

2. Master Plan

2.1 Natural Condition at the New Cebu Port

This chapter describes as to the following survey result, i.e., Current, Tide, Bathymetric and Topographic Survey which has been carried out in the New Cebu Port Site (Consolacion Area).

2.1.1 Current

It is reported that the main current flow around this area is tidal flood/ebb current. In order to comprehend real flow movement with regard to design of port facilities (berth, causeway, etc) it has been surveyed by placing current meter in the sea.

Survey data are now under analysis and in the following, key points are mentioned, which are made clear at present time.

(1) Current Meter Survey

After setting the automatic recording current meter in the sea, 30 day-continuous observation has been carried out. The observation point is located at 1.5 km offshore in Consolacion Area (refer to the location map Fig. 2.1.1-1). Coordinate and depth of the survey point are shown as follows.

1) Coordinate

E: 609499.000, N: 1144940.000

2) Depth : 2.5 m (surface) , 8.5 m (middle), 12.5 m (bottom)

In addition to current meter survey, tide level is simultaneously measured during 30 days.

(2) Characteristics of the Current

Main current in the site are flood and ebb tide flow. The characteristics is mentioned below from the view points of velocity and direction.

1) Velocity of Current. (See Fig. 2.1.1-2)

It is written that current velocity is to knot (0.1 to 0.3 m/sec), in the chart of Cebu Harbour and Approaches which is published by NAMRIA.

On the other hand, in reference to "Tide and Current Tables Philippines 2001", maximum velocity of the current is estimated at 0.73 m/sec (1.2 knot) during both flood and ebb tide.

As a result of present current meter survey, the average velocity and maximum one are respectively 0.1 m/sec (0.2 knot) and 0.5 m/sec (nearly 1.0 knot). These velocity values are observed at near sea surface and middle level. On the contrary near the sea bottom, velocity is small, which is below 0.1 m/sec (0.2 knot).

As a consequence, current velocity in this site is estimated at 0.2 m/sec (0.4 knot) to 0.7 m/sec (1.3 knot), in both flood and ebb tide.

2) Direction of Current (Refer to Fig. 2.1.1-3 to 5)

In the Consolacion area, topographical factor is especially dominant to the current direction. That is to say, as shown in the topographic map (Refer to Fig. 2.1.1-1), relevant site is located in the entrance position of the channel between Cebu and Mactan Island, which extends straight from SWW to NEN in direction. As a result of present survey, major current direction is from SW (bearing 195° to 240°) to NE (bearing 0° to 45°) which nearly conform the direction of the above-mentioned channel. Direction NE corresponds to the flood tide direction, on the other hand SW corresponds to the ebb tide direction.

These observation data are obtained at the near sea surface (Refer to Fig. 2.1.1-3) and middle depth (Fig. 2.1.1-4). While at the sea bottom, the current is scattered in disorderly direction NE (bearing 320° to 180°) and conspicuous direction cannot be found out (Refer to Fig. 2.1.1-5).

(3) Tide Level

In this survey, 30 days continuous tide observation has been carried out. The result is summarized in the tide level change graph (See Fig. 2.1.1-1). In the following, elements of the tide level are presented, which are estimated comparing the observation record with the data of the Tide and Current Tables Philippines 2001.

1. Datum-line (0.00m) : MLLW (Mean Lower Low Water) is applied.
2. HWL = 1.90 m
3. MSL = 0.58 m
4. LWL = -0.35 m

In the Tide and Current Tables Philippines 2001, the lowest tide level is recorded daily between -0.20 to -0.37 m of long period (1 year). The value of LWL in the present tide observation (30 days) is -0.4 m. Although there is slight difference (20 cm) between 2 figures mentioned above, consequently, the Cebu baseport is set LWL at -0.35 m and it is expected that long period data of -0.20 to -0.37 m is more reliable than short period data of -0.4 m, the low water level at new Cebu port is set at -0.35 m.

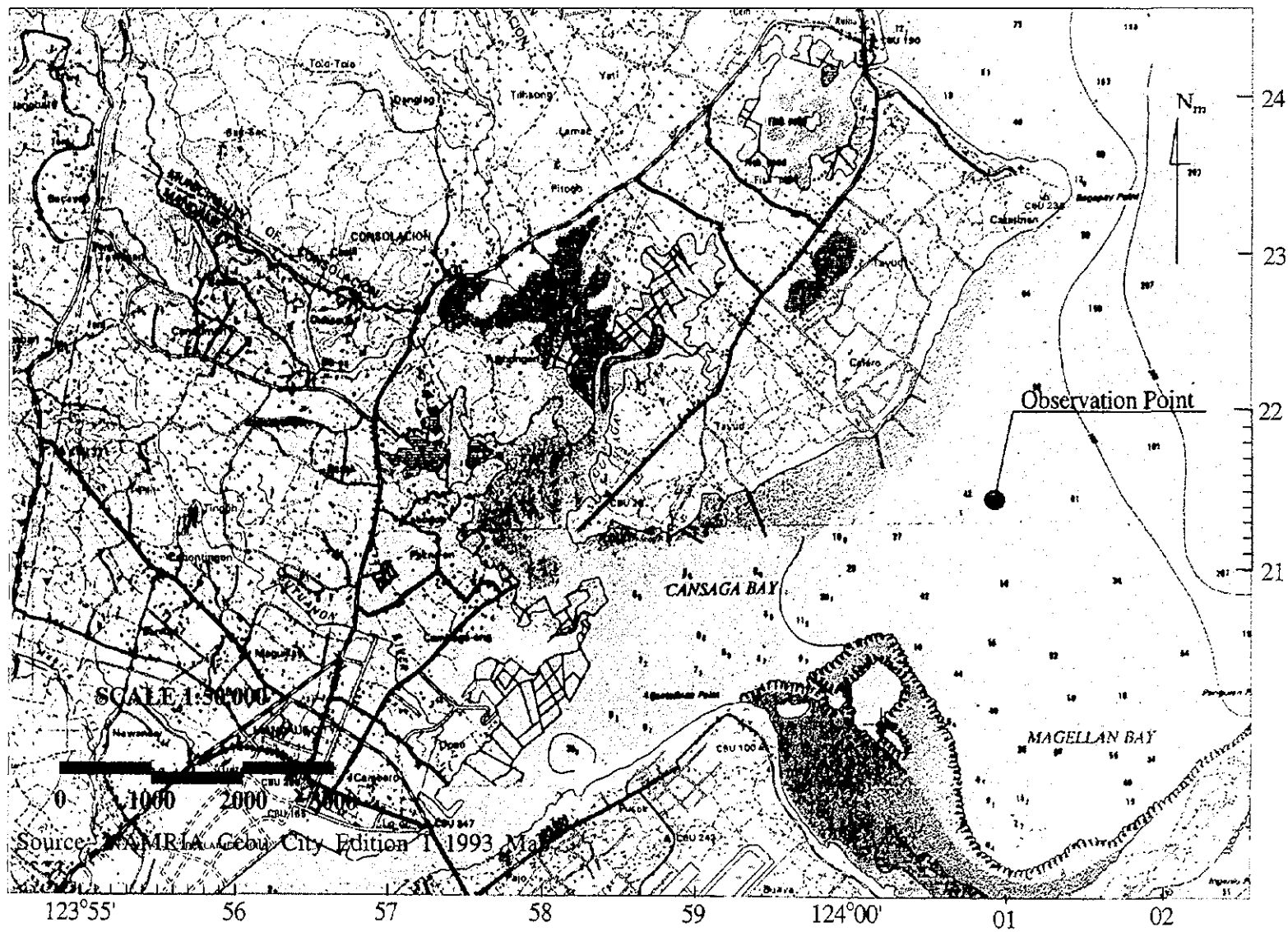


Fig. 2.1.1-1 Tide Current Survey Location Map

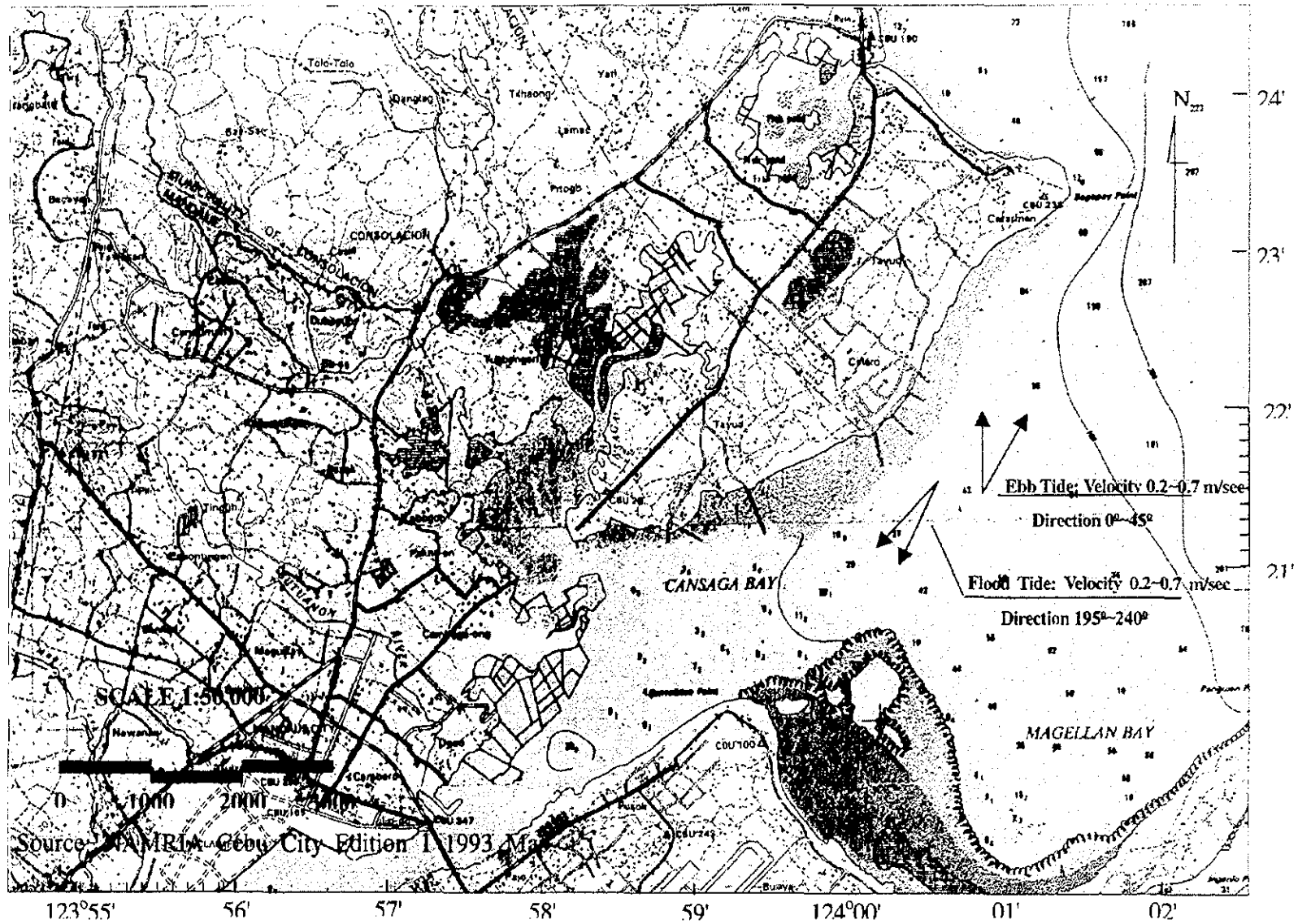
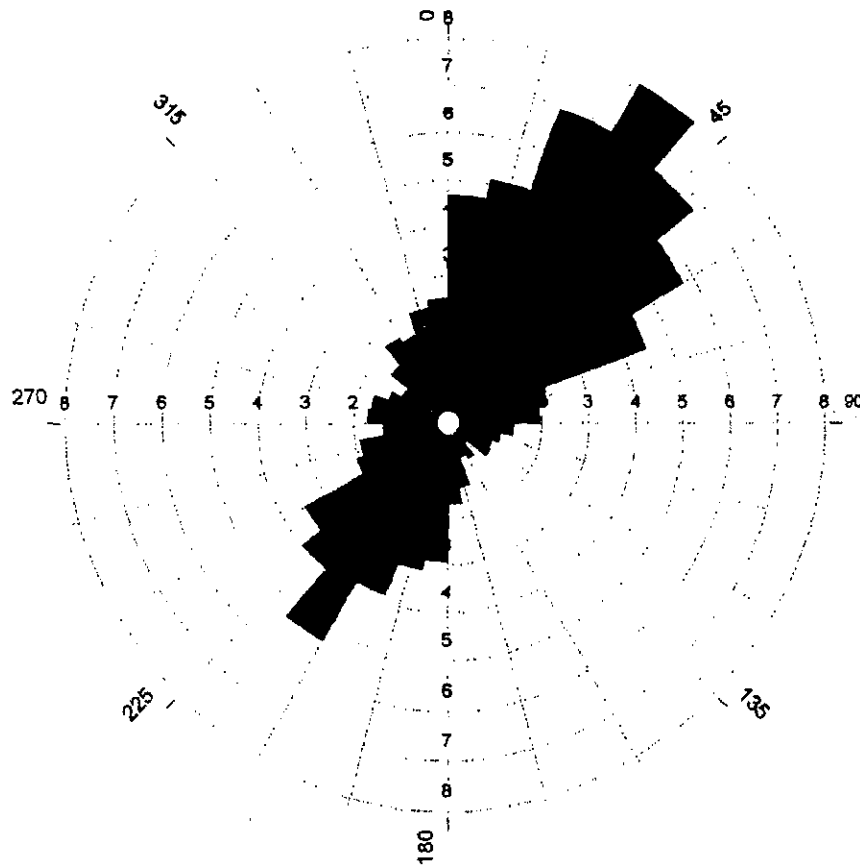


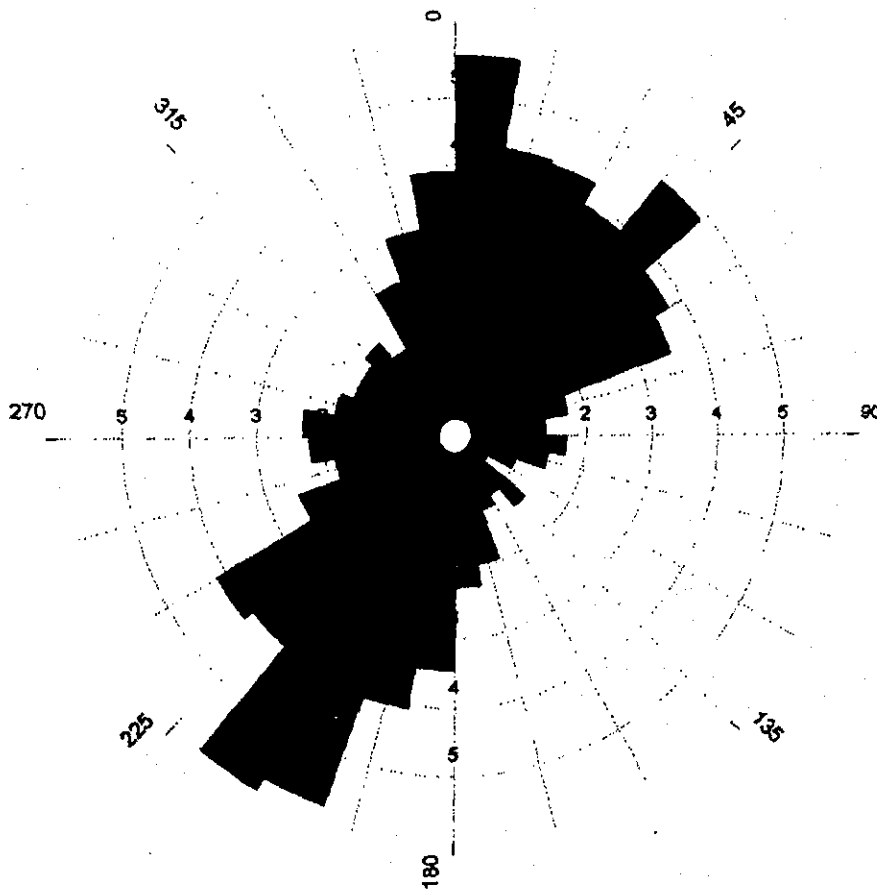
Fig. 2.1.1-2 Major Current Flow in the Proposed Site for New Cebu Port



Calculation Method Frequency
Class Interval 10 Degrees
Length Filtering Activated
Minimum Length 0
Maximum Length 0
Azimuth Filtering Deactivated
Data Type Unidirectional
Population 1,946
Maximum Percentage 8.1 Percent
Mean Percentage 2.8 Percent
Standard Deviation 1.96 Percent
Vector Mean 19.7 Degrees
Confidence Interval ... 8.98 Degrees
R-mag 0.2

CURRENT FLOW DIRECTION AT CEBU
LOCATION2,NEAR SURFACE CURRENTS

Fig. 2.1.1-3 Current Flow Direction Sea Surface



Calculation Method Frequency
Class Interval 10 Degrees
Length Filtering Activated
Minimum Length 0
Maximum Length 0
Azimuth Filtering Deactivated
Data Type Unidirectional
Population 1,946
Maximum Percentage 6 Percent
Mean Percentage 2.8 Percent
Standard Deviation 1.47 Percent
Vector Mean 315.54 Degrees
Confidence Interval ... 22.66 Degrees
R-mag 0.08

CURRENT FLOW DIRECTION AT CEBU.
LOCATION2.MID DEPTHCURRENTS

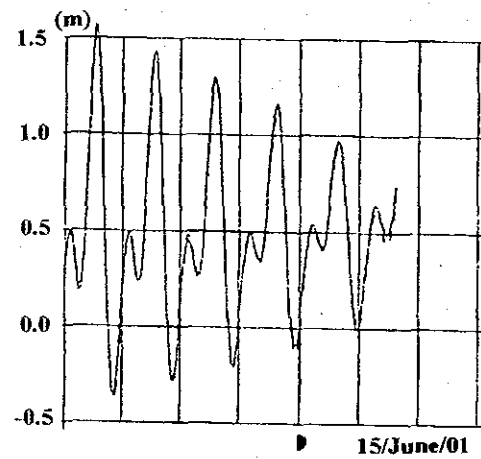
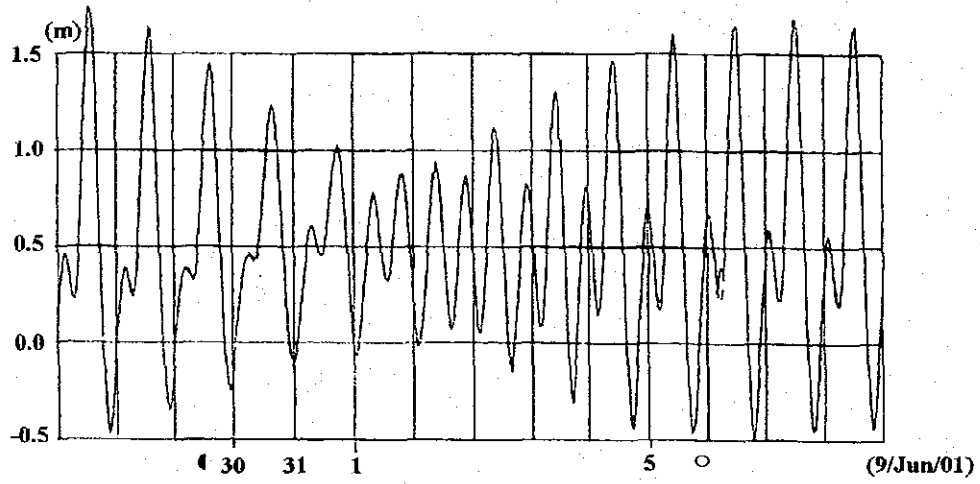
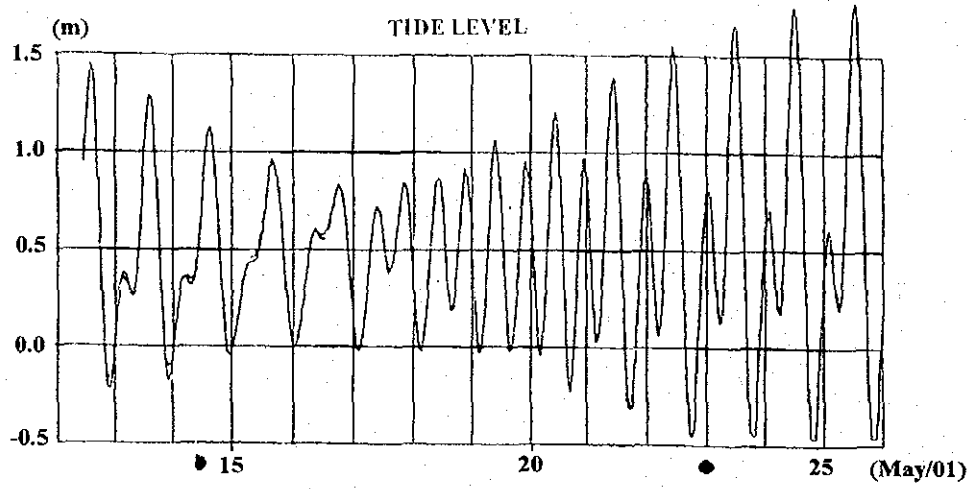
Fig. 2.1.1-4 Current Flow Direction Middle Depth



Calculation Method Frequency
Class Interval 10 Degrees
Length Filtering Activated
Minimum Length 0
Maximum Length 0
Azimuth Filtering Deactivated
Data Type Unidirectional
Population 1,946
Maximum Percentage 5.3 Percent
Mean Percentage 2.8 Percent
Standard Deviation 1.31 Percent
Vector Mean 75.05 Degrees
Confidence Interval ... 10.38 Degrees
R-mag 0.17

CURRENT FLOW DIRECTION AT CEBU
LOCATION2, NEAR BOTTOM CURRENTS

Fig. 2.1.1-5 Current Flow Direction Sea Bottom



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-
- ▶
- ◀

Fig. 2.1.1-6 Tide Level Change Graph

2.1.2 Bathymetry

In this chapter, bathymetric characteristics is shown as a result of bathymetric survey.

(1) Bathymetric Survey

The survey has been carried out around the proposed new Cebu Port area of 150 ha (1.5 km wide and 1.0 km long towards offshore). Location map is shown in Fig. 2.1.2-1.

1) Survey Method

Water depth is measured by echo sounding method which is common procedure for bathymetric survey. While in the shallow tidal zone which spreads in front of shoreline, ground height is measured by direct levelling and water depth is reckoned.

2) Basic Control Point Setting

At the site, the setting of new basic control points are first carried out. For this purpose, 10 control points are installed (Refer to Table 2.1.2-1).

Table 2.1.2-1 Basic Control Point for Survey

No	Coordinate		Elevation
	East	North	
CL-1	608016.449	1145311.719	4.737
CL-2	607953.749	1145458.846	10.925
CL-3	608563.527	1145970.233	25.575
CL-4	609083.414	1145768.723	3.646
CL-5	608280.559	1145463.702	5.785
CPA-1	608266.727	1144773.996	3.026
CPA-2	608224.062	1144884.336	2.720
CPA-3	608190.883	1144945.172	3.070
A-1	609531.239	1145511.497	2.926
A-2	609546.308	1145416.140	3.132

3) Setting Coordinate of Survey Points

Coordinate of Survey points are measured by G.P.S. (Global Positioning System) method. While Total Station Method is also applied around the tidal zone, and in this method, coordinate of survey points are automatically calculated by measuring bearing and distance from the control points.

4) Basic Level (Datum-line)

According to the Tide and Current Tables, Philippines 2001, water level of Cebu Port is reckoned from the MLLW (Mean Lower Low Water). In this survey, therefore, the MLLW is adopted as basic level (± 0 in meter).

5) Depth Contour Map (Refer to Fig. 2.1.2-2)

Result of bathymetric survey is shown on the depth contour map (Refer to Fig. 2.1.2-2), in which water depth is presented together with main land/sea marks.

(2) Characteristics of Bathymetry

From geological/topographical view point, this region was originally coral reefs and through process of earth crust upheaval together with marine regression, present topographic form have been settled. It is classified into following 2 types i.e. (1) Tidal Flat Zone and (2) Deep Channel.

1) Tidal Flat Zone

It spreads widely in front of the shore and about 600 m toward offshore and its area is estimated approximately 60 ha. It appears a relic of old lagoon of coral reef.

During high tide it is submerged and its water depth is reckoned 20 to 50 cm. While at low tide, muddy shoals/sand bars are seen where short mangroves are scattered at this area.

2) Deep Channel

At the offshore side of the tidal flat zone, deep channel is formed where main navigation route is set up. Water depth becomes sharply large toward offshore, which is a common bathymetric feature of coral reef. As a consequence, it is measured over 50 m deep around central part of the channel, although nearly 10 m at the boarder of tidal flat zone. According to the chart of Cebu Harbour and Approaches, depth shows over 150 m in the deeper place.

(3) Geological Condition

1) Tidal Flat Zone

Main Geological type consists of clayish soil with coral fragments and limestone boulders are scattered in some places. The soil data obtained by the soil investigation as described in section 6.2 to select the final area of the new Cebu port is elaborated for the preliminary design of the port facilities.

Engineering properties are summarized as follows:

- Soft Clay layer with coral fragments, the standard penetration test (S.P.T). blow number N 1 to 3 widely covers sea bed surface. Its thickness is 10 m on the average, and it is consolidable layer in which subsidence to some extent will be caused in case of embankment.
- Under Soft Clay layer, sand/gravel layer accompanying coral boulders is interlaid 15 to 20 m in thickness. S.P.T. blow number N is 12 on the average although exceed to 50 sporadically due to big boulders.
- Bearing layer for pile foundation underlies between 25 m and 30 m deep.

2) Deep Channel

Geological type in this area is composed of sand/gravel of coral fossils. In addition limestone boulders are scattered in some places. From Engineering view point, soft soil is scarcely contained, therefore it is regarded to be sufficiently firm for structure foundation.

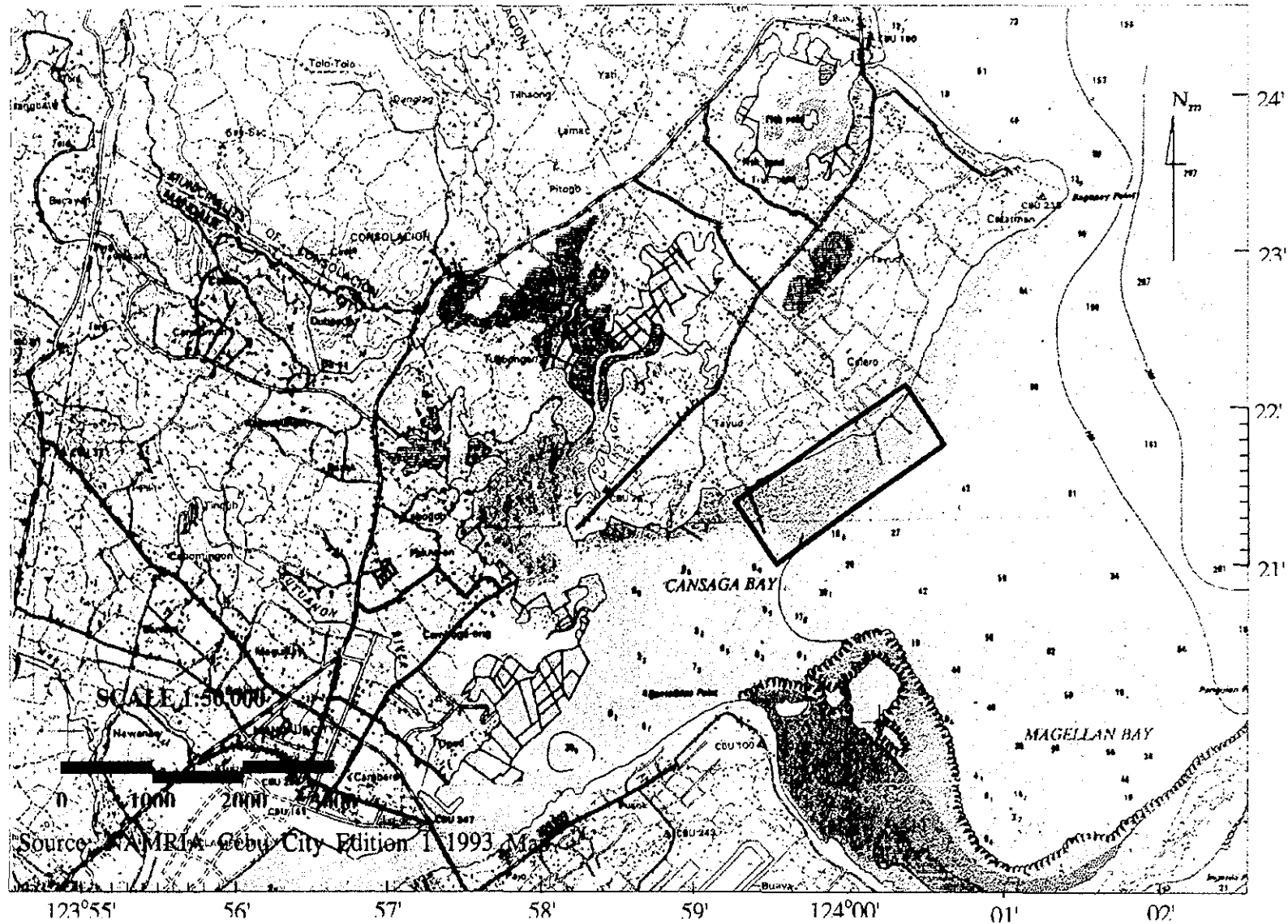


Fig. 2.1.2-1 Location of Bathymetric Survey

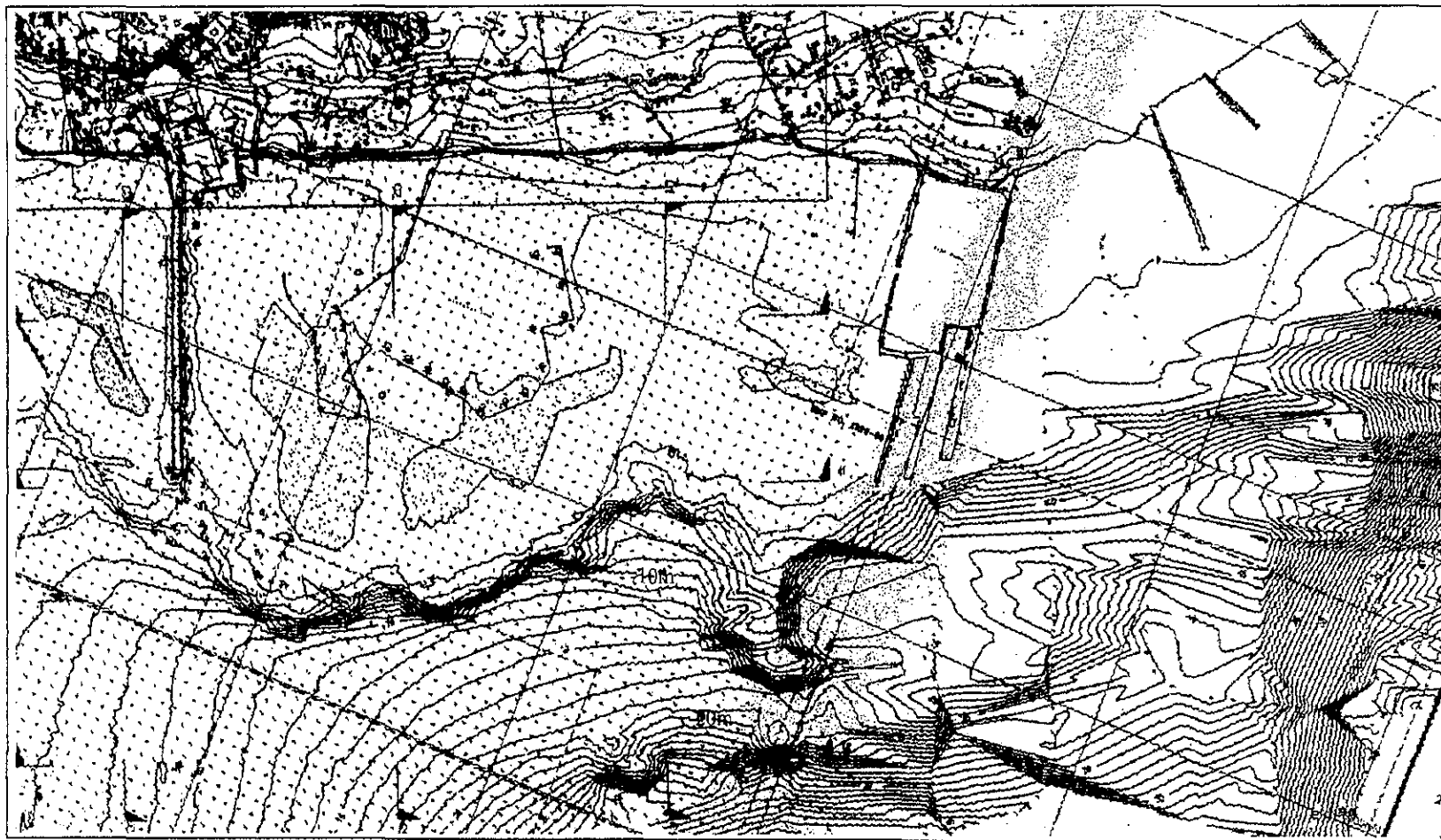


Fig. 2.1.2-2 Bathymetric Map

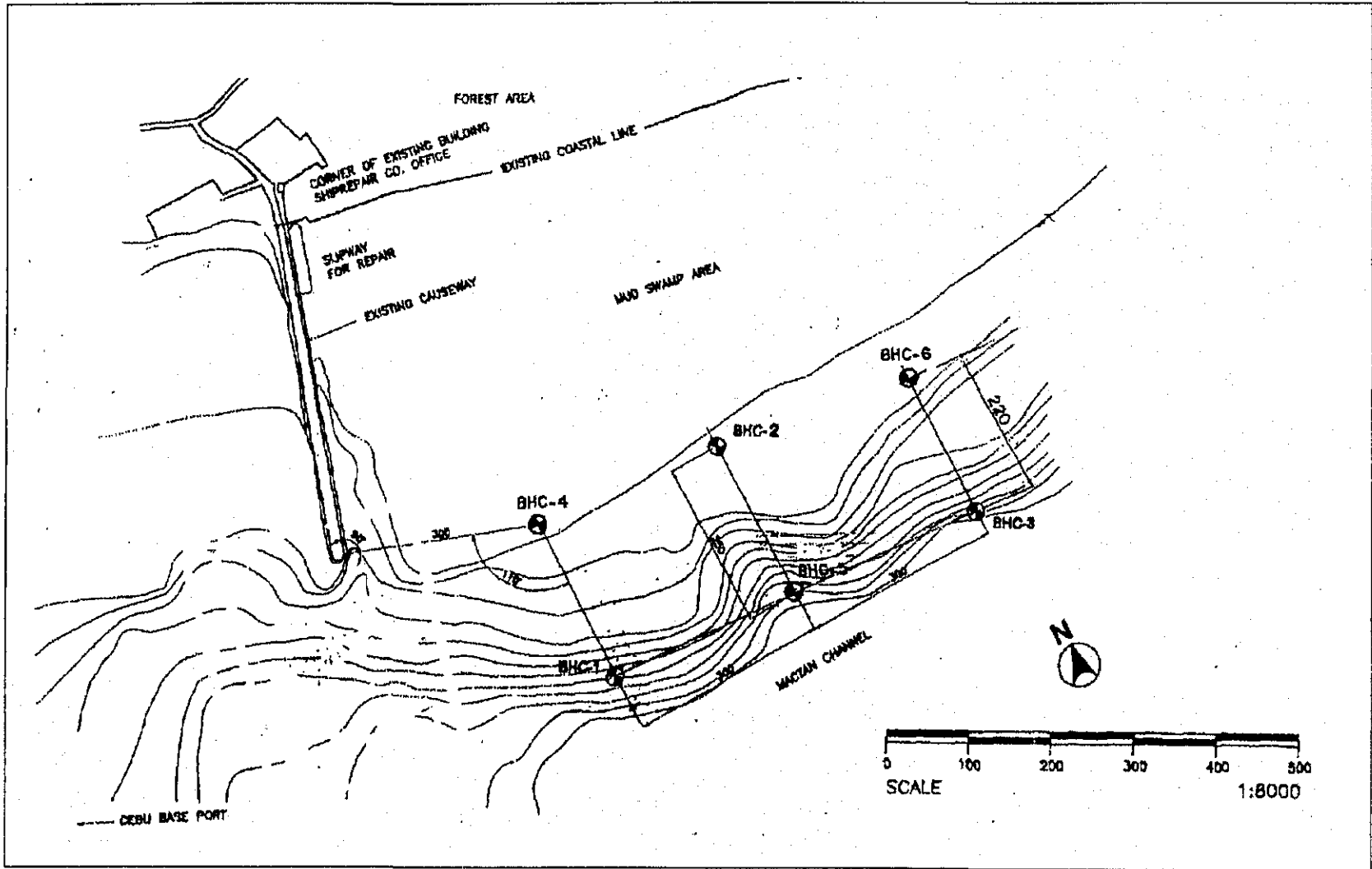


Fig. 2.1.2-3 Boring Points - Consolacion Site

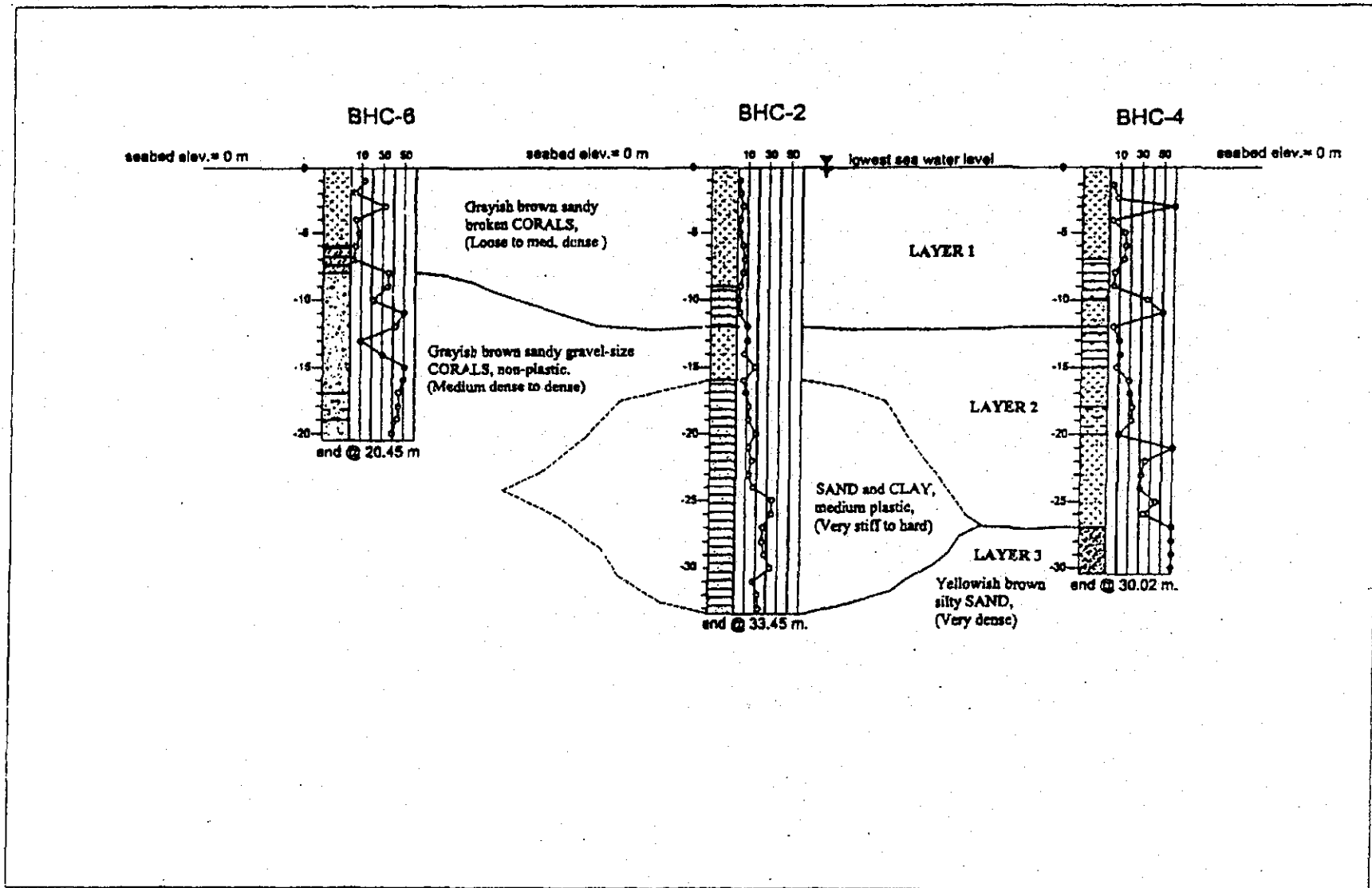


Fig. 2.1.2-4 Soil Profile (shallow area)

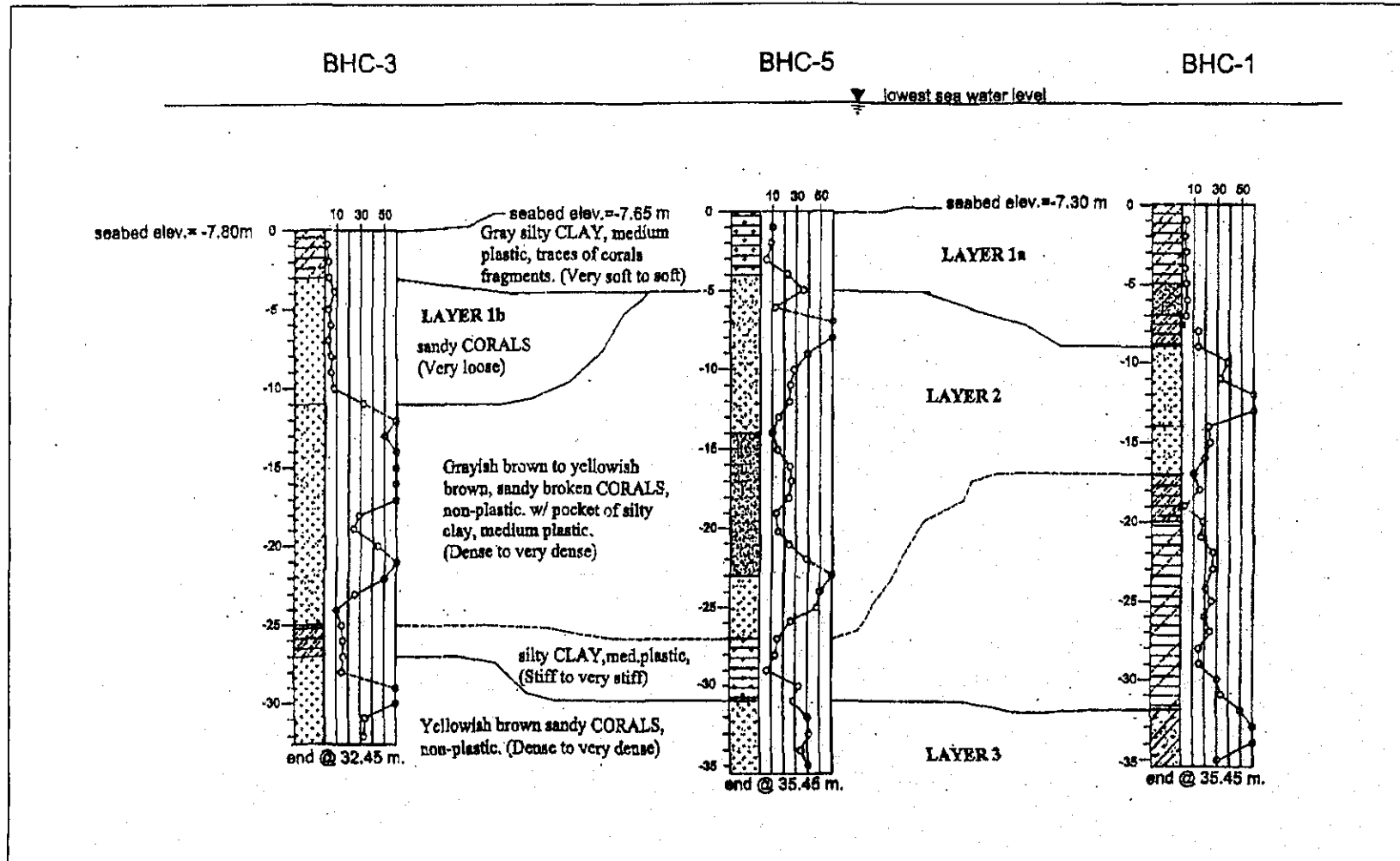


Fig. 2.1.2-5 Soil Profile (deep area)

2.1.3 Topography

In order to design the facilities to be built in the land including access road, topographic survey has been carried out in the area connecting to the shore. Survey area is 150 ha, 1.5 km long along shoreline and 1 km wide inland. Especially in the shore side area (100 ha), detailed survey with 1 m space contour line has been carried out. Location map is shown in Fig. 2.1.3-1.

(1) Topographic Survey

1) Survey Method

At first, basic control points are placed and continuously from these control points the total station method was applied together with leveling, thus, all the points are surveyed.

2) Basic Control Point Setting

As a primary procedure, basic control points are placed on site. These are shown in the following table (Table 2.1.3-1), which are common for bathymetric survey

Table 2.1.3-1 Basic Control Point

No	Coordinate		Elevation
	East	North	
CL-1	608016.449	1145311.719	4.737
CL-2	607953.749	1145458.846	10.925
CL-3	608563.527	1145970.233	25.575
CL-4	609083.414	1145768.723	3.646
CL-5	608280.559	1145463.702	5.785
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A-1	609531.239	1145511.497	2.926
A-2	609546.308	1145416.140	3.132

Coordinate and level are given by G.P.S. (Global Positioning System)

Coordinate is checked with NAMRIA control point CBU 238 (National Mapping and Resource Information, Cebu 238) which is presented on Topographic Map CEBU CITY (Scale 1 to 50000).

While, level is checked in collation with MLLW (Mean Lower Low Water) which is basic level ± 0 for bathymetric survey as described in Section 2.1.2.

3) Survey by Total Station Method

Starting from basic control points, traverse points are placed in proper location. Instrument is set up on those points and bearing/distance of each points are measured. As a consequence, coordinate and level are automatically shown by computer.

4) Topographic Map

Survey result is summarized on the topographic map, as shown in Fig. 2.1.3-2.

In the map, contour lines are indicated with spacing of 1 m, and main land marks such as roads, houses and independent large trees are shown. Moreover regarding the plant, following kinds are remarked, i.e. coco, mango, bamboo, broad-leaved tree, shrub and grass.

(2) Characteristics of Topography

As described above, this region is of old coral reefs which have become the land through earth-crust uplift and/or draw down of sea level.

From the view point of topographic element, the following 2 types i.e. (1) Terrace and (2) Hill are observed. Around sea side area of the shore, tidal flat spreads widely, which is described in detail in Section 7.1.2.

1) Terrace

Low terrace elevation 5 to 7 m is distributed along shore line. Width is measured about 300 m inland from the shore. It is nearly flat though slope declines very gentle towards the shore, 1/500 in grade.

Although there is a monastery at inland part, major part consists of natural grass and/or shrub land in which cocos and broad leaved trees are scattered. Small mango plantations are found locally.

Soil type of ground surface is composed of clayey soil of limestone origin mixed with old coral fragments. Thickness is estimated at less than 1 m and rocks of limestone crop out in some places.

2) Hill

Inland region is a gently undulated hill 15 to 30 m in elevation which is gradually transferred from the terrace region. Undulation has been caused by erosion action, as a result limestone rock outcrop in higher hill top and on the contrary in the valley and basin, soil sediments are relatively thick.

Major parts are developed for residential area and there are now many houses with gardens and/or vegetable farm.

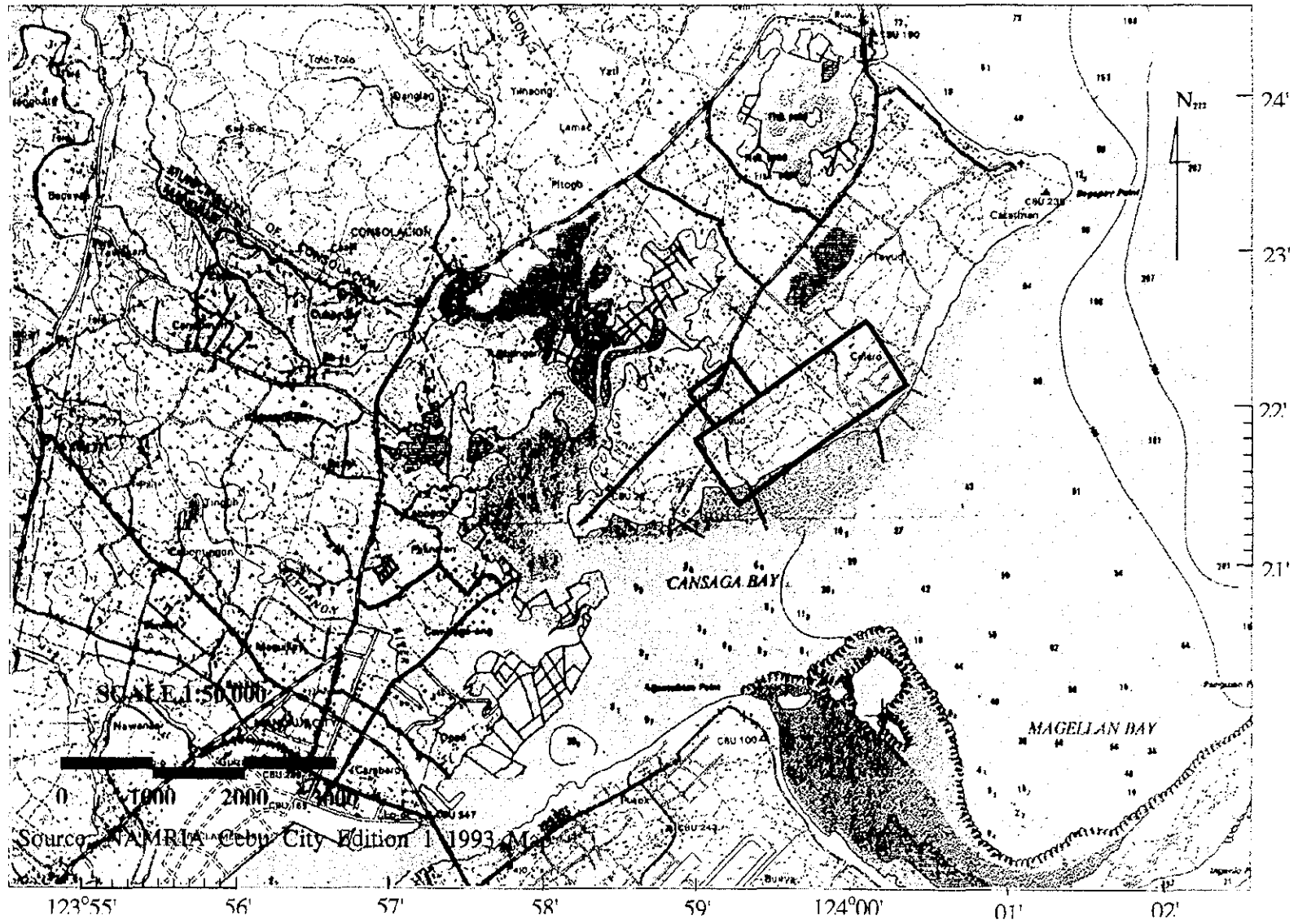


Fig. 2.1.3-1 Location of Topographic Survey

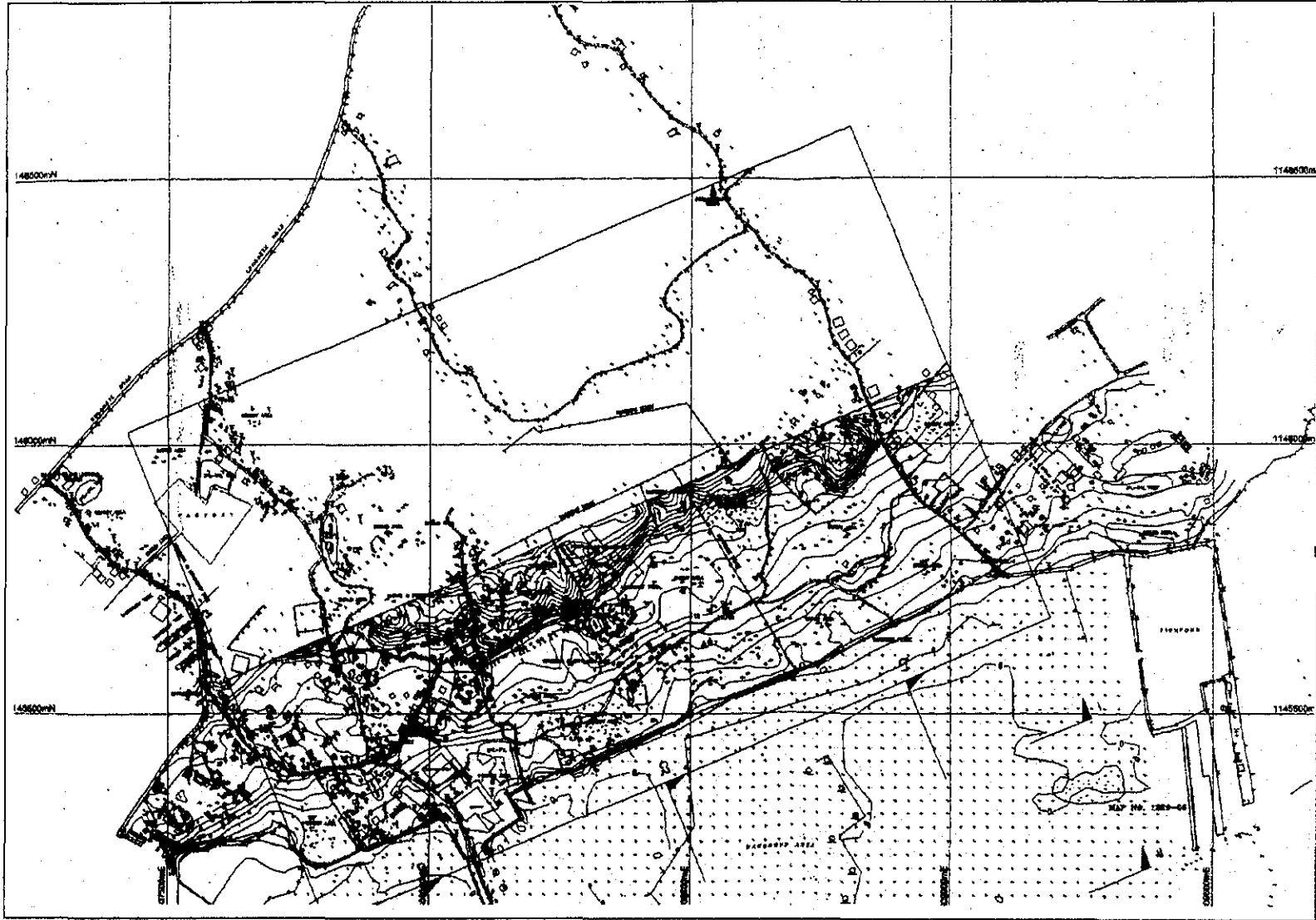


Fig. 2.1.3-2 Topographic Map

2.2 Natural Environmental Condition in Development Sites

Environmental survey was carried out from May to July in 2001 by JICA study team. This section describes the current environmental status in the development sites from the results of the environmental survey.

(1) The Surveyed Items

The Natural Environmental survey items that we conducted are as follow:

- 1) Water Quality
- 2) Seabed Quality
- 3) Noise
- 4) Fauna and Flora, especially corals and mangroves

(2) Surveyed Area

- 1) Consolacion coastal area
- 2) Cebu Baseport
- 3) Toledo Port area
- 4) The San Remigio coastal area

2.2.1 Water Quality

(1) Parameters

Water quality samples were collected at 5 stations at each study site : Fig. 2.2.1-1, 2.2.1-2, 2.2.1-3, 2.2.1-4 show 1) Cebu Base Port, 2) the New Cebu Port, 3) Toledo port, 4) the New San Remigio relatively. Following parameters were analyzed in collected samples in each site for the preliminary EIA study of the project.

DENR Administrative Order No.34 defined the water quality as 8 classifications based on water usage. The water at the coastal area in this project is categorized Class SC in the classification of DENR

- | | |
|-----------------------------|--|
| 1) pH | 2) Dissolved Oxygen |
| 3) BOD | 4) COD |
| 5) Total Suspended Solid | 6) Surface Active Agent with Methyleneblue |
| 7) Oil and Grease (Content) | 8) Phenols |
| 9) Total Coliform | 10) Fecal Coliform |
| 11) Copper | 12) Arsenic |
| 13) Cadmium | 14) Hexavalent Chromium |

- | | |
|-------------------|-------------------------|
| 15) Cyanide | 16) Lead, |
| 17) Total Mercury | 18) Organic Phosphorous |
| 19) Total P | 20) Total N |

The results of the seawater quality survey in respective sites are shown in Tables 2.2.1-1, 2.2.1-2, 2.2.1-3, and 2.2.1-4. These results shall be compared with the DENR Standards for Class SC (Coastal Water). Class SC per DENR DAO 34 (DENR Administration Order No. 34 Water Quality Criteria Amending Section 68 and 69 issued in 1990) is chosen as reference because the present water use of all the project sites are for boating and navigation purpose.

(2) Results of parameters

Almost all the seawater samples collected are clear in color except for seawater samples 1, 2 and 3 from Cebu Base Port that are slightly turbid. This observation indicates that these water samples are slightly polluted.

pH: All the registered pH levels of seawater samples are within the prescribed pH range for Class SC coastal water.

DO: Comparing with the DENR Standard of 5 mg/L for dissolved oxygen, all seawater samples registered higher than the prescribed standard.

BOD: The BOD levels of seawater samples 1,2 and 3 from Cebu Base Port area are notably higher than the DENR standards. This observation can be attributed to the disposal of wastewater directly to the water channel. These samples were taken very near the pier areas and possibly near to the outfall of the wastewater coming out of the port area. In contrast, those samples taken outward of the pier areas registered lower BOD values but still higher than the DENR standard. The BOD samples of seawater samples from New Cebu Port area are also higher than the DENR standards. The Seawater samples from San Remigio and Toledo Port areas registered lower BOD values compared to the BOD levels from Cebu Base Port area.

COD: The COD levels of all seawater samples follow the BOD trends for all the survey sites.

Coliform: Most of the seawater samples registered very high total coliform levels. Specifically, water samples from Cebu Base Port area except for sample 5 exceeded the DENR standard. Sample 3 from New Cebu Port area also registered a very high coliform count. High levels of coliform were also registered for seawater samples 2 and 3 from Toledo area. Contrastingly, all seawater samples from San Remigio area are well below the DENR standard.

Fecal coliform levels were found to be very high for seawater sample 2 of Cebu Base Port area and seawater sample 3 of New Cebu Port area. Almost all the rest of seawater samples registered less than 2 MPN/100 ml.

Copper: Copper levels for all seawater samples taken from Cebu Base Port area registered a value of 0.05 mg/L which is the same as the DENR standard. All the rest of seawater samples taken from New Cebu Port, San Remigio and Toledo Port areas are very well below the DENR standard.

Arsenic: Seawater samples 1, 2, 3, and 5 from Cebu Base Port area registered concentration levels higher than the DENR standard of 0.05 mg/L. The same trend for seawater samples 2, 3 and 4 from Toledo Port area was also observed. All the rest of seawater samples are well below the DENR standard for arsenic.

Chromium: Hexavalent chromium registered very low concentration levels for all seawater samples.

Lead: Lead levels registered higher values than the DENR standard of 0.05 mg/L.

Mercury: Mercury on the other hand registered concentration levels that are very well within the DENR standard.

For total phosphates, total nitrogen and sulfates, there are no published DENR standards. Registered concentration values for all water samples are well within the expected concentration range for seawater.

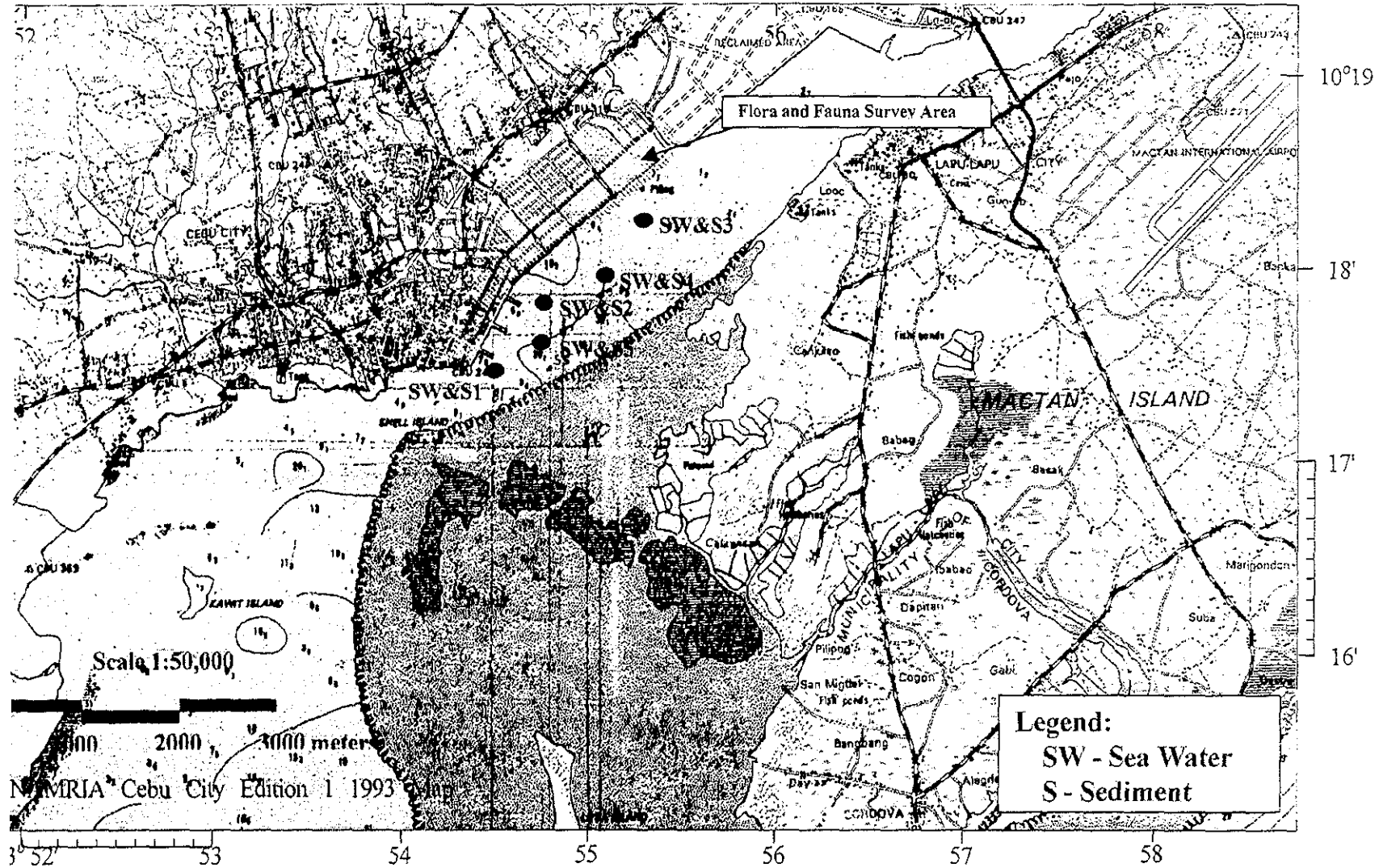


Fig. 2.2.1-1 Location Map of Water Quality and Seabed Quality Surveys, Sampling Points and terrestrial flora survey area in the Existing Cebu Base Port Area

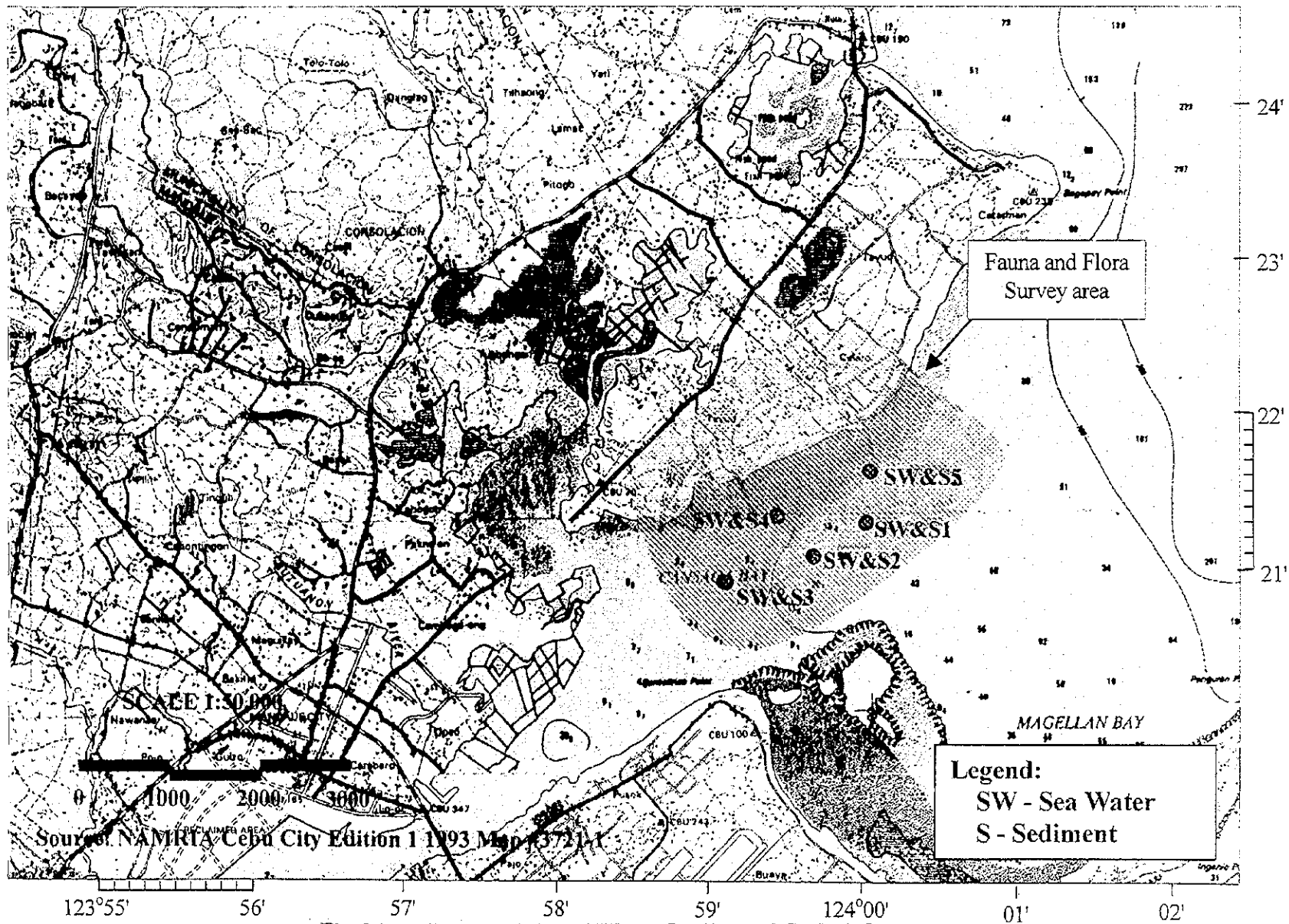


Fig. 2.2.1-2 Location Map of Water Quality and Seabed Quality Surveys Sampling Points and Fauna and Flora Survey area in New Cebu Port

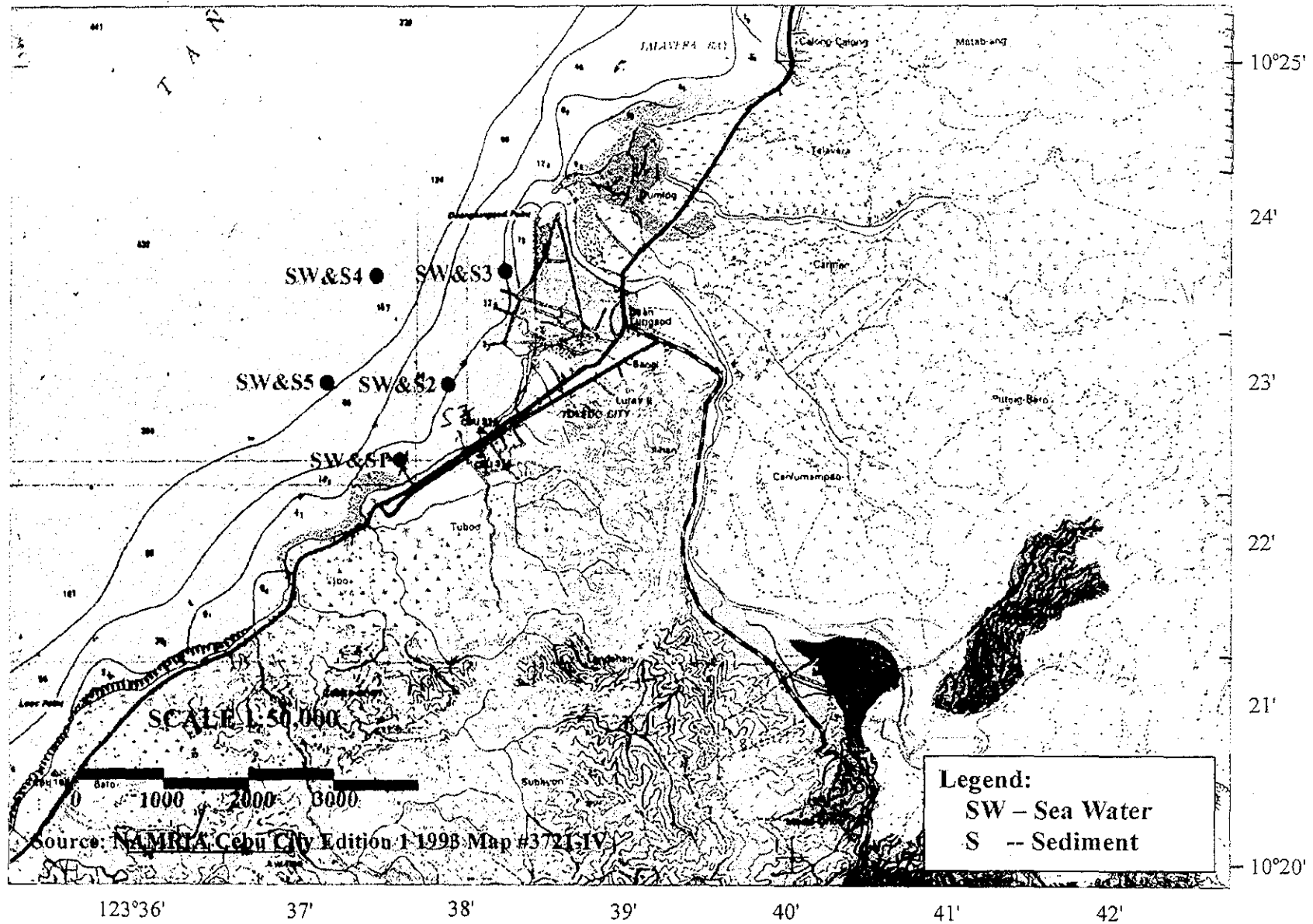


Fig. 2.2.1-3 Location Map of Water Quality and Seabed Quality Surveys Sampling Points in the Toledo Port Area

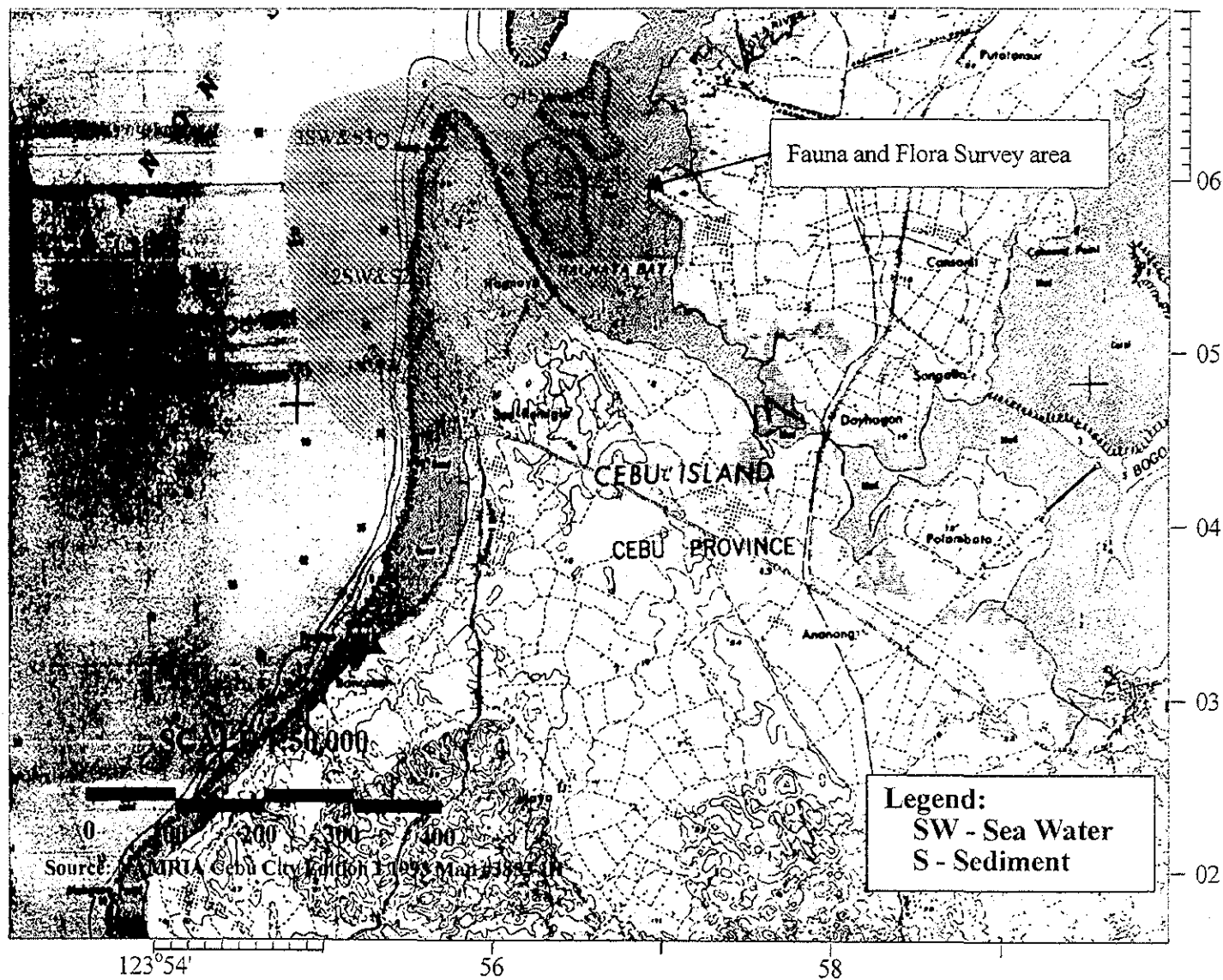


Fig. 2.2.1-4 Location Map of Water Quality and Seabed Quality Survey Sampling Points and Fauna and Flora Survey area in San Remigio Port Area

Table 2.2.1-1 Results of the Sea Water Quality Survey at the Existing Cebu Base Port Area

Parameter	Sampling Station					DENR Standard ¹
	1	2	3	4	5	
Coordinates	10°17'.45N 123°54'.5E	10°17'.8N 123°54'.8E	10°18'.25N 123°54'.2E	10°17'.95N 123°54'.1E	10°17'.6N 123°54'.1E	
Sampling Date & Time	02 June 2001 10:54 am	02 June 2001 11:14 am	02 June 2001 11:35 am	02 June 2001 10:24 am	02 June 2001 11:09 am	
Climate	Sunny, clear day	Sunny, clear day	Sunny, clear day	Sunny, clear day	Sunny, clear day	
Color (visual)	Slightly turbid	Slightly turbid	Slightly turbid	Clear	Clear	
PH	7.84	7.26	7.99	7.99	7.75	6.0-8.5
Temperature, °C	30.8	31.3	31.4	31.2	31.2	
Conductivity, mS	59.4	59.4	59.9	59.9	59.5	
Salinity, ppt	35.4	33.2	35.2	35.2	35.2	
Dissolved Oxygen (DO), mg/L	7.11	7.26	8.56	8.83	7.75	5.0
Turbidity, NTU	0.25	0.45	0.25	0.35	0.4	
Biochemical Oxygen Demand (BOD), mg/L	80	99	110	20	19	7-10
Chemical Oxygen Demand (COD), mg/L	190	211	305	59	45	-
Total Suspended Solids, mg/L	2.0	4.5	<1.0	<1.0	2.0	-
Surfactants or Surface Active Agent with Methylene Blue, mg/L	0.02	0.04	0.02	0.03	0.02	0.5
Oil and Grease, mg/L	2.4	3.3	7.5	6.1	5.0	3
Phenols, mg/L	0.04	0.02	0.04	0.05	0.05	-
Total Coliform, MPN/100 mL	2400	>160,000,000	2,400	2,400	240	1,000
Fecal Coliform, MPN/100 mL	<2	90,000,000	<2	<2	<2	-
Copper, mg/L	0.05	0.05	0.05	0.05	0.04	0.05
Arsenic, mg/L	0.052	0.053	0.057	0.05	0.06	0.05
Cadmium, mg/L						0.01
Hexavalent Chromium, mg/L	0.002	0.003	0.001	0.004	0.001	0.1
Cyanide, mg/L						0.05
	0.034	0.32	0.29	0.35	0.40	0.05
Lead, mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.002
Organic Phosphorus, mg/L						Nil
Total PO ₄ , mg/L	<0.01	<0.01	<0.01	0.01	<0.01	-
Total N, mg/L	2.5	3.3	3.3	2.5	2.5	-
Sulfates, mg/L	2,528	2,121	2,727	2,813	2,867	-

Table 2.2.1-2 Results of the Sea Water Quality Survey at the New Cebu Port Area

Parameters	Sampling Stations					DENR Standard ¹
	1	2	3	4	5	
Coordinates	10°21'17N 124°00'02E	10°21'03N 124°59'47E	10°20'54N 123°59'05E	10°21'18N 123°59'33E	10°21'38N 123°59'46E	
Sampling Date & Time	03 June 2001 9:15 am	03 June 2001 9:23 am	03 June 2001 9:32 am	03 June 2001 9:40 am	03 June 2001 9:51 am	
Climate	Sunny, clear day, high tide	Sunny, clear day, high tide	Sunny, clear day, high tide	Sunny, clear day, high tide	Sunny, clear day, high tide	
Color (visual)	Clear	Clear	Clear	Clear	Clear	
PH	7.87	7.98	7.93	7.93	8.02	6.0-8.5
Temperature, °C	31.2	31.1	31.2	31.3	31.5	
Conductivity, mS	53.9	53.7	53.4	53.6	53.6	
Salinity, ppt	35.3	35.3	35.1	35.2	35.2	
Dissolved Oxygen (DO), mg/L	7.3	7.49	6.77	6.85	8.01	5.0
Turbidity, NTU	0.20	0.20	0.55	0.25	0.15	
Biochemical Oxygen Demand (BOD), mg/L	24.4	35.4	13.2	20.0	15.8	7-10
Chemical Oxygen Demand (COD), mg/L	51.3	76.5	28.2	41.3	36.2	-
Total Suspended Solids, mg/L	<1.0	<1.0	8.5	<1.0	2.5	-
Surfactants or Surface Active Agent with Methylene Blue, mg/L	0.03	0.05	0.04	0.02	0.02	0.5
Oil and Grease, mg/L	6.5	5.4	7.1	6.7	3.3	3
Phenols, mg/L	<0.01	<0.01	<0.01			-
Total Coliform, MPN/100 mL	240	240	900,000	240	240	1,000
Fecal Coliform, MPN/100 mL	<2	<2	900,000	<2	<2	-
Copper, mg/L	0.05	0.05	0.05	0.05	0.05	0.05
Arsenic, mg/L	0.022	0.03	0.021	0.031	0.021	0.05
Cadmium, mg/L						0.01
Hexavalent Chromium, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	0.1
Cyanide, mg/L						0.05
Lead, mg/L	0.38	0.40	0.38	0.43	0.40	0.05
Total Mercury, mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.002
Organic Phosphorus, mg/L						Nil
Total PO ₄ , mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	-
Total N, mg/L	1.6	6.6	1.6	1.6	1.6	-
Sulfates, mg/L	2,700	2,677	2,279	2,528	2,560	-

Table 2.2.1-3 Results of the Sea Water Quality Survey at the Toledo Port Area

Parameters	Sampling Stations					DENR Standard ¹
	1	2	3	4	5	
Coordinates	10°22'30N 123°37'36E	10°22'58N 123°37'54E	10°23'39N 123°38'21E	10°23'45N 123°37'33E	10°23'01N 123°38'08E	
Sampling Date & Time	05 June 2001 8:51 am	05 June 2001 9:06 am	05 June 2001 9:15 am	05 June 2001 9:32 am	05 June 2001 9:24 am	
Climate	Cloudy, rainy day	Cloudy, rainy day	Cloudy, rainy day	Cloudy, rainy day	Cloudy, rainy day	
Color (visual)	Clear	Clear	Clear	Clear	Clear	
PH	7.89	7.88	7.41	7.9	7.79	6.0-8.5
Temperature, °C	30.0	30.8	29.8	30.2	29.6	
Conductivity, mS	53.8	53.0	51.0	53.4	53.2	
Salinity, ppt	35.4	34.9	34.0	35.2	35.0	
Dissolved Oxygen (DO), mg/L	6.25	6.12	6.33	5.90	6.45	5.0
Turbidity, NTU	<0.05	0.10	<0.05	0.25	<0.05	
Biochemical Oxygen Demand (BOD), mg/L	4.4	3.0	7.2	7.8	9.7	7-10
Chemical Oxygen Demand (COD), mg/L	7.6	5.7	15.2	17.1	17.1	-
Total Suspended Solids, mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	-
Surfactants or Surface Active Agent with Methylene Blue, mg/L						0.5
Oil and Grease, mg/L			8.4	<0.5	<0.5	3
Phenols, mg/L	0.02	0.13	0.09	<0.01	0.01	-
Total Coliform, MPN/100 mL	240	2,400	2,400	700		1,000
Fecal Coliform, MPN/100 mL	<2	<2	<2	<2	<2	-
Copper, mg/L	0.01	0.01	0.01	0.02	0.03	0.05
Arsenic, mg/L	0.030	0.060	0.060	0.054	0.041	0.05
Cadmium, mg/L						0.01
Hexavalent Chromium, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	0.1
Cyanide, mg/L						0.05
Lead, mg/L	0.25	0.17	0.22	0.22	0.14	0.05
Total Mercury, mg/L	<0.0001	<0.0001	0.22	<0.0001	<0.004	0.002
Organic Phosphorus, mg/L						Nil
Total PO ₄ , mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	-
Total N, mg/L	1.2	<1.0	1.6	3.3	6.6	-
Sulfates, mg/L						

Table 2.2.1-4 Results of the Sea Water Quality Survey at the New San Remigio Port Area

Parameters	Sampling Stations					DENR Standard ¹
	1	2	3	4	5	
Coordinates	11°04'58N 123°55'38E	11°05'24N 123°55'33E	11°06'16N 123°55'20E	11°06'29N 123°56'48E	11°06'02N 123°56'16E	
Sampling Date & Time	04 June 2001 8:48 am	04 June 2001 9:07 am	04 June 2001 9:25 am	04 June 2001 9:37 am	04 June 2001 9:48 am	
Climate	Sunny, clear day	Sunny, clear day	Sunny, clear day	Sunny, clear day	Sunny, clear day	
Color (visual)	Clear	Clear	Clear	Clear	Turbid	
PH	7.74	7.94	7.88	7.94	7.87	6.0-8.5
Temperature, °C	29.8	29.8	29.9	29.7	30.2	
Conductivity, mS	57.3	58.8	58.6	58.6	57.8	
Salinity, ppt	34.2	35.4	35.3	35.4	34.5	
Dissolved Oxygen (DO), mg/L	5.41	6.65	6.11	6.24	5.42	5.0
Turbidity, NTU	<0.05	<0.05	<0.05	<0.05	0.05	
Biochemical Oxygen Demand (BOD), mg/L	13.1	10.4	13.2	15.1	23.6	7-10
Chemical Oxygen Demand (COD), mg/L	28.5	24.7	28.5	32.3	47.5	-
Total Suspended Solids, mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	-
Surfactants or Surface Active Agent with Methylene Blue, mg/L						0.5
Oil and Grease, mg/L	10.8	9.2	7.4		5.9	3
Phenols, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	-
Total Coliform, MPN/100 mL	50	23	240	23	23	1,000
Fecal Coliform, MPN/100 mL	<2	<2	<2	<2	<2	-
Copper, mg/L	0.02	0.02	0.02	0.02	0.02	0.05
Arsenic, mg/L	0.030	0.029	0.039	0.028	0.011	0.05
Cadmium, mg/L						0.01
Hexavalent Chromium, mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	0.1
Cyanide, mg/L						0.05
Lead, mg/L	0.27	0.25	0.21	0.22	0.21	0.05
Total Mercury, mg/L	<0.0001	<0.0001	<0.0001	<0.0001	0.26	0.002
Organic Phosphorus, mg/L						Nil
Total PO ₄ , mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	-
Total N, mg/L	1.6	1.6	1.6	1.6	<1.0	-
Sulfates, mg/L						