast through the regression analysis based upon a logistic curve of the following type:

$$Pt = \frac{Pm}{1 + C^{(t-to)}}$$

Pt : Containerization ratio at year t

Pm : Ultimate value of containerization ratio

C : Parameter

t : Year

to : Year in which P = 1/2 Pm

The ultimate rate of containerisation Pm tends to be 90% - 100% for the commodities of A group, and Pm = 90% is assumed in this estimate.

Through the regression analysis based on the past historical data, the following estimate is derived:

$$Pt = \frac{90}{1 + 0.87636^{(t-16.14)}} \quad (\%) \quad (r = 0.9)$$

here, t=0 in 1984

Thus, the containerisation rate in the years 2000 and 2010 are forecast 45% and 70%, respectively.

Multiplying these containerisation rates and forecasted containerisable cargo volumes in Table 3-1-3, the future volume of containerised cargoes is estimated as 6957 thousand tons in 2000 and 21962 thousand tons in 2010.

4) Average cargo volume per loaded 20ft container has been increasing during 1984-1988 and was 13 tons in 1988 in TCDD major ports.

This figure is assumed to continue in the future.

5) Empty container ratio (empty containers / total containers (TEU)) was 0.33 in 1988 at the TCDD major ports.

This figure is assumed to be constant for the futune in this estimate.

6) Thus, future containers of foreign trade excluding transit transport at the national level is forecast as indicated in Table 7-1-5.

Table 7-3-5

unit : 1000TEUs

Type of Containers \ Year	1988 (Actual)	2000	2000/1988	2010	2010/1988
Loaded	92	535		1690	
Empty	44	265		840	
Total	135	800	% 16 p.a.	2530	% 14 p.a.

Note : 1) 1988 Actual Data is of TCDD major ports.

2) The forecast of National Ports Master Plan (1983) was 1876 thousand TEUs in 2000.

(3) Break-bulk General Cargoes (Containerisable Goods)

Break-bulk general cargo is forecast as general cargoes less containerised cargoes as follows:

Table 7-3-6

unit : 1000tons

Type of Cargo \ Year	1986 (Actual)	2000	2000/1986	2010	2010/1986
Break Bulk G.C	6275	9200	% 3.0 p.a.	9900	% 2.0 p.a.

(4) Iron Ore

1) Value Added of Manufacturing Sector (V.A.M)

(VAM)=0.28137 x (GDP) - 3400 (r=0.966)

Thus, VAM in 2000 = 53900 (Billion TL)

VAM in 2010 = 97400 (-ditto-)

2) Consumption of Iron and Steel (Crude Steel Basis)

i) Ln (Consumption per capita) = 143.4 Ln (VAM) - 1299 (r=0.9)

Thus, Consumption per capita in 2000 = 263 kg

ditto in 2010 = 348 kg

These figures seem reasonable compared with those of other countries (Fig.3-1-2).

ii) Thus, national consumption of Iron and Steel is ;

Year	Consumption 1,000tons
1988	8,650
2000	18,000
2010	29,000

3) Production of Iron and Steel

During the 6th Plan Period, production of crude steel is targeted at 12000 thousand tons with an average growth rate 7.1% p.a. since 1989. Assuming the same growth rate from 1995 onwards, production is forecast at 18000 thousand tons in 2000, which implies self sufficiency in terms of crude steel.

Assuming self sufficiency in 2010 also, the production of crude steel is forecast at 29000 thousand tons.

In order to materialize the targeted production in 2000, the average production growth rate in EAFs during 1988-2000 and 2010 is expected to be 7% p.a. which seems reasonable as compared to 24% p.a. growth during 1980-1988.

Table 7-3-7

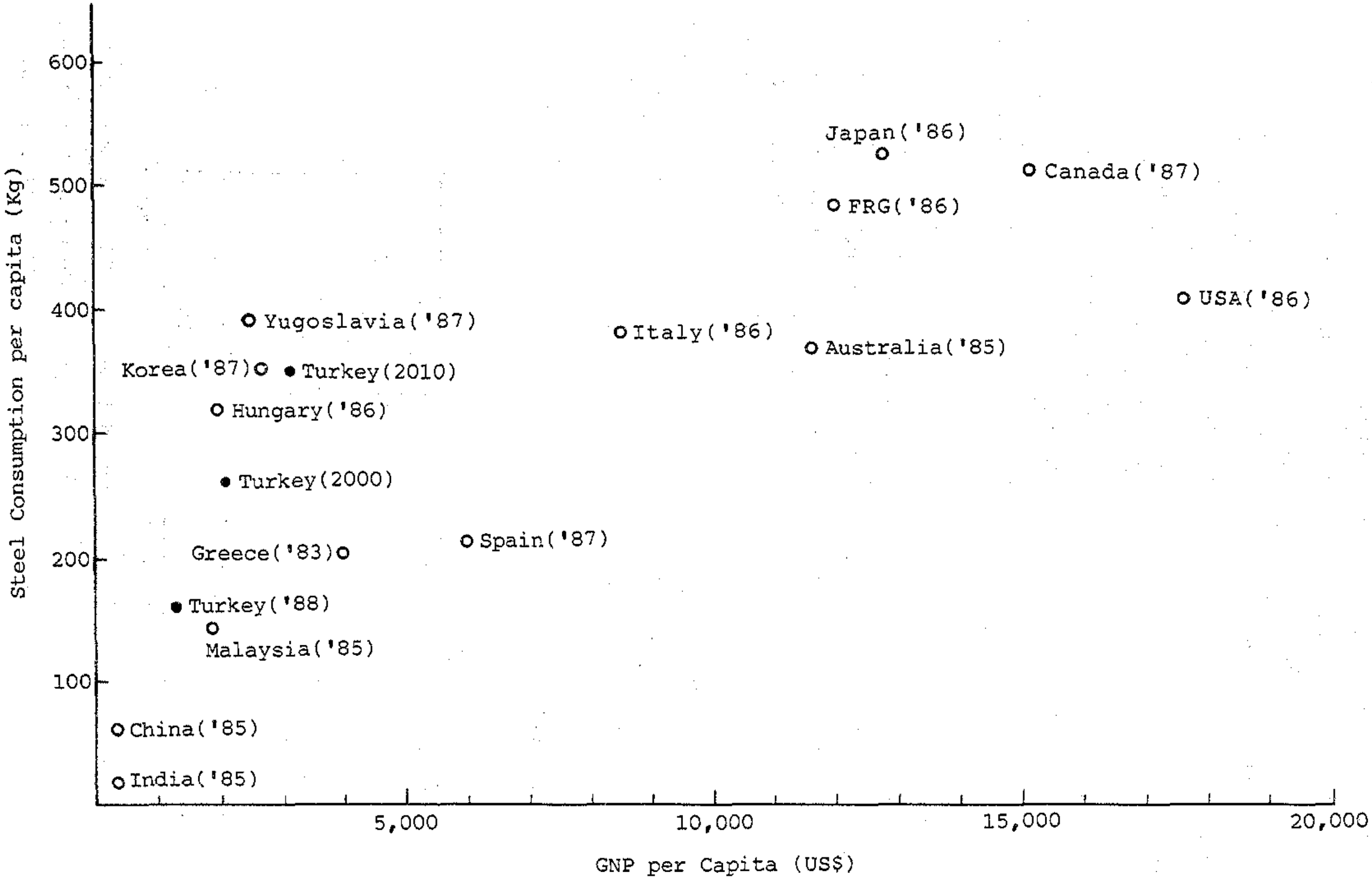
unit : 1000 tons

Year	Karabuk 1)	Isdemir 1)	Erdemir 1)	EAFs	Total
1988	582	1775	1815	3810	7982
1995	1100	2400	2530		
2000	1100	3250	6000	7650	18000
2010	2) 2000+1100	3250	6000	16650	29000

(Note) 1) Expansions at Karabuk, Isdemir and Erdermir are based upon interviews.

2) New furnace at the Black Sea Coast

Fig. 7-3-2 Steel Consumption



4) Ore Requirement

i) Actual data for Karabuk and Isdemir

Year	Production	Ore Req.	Ore/Pro.
	000tons	000tons	
1988	2393	4717	1.97=2.0

ii) Ore Demand

000tons 000tons
9350 x 2.0 = 18700 in 2000

000tons 000tons
12850 x 2.0 = 28500 in 2010

iii) Ore Production

6th Plan
000tons % 000tons
(5500 in 1989) x 1.8 p.a.(6th Plan)= 6700 in 2000
8000 in 2010

iv) Net Import of Ores

12000 thousand tons in 2000

17000 thousand tons in 2010

(5) Coal and Cokes

Regression Analysis with VAM:

Year	VAM(X) (Billion TL)	Import(Y) (1000tons)
1982	14857	1129
1983	16119	992
1984	17774	2166
1985	18759	2494
1986	20572	2974

Y = 0.37054 X - 4577 (r=0.958)

Hence 1 Y = 15400 thousand tons in 2000 (12.5% p.a.)
(6th Plan = 14 % p.a.)

Y = 31500 thousand tons in 2010 (10.3% p.a.)

(6) POL and POL Products

1) Consumption

The 6th Plan targets a 6.8% p.a. increase in POL and POL products, implying the GDP elasticity of POL consumption is unity.

Assuming the unity as the elasticity of demand, consumption is estimated to be 6.7% p.a. increase during 1986-2000 and 5.8% p.a. increase during 2000-2010.

2) Production

The 6th Plan targets a 5.4% p.a. increase in POL and POL products production. Assuming the same growth rate, future production is estimated as follows and imports is forecast as Consumption less Production:

Table 7-3-8 unit:1000tons

	1988(*)	2000	2010
Consumption	15255	33200	58300
Production	2000	3800	6400
Net Imports	13255	29400	51900

(*) Ge Si Bil Data

(7) Iron and Steel

1) Import

The following regression equation is derived based on the past actual data of the import amount and VAM during 1982-1986 (Foreign Trade Statistics);

Ln Y = 5415 Ln (VAM) -50,800 (r=0.8)

Y = Import of Iron and Steel (1000 tons)

VAM : Value Added of Manufacturing Sector (Billion TL, 1988 price)

Hence, Y = 8,200 thousand tons in 2000

Y = 11,400 thousand tons in 2010

Table 7-3-9 Summary Results of Foreign Trade : Micro Forecast

unit : 1000 tons

	1988(Ge Si Bil Data)			2000			2010		
	Import	Export	Total	Import	Export	Total	Import	Export	Total
Dry Bulk	7,947	5,090	13,037	28,300	3,100	31,400	50,100	3,100	53,200
					(*)			(*)	
Ore	2,626	2,488	5,114	12,600	600	13,200	18,300	600	18,900
Coal	5,053	131	5,184	15,400	-	15,400	31,500	-	31,500
				(*)	(*)	(*)	(*)	(*)	(*)
Others	268	2,469	2,737	300	2,500	2,800	300	2,500	2,800
Liquid Bulk	13,255	6,272	19,528	34,200	2,100	36,300	56,700	2,100	58,800
					(*)			(*)	
POL and POL products	10,477	5,952	16,429	31,200	1,800	33,000	53,700	1,800	55,500
				(*)	(*)	(*)	(*)	(*)	(*)
Others	2,776	317	3,093	3,000	300	3,300	3,000	300	3,300
General Cargo	10,990	8,302	19,292	23,500	26,900	50,400	39,100	46,400	85,500
	(86)	(86)	(86)						
Iron and Steel	2,316	2,829	5,145	8,200	7,100	15,300	11,400	9,000	20,400
	(86)	(86)	(86)						
Containerisable G.C.	1,441	4,834	6,275	3,700	12,500	16,200	7,300	24,500	31,800
	(86)	(86)	(86)						
Other G. C.	4,687	2,961	7,648	11,600	7,300	18,900	20,400	12,900	33,300
				(*)		(*)	(*)		(*)
Timber	619	42	661	600	-	600	600	-	600
Foreign Total	32,810	19,708	52,518	86,600	32,100	118,700	146,500	51,600	198,100
			(TCDD)						
(Containers)						7,000			21,900
			(")						
			TEU			TEU			TEU
			135,000			800,000			2.530,000
			(86)						
(Break-bulk)			13,106			28,100			43,200
			(86)						
(of which, containerisable)			6,275			9,200			9,900

2) Export

The following regression equation is derived based on the past actual data of the export amount and Hot Metal production during 1982-86 (Foreign Trade Stnsitics) ;

Ln Y = 3680 Ln X - 28943 (r=0.925)

X : Hot Metal Production (thousand tons)

Y : Export of Iron and Steel

Hence, Y = 7100 thousand tons in 2000

Y = 9000 thousand tons in 2010

(8) Other Cargoes

Assuming the GDP elasticity is unity,

Import:	11600thousand	in 2000
Export:	7300 "	"
Import:	20400 "	in 2010
Export:	12900 "	"

(Note) 1) Figures in brackets are included numbers.

2) Asterisked figures are estimated from the past actual data.

3) All figures exclude transit cargoes.

7-3-2 Domestic Trade

According to the data provided by Ge Si Bil, MOT, the major features of the domestic trade by shipping are as follows:

1) liquid bulk cargoes are predominant with the percentage share of about 70%.

2) general cargoes occupy the second largest share after liquid bulk, with about a 20% share.

3) dry bulk cargoes occupy the smallest share of about 10%.

The bulk cargoes at the national trade level have no direct relations with those of Filyos Port, and they can be forecast more appropriately based on the industrial location analysis at Filyos.

Thus, only the general cargoes will be estimated in this section as follows:

Assuming the GDP elasticity is unity,

22400 thousand tons in 2000

29400 thousand tons in 2010

Table 7-3-10 Domerdic Trade Composition

unit : 1000 tons

Commodity	1987		1988		Total	
		%		%		%
Dry Bulk	(6033)	(13)	(6925)	(13)	(12958)	(13)
Grain	523	1	484	1	1007	1
Ore	2442	5	2505	5	4947	5
Coal	3065	7	3933	7	6998	7
Liquid Bulk	(31990)	(68)	(35766)	(68)	(67666)	(68)
Crude	19097	41	22081	42	41178	41
POL Product	11577	25	12817	24	24388	24
Gas	506	1	423	1	929	1
Others	806	2	446	1	1252	1
General Cargo	(8590)	(18)	(10075)	(19)	(18665)	(19)
Industrial Product	2466	5	2903	5	5369	5
Agricultural Product	132	0	51	0	183	0
Others	5989	13	7199	13	13108	13
Timber	(134)	(0)	(88)	(0)	(222)	(0)
Total	46747	100	52854	100	99601	100

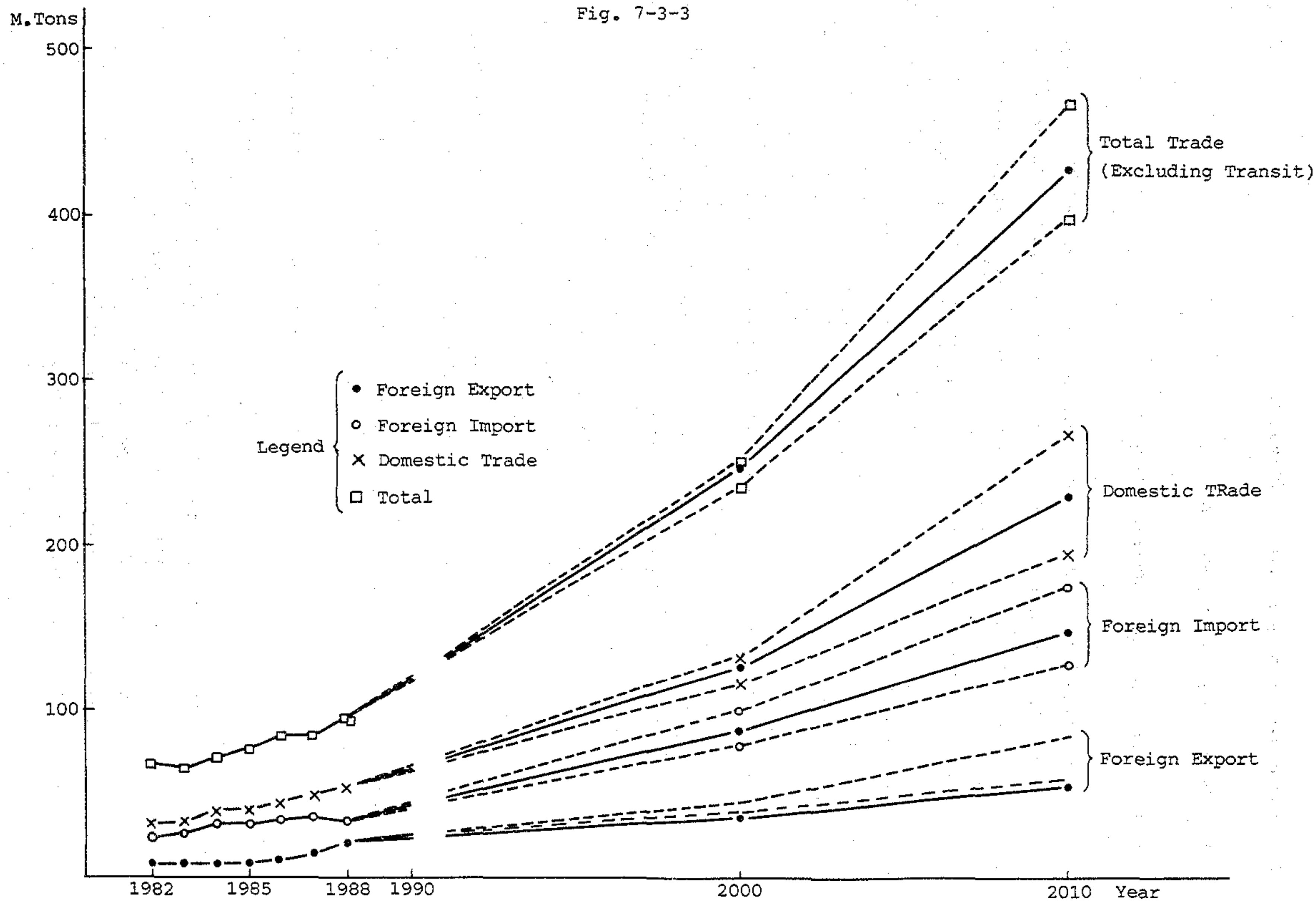
7-3-3 Relation between Macro and Micro Projections

The forecast cargo throughputs at Turkish ports (nation - wide) are indicated in Fig 7-3-1.

This figure shows that micro projections have enough compliance with the macro projections.

Hence, micro projections will be adopted as the future forecast in this Study.

Fig. 7-3-3


M.Tons
500
400
300
200
100
1982
1985
1988
1990
2000
2010
Year
Legend
Foreign Export
Foreign Import
Domestic Trade
Total
Total Trade
(Excluding Transit)
Domestic TRade
Foreign Import
Foreign Export

7-4 Cargo Demand Projections for Filyos Port

7-4-1 Methodology of Projections

(1) Containers and Other General Cargoes

The containers and other general cargoes to be handled at Filyos are determined by the linear programing method so as to minimise the total land transport cost of the nation-wide cargoes of these types, as follows:

1) First 1 determine Xij matrix which minimise $g = \sum_{i,j}^{m,n} Cij\ Xij$,

under the conditions of,

$$Xij \geqq 0$$

$$\sum_{j=1}^{m} Xij \leqq Pi$$

$$Xij \geqq Dj$$

Here, Xij : cargo volume to / from Region j (j=1,...,n) and to be handled at Port i (i=1,...,m)

g : Objective Function for total land transport cost

Cij : Land transport cost per unit cargo between Port i and Region j (distances by road used)

Pi : The handling capacity of Port i

Dj : Total volume of cargoes to / form Region j (Here, national volume is allocated to Region j according to the Gross Regional Product of the Region)

2) Then, cargo volume to be handled at Port i is estimated as follows :

$$Ti = \sum_{j=1}^{n} Xij$$

Using this equation, cargo volume to be handled at Filyos is determined.

3) The calculations are carried out for two alternative cases:

Case A (no constraint for port capacities)

Case B (assumed port capacities)

Case A reveals the minimum-path solution, while Case B reflects the capacities of ports.

4) Division of Regions is shown in Fig 7-4-1.

5) Assumed capacities of ports are shown in Table 7-4-1.

Table 7-4-1 Possible Capacity of Ports

	Long term				
Name of Port	Gen. 1,000t	Cont. 1,000TEU	bulk(G) 1,000t	Bulk(M) 1,000t	Liquid 1,000t
Trabzon	1,500	250			
Samsun	1,100	600		7,000	
Filyos	1,500	350	1,400	11,000	1,000
Hayderpasa	630	400	3,000		
Derince	825	833	1,400		
Bandirma	1,650		1,300	2,500	1,000
Izmir	1,155	1,083	4,400		
Antalya	690	83	1,200		
Mersin	1,155	1,000	2,000	5,800	4,200
Iskendern	600	433		6,200	
Total	10,805	5,032	14,700	32,500	6,200

Fig. 7-4-1 Division of Regions

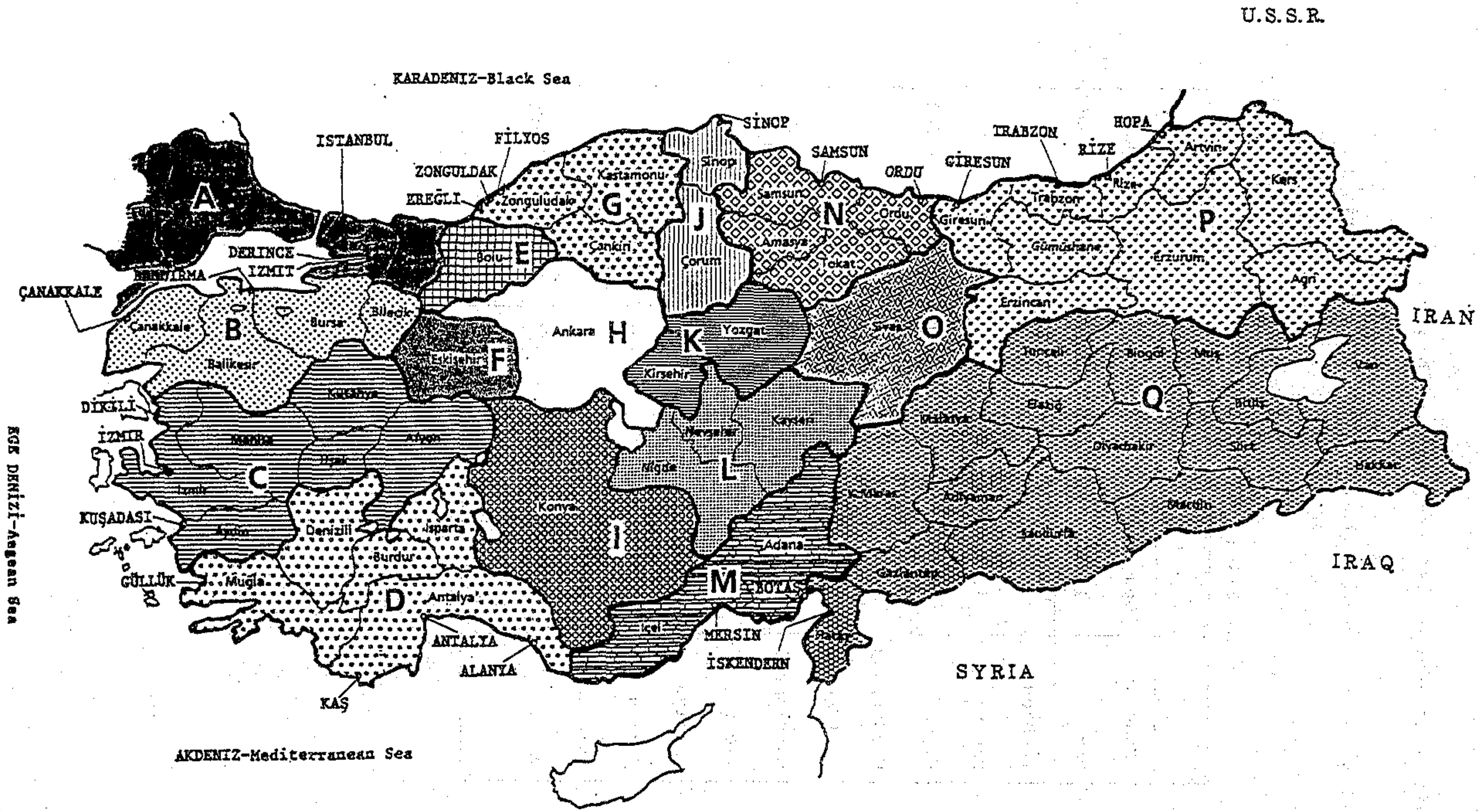


Table 7-4-2(1) Container Allocation in 2000 (Case A)

Unit: 1,000 TEU

	MARMARA	IZMIR	ANTALYA	MERSIN	ISKENDERN	TRABZON	SAMSUN	FILYOS	TOTAL
ISTANBUL	240.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	240.56
CANAKKALE	44.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	44.64
IZMIR	0.00	88.24	0.00	0.00	0.00	0.00	0.00	0.00	88.24
DENIZLI	0.00	0.00	31.84	0.00	0.00	0.00	0.00	0.00	31.84
BOLU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.92	5.92
ESKISEHIR	7.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.76
ZONGULDAK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.96	16.96
ANKARA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	73.76	73.76
KONYA	0.00	0.00	0.00	22.24	0.00	0.00	0.00	0.00	22.24
CORUM	0.00	0.00	0.00	0.00	0.00	0.00	8.32	0.00	8.32
YOZGAT	0.00	0.00	0.00	0.00	0.00	0.00	6.40	0.00	6.40
KAYSERI	0.00	0.00	0.00	16.48	0.00	0.00	0.00	0.00	16.48
ADANA	0.00	0.00	0.00	49.20	0.00	0.00	0.00	0.00	49.20
TOKA	0.00	0.00	0.00	0.00	0.00	0.00	34.56	0.00	34.56
SIVAS	0.00	0.00	0.00	0.00	0.00	0.00	5.92	0.00	5.92
ERUZURUM	0.00	0.00	0.00	0.00	0.00	34.40	0.00	0.00	34.40
DIYARBAKIR	0.00	0.00	0.00	0.00	112.80	0.00	0.00	0.00	112.80
TOTAL	292.96	88.24	31.84	87.92	112.80	34.40	55.20	96.64	800.00

174,022.32

Table 7-4-2(2) Container Allocation in 2010 (Case A)

Unit: 1,000 TEU

	MARMARA	IZMIR	ANTALYA	MERSIN	ISKENDERN	TRABZON	SAMSUN	FILYOS	TOTAL
ISTANBUL	707.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	707.89
CANAKKALE	142.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	142.19
IZMIR	0.00	295.50	0.00	0.00	0.00	0.00	0.00	0.00	295.50
DENIZLI	0.00	0.00	106.77	0.00	0.00	0.00	0.00	0.00	106.77
BOLU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.70	16.70
ESKISEHIR	24.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.79
ZONGULDAK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	56.42	56.42
ANKARA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	198.60	198.60
KONYA	0.00	0.00	0.00	74.89	0.00	0.00	0.00	0.00	74.89
CORUM	0.00	0.00	0.00	0.00	0.00	0.00	25.30	0.00	25.30
YOZGAT	0.00	0.00	0.00	0.00	0.00	0.00	22.01	0.00	22.01
KAYSERI	0.00	0.00	0.00	53.13	0.00	0.00	0.00	0.00	53.13
ADANA	0.00	0.00	0.00	160.40	0.00	0.00	0.00	0.00	160.40
TOKA	0.00	0.00	0.00	0.00	0.00	0.00	114.36	0.00	114.36
SIVAS	0.00	0.00	0.00	0.00	0.00	0.00	19.73	0.00	19.73
ERUZURUM	0.00	0.00	0.00	0.00	0.00	114.61	0.00	0.00	114.61
DIYARBAKIR	0.00	0.00	0.00	0.00	396.70	0.00	0.00	0.00	396.70
TOTAL	874.87	295.50	106.77	288.42	396.70	114.61	181.40	271.72	2.529.99

559,673.95

Table 7-4-3(1) G.C. Allocation in 2000 (Case A)

Unit: 1,000 TEU

	MARMARA	IZMIR	ANTALYA	MERSIN	ISKENDERN	TRABZON	SAMSUN	FILYOS	TOTAL
ISTANBUL	2,766.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,766.44
CANAKKALE	513.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	513.36
IZMIR	0.00	1,014.76	0.00	0.00	0.00	0.00	0.00	0.00	1,014.76
DENIZLI	0.00	0.00	366.16	0.00	0.00	0.00	0.00	0.00	366.16
BOLU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	68.08	68.08
ESKISEHIR	89.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	89.24
ZONGULDAK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	195.04	195.04
ANKARA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	848.24	848.24
KONYA	0.00	0.00	0.00	255.76	0.00	0.00	0.00	0.00	255.76
CORUM	0.00	0.00	0.00	0.00	0.00	0.00	95.68	0.00	95.68
YOZGAT	0.00	0.00	0.00	0.00	0.00	0.00	73.60	0.00	73.60
KAYSERI	0.00	0.00	0.00	189.52	0.00	0.00	0.00	0.00	189.52
ADANA	0.00	0.00	0.00	565.80	0.00	0.00	0.00	0.00	565.80
TOKA	0.00	0.00	0.00	0.00	0.00	0.00	397.44	0.00	397.44
SIVAS	0.00	0.00	0.00	0.00	0.00	0.00	68.08	0.00	68.08
ERUZURUM	0.00	0.00	0.00	0.00	0.00	395.60	0.00	0.00	395.60
DIYARBAKIR	0.00	0.00	0.00	0.00	1,297.20	0.00	0.00	0.00	1,297.20
TOTAL	3,369.04	1,014.76	366.16	1,011.08	1,297.20	395.60	634.80	1,111.36	9,200.00

2,001,256.68

Table 7-4-3(2) G.C. Allocation in 2010 (Case A)

Unit: 1,000 TEU

	MARMARA	IZMIR	ANTALYA	MERSIN	ISKENDERN	TRABZON	SAMSUN	FILYOS	TOTAL
ISTANBUL	2,770.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,770.02
CANAKKALE	556.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	556.38
IZMIR	0.00	1,156.32	0.00	0.00	0.00	0.00	0.00	0.00	1,156.32
DENIZLI	0.00	0.00	417.78	0.00	0.00	0.00	0.00	0.00	417.78
BOLU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	65.34	65.34
ESKISEHIR	97.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.02
ZONGULDAK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	220.77	220.77
ANKARA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	777.15	777.15
KONYA	0.00	0.00	0.00	293.04	0.00	0.00	0.00	0.00	293.04
CORUM	0.00	0.00	0.00	0.00	0.00	0.00	99.00	0.00	99.00
YOZGAT	0.00	0.00	0.00	0.00	0.00	0.00	86.13	0.00	86.13
KAYSERI	0.00	0.00	0.00	207.90	0.00	0.00	0.00	0.00	207.90
ADANA	0.00	0.00	0.00	627.66	0.00	0.00	0.00	0.00	627.66
TOKA	0.00	0.00	0.00	0.00	0.00	0.00	447.48	0.00	447.48
SIVAS	0.00	0.00	0.00	0.00	0.00	0.00	77.22	0.00	77.22
ERUZURUM	0.00	0.00	0.00	0.00	0.00	448.47	0.00	0.00	448.47
DIYARBAKIR	0.00	0.00	0.00	0.00	1,552.32	0.00	0.00	0.00	1,552.32
TOTAL	3,423.42	1,156.32	417.78	1,128.60	1,552.32	448.47	709.83	1,063.26	9,900.00

2,190,028.50

Table 7-4-4(1) Container Allocation in 2000 (Case B)

Unit: 1,000 TEU

	MARMARA	IZMIR	ANTALYA	MERSIN	ISKENDERN	TRABZON	SAMSUN	FILYOS	TOTAL	CONSTRAINT
ISTANBUL	240.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	240.56	240.56
CANAKKALE	44.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	44.64	44.64
IZMIR	0.00	88.24	0.00	0.00	0.00	0.00	0.00	0.00	88.24	88.24
DENIZLI	0.00	0.00	31.84	0.00	0.00	0.00	0.00	0.00	31.84	31.84
BOLU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.92	5.92	5.92
ESKISEHIR	7.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.76	7.76
ZONGULDAK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.96	16.96	16.96
ANKARA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	73.76	73.76	73.76
KONYA	0.00	0.00	0.00	22.24	0.00	0.00	0.00	0.00	22.24	22.24
CORUM	0.00	0.00	0.00	0.00	0.00	0.00	8.32	0.00	8.32	8.32
YOZGAT	0.00	0.00	0.00	0.00	0.00	0.00	6.40	0.00	6.40	6.40
KAYSERI	0.00	0.00	0.00	16.48	0.00	0.00	0.00	0.00	16.48	16.48
ADANA	0.00	0.00	0.00	49.20	0.00	0.00	0.00	0.00	49.20	49.20
TOKA	0.00	0.00	0.00	0.00	0.00	0.00	34.56	0.00	34.56	34.56
SIVAS	0.00	0.00	0.00	0.00	0.00	0.00	5.92	0.00	5.92	5.92
ERUZURUM	0.00	0.00	0.00	0.00	0.00	34.40	0.00	0.00	34.40	34.40
DIYARBAKIR	0.00	0.00	0.00	0.00	112.80	0.00	0.00	0.00	112.80	112.80
TOTAL	292.96	88.24	31.84	87.92	112.80	34.40	55.20	96.64	800.00	800.00
CONSTRAINT	1,233.00	1,083.00	83.00	1,000.00	433.00	250.00	600.00	350.00	5,032.00	

174,022.32

Table 7-4-4(2) Container Allocation in 2010 (Case B)

Unit: 1,000 TEU

	MARMARA	IZMIR	ANTALYA	MERSIN	ISKENDERN	TRABZON	SAMSUN	FILYOS	TOTAL	CONSTRAINT
ISTANBUL	707.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	707.89	707.89
CANAKKALE	142.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	142.19	142.19
IZMIR	0.00	295.50	0.00	0.00	0.00	0.00	0.00	0.00	295.50	295.50
DENIZLI	0.00	23.77	83.00	0.00	0.00	0.00	0.00	0.00	106.77	106.77
BOLU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.70	16.70	16.70
ESKISEHIR	24.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.79	24.79
ZONGULDAK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	56.42	56.42	56.42
ANKARA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	198.60	198.60	198.60
KONYA	0.00	0.00	0.00	74.89	0.00	0.00	0.00	0.00	74.89	74.89
CORUM	0.00	0.00	0.00	0.00	0.00	0.00	25.30	0.00	25.30	25.30
YOZGAT	0.00	0.00	0.00	0.00	0.00	0.00	22.01	0.00	22.01	22.01
KAYSERI	0.00	0.00	0.00	53.13	0.00	0.00	0.00	0.00	53.13	53.13
ADANA	0.00	0.00	0.00	160.40	0.00	0.00	0.00	0.00	160.40	160.40
TOKA	0.00	0.00	0.00	0.00	0.00	0.00	114.36	0.00	114.36	114.36
SIVAS	0.00	0.00	0.00	0.00	0.00	0.00	19.73	0.00	19.73	19.73
ERUZURUM	0.00	0.00	0.00	0.00	0.00	114.61	0.00	0.00	114.61	114.61
DIYARBAKIR	0.00	0.00	0.00	0.00	396.70	0.00	0.00	0.00	396.70	396.70
TOTAL	874.87	319.27	83.00	288.42	396.70	114.61	181.40	271.72	2,530.00	2.530.00
CONSTRAINT	1,233.00	1,083.00	83.00	1,000.00	433.00	250.00	600.00	350.00	5,032.00	

559,982.91

Table 7-4-4(3) G.C. Allocation in 2000 (Case B)

Unit: 1,000 TEU

	MARMARA	IZMIR	ANTALYA	MERSIN	ISKENDERN	TRABZON	SAMSUN	FILYOS	TOTAL	CONSTRAINT
ISTANBUL	2,731.88	0.00	0.00	0.00	0.00	0.00	0.00	34.56	2.766.44	2,766.44
CANAKKALE	373.12	140.24	0.00	0.00	0.00	0.00	0.00	0.00	513.36	513.36
IZMIR	0.00	1,014.76	0.00	0.00	0.00	0.00	0.00	0.00	1.014.76	1,014.76
DENIZLI	0.00	0.00	366.16	0.00	0.00	0.00	0.00	0.00	366.16	366.16
BOLU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	68.08	68.08	68.08
ESKISEHIR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	89.24	89.24	89.24
ZONGULDAK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	195.04	195.04	195.04
ANKARA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	848.24	848.24	848.24
KONYA	0.00	0.00	0.00	255.76	0.00	0.00	0.00	0.00	255.76	255.76
CORUM	0.00	0.00	0.00	0.00	0.00	0.00	95.68	0.00	95.68	95.68
YOZGAT	0.00	0.00	0.00	0.00	0.00	0.00	73.60	0.00	73.60	73.60
KAYSERI	0.00	0.00	0.00	189.52	0.00	0.00	0.00	0.00	189.52	189.52
ADANA	0.00	0.00	0.00	565.80	0.00	0.00	0.00	0.00	565.80	565.80
TOKA	0.00	0.00	0.00	0.00	0.00	0.00	397.44	0.00	397.44	397.44
SIVAS	0.00	0.00	0.00	0.00	0.00	0.00	68.08	0.00	68.08	68.08
ERUZURUM	0.00	0.00	0.00	0.00	0.00	395.60	0.00	0.00	395.60	395.60
DIYARBAKIR	0.00	0.00	0.00	143.92	600.00	553.28	0.00	0.00	1.297.20	1.297.20
TOTAL	3,105.00	1,155.00	366.16	1,155.00	600.00	948.88	634.80	1.235.16	9.200.00	9,200.00
CONSTRAINT	3,105.00	1,155.00	690.00	1,155.00	600.00	1,500.00	1.110.00	1.500.00	10,815.00	

2,136,046.28

Table 7-4-4(4) G.C. Allocation in 2010 (Case B)

Unit: 1,000 TEU

	MARMARA	IZMIR	ANTALYA	MERSIN	ISKENDERN	TRABZON	SAMSUN	FILYOS	TOTAL	CONSTRAINT
ISTANBUL	2,548.62	0.00	0.00	0.00	0.00	0.00	0.00	221.40	2,770.02	2,770.02
CANAKKALE	556.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	556.38	556.38
IZMIR	0.00	1,155.00	1.32	0.00	0.00	0.00	0.00	0.00	1,156.32	1,156.32
DENIZLI	0.00	0.00	417.78	0.00	0.00	0.00	0.00	0.00	417.78	417.78
BOLU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	65.34	65.34	65.34
ESKISEHIR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.02	97.02	97.02
ZONGULDAK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	220.77	220.77	220.77
ANKARA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	777.15	777.15	777.15
KONYA	0.00	0.00	0.00	293.04	0.00	0.00	0.00	0.00	293.04	293.04
CORUM	0.00	0.00	0.00	0.00	0.00	0.00	99.00	0.00	99.00	99.00
YOZGAT	0.00	0.00	0.00	0.00	0.00	0.00	86.13	0.00	86.13	86.13
KAYSERI	0.00	0.00	0.00	207.90	0.00	0.00	0.00	0.00	207.90	207.90
ADANA	0.00	0.00	0.00	627.66	0.00	0.00	0.00	0.00	627.66	627.66
TOKA	0.00	0.00	0.00	0.00	0.00	0.00	447.48	0.00	447.48	447.48
SIVAS	0.00	0.00	0.00	0.00	0.00	0.00	77.22	0.00	77.22	77.22
ERUZURUM	0.00	0.00	0.00	0.00	0.00	448.47	0.00	0.00	448.47	448.47
DIYARBAKIR	0.00	0.00	0.00	26.40	600.00	925.92	0.00	0.00	1.552.32	1.552.32
TOTAL	3.105.00	1.155.00	419.10	1.155.00	600.00	1.374.39	709.83	1.381.68	9.900.00	9.900.00
CONSTRAINT	3.105.00	1.155.00	690.00	1.155.00	600.00	1.500.00	1.110.00	1.500.00	10.815.00	

2,416,289.70

(2) Bulk Cargoes

The volumes of bulk cargoes to be handled at Filyos are estimated commodity-wise based on the future industrial development in the hinterland of Filyos.

7-4-2 Cargo Demand Projections

(1) Container Throughput

Container throughput at Filyos is estimated as follows as shown in Table 7-4-1:

In 2000 97 thousand TEUs
In 2010 270 "

(2) Other General Cargo (Break Bulk)

Break-bulk general cargoes are estimated as follows as shown in Table 7-4-3.:

In 2000 800 thousand tons (less 30 thousand tons : Eregli)
In 2010 800 " (less 30 thousand tons : Eregli)

The estimate based on port capacities in Table 7-4-1 are shown in Table 7-4-4.

(3) Industrial Cargo

1) Related to Steel Mills

i) Expansion Project of Karabuk Works

According to the information provided by the TDCI, the following throughputs at Filyos are expected:

Unloading :

(Import) 1,700,000 tons of Iron ore for Karabuk Works.
(700,000 tons for foreign import and 1 million tons for coastaltransport from Samsun)
800,000 " " coal " (1,600,000 tons after

the year 2000)

45,000	"	"	aux. materials.
225,000	"	"	scrap.
900,000	"	"	billet for private mills.
Total			3670 thousand tons in 2000
			4470 " in 2010

Loading :

(Domestic)1,150,000	tons	of	steel products (from Karabuk)
700,000	"	"	bars (from private mills) " "
Total			1850 thousand tons in 2000 and 2010

ii) New Steel Mill to be located at Filyos Port

The establishment of a new steel mill by 2010 is expected at Filyos Port.

The cargo throughputs in 2010 is estimated as follows:

a) Production Capacity 2 million tons

b) Foreign Imports in 2010

Iron Ore	3,000 thousand tons	(ore ratio = 1.5)
Coal	2,000 thousand tons	(ratio = 1.0)
Scrap	400 thousand tons	(x 0.2)
Total	5,400 thousand tons	

c) Foreign Exports in 2010

Iron/Steel 1,000 thousand tons

d) Domestic Export

Pig Iron	400 thousand tons	(x 0.2)
Slag	200 thousand tons	
Iron/Steel	1,000 thousand tons	
Total	1,600 thousand tons	

iii) Summary Results related to Steel Mills

unit : 1000 tons

	2000				2010			
	F.Exp	F.Imp	D.Exp	D.Imp	F.Exp	F.Imp	D.Exp	D.Imp
Iron Ore	-	700	-	1,000	-	3,700	-	1,000
Coal	-	800	-	-	-	3,600	-	-
Iron/Steel (including Pig Iron,Scrap)	-	1,170	1,850	-	1,000	1,570	3,450	-
Total	-	2,670	1,850	1000	1,000	8,870	3,450	1,000
Grand Total	5,520				14,300			

2) Other Industrial Cargoes

Based on the industrial analysis, the following additional industrial cargoes are estimated to arise from recommended industrial complex.

Unit:1000 tons

Industrial Complex	Commodity	2010		
		Foreign Import	Foreign Export	Total
Food Processing	Grain	120	120	240
Wood Processing	Logs	270		370
	Timber etc		100	