5. THE PORT OF LA UNION

5.1 Existing Port Facilities of the Ports: Cutuco and Punta Gorda

5.1.1 The Port of Cutuco

1. This port has one pier for general cargo and bulk cargo(solid and liquid), the characteristics of which are shown in Table 5-1-1.

Table 5-1-1 Characteristics of the Pier at the Port of Cutuco

Name of Berth	Length (m)	Width (m)	Depth (m)
North Berth	152	7.6	9.2
South Berth	174	6.1	7.2

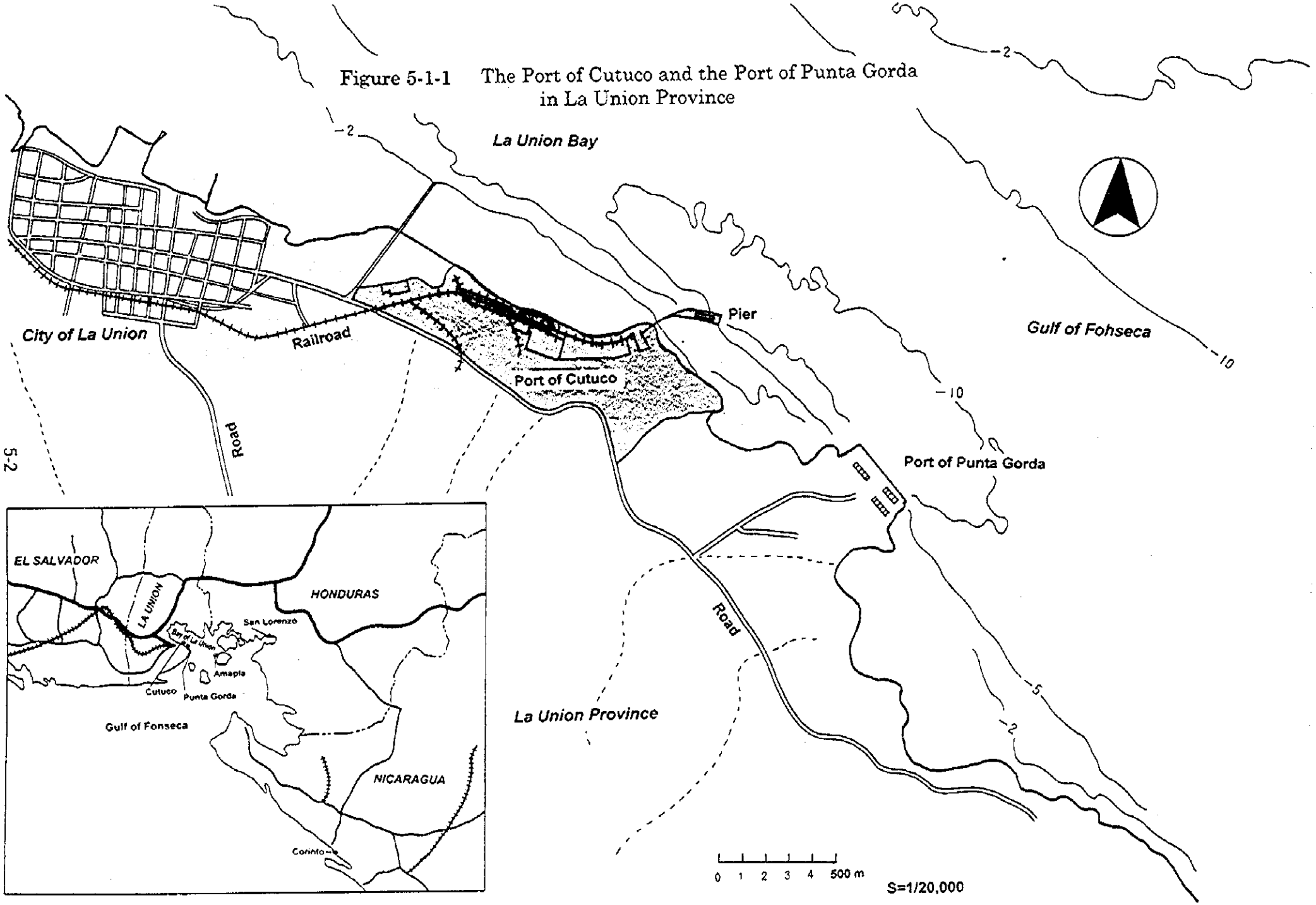
Source: CEPA

2. The pier has piping facilities for liquid cargo, which are connected with tanks owned by private companies on land. Total area of the land for the port is 482, 824 m^2. Of this total, 26,170 m^2 is allocated for transit sheds, where seven warehouses are located, including one owned by the customs office for import cargo.

3. The access to the pier is by road and by railroad. Two branch lines come into the North Berth and one line runs along the South Berth.

4. This port was constructed from 1912 to 1915. Its structures such as piles and beams are seriously timeworn and corroded, thus since October 1996 it has been closed for fear of collapse. Having been temporarily reinforced, it is now waiting for full rehabilitation (about 3 million colones) as part of the conditions to grant a concession of the port (to be explained later).

Figure 5-1-1 The Port of Cutuco and the Port of Punta Gorda in La Union Province



5.1.2 The Port of Punta Gorda

5. The Port of Punta Gorda is a relatively deep wharf capable of accommodating a conventional cargo vessel. It was built twenty years ago. It is 300 m long, 25 m wide and 9.5 m deep. Its length is approximately equivalent to three (3) berths of tuna boats. Its other facilities are outlined below:

- a ship dock for repair
  (up to 1,700 DWT with a length of 70 m and a width of 12.80 m)
- two freezer warehouses (-32 degrees Celsius; 5,000 m^2)
- five refrigerated warehouses for rent
- an ice plant
- a power plant (2.3KV)
- a water management plant
- a maintenance workshop
- an administration building
- a custom, navy and immigration office

6. Some buried sections (assumed to have been caused by soil collapse of the bank) in front of the wharf are being dredged.

7. The access road is paved from the town to the Port of Punta Gorda through the Port of Cutuco. (The road from here to the east is a dirt road where it is difficult to pass for ordinary vehicles.) The volume of traffic is 542 vehicles/day in 1996, 60% of which is represented by trucks.

8. This access road also passes through the town. This section is narrow, sandwiched by small buildings and houses, and congested with cars and people. When a new port is planned in La Union, a new road for port traffic should also be planned, going around the town area and directly reaching the principal roads such as the Pan-american highway and the Litoral highway.

5.1.3 Navigation Channel and Other Related Facilities

9. The access channel to the Port of Cutuco is a natural one which passes between the Zacate reef of the Zacatillo Island and the Punta Chiquirin, with a length of about 10 km and a width of 300 m. It is common to the Port of Punta Gorda.

10. A few kilometers to the west of the Port of Cutuco, a naval base is located at the east edge of the town area of La Union. It has small piers of a depth of 2-3 m for several patrol ships. The ship traffic around the area of La Union is controlled by this office.

11. The usage of the channel to the Port of Cutuco and the Port of Punta Gorda is now under the Navy's control. Three lighthouses are installed by CEPA along the channel, at the Zacate reef of the Zacatillo Island, at Punta Chiquirin, and at Punta de Amapala. At present, these are not working properly.

12. The Port of Cutuco doesn't have tugboats. Only pilots are provided by CEPA for cargo ships to call at the port. According to the Navy, a skilled pilot familiar with La Union could pass a larger ship between Zacatillo Island and Punta Chiquirin, and maneuver it to the port without tugboats.

13. In the waterfront of the town of La Union, many small motorized passenger boats which ply between islands in the Gulf of Foncesa and other small boats of local fishermen are anchored.

14. More than 1.5 km to the east of the Port of Punta Gorda, a few small private shrimp facilities are located. The nearest is an old pier which is out of service and broken down (Multipesca). The second one is Veralmal, and the third (and farthest away) is Indumal. The average dimensions of shrimp ships are up to 80t, 20 m long and 2-3 m deep.

5.2 Current Utilization of the Port Facilities

5.2.1 The Port of Cutuco

1. The Port of Cutuco was closed in October 1996. Only import cargo had been handled at the port since 1992. Table 5-2-1 shows the recent utilization of the port for the recent three years. Of these years, port utilization by ship type in the busiest year of 1995 is summarized in Table 5-2-2.

2. According to Table 5-2-1, major cargoes are diesel oil, fertilizer and cement for import. These are carried by relatively large ships; diesel oil

by 30,000-45,000 DWT with 1,000-3,000 ton, fertilizer by 5,000-25,000 DWT with 3,000-7,000 ton, and cement by 8,000 DWT with 7,000 ton, taking into consideration the cargo volume to the port. The first cargo is handled by pipeline, and the others are by railroad there.

3. Port utilization by ship type in Table 5-2-2, compared with that of the Port of Acajutla in Table 4-2-2, indices related to cargo movement (cargo movement/port staying hours/ship, cargo movement/on-berth hours/ship, and cargo movement/working hours/ship) are much lower than those of Acajutla.

4. Those are around one-tenth of Acajutla for general ships, a quarter for dry bulk ships, a half for liquid bulk ships, and one-fifth for total ships. This affects other indices related to time such as on-berth hours/ship and working hours/ship.

5. Today its major users have become shrimp boats which previously called at the Port of Punta Gorda. The Port of Punta Gorda started serving cargo ships instead of the Port of Cutuco, and such local shrimp boats prefer the Port of Cutuco to the international Port of Punta Gorda for tuna boats, which has established a tariff system consistent with international standards.

6. This port is waiting for a new concessionaire to emerge, who will be determined in the future.

Table 5-2-1 Recent Utilization of the Port of Cutuco

Year	Ship (DWT)	Origin	Cargo	Volume (ton)	Cargo Handling
1995					
1	40,030	Panama	Diesel oil	3,022	Pipeline
2	39,870	Colombia	Diesel oil	1,849	Pipeline
3	39,435	Panama	Diesel oil	2,005	Pipeline
4	39,128	U.S.A.	Diesel oil	3,399	Pipeline
5	38,549	Venezuela	Diesel oil	3,360	Pipeline
6	36,000	Panama	Diesel oil	3,632	Pipeline
7	36,000	Panama	Diesel oil	1,648	Pipeline
8	35,653	U.S.A.	Diesel oil	2,728	Pipeline
9	35,100	U.S.A.	Diesel oil	2,027	Pipeline
10	29,990	U.S.A.	Diesel oil	3,438	Pipeline
11	29,264	Panama	Diesel oil	2,779	Pipeline
12	11,663	U.S.A.	Fertilizer	6,826	Railroad
13	6,996	U.S.A.	Fertilizer	5,840	Railroad
14	6,586	Venezuela	Fertilizer	5,872	Railroad
15	7,550	Cuba	Cement	7,200	Railroad
16	7,550	Cuba	Cement	7,205	Railroad
1996					
1	39,977	U.S.A.	Diesel oil	1,201	Pipeline
2	29,998	Panama	Diesel oil	2,743	Pipeline
3	23,536	Germany	Fertilizer	6,435	Railroad
4	22,645	Germany	Fertilizer	3,014	Railroad
5	6,596	Venezuela	Fertilizer	5,753	Railroad
1997					
1	43,928	Trinidad Tobago	Diesel oil	2,310	Pipeline
2	38,987	Aruba	Diesel oil	3,221	Pipeline

Source: Annual Statistics: The Port of Cutuco (CEPA)

Table 5-2-2 Port Utilization by Ship Type in 1995

Unit: Cargo(t), Hour(

	General	Dry Bulk	Liquid Bulk	Total
Total Cargo Movement (A)	14,405	18,742	29,911	63,058
Total Calling Ships (B)	2	4	12	18
Cargo Movement/ Ship (A)/(B)	7,203	4,686	2,493	3,503
Average Ship Size (G.T.) (C)	4,849	7,882	19,489	15,283
Port Staying Hours/ Ship (1)	182.00	166.00	32.00	78.44
Port Entrance-Pier Hours/ Ship	5.00	4.00	10.00	8.11
On-Berth Hours/ Ship (3)	176.00	154.00	22.00	68.44
Working Hours/ Ship (4)	104.00	108.00	14.00	44.89
No-Working Hours/ Ship (5)	72.00	46.00	8.00	23.56
Pier-Pier Hours/ Ship (6)	1.00	8.00	0.00	1.89
Pier-Port Exit Hours/ Ship (7)	0.00	0.00	0.00	0.00
Cargo Movement/Port Staying Hours/Ship (A)/(B)/(1)	39.6	28.2	77.9	44.7
Cargo Movement/On-Berth Hours/Ship (A)/(B)/(3)	40.9	30.4	113.3	51.2
Cargo Movement/Working Hours/Ship (A)/(B)/(4)	69.3	43.4	178.0	78.0
Port Entrance-Pier Hours/Port Entrance-Pier Hours/Ship (2)/(1)	2.7%	2.4%	31.3%	10.3%
On-Berth Hours/Port Entrance-Pier Hours/Ship (3)/(1)	96.7%	92.8%	68.8%	87.3%
Pier-Pier Hours/Port Entrance-Pier Hours/Ship (6)/(1)	0.5%	4.8%	0.0%	2.4%
Pier-Exit Hours/Port Entrance-Pier Hours/Ship (7)/(1)	0.0%	0.0%	0.0%	0.0%
Working Hours/On-Berth Hours/Ship (4)/(3)	59.1%	70.1%	63.6%	65.6%
No-Working Hours/On-Berth Hours/Ship (5)/(3)	40.9%	29.9%	36.4%	34.4%

Source: Annual Statistics: The Port of Cutuco (CEPA)

5.2.2 The Port of Punta Gorda

7. As a fishery port, it is called at by at least one fishing boat daily or around 40 boats a month. Its two freezer warehouses haven't been greatly used for a long time.

8. From the time the Port of Cutuco was closed in October 1996, it has been called at by large commercial ships carrying fertilizers. As of March 1997, the largest ship anchored is a 190 m long, 22,000 DWT ship carrying 7,000 t of fertilizer. Ships with containers have also called at the port. (However, loading capacity of the pier is limited to 2 t/m^2.)

9. A propane gas company, which occupies more than 70 % of the market of the country, just started its operation at the Port of Punta Gorda in April, 1996. The company installed 20 tanks behind the port to distribute the imported product throughout the country. It will increase the number of tanks to 30 and build a new large tanker as soon as possible.

10. The international issues which prohibited El Salvador and other countries (from Mexico to Ecuador) from fishing tunas have been resolved recently. The problem was that too many dolphins were caught together with tunas, which are usually in shoals.

11. Based on the settlement, tuna fishing has resumed once again. In December 1997, 27 tuna boats are reported to call at the port. In addition, a Spanish company is planning to install several factories just behind the port in order to process the tuna, and it also has a expansion plan for the future. The port is starting to work as originally designed.

12. According to CORSAIN, the port is expected to be saturated sooner or later. Tuna boats are said to moor at the pier for 5-7 days/ship on the average. At that time, a decision on which cargo should be given priority will have to be made. Fertilizer might be dropped first since its handling must be separated from fish handling.

13. At present, fertilizer occupies the major part of import cargo in the Port of La Union, which is vitally important for regional development. It is difficult to carry fertilizer from the Port of Acajutla from the viewpoint of transportation costs.

14. It is necessary to prepare the appropriate port facilities for fertilizers and other commodities as soon as possible.

5.3 Administration, Management and Operation

5.3.1 Port of Cutuco

1. The Port of Cutuco has two docks for the handling of general cargo, and dry and liquid in bulk goods. Railroads provide direct access to both docks; the northern dock offers two railroads branches and the southern dock one.

2. To handle liquid cargo, the seaport has pipes installed in the pier, connected to privately owned tanks installed on land. It also offers a 482,824 sq. meters open court and a covered area of 26,170.70 sq. meters, alloted among seven warehouses, including one for import merchandise, which is the property of the Customs office.

3. Cutuco also offered a system for transfering import goods by railroad, from the Cutuco seaport to any of the Customs warehouses in the country. The Cutuco seaport operates all year long, 24 hours at day, except Friday.

5.3.2 Organization Relate to Port of Cutuco Activity

4. This port does not have a fire department or Port Police. Exist security for the installation exists. There are also no Immigration offices, however the captainship of the Port performs this function when necessary. For customhouse of the finance ministry, the port of Cutuco has a marine customhouse La Union, which depends on the General customhouse Direction.

5. For human, animal and vegetables quarantine, there are no offices of quarantine. When necessary, collaboration with the division of cattle quarantine in the border of El AMATILLO is requested.

5.3.3 Port of Punta Gorda

6. The industrial fishing port from Punta Gorda was born due to the needs of the national and international fishing industry for a safe place, with advanced technology and modern installations, to supply all the inconveniences and ease the process, handling and maintenance of se products. It has been designed to work as a tuna fish port.

7. The port is equipped with infrastructure, equipment and installations of advanced technology.

5.4 Natural Conditions of the Coastal Area of La Union

5.4.1 Origin of Fonseca Gulf

1. Fonseca Gulf was created by the following stages:

1) 2,000,000 years ago, at the tertiary period, Central America emerged because of the strong compression running from the South to North and was formed roughly.

2) Central Fosa was formed by the fracture along the main axis parallel to the coast.

3) Within the Fosa, there were many volcanic activities and the volcanic chain was formed along the fracture. Some volcanic production flows out and it made the magmatic chamber empty: As a result the vertical displacements happened.

4) Within the Fosa, the land area, now called Fonseca's Gulf, still remained at the lower lever.

5) The present seabed of Fonseca's Gulf especially northern half of the Gulf was created by the materials transported by the Goascoran River.

2. The probability of the eruption of the Conchagua volcano is said to be the 10% in a period of 100 years. (Sources: Geografia de El Salvador, 1980)

5.4.2 Location and Present Conditions

(1) Fonseca Gulf

3. Fonseca Gulf is entered between Punta de Amapala and Punta Cosiguina, 19 miles SE, and recedes about 30 miles NE to its head. The coasts of El Salvador and Honduras front the NW and NE shores of the gulf and contain Puerto Amapala, and Bahia San Lorenzo. The Estero Real, a navigable river, discharges into the SE side of the gulf and is bordered by Nicaragua.

4. Several prominent volcanic peaks rise on both sides of the gulf entrance and a number of high and conspicuous islands lie within the inner part. Punta de Amapala, the W entrance point, is low, flat, and fronted by a reef which extends up to 0.3 mile offshore. This reef, which is marked by breakers, has been reported (1994) to extend farther offshore than charted.

5. Volcan San Miguel (13°24'N., 88°18'W.), 2,132m high, stands 28.5 miles NW of Punta de Amapala. El Pinal, the tallest summit, is 1,280m high and partly wooded. The other summit is grass-covered and more rounded.

6. Volcan Consiguina, the tallest peak rising on the SE side of the entrance, is 872m high and stands 8.5 miles NE of Punta Cosiguina. On a clear day, this volcano can be seen from up to 70 miles offshore. (Figure 5-4-1)

(2) Conchaguita Isle

7. Isla Conchaguita (13°14'N., 87°46'W), 505m high, lies on the W side of the gulf, 8 miles NE of Punta de Amapala. The channel lying W of this island leads to La Union. A shallow flat extends 2.3 miles NNE from Isla Conchaguita to Isla Martin Perez (13°17'N., 87°44'W).

(3) Meanguera Isle

8. Isla Meanguera (13°11'N., 87°43'W.) lies near the middle of the Golfo de Fonseca, 9 miles within the entrance. This island has irregular, cliffy shores and is 494m high in its central part. Isla Meanguerita, a small islet, lies close off the SE extremity of this island and may safely be passed on either side.

(4) Zacatillo Isle

9. Isla Zacatillo (Isla Punta Sacate) (13°18'N., 87°46'W.), irregular in shape, lies NW of Isla Martin Perez and is separated from it by Dyer Strait. Zacate Reef, with rocky heads awash in places, extends about 0.5 mile S from the SW end of this island. An isolated shoal, with a depth of 2.1m, lies in Dyer Strait, about 0.5 mile S of the reef. The channel lying between the reef and Punta Chiquirin forms the main approach to La Union. Colima Shoal, with a depth of 3.9m, lies on the W side of this channel, about 0.3 mile NNE of Punta Chiquirin. Several other detached shoals, with depths of 3.9 to 4.3m lie close off the E and SE sides of the same point. Lights are shown from structures standing on Punta Chiquirin and the NW side of Isla Zacatillo.

(5) La Union Bay

10. La Union Bay (13°20'N., 87°47'W.), large and sheltered, has enough depths for navigation over most of its area. This bay is entered close E of Punta Chiquirin and extends about 8 miles in a NW direction. the N shore of the bay is fronted by a large drying flat and, with the

exception of the approach channel, depths of 6m and less prevail over the remaining area.

11. The current situation south shore of the bay between the Cutuco Port and Punta Chiquirin is as follows. (Figure 5-4-2)

Area 1: Punta Cutuco Bay (1.0 km. between Cutuco Port and Punta Gorda) Although this bay is shallower than -5m, the water in front of the bay deepens sharply until around -10m or more.

At the root of Punta Cutuco, there is a small beach with being beach house. The beach disappears likely at the flood. Behind the Punta Cutuco Bay, the foothill of the Volcano Conchagua stretches.

Area 2: (1.6 km. between Punta Gorda Port and private jetties). Punta Gorda Port was constructed by partially reclamation in front of the existing shore line. Next to Punta Gorda Port, the swamps continue and small mangroves are dotted. The hinterland of this area is relatively high and steep.

A valley at the deepest point of this area is a border between the national land and the private land.

In the private land area, there are three jetties and sheds for fishing. Three jetties are rubble mound causeway with open type pier at the end.

Area 3: (2.0 km. between private jetties and Punta Remolino).
The rugged beaches and small plain beaches appear alternately along the coast. Around the plain beaches, the small villages are formed, one of them is Puerto Viejo. They constructed the rubble mound revetment to protect from the high tide.

All the houses own the canoes and fishing motor boat.

The "Punta Remolino" is originated from the whirlpool of sea water.

Area 4: (2.0 km. between Punta Remolino and Punta Chiquirin).
At the foothill of the Volcano, this area are formed with relatively plain plateau. But, the steep cliff with rugged beaches continue. Small plain beaches are dotted in some places. Light beacon is installed on the top of Punta Chiquirin.

Isla Zacatillo is located at the opposite side of the channel. Although waves from the Pacific Ocean with direction SW intrude until Punta Chiquirin, they decrease in wave heights along the La Union Bay due to the wave diffraction.

5.4.3 Port of La Union.

(1) Weather Conditions

12. In as much as the harbor is landlocked, the prevailing winds are usually light, but the heat is excessive. During the dry season (December to May), winds blow mainly from the E-NE. During the rainy season, the Chubascos blow usually from the SW.

Table 5-4-1. Monthly Average Wind Velocity

ITEMS	Month												Ave.
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
Average (m/sec)	3.4	3.6	3.3	3.3	2.6	2.1	2.3	2.2	2	1.9	2.2	2.8	2.6
Deviation	0.2	0.3	0.1	0.5	0.2	0.2	0.4	0.2	0.1	0.1	0.4	0.3	0.1
Max.(m/sec)	3.8	4.2	3.6	4.2	2.9	2.5	2.8	2.5	2.2	2	2.9	3.3	2.8
Min.(m/sec)	3	3.3	3.2	2.7	2.3	1.8	1.8	1.9	1.8	1.6	1.8	2.3	2.4
Prevailing Wind Direction	E-NE	E-NE	S-SW	S-SW	S-SW	S-SW	E-NE	S-SW	S-SW	S-SW	NE	E-NE	

(2) Tides

13. The tidal differences are about 3m at springs and 2.3m at neaps.

Table 5-4-2 Tidal Level at Cutuco Port

High Water Level		Low Water Level	
HWLS	HWLN	LWLS	LWLN
3.05 m	2.44 m	0.03 m	0.61 m

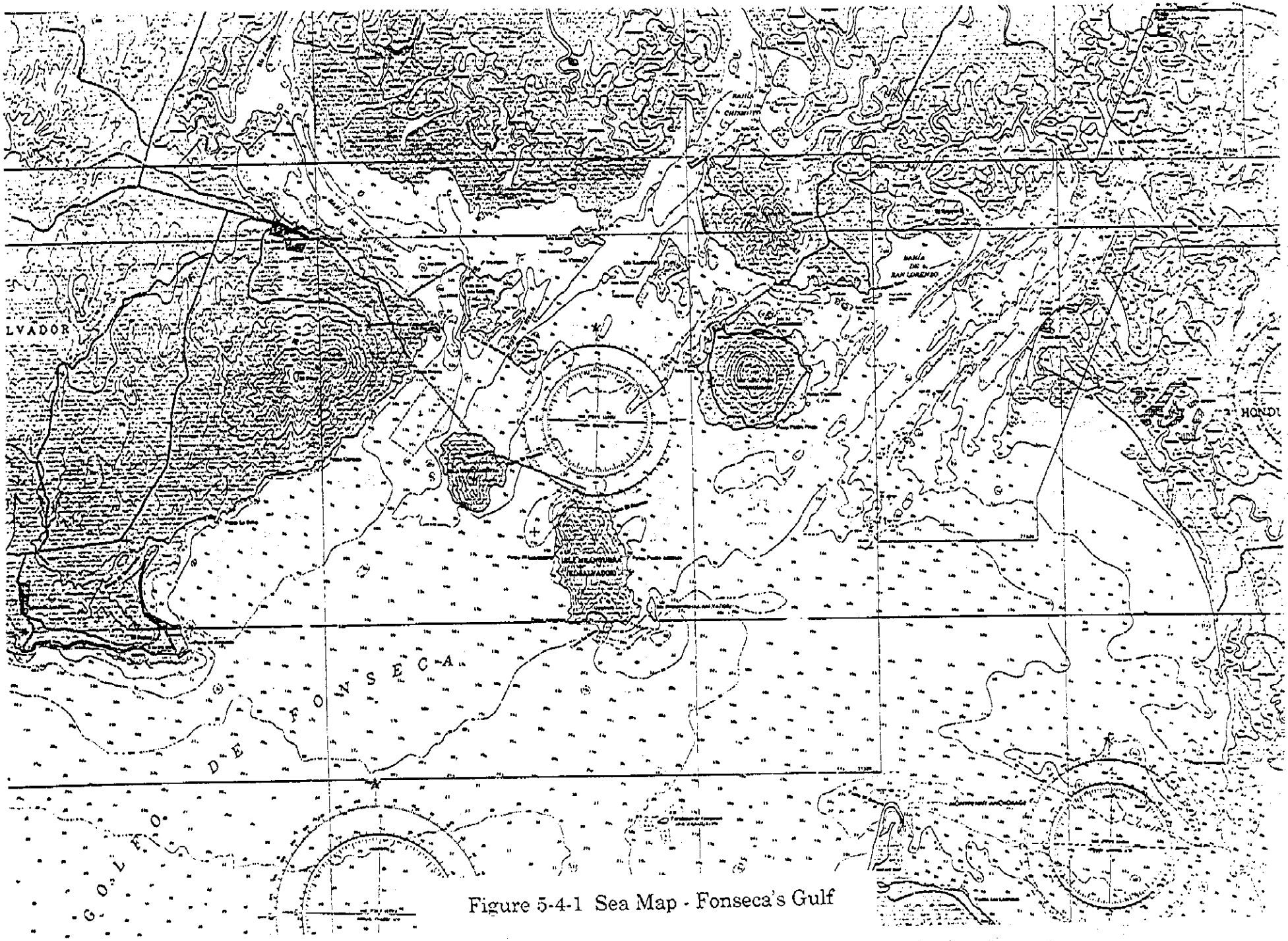


Figure 5-4-1 Sea Map - Fonseca's Gulf

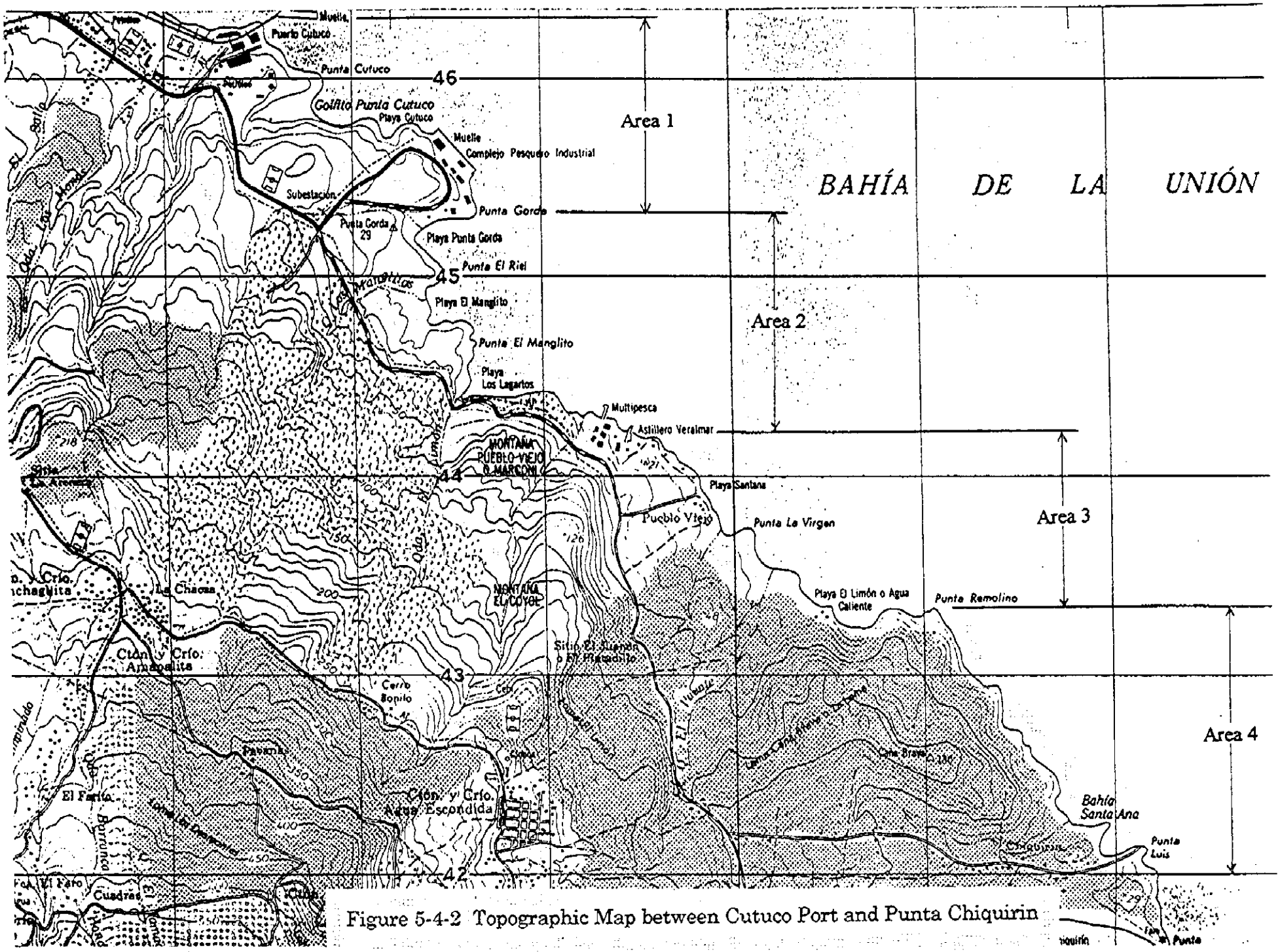


Figure 5-4-2 Topographic Map between Cutuco Port and Punta Chiquirin

(3) Currents

14. The currents are fairly regular except during the rainy season when the ebb flows somewhat longer than the food. Off Punta Chiquirin, the ebb current sometimes runs at a rate of 3 knots and causes a heavy race which has the appearance of breakers. The current divides N of Isla Conchaguita. One branch sets N into the bay and the other branch sets NE between Isla Zacatillo and Isla Martin Perez. (Source: Un Estudio de los Puertos de la República, Agosto 1954). (Figure 5-4-3)

15. The study team conducted the current survey to examine the local current at the point A and the point B. (Figure 5-4-4). The results of the survey summarized below:

16. Max current velocities at the point A and point B was 1.03 m/sec and 1.42 m/sec respectively. These values are nearly equivalent to that of the existing observation records. And, it seems that the current condition does not affect the ship maneuvering at the water area.

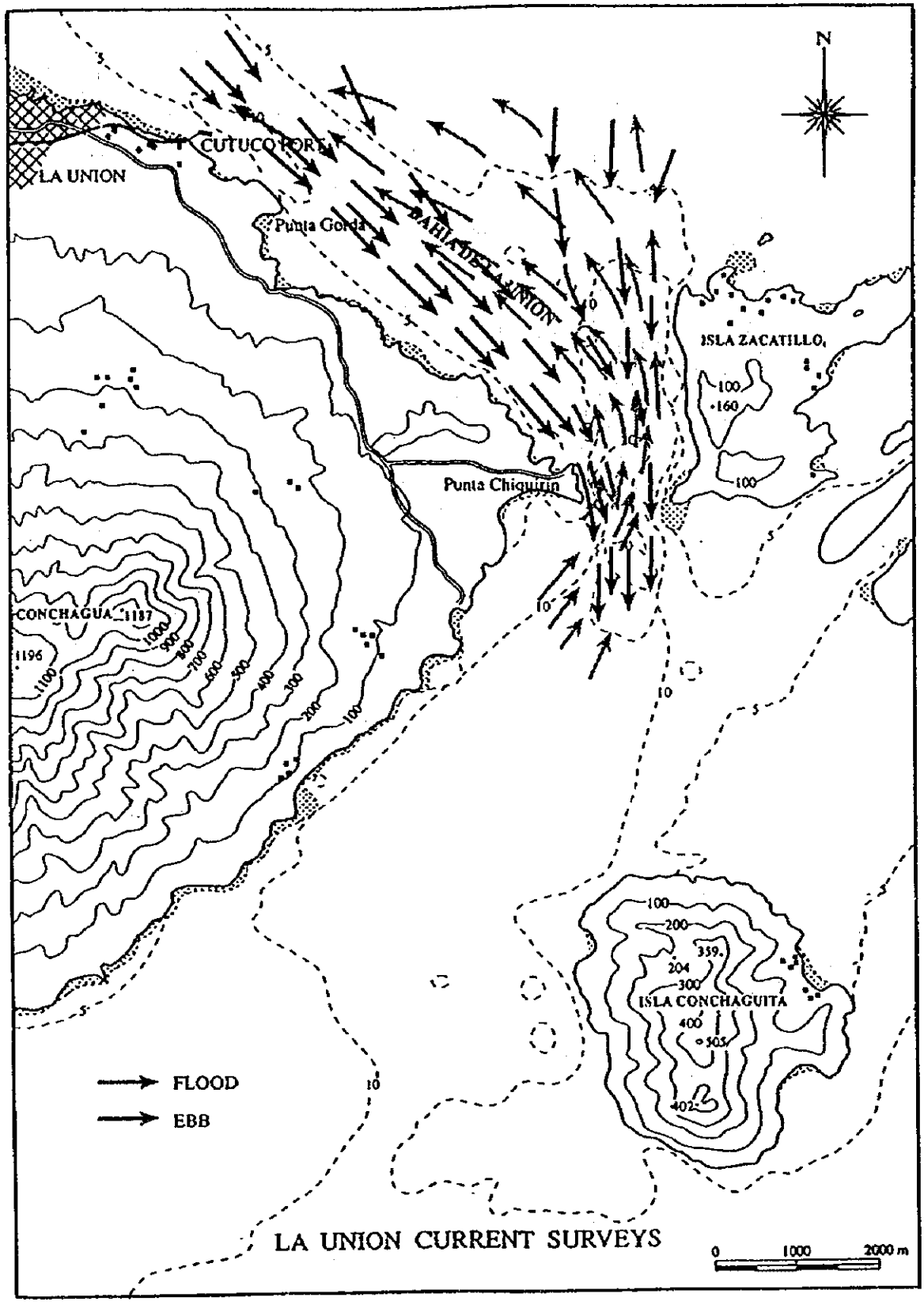
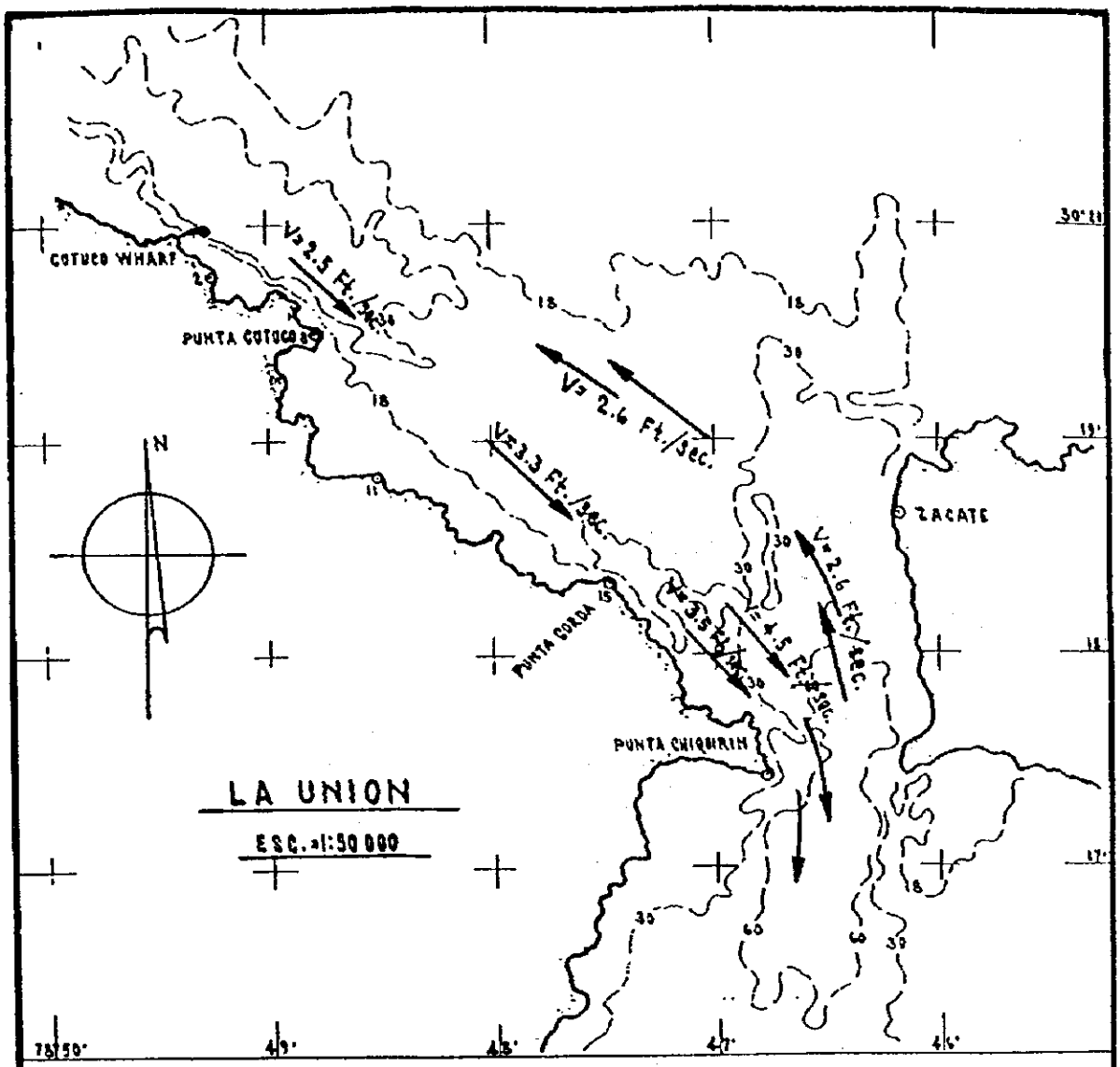


Figure 5-4-3 (1) Current Observation Records at La Union



CURRENT SURVEY #1 - LA UNION
February 8th - 08.00 to 19.00 hrs.

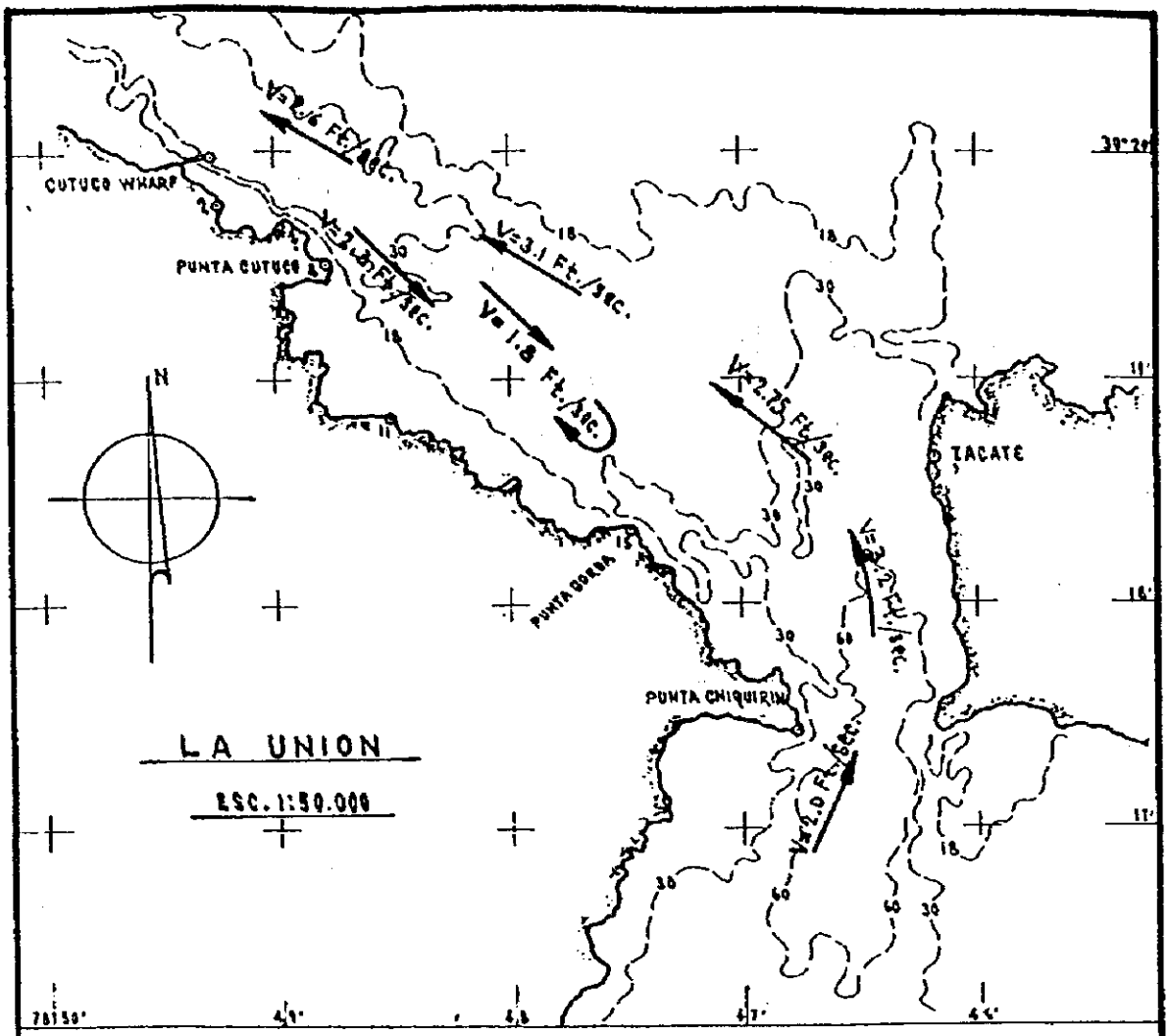
TIDES	HEIGHT	WIND
High Tide 06.23	9.8 feet	Morning-North 20 to 25 m.p.h.
Low Tide 12.15	-0.8 feet	Afternoon-North 25 to 30 m.p.h.
High Tide 18.51	10.5 feet	

SEA: Choppy - Waves 2 to 3 feet.

Max Float Velocities:
Ebb Tide - 4.5 Feet/sec.
Flood Tide - 2.6 Feet/sec.

Remarks:
Fresh wind appeared to be influencing float velocities.

Figure 5-4-3 (2) Current Observation Records at La Union



CURRENT SURVEY #2 - LA UNION
March 5th, 1954 - 07.00 to 14.00 hrs.

TIDES		HEIGHT	WINDS
High	02.53	9.7 feet	07.00 hrs. ENE 0-5 m.p.h.
Low	08.53	- 0.7 feet	09.00 hrs. ENE 20-25 m.p.h.
High	15.23	10.2 feet	10.00 to 14.00 hrs. ENE 10-20 m.p.h.

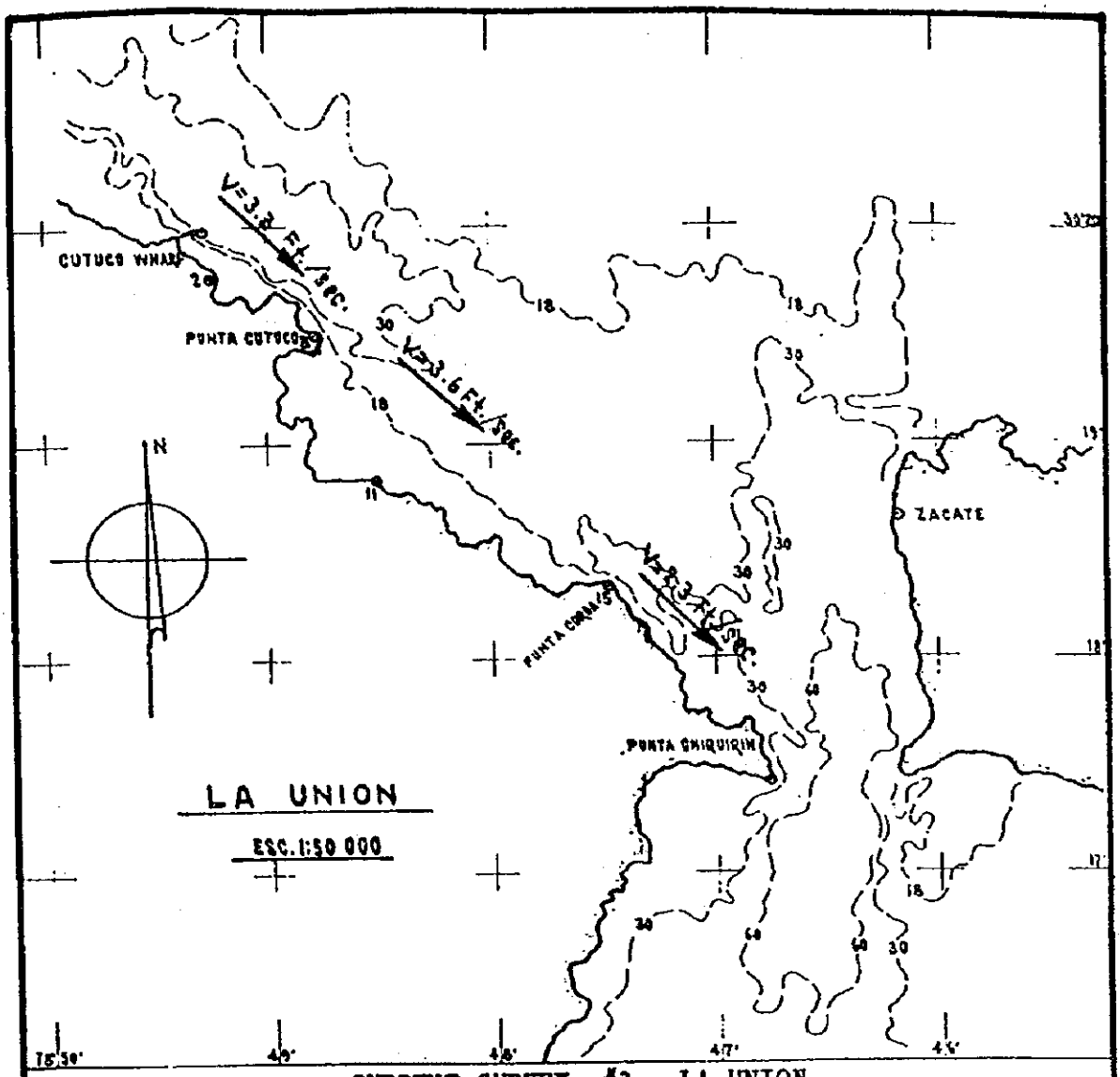
SEA: - Slight Chop.

Max Float Velocities: -
Ebb 2.3 Feet/Sec.
Flood 3.2 Feet/Sec.

REMARKS:
Float velocities at start of survey recorded tail end of ebb.

Slack water at approx 8.45 to 9.15

Figure 5-4-3 (3) Current Observation Records at La Union



CURRENT SURVEY #3 - LA UNION
March 6th, 1954 - 07.00 to 09.00 hrs.

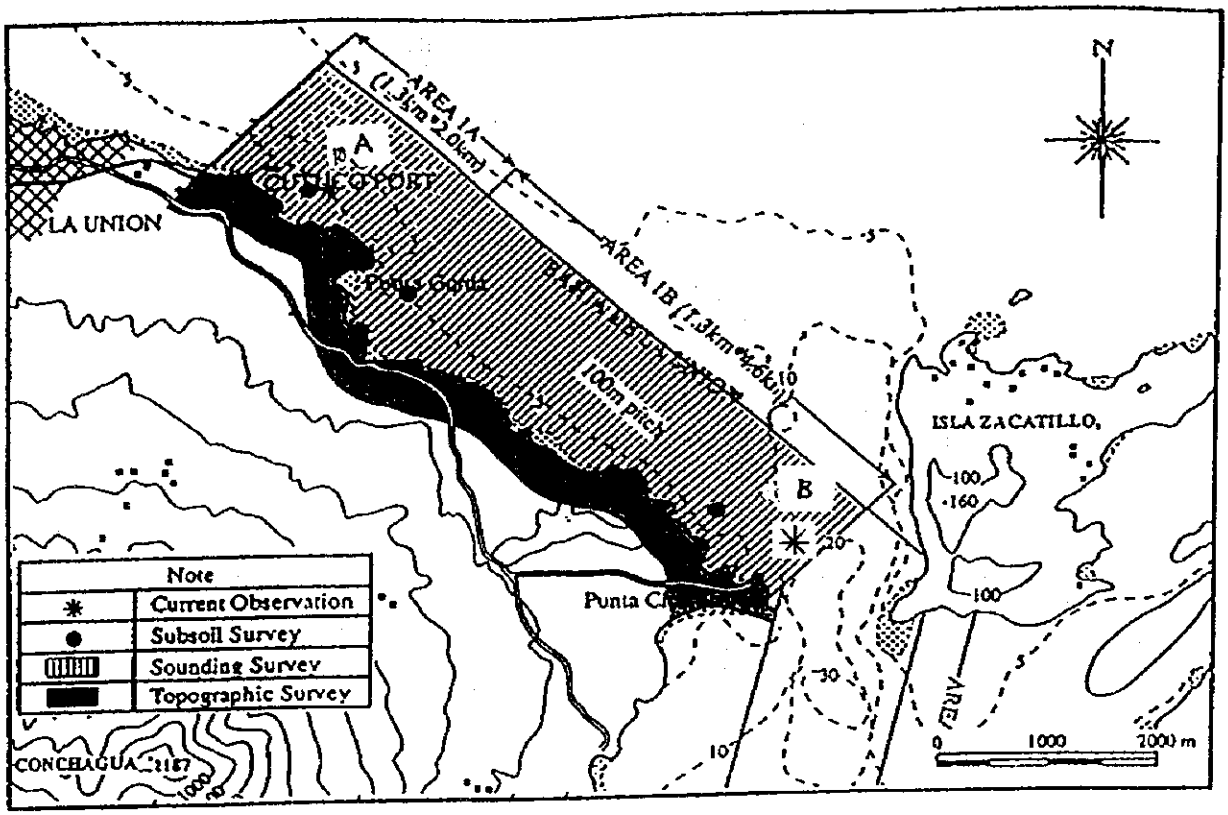
TIDES		HEIGHT	WINDS
High	03.42	10.1 feet	07.30 ENE 5 - 10 m.p.h.
Low	9.39	- 1.1 Feet	09.00 ENE 0 - 5 m.p.h.
High	16.10	10.8 Feet	

SEA: Calm

Max Float Velocities: -
Ebb. 3.6 feet/Sec.

REMARKS:

Figure 5-4-3 (4) Current Observation Records at La Union



CURRENT OBSERVATION - LA UNION BAY

Max. Velocity at Point A

Observation Point	Date	Weather	Wind (m/s)	Tide		
					Hour	Height (m)
A	4 Dec. 1997	Clear	0.3 ~ 1.5	High	05:44	3.02
				Low	11:40	-0.09
Water Depth (m)	Hour	Temperature(C)	Wave (m)	Current Velocity(m/sec)		Direction
11.0	10:00	35°	0.05	1.03		108°

Max. Velocity at Point B

Observation Point	Date	Weather	Wind (m/s)	Tide		
					Hour	Height (m)
B	4 Dec. 1997	Clear	1.6 ~ 3.3	High	05:44	3.02
				Low	11:40	-0.09
Water Depth (m)	Hour	Temperature(C)	Wave (m)	Current Velocity(m/sec)		Direction
27.0	09:00	35°	0.05	1.42		135°

Figure 5-4-4 Current Observation Results at La Union

(4) Waves

17. The characteristics of the deep water waves offshore the Central America are shown in Fig. 4-4-3, Table 4-4-2-3. (Sources: Sailing Directions for South America, U.S. Naval Oceanographic Office). In this case, it is assumed that the periods of swell and sea are 20 sec. and 10 sec. respectively.

18. Among these deep water waves, waves with direction SW are expected to affect the channel between Punta Chiquirin and Zacatillo Isle. But, the channel is sheltered from the waves with another directions by the Conchaguita Isle and Meanguera isles. SW waves shares the 22% of the total. So, wave frequencies by wave height at Punta Chiquirin are summarized below.

Table 5-4-3 Wave Frequency by Wave Height at Punta Chiquirin.

Wave Height (m)	Frequency	
	(Nos.)	(%)
0 - 0.5	4,143	84.2
0.5 - 1.0	312	6.3
1.0 - 1.5	291	5.9
1.5 - 2.0	63	1.3
2.0 - 2.5	50	1.0
2.5 - 3.0	63	1.3
Total	4,922	100.0

19. They are transformed by wave diffraction into the channel. Therefore, all the waves at La Union Port are expected to be less than 0.3 m in height. (Figure 5-4-5)

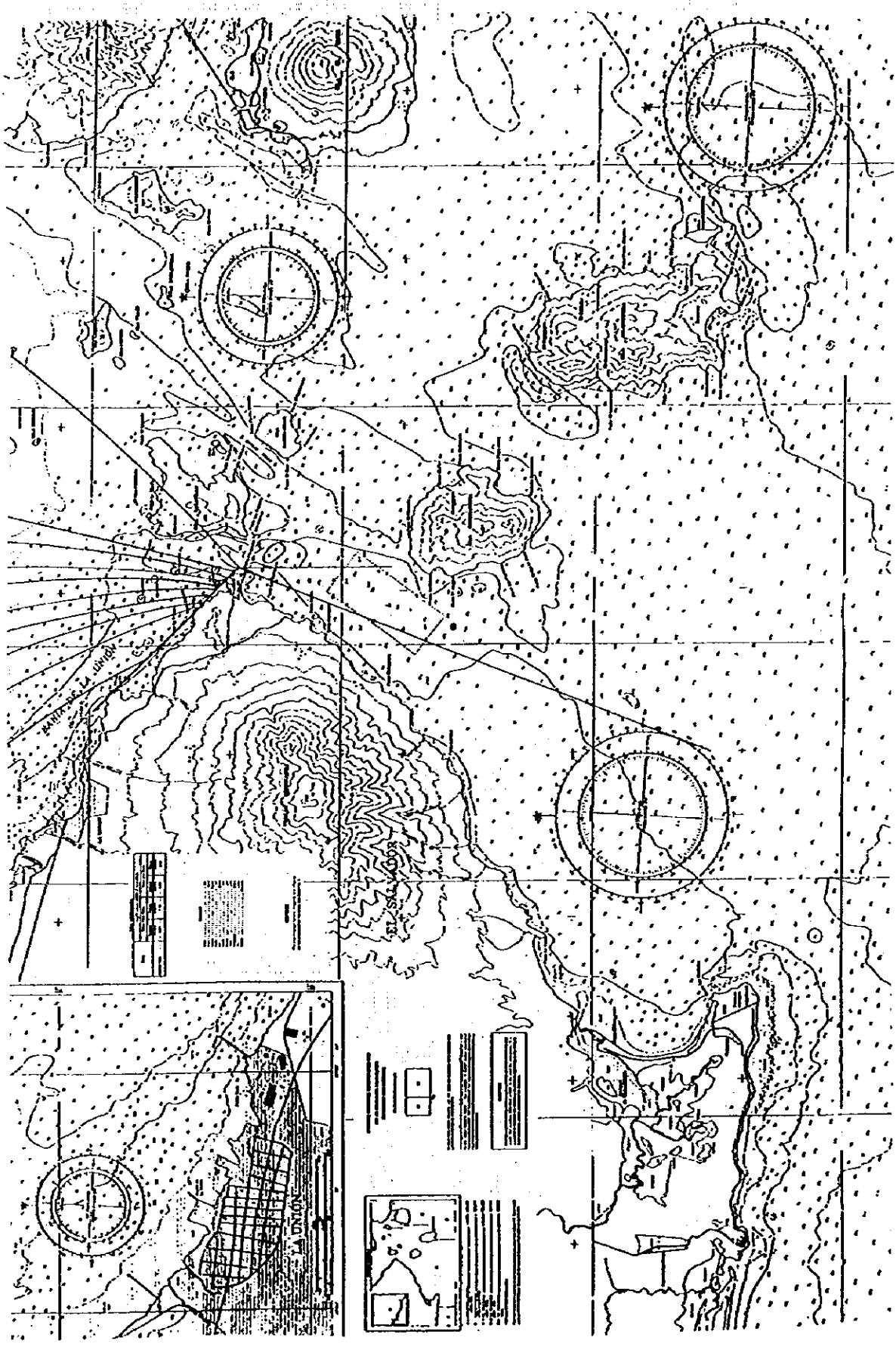


Figure 5-4-5 Wave Diffraction Diagram for La Union Port

20. Table 5-4-4 can be used to determine wave heights which may be expected in harbors and bays with short fetches when strong winds prevail. But, at La Union Port, strong winds seldom blow. So, the waves caused by strong winds will be neglegible.

Table 5-4-4 Wave Heights Expected in Areas with Short Fetches and Selected Wind Speeds.

Fetch * / Wind **	1	2	5	8	10
6	1.3	2.6	3.4	4.3	4.9
8	1.8	3.4	4.8	6.2	7.2
10	2.5	4.5	6.4	8.5	9.4

*: Nautical miles 1 nautical mile = 1.8531 km

**: Beaufort force. 6:10.8 ~ 13.8 m/sec, 8:17.2 ~ 20.7 m/sec, 10:24.5 ~ 28.4 m/sec

(5) Sedimentation.

21. In the northern half of the Fonseca's Gulf, the sea bed is the alluvial soil. However, the southern part of the La Union Gulf is not too much affected by the discharge from the Goascoran River. The rock foundation under the sea water lies at the relatively shallow level.

22. Although La Union Bay is shallower than the -10 m depth mostly, there is a some extent deeper than -10m (area: 2 km x 300 m) in front of the Cutuco Port and Punta Gorda. This area is recognized by both the sea maps published at the year 1984 and 1994. This also proves the stability of the seabed depths without sedimentation.

(6) Subsoil Condition.

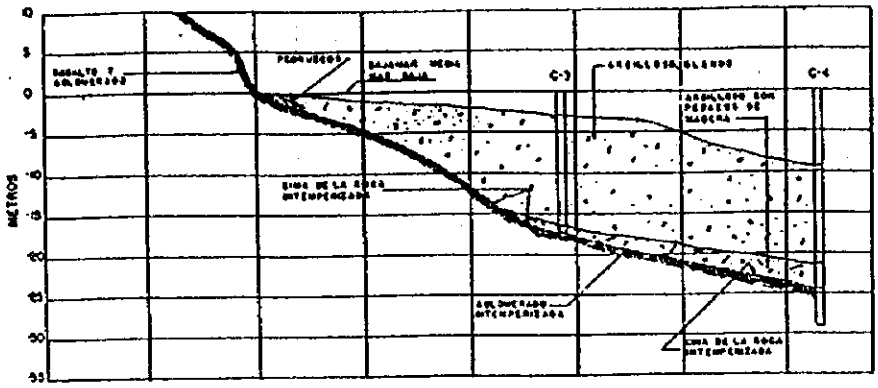
23. According to the subsoil survey carried out by CEPA in 1954, clay layers with the thickness of 10-15 m are formed under the sea water at both sides of Punta Gorda Port. Under the clay layer, there appear rock foundations with max -30 m depth. (Figure 5-4-6)

24. In 1977, ten (10) borings were conducted around the jetty of cutuco Port. As a result, the relatively hard sandy loyeres with N valves more than 30 are recognized from the surface of the seabed. There are differences in the soil characteristics in both locations. (Figure 5-4-7)

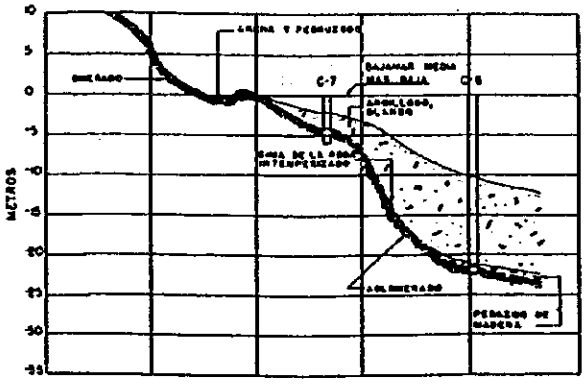
(7) Field Survey around the Potential Project Site.

25. In addition to the collection and analysis of the existing data and information, the following observation was carried out around the potential project site(s) of the ports of La Union. (Figure 5-4-8)

* Tidal current survey
* Topographic survey
* Bathymetric survey
* Boring and soil test



SECCION-4



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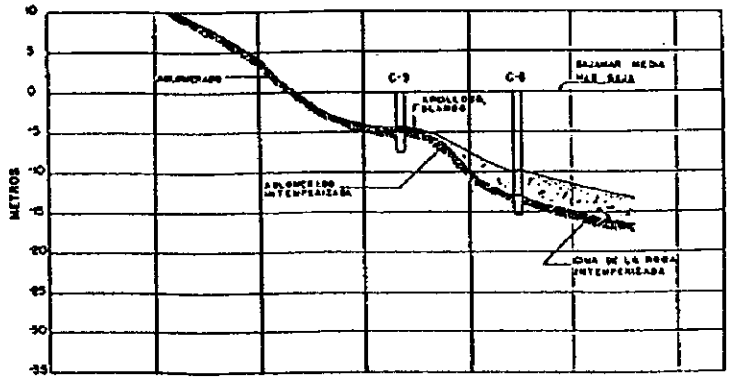
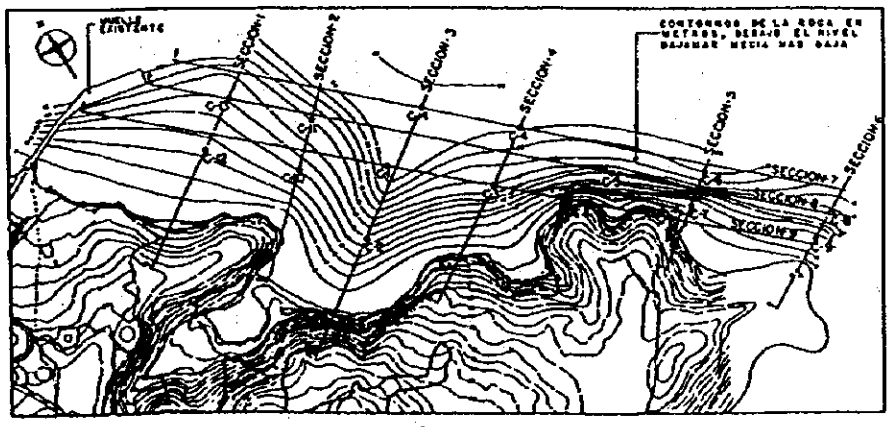


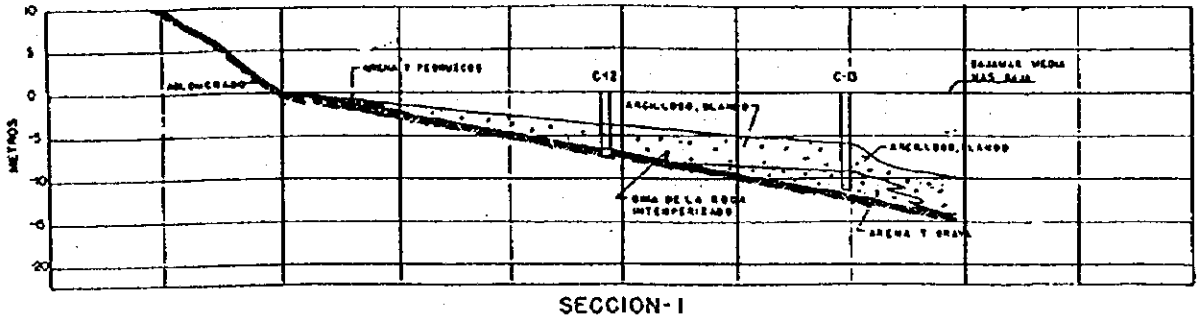
SECCION-6

PUNTO CUTUCO
SECCIONES GEOLOGICOS

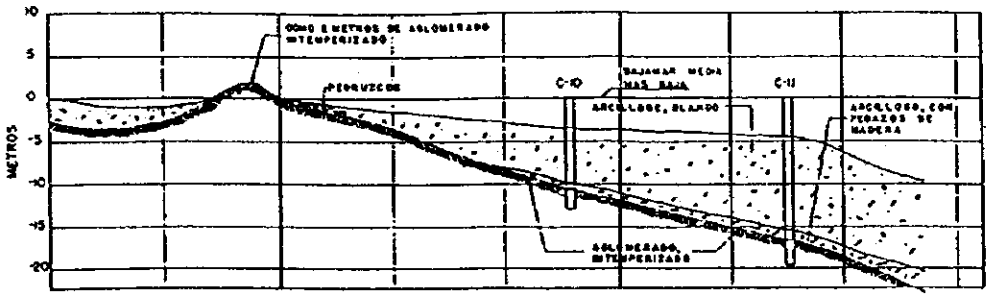


PLAN

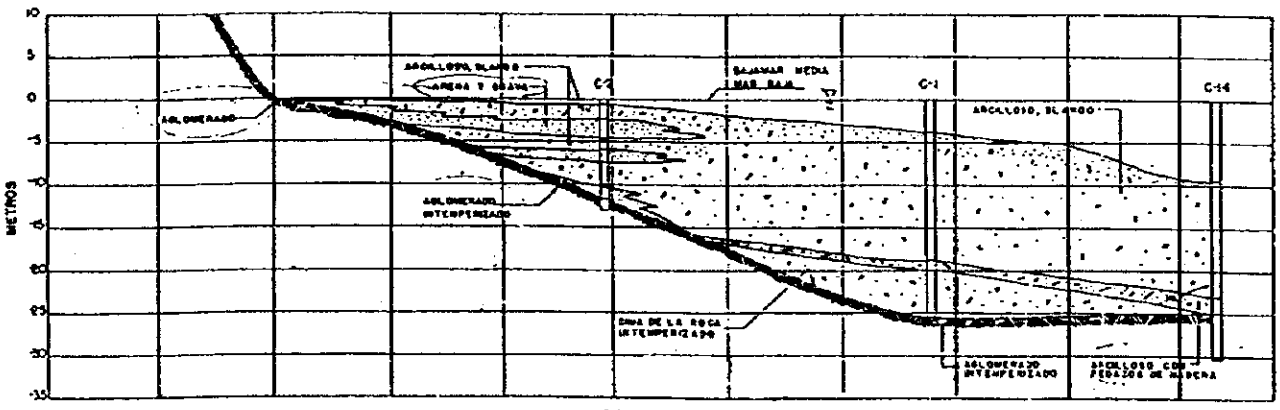
Figure 5-4-6 (1) Geological Sections - La Union Port



SECCION-1



SECCION-2



SECCION-3

PUNTO CUTUCO
SECCIONES GEOLOGICOS

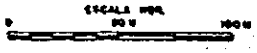
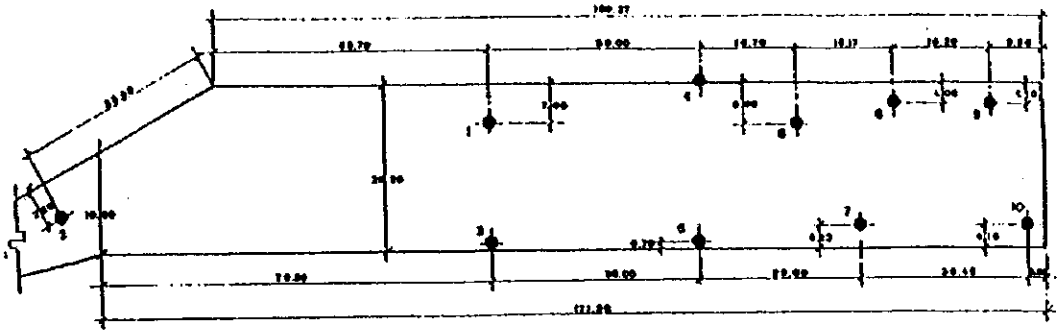
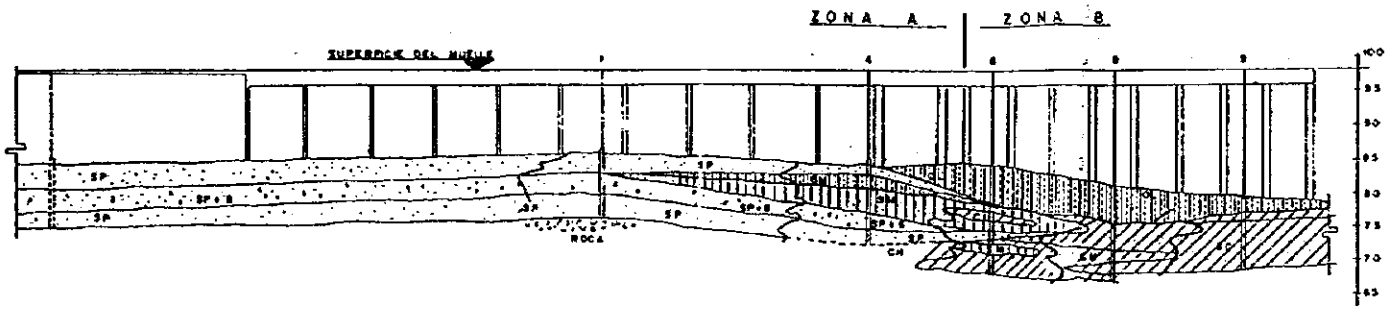


Figure 5-4-6 (2) Geological Sections - La Union Port



U B I C A C I O N D E P E R F O R A C I O N E S

esc. 1: 750



P E R F I L C O S T A D O N O R T E esc. 1: 500

Figure 5-4-7 Geological Section for Cutuco Port

NOTES

SYMBOL	DESCRIPTION
PT	Peat, highly organic clayey silt, dark gray ± 35 and 75% of sand.
OL	Organic clayey silt, medium low plasticity, dark gray, ±10 to 40% of sand.
SP	Step graded sand, with fragment of cracked rock, dark gray, ± 80 to 90% of sand.
SP + G	Step graded sand, with isolated gravels, dark gray, ± of 95% of sand.
SM-OL	Silty sand, lightly organic, clear and dark gray, ± of 75 to 80% of sand.
SC-OL	Clayey sand, lightly organic, medium low plasticity, dark gray, ± 75% of sand.
CL	Sandy clay, medium low plasticity, with isolated gravels, clear and dark coffee color, ± of 30 to 65% of sand.
SC	Clayey sand, medium low plasticity, with fragments of rocks in different grades of decomposition, clear and dark coffee color, ± of 30 to 65% of sand.
SM	Silty clay, medium high plasticity with fragments of rocks in different grades of decomposition, clear coffee color, ± 20 to 45% of sand.
CH	Silty clay, medium high plasticity with fragments of rocks in different grades of decomposition, clear coffee color ± 20 to 45% of sand.

NOTES

SYMBOL	*DESCRIPTION*
PT	Peat, highly organic clayey silt, dark gray ± 35 and 75% of sand.
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CH	Silty clay, medium high plasticity with fragments of rocks in different grades of decomposition, clear coffee color ± 20 to 45% of sand.

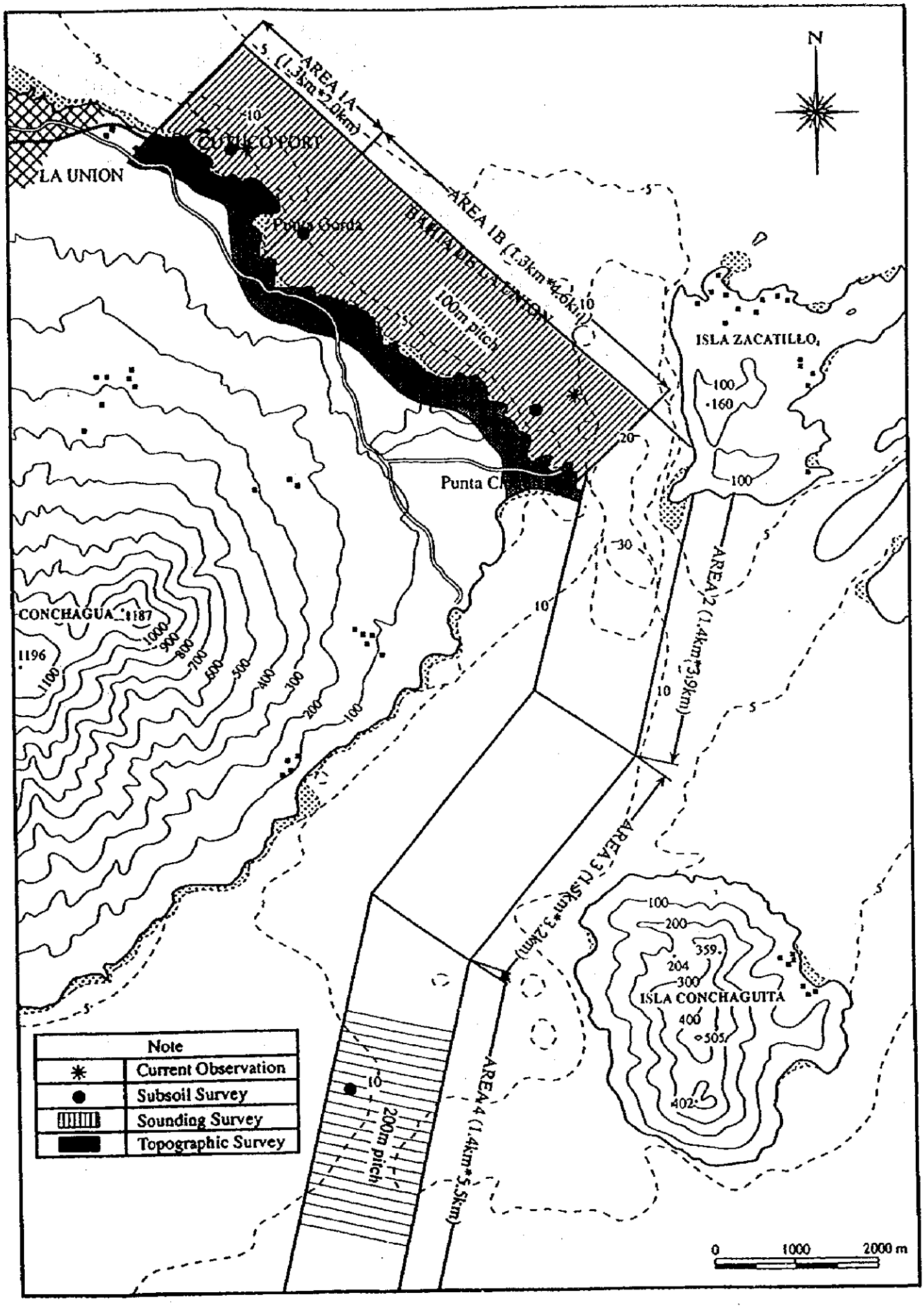


Figure 5-4-8 Location Map of Natural Conditions Survey

5.5 Environmental Conditions of the Coastal Area of La Union

1. According to the field observations, the environmental situation of the bay and surrounding area is very complicated. The critical points mainly are:

Water pollution
Solid wastes
Deforestation
Sediment deposits on the river deltas on the bay (siltation).

2. This situation is mentioned in the strategic plan for suitable development the Salvadoran area of Fonseca Gulf. That document was prepared by the Government of El Salvador (July, 1996) with the support of Organization American States (OAS). In that document is mentioned in a general way the environmental situation of Province of La Union, it establishes that more of 80% of that province is deforested which is an indicator that for long time the peasants has developed bad agriculture practices. In the same way the mangroves have been over exploited to obtain timber and fire wood. This same problematic is mentioned by Ibarra M, in the Final Draft Formulation Rules to the advantage of Ecosystems of Mangroves (SEMA, 1993), it also mentions that the reduction of the mangroves could affect the fishery production mainly the shrimp catch.

5.5.1 Existing Situation

(1) Quality of Water

3. In the area under consideration for location of the new port the shore is composed by sand and rock, bordering the Volcano Conchagua.

4. According with some data collected by Executive Commission Hydroelectric of Lempa River (CEL), report that the content of Coliform bacteria in tap water was about 3/100 ml which was a very low level.

	Temperature	Ph
Well water CEPA-FENADESAL	30.0	6.6
Faucet water coming from well CEPA-FENADESAL	31.0	6.6
Served water from ANDA	32.0	6.9
Rain water tank CORSAIN	33.0	7.0

5. Analysis of water sample taken by GEOCEL laboratory:

Na	48.8 ppm
Ca	129.0 ppm
Cl	367.7 ppm
HCO3	160.39 ppm
k	11.7 ppm
Mg	83,0 ppm
S04	25.6 ppm
Si02	67.0 ppm
Ph	7.98 ppm
F	0.1 ppm
N03 <	1.0 ppm
P04	4.5 ppm

6. The analyzed sample had a low content of sodium and a high content of calcium and chlorine.

7. In 1976 the Natural Resources Direction found in the bay 0.1 ppm of dissolved oxygen which was very low because the normal content must be 4 ppm which is recommended for good quality of water.

8. In the present report it has been mentioned that the environmental conditions in the Bay show a tendency to very drastic the levels of pollution.

9. During the visit to the area was evident the amount of garbage accumulated close of the bay and the sewage discharged into the bay.

(2) Quality of Air

10. In relation with the atmospheric pollution in the area apparently it is clean because the industrial activities are very low and the traffic of vessels is very low but the emanation of smog is coming by the transport in the city coming by the buses and trucks.

(3) Soil

11. During the visit in this area it was evident that the neighbor areas are eroded mainly for the agricultural activities. It was observed that the original vegetation has been changed to cultivate: corn, beans, sorghum, water melon and such activities has contribute to increase the process of sedimentation into the bay.

(4) Vegetation

12. The vegetation into the area is considered in good conditions. Mangroves in the area is very small, approximately less than one Ha.

(5) Cultural Aspects

13. There are no historical, religious or cultural artifacts.

(6) Potential Major Impacts from the Construction of Port.

a) Dredging of sediment.	This has not yet been assessed.
b) Disturbance.	Due to construction and increased turbity of water this will be a temporary effect.
c) Dust from loading/unloading operations.	This effect will be minimized.
d) Noise from access traffic.	This is not considered to be significant.
e) Effects on flora and fauna.	This has not yet been assessed.
f) Social effects.	The area selected is not close to large urban center.

5.5.2 Existing Environmental Data

14. La Union Bay shoreline is approximately 24 km. long. The bay includes two river deltas, Goascorán and Sirama, 5 and 7 km. long respectively.

15. La Union Bay is a part of the 70 km wide Gulf of Fonseca, shared by El Salvador, Honduras and Nicaragua.

16. Within the Gulf there are several islands. The islands that belong to El Salvador are listed below, together with their respective areas:

- Conchaguita, 8.45 km²
- Martín Pérez, 1.09 km²
- Meanguera, 16.33 km²
- Meanguerita, 0.35 km²
- Perico, 2.11 km²
- Zacatillo, 4.96 km²

17. The following municipalities border the Bay of La Unión:

- La Unión, the provincial capital
- Conchagua

- Pasaquina
- San Alejo

18. The locations are shown in Appendix 2, Exhibit 2.

19. A number of institutions were visited to obtain information about water pollution. Water pollution is caused primarily by the unregulated discharge of raw sewage from the city, local settlements and other facilities. Raw sewage is discharged in estuaries and in to the ocean.

20. The following list, details the entities visited, their activities and type of pollution caused by them, respectively.

Table 5-5-1 List of principal polluters of the Bay of La Unión.

Entity	Activity	Pollution
Social Security Hospital	Health care	Hospital solid wastes and sewage.
Municipality of La Unión	Solid wastes collection	Solid wastes of different origins
Naval Base	Coast Guard	Sewage
Army Depot No. 3	Army	Sewage
Government Center	Government	Sewage
Barrio San Carlos	Settlement	Solid wastes and sewage
Colonia Bella Vista	Settlement	Solid wastes and sewage
Caserío Las Chacaras	Settlement	Solid wastes and sewage
El Esterito	Slaughterhouse	Residual waters and sewage
Multipesca	Fishing	Liquid and solid wastes
Veralmar	Fishing	Oils and solid wastes
Marex	Processing plant	Residual waters and sewage
CEL, Power Authority	Energy generation	Diesel spills
ANDA, Water Authority	Potable water supply	Sewage
Cutuco Pier	Port	Petroleum products and sewage
Former Naval Base	School	Sewage
La Fuerteza	Slum	Defecation on the beaches, solid wastes and sewage.

21. Other sources of pollution include abandoned ships, located north of the bay; 22 of which are sunken and 6 of which are still afloat near Punta Gorda. As shown in the photographs in Appendix 2, Exhibits 3 and

4.Other sources of pollution include abandoned ships, located north of the bay; 22 of which are sunken and 6 of which are still afloat near Punta Gorda. As shown in the photographs in Appendix 2, Exhibits 3 and 4.

5.5.3 Social Environment in the Coastal Area

22. There are three main settlements in the study area:

Chiquirín, located north east of Chiquirín cape light house. Population: 2000.
Pueblo Viejo, located between shipyard Veralmar and "Remolino" cape. Population: 500.
La Gaviota, located between Cutuco harbor and CORSAIN fishing complex at "Punta Gorda". Population: 200.

23. Appendix 2, Exhibit 5 shows the location of these settlements.

(1) Economic Activities

24. The principal economic activity of the inhabitants of the area are agriculture and fishing. The principal agricultural products of the area are:

Corn
Sesame Seed
Sorghum
Watermelon
Melon
Tomatoes

25. By quantities, corn and sorghum are the main products of the area.

26. Agricultural products are used mainly for local consumption, and only 10% to 20% are commercialized. Cattle and poultry activity is at a minimum. Families raise one or two cows, pigs and hens for local consumption.

27. The inhabitants of the area engage in artisan fishing, which generates low income, due to competition with the commercial fishing boats, over-exploitation of marine resources and periodic climatic changes caused by "El Niño". Fishing is mainly for local consumption with seasonal commercial fishing that depends on quantities and season of the year.

(2) Transport, Utilities and Living Facilities.

28. The three settlements indicated above are connected by a road. From La Unión to CORSAIN fishing complex, there is a paved road. From there to La Gaviota there is an unpaved rural road. From La Gaviota to Pueblo Viejo and Chiquirín, there is an unpaved road which is passable only during the dry season. The area is served by 2 daily buses of route 148. Boat and canoe transportation is popular in the area.

29. Of the three settlements, only La Gaviota does not have electric energy service.

30. In Chiquirín and Pueblo Viejo there are thermal springs and wells for individual water supply. La Gaviota uses wells for individual water supply.

31. There is no telephone service in the settlements. The inhabitants travel to La Unión for this service.

32. There are 2 schools, K-6th grade, serving Chiquirín and Pueblo Viejo. La Gaviota does not have a school because it is very close to the city of La Unión where inhabitants' children attend school. Illiteracy rate in the area is estimated to be about 70%.

33. There is a health clinic in Chiquirín to serve the immediate area. The rest of the inhabitants use La Unión health services. In 1999 a health unit will be built in "Playitas" a settlements located 3 kilometers southeast of Chiquirín.

34. The registered houses in the settlements are as follows:

Chiquirín:	200
Pueblo Viejo:	80
La Gaviota:	38

35. The majority of the houses are built with mud, reinforced with cane (locally known as bahareque), adobe, tin sheets and clay roof tiles. There are a few houses built with brick and reinforced concrete.

(3) Traditional and Cultural Assets

36. There are no known traditional and cultural assets nor artisan works in the area.

5.5.4 Solid Wastes

37. There is no solid wastes collection service in the area. Solid wastes are either buried, burned, dumped on the ground, or simply dumped in the bay.

38. All houses have toilet facility, excavated in the ground. Inhabitants also defecate directly on the ground. The lack of appropriate sanitary facilities is among the chief causes of gastrointestinal diseases among the inhabitants of the area.

39. The municipal solid wastes burning takes place within the area of the study, on a 10 hectarea lot owned by the municipality of La Unión, located between the ravines "Los Manglitos" and "El Limón" (see Appendix 2, Exhibit 6). Said lot is traversed by an unnamed ravine. During the rainy season solid wastes are washed and deposited through the ravine on "El Manglito" beach, located between Punta Gorda and the pier owned by Multipesca. Burning of solid wastes is performed by the Municipality without any pretreatment.

40. The municipality of La Unión is planning to build a sanitary landfill, for municipal solid wastes of the area, and to purchase 2 garbage collection trucks, each equipped with a garbage compactor container, for the collection of the household solid wastes.

5.5.5 Deforestation

41. Deforestation has taken place in the vicinity of the settlements, to clear the area for agriculture. The steep slopes of the cleared coastal areas result in serious soil erosion. This problem is encautered in an area that stars about 2 km from the shore and extends about half the distance to the Conchagua volcano.

5.5.6 Sediment Deposits on the River Deltas and on the Bay (Siltation)

42. Deforestation and soil erosion are the main causes of the sediments deposits on the river deltas and on the bay (siltation).

5.5.7 Data on Natural Disasters (Risk)

(1) Seismic Risk

43. There is significant seismic hazard in the area of La Unión Port and the coastal area involved in this port reactivation study. Based on a preliminary seismic hazard evaluation performed by The Study Team

(Reference #3), the port of La Unión is included in the areas of major seismic risk in El Salvador. Based on eyewitness records, there was considerable damage to homes and other structures during recent earthquakes in the 1960's and 70's.

44. Most earthquakes sources that could affect the study appear to be related to active faults within the land area of El Salvador. Apparently, there is no historical evidence of tsunamis or tsunami related damage from the Pacific Ocean, although the subduction zone of the Cocos Plate in the Pacific Ocean parallel to the coast of El Salvador has produced many significant seismic events.

(2) Floods

45. There is no significant flood hazard in the study area.

(3) Tropical storms.

46. It appears that there is no significant storm hazard in the study area. Inhabitants report that strong windstorms are not frequent.

(4) Landslides

47. There is no significant landslide hazard in the study area. The inhabitants reported that a major landslide occurred in 1987 at the settlement of Amapalita, Southwest of the study area.

(5) Drought

48. Drought was reported in the years of 1992 and 1997, associated with "El Niño". It adversely affected agriculture and fishing.

(6) Data on Water Resources

49. The most important rivers of the area are:

50. River Goascorán, and its tributaries: Unire or Guajiniquil, El Gueripe, El Sauce, and sub-affluents: El Chiquito and Grande de Anamorós.

51. River Pasaquina, and its tributaries: Coyolar, Lagartero, Agua Salada, Las Piñas, Santa Rosa, Las María and La Chorera.

River Sirama, and its tributaries: Pavana, Santa Cruz and Ceibito.
River El Nacimiento

River El Municipio
River El Camarón and
River El Zapote

5.5.8 Natural Environment in the Coastal Area

(1) Ecological Data

52. This section is based on existing data related to the study area. The data are incomplete and may not be current.

53. Revised flora and fauna data will be available upon completion of the ongoing environmental survey currently being performed by the Study Team.

1) Flora

a) Flora distribution

54. The flora distribution of the study area consists of:
- Caducifolio forest
- Subperennifolio forest
- Rocky beach vegetation
- Eco systems of escarpment

55. The stratum of the area of the study consists of:
- Grasses
- Bushes
- Tress

b) Rare and Endangered Species

56. The inhabitants of the study area reported the following rare species:

Common Name	Scientific Name
Lagarto	Siadendron excelsum
Cortés Amarillo	Tabebuia chrysantra
Huesillo	Casearia sylvestris

57. The inhabitants of the study area reported on several endangered species. It must be noted that these species are considered endangered due to their over-exploitation for commercial use, as follows:

Common Name	Scientific Name
Cedro	Cedrela odorata
Conacaste	Enterolobium adioncephalum
Madrecacao	Eliricidia sepium
Zapote	Calocarpum mammosun
Castaño	Sterculia apetala

c) Valuable Species

58. The inhabitants of the study area also reported the following valuable species due to their demand for construction or for their use as fuel:

Common Name	Scientific Name
Cedro	Cedrela odorata
Mangle	Rhizophora mangle
Madrecacao	Gliricidia sepium
Caulote	Guazuma ulmifolia
Chaperno	Lonchocarpus sp

d) Local Species

59. The inhabitants of the study area reported the local species listed in Appendix 2, Table I - Tree Species of the Study Area.

e) Species of Commercial Importance

Common Name	Scientific Name
Cedro	Cedrela odorata
Mangle	Rhizophora mangle
Madrecacao	Gliricidia sepium

f) Background Data of Local Flora Distribution

60. The inhabitants of the study area reported the tree species of the area and surroundings listed in Appendix 2, Table II, Flora - Tree Species of Area Surroundings.

2) Fauna

a) Animal

61. The inhabitants of the study area reported that the animal population has been substantially reduced because most of the animals are used for subsistence. they reported the mammals and reptiles listed in Appendix 2, Table III Fauna - Mammals and Reptiles of the Study Area.

b) Bird

62. The inhabitants of the study area reported an abundance of birds, due to the vicinity of Conchagua volcano. They reported the birds listed in Appendix 2, Table IV Fauna - Birds.

c) Fish

63. The inhabitants of the study area reported that there is a great variety of fish, molusks, crustaceous and batrachians in the bay of La Unión. They reported the fish fauna listed in Appendix 2, Table V Fauna - Fishes, Mollusks, Crusctaceous and Batrachians of the Study Area.

d) Aquatic Insect

64. The inhabitants of the study area reported that during the rainy season there is an abundance of mosquitoes and dragon flies.

5.5.9 Recent Environmental Problems

65. Based on the information provided by the Department of Environmental Sanitation of the Ministry of Health and the Mayor's Office of La Unión, there is not record of major environmental problems in the city. However, the inhabitants are accustomed of dumpling combined with the discharging of the city's raw sewage, is rapidly developing into serious environmental problems which should be dealt within the very near future.

5.5.10 Examples of Environmental Impact in Development Projects in El Salvador.

66. Due to demands of Environmental Impact Assessment is a mater very recent in El Salvador practically not so much have been do it. For example, according with officials of CORSAIN when the Governments of El Salvador and France built CORSAIN, during that time

approximately 20 years ago the EIA was no well known. Wherever in the last years some international organizations such as Development Inter American Bank had obligated to the Governments studies of Environmental Impact Assessment such as the construction of Roads which is executed by the Ministry of Public Works in the Program of Rurals Roads which is signed in loan agreement GOES-BID number 844, SF-ES.

67. The other EIA was related to thermo electrical plant for the generation of electricity. The feasibility study was completed in 1995. Officials of CEL reported that the project is waiting for a National or international institution interested to invest in El Salvador.

68. Actually, the Governments of El Salvador and Japan are preparing a Study for the Reactivation of La Unión Port, in that study is included a EIA.

5.6 Structures of Port Facilities

5.6.1 Outline of Port Facilities

1. The Cutuco Port was constructed in 1916. The original layout of the port facilities was almost same as the existing one. Afterwards, in 1955, the jetty was extended some 52 m. or more. Main dimensions of port facilities are listed in Table 5-6-1. In addition, to handle liquid cargo, the Port has pipe lines installed along the jetty, connected to privately owned tanks built on land.

2. The Port has the open yard of 483,000 m² and the buildings of some 26,170 m² consisting of seven warehouses and one transit shed on the jetty. As these storages were planned for the direct discharging to and loading from rail, they form the platform without any access road.

Table 5-6-1 Main Port Facilities (Cutuco Port)

Area	Facilities	Dimension	Structural Type	Design Super-vision	Con-tractor	Con-struction Year	Main Use
	Access Bridge	L= 131 m W= 5.2 m	Open-Type with concrete piles.	-	-	1916	
Jetty	Northern Berth	L=152 m D= -9.2 m	Open-Type with concrete piles.	-	-	1916 1955	General Liquid
	Southern Berth	L=171 m D=-7.6 m	Open-Type with concrete piles.	-	-	1916 1955	General

Table 5-6-2 Storage (Cutuco Port)

Area	Facility	Dimension	Structural Type	Construction Year	Main Use
Jetty	Transit Shed	2,375 m²	Steel-framed with steel corrugated plate roof	1916	General
Land Area	Warehouse No. 1	50m x 20m	Steel-framed with steel corrugated plate roof, concrete block wall, w/o column	1955	-
	Warehouse No. 2	50m x 20m	Steel-framed with steel corrugated plate roof, concrete block wall, w/ column	1955	-
	Warehouse No. 3	240m²	Steel corrugated wall and roof	-	-
	Warehouse No. 4	75m x 15m	Steel-framed with steel corrugated plate roof, concrete block wall	1975	-
	Warehouse No. 5	75m x 15m	Steel-framed with steel corrugated plate roof, concrete block wall	1975	-
	Warehouse No. 6	150m x 62.5m	Steel-framed with steel corrugated plate roof, w/o column	1969	-
	Warehouse No. 7	9930m²	Steel-framed with steel corrugated plate roof	1964	Rented to Fish Processing Co.

5.6.2 Port Facilities Assesment

3. The Cutuco Port was constructed in old time, 1916, so the drawings, design reports, etc. in those days are not remained. Port facilities of Cutuco were assessed based on the existing data and the field survey. Deterioration of the structures was surveyed by inspecting the slabs, beams and piles of the jetty.

(1) Access Bridge

4. Access bridge with the total length of 131 m was constructed in 1916. The width of the bridge is only 5.2m, and the railways are laid on the bridge. So, the trucks and the usual cars can hardly run on the bridge. The span length of the support by piles in some 9.1 m.

5. At the left side of slabs, two pipelines are installed. One of them is connected to the power plant in the hinterland (4.5km apart from the Port) to send the diesel oil.

6. The superstructure of the bridge is supported by the two (2) vertical concrete piles. The piles are of reinforced concrete with a square

cross section (50cm x 50cm). Deterioration of piles is severe with the loss of concrete surface and exposure of reinforcement. The bridge barely withstands for use.

(2) Open Type Jetty with Concrete Piles.

7. This type of jetty was constructed next to the access bridge continuosly in 1916. The total length of this jetty is 171 m. The jetty has the nine (9) vertical reinforced concrete piles with interval of 3.05m. in a cross section. (Figure 5-6-2).

8. The piles and beams form the grids of 3.05 m. x 9.15 m transmitting the load on the jetty to the subsoil foundation. The piles are of reinforced concrete with a square cross section (50cm x 50cm). Below the splash zone, the thick shells adhere to the surface of the piles. So, their surface conditions are not visual. But, judging from their conditions in the air, deterioration of piles is severe with the loss of concrete surface and exposure of reinforcement. Such deterioration is found all over the jetty.

9. The severe degree of deterioration is found especially in the beams. Concrete are lossed at the lower end of beams and the exposed reinforcement is considerably corroded.

10. The slabs of the superstructure were constructed by stone materials with the thickness of 0.2 m. At present, they are deformed and inconvenient for the traffic.

11. In the past, the jetty had been used for the train load with some 20 ton/m^2 estimated. However, as the jetty has only vertical piles it seems that the jetty was not bearable enough to the lateral forces by ships and seismicity.

(3) Open Type Jetty with Steel Piles.

12. The existing jetty was extended by adopting this type of jetty in 1955. The total length is around 51 m. The jetty has the thirteen (13) steel piles with interval of some 3 m. in a cross section. (Figure 5-6-3). The steel piles are H shaped ones. Thick rust appears along the whole length of piles. Almost a third of cross section seems to be lost due to the corrosion. Reinforcement by welding the rails to piles was worked out. Furthermore, below the splash zones, surface of piles were covered by concrete (63 cm x 63 cm). But, corrosion are still in progress, and these countermeasures are of no use.

13. The slabs and beams are slightly damaged compared to piles. But, cracks and resulting loss of concrete and exposure of reinforcement are common.

(4) Conclusions

14. The rehabilitation of the Cutuco Port was planned at the early 1970's but the project was not realized because of some reasons. So, the structures of the jetty continued to degrading significantly. In 1995, the reparation and reformation of the Cutuco Port was studied. The study proposed the followings.

1) Concrete Pile Zone.
   To repair the deteriorated concrete piles and to supply the reinforment by steel materials.
   To improve some sections in order to resist the ships and seismicity.

2) Steel Pile Zone.
   Substitution of the 99 (10 x 9) existing steel piles for 54 (6 x 9) concrete reinforced piles.
   To reinforce of transverse beams and to supply of longitudinal new beams.

15. This means the overall reconstruction. According to the study team's inspection, the severe degree of deterioration found in slabs, beams and piles alike indicates that the jetty is in a critical condition for operation.

16. Although the port facilities of the Cutuco have been maintained well, the facilities is superannuated as a whole in the lapse of time. As a result, the rehabilitation of the existing port facilities need the costs as much as the new construction. Therefore, the existing facilities should be renovated physically and functionally.

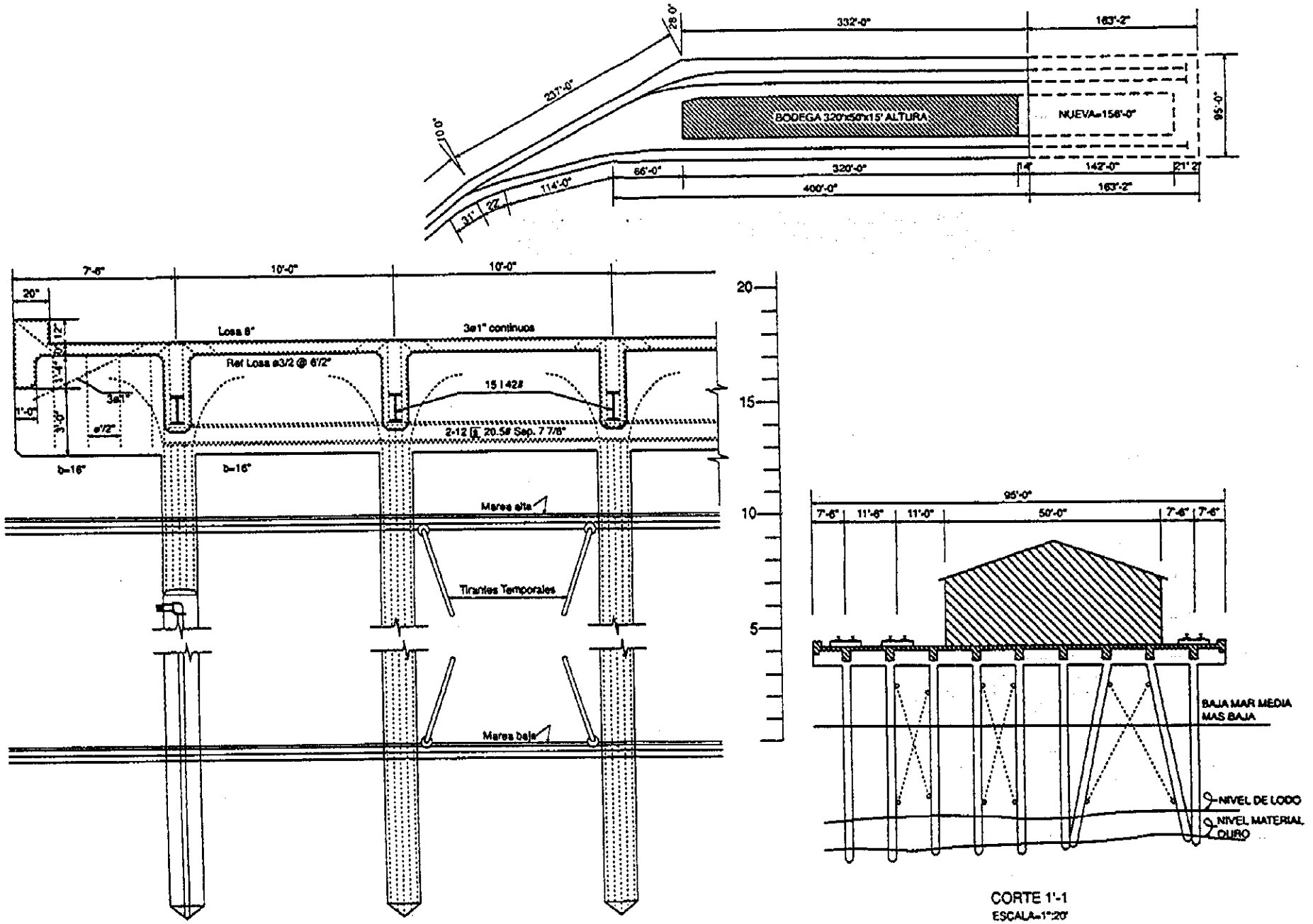
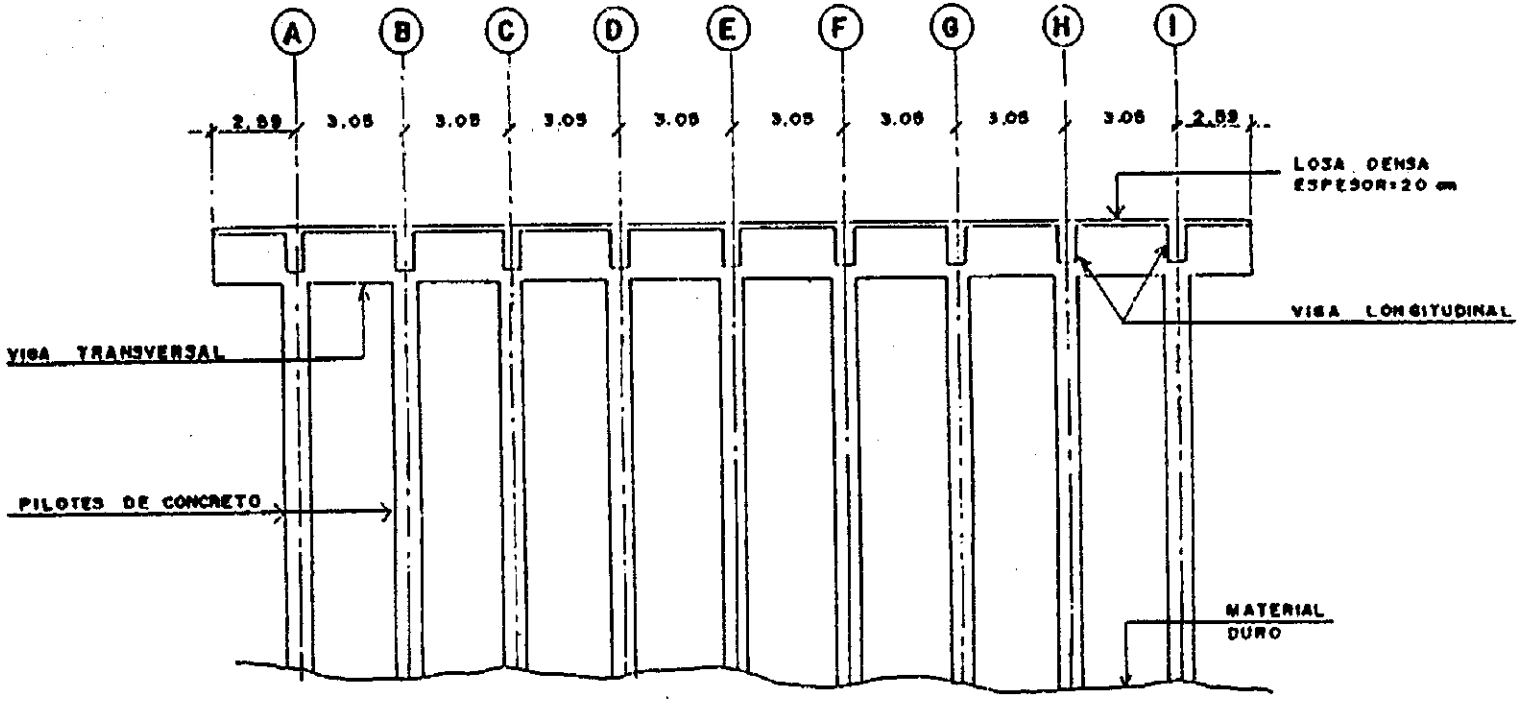


Figure 5-6-1 Design Drawings of Cutuco Port



SECCION TRANSVERSAL EN ZONA DE CONCRETO
(ZONA ANTIGUA)
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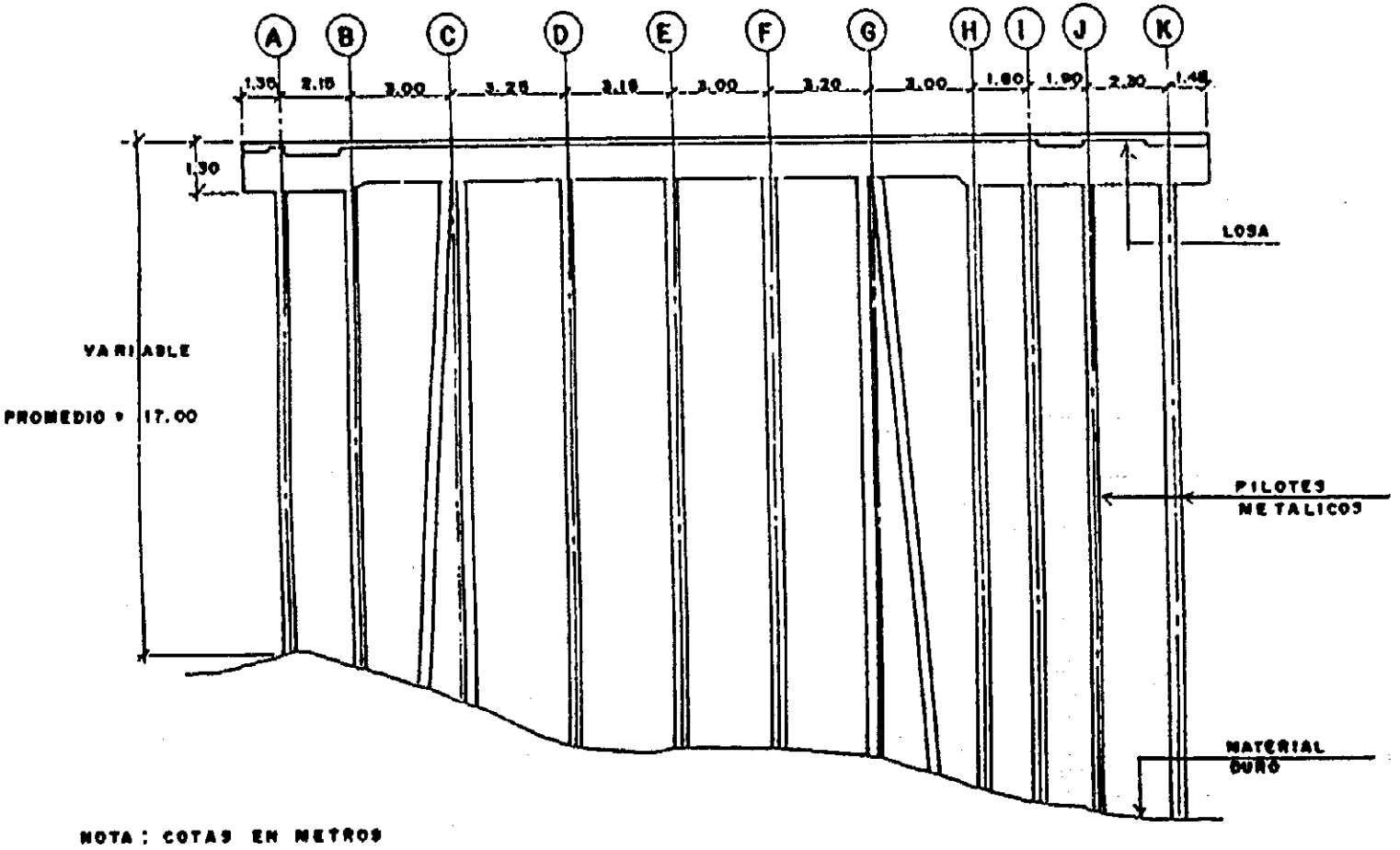
Figure 5-6-2 Cross Section of Concrete Pile Zone - Cutuco Port



SECCION TRANSVERSAL EN ZONA METALICA esc. 1:200

(ZONA NUEVA)

Figure 5-6-3 Cross Section of Steel Pile Zone - Cutuco Port.

5.7 Progress of Privatization

5.7.1 Concession in The Port of Cutuco

1. The concession covers 57 manzanas of land with 8,895.36 square varas, within which are included the dock facilities, warehouses, yards, land, offices, houses, access and perimeterial fences.

2. The concession permits the commercial activities, provided that he make concessionaire to conduct all the necessary investment, and maintains the facilities and equipment in optimum operating condition.

3. The port will provide ship service (docking, undocking and stay) and cargo handling service (mooring, loading, unloading and storage).

4. Activities or projects carried out at the Port of Cutuco should not compromise the national sovereignty of El Salvador. The concessionaire shall respect and comply with the current norms.

5.7.2 Progress of The Port of Cutuco Concession

5. Table shows the chronology of The Port of Cutuco Concession

Table 5-7-1 Chronology of the Port of Cutuco Concession

ACTIVITY	DATE
1. Checking of the reference terms by the port's committee.	September/23-30/97
2. Approval of the reference terms by the Directive team.	September/30/97 to October/7/97
3. Announcement of tender procedures in newspapers and on the internet.	October/8-10/97
4. Embassy notice.	October/9,10/97
5. Withdrawal of document for bid in CEPA.	October/6/97 to Novenber/31/97
6. Withdrawal of documents via Internet	October/6/97 to December/31/97
7. Deadline for registration as a participant to companies that withdrew reference terms via Internet.	February/27/97
8. Deadline for documents submission, clarifying or modifying reference terms.	April/10/98
9. Presentation and opening of offers.	April/30/98
10. Evaluation offers	June/15/98
11. Board of Directors Team approval to the deadline evaluation results.	June/23/98
12. Deadline for presentation to the legislative assembly the CEPA recommendation for awarding the bid.	June/30/98
13. Period for analysis by the assembly and decree emission.	July/30/98
14. Deadline decree published in the official newspaper.	August/13/98
15. Notice to participants by CEPA about results and evaluation of offers and bid awarding.	August/21/98

5.8 Future Development Plan

5.8.1 The Port of Cutuco

1. At present, CEPA intends to improve the Port of Cutuco using private finances by granting concessions. In this way the national government can use its resources in other important fields such as health and education.

2. It is said that Shell was interested in the concession, to have an oil port for a nearby power plant project. A study for this facility was completed with funds of the World Bank in the early 1990's. It is not clear if Shell is still interested in the project. The current situation will be explained later.

3. Concerning the latest concession procedure in progress as of December 1997, 10 private companies and groups bought the document for it. Their current businesses are tuna(1), shrimp(1), construction(4), shipyards(1), oil(1), finance(1), and fertilizer(1) companies. The following companies were interviewed by the Study Team;

a) The construction company which the Study Team met is one of the major international construction companies of Italy. It is studying the feasibility of the construction and operation of a new port and a highway as dry canal and/or a new pipeline connecting the Pacific and Atlantic Ocean similar to that of Panama.

b) The shrimp company showed its interest as a representative of the shrimp association of the country. Shrimp boats used to use the Port of Punta Gorda before the Port of Cutuco was closed. Since the Port of Punta Gorda started to serve cargo ships as well, shrimp boats are using the Port of Cutuco for the time being. The basic idea is to build a shrimp base with processing factories in the land area of the port.

4. (As an alternative for concession, the existing Port of Cutuco, with necessary rehabilitation, might serve for companies handling light cargoes at present who might lose their facilities because the new port construction will go on for years. In another way, it might be able to be utilized as tourism port from the viewpoints of its location close to the city and its limited loading capacity, as well.)

5. Here, the concept of the "dry canal" should be commented on. It is not highly feasible, if its function is similar to the existing Panama Canal as the pathway between the Pacific Ocean and the Atlantic Ocean,

and as long as the Panama Canal is operated smoothly after it reverts to Panama in the year 2000.

6. Significantly large amounts of daily cargo, handling and transportation (much more than several thousand boxes of containers) would be required for the port and the highway. In the case of dry bulk cargo, its unloading, transportation on land and loading seems to be more expensive than all water service via the Panama Canal by exclusive large vessel.

7. At its best, its role would be principally similar to the services which currently transport container cargo of El Salvador to/from the east coast of the U.S. and Europe via ports on the Atlantic coast of Guatemala and Honduras, or to/from the west cost of the U.S. and East Asia via the Port of Quetzal. (Needless to say, it will promote regional developments and trade. The function of "dry canal would be supplementary.)

8. That is, container cargo of El Salvador for the Atlantic could have more convenient access to the Port of Cortes, and Honduran container cargo for the Pacific Rim would have convenient access to the port of La Union instead of the Port of San Lorenzo, the capacity of which is limited now.

9. Again, the Port of Cutuco is located in the interior of the Gulf of Fonseca. The gulf is about 35 km wide and 40 km long, almost perfectly protected from the waves from the Pacific Ocean by the many islands located around the gulf entry.

10. In addition, the depth of the natural channel from the gulf entry to the port is generally more than 12 m deep, excluding the wide shallow area of a depth of 6 m between the Punta Chiquirin and the port. Therefore, compared with the ports of the neighboring countries on the Pacific side, natural conditions for a port are ideal.

11. At the very least, in order to cope with the maximum cargo volume experienced in the past, a pier of a depth of more than 7.5 m and a length of 268 m (= 152+174x2/3), equivalent to the existing pier is necessary. It is almost the same size as that of the existing pier of the Port of Punta Gorda, which is 9.5 m deep and 300 m long.

5.8.2 The Port of Punta Gorda

12. Aside from the activities explained in the previous section, CORSAIN is studying a plan to build a small marina to accommodate leisure cruiser boats which make excursions around North and South

America as part of regional development. The site is just south of the existing port of Punta Gorda.

13. In case that a new cargo port is located around the site, it might be better to relocate it to another site in such a waterfront of the town area (or the existing Port of Cutuco), from the point of view that passenger movement should be separated from cargo movement and that citizens and tourists can visit the site easily and enjoy the beautiful gulf.

14. A neighboring area around the existing Port of Punta Gorda is owned by CORSAIN. According to CORSAIN, it is able to be utilized for other purposes than CORSAIN's projects from the points of view of national or regional development.

5.8.3 Other Projects

15. Around the Port of Cutuco and the Port of Punta Gorda, a thermal power plant was planned by CEL with the assistance of the World Bank (1991 to 1995).

16. Acajutla and La Libertad were also included as possible project sites. However, they were dropped, since they face the ocean and have some problems in fuel handling. As a result, the existing site in La Union was selected.

17. There are two major alternatives related to fuel. One is an oil plant located between the Port of Cutuco and the Port of Punta Gorda, and the other is a coal plant just to the east of the Port of Punta Gorda. The coal plant was selected mainly because it offers the possibility of expansion.

18. The power plant has a capacity of 150 MW(- 450 MW). A pier of a depth of 10-12 m deep is planned in front of the coal plant for a 20,000-30,000 DWT ship. (The oil plant was supposed to utilize the existing Port of Cutuco after rehabilitation or Punta Gorda with small modifications.)

19. The construction cost is US$ 210 million. CEL has been waiting for private participation. Laws were revised in 1996 to allow private companies to invest in this field. On the other hand, the electric demand is running along the low case projected by CEL. If no one is interested in the project by the year 2005, CEL will have to make a decision, taking into consideration demand and supply, power transmission, and fuel price.

(Reference #3), the port of La Unión is included in the areas of major seismic risk in El Salvador. Based on eyewitness records, there was considerable damage to homes and other structures during recent earthquakes in the 1960's and 70's.

20. Most earthquakes sources that could affect the study appear to be related to active faults within the land area of El Salvador. Apparently, there is no historical evidence of tsunamis or tsunami related damage from the Pacific Ocean, although the subduction zone of the Cocos Plate in the Pacific Ocean parallel to the coast of El Salvador has produced many significant seismic events.

(2) Floods

21. There is no significant flood hazard in the study area.

(3) Tropical storms.

361. It appears that there is no significant storm hazard in the study area. Inhabitants report that strong windstorms are not frequent.

6. REGIONAL TREND OF INTERNATIONAL CONTAINER TRANSPORTATION

6.1 Worldwide Trend of Container Transportation

1. Worldwide maritime container demand has been increasing strongly over the past three decades. The containerization of general cargo first started in the developed countries in Europe, North America and Japan, followed by the newly industrializing countries of East Asia, and is now beginning to include the developing countries.

2. Because of growing global containerization and rising volume in trade , large vessels have been required more and more. These have placed demands on ports to continually improve their capabilities in terms of quay length and strength, gantry crane specification, berth depth and storage space. The most advanced ports are currently gearing themselves for 6,000 TEU vessels and are preparing for the possible needs of future larger vessels. Singapore, for example, is considering the possible requirements of 8,000 TEU vessels. Post-panamax container gantry cranes have become the norm and a number of ports are now investing in super-post panamax gantry cranes, capable of reaching across vessels with 18 container cells width.

3. The economic of operating large vessels require that ship calls be limited to large volume ports, and kept for a minimum length of stay. To maintain competitive, major ports have had to become very efficient investing in new technology at all stages of ports operation to rationalize, automate, and accelerate all processes.

4. At the same time, the system of port operation is being revolutionized. The concentration of mainline vessel calls at fewer major ports is creating hub- and spoke operations, with mainline vessels being served by feeder vessels from surrounding lower-volume ports.

5. The worldwide growth of maritime container market and the need to find ways of financing the heavy port investments needed to accommodate successive generations of container vessels, has led governments all over the world to increasingly depend on the private sector to provide the solutions to economic needs. The trend of privatization in the port sector has been spread through North America, Europe, East Asia, Australia and Latin America.

6. While some ports have been privatized by themselves, the increasingly popular model is the privatization of port services on long - term leases. So-called build operate transfer contracts have become

typical all over the world.
The privatization trend has given stevedore companies the opportunity to contribute their expertise around the world. This has ranged from consulting projects to building and operating container terminals.

7. The Singapore Port Authority is investing in build and management container terminal ventures in China. In America, the Seattle-based Stevedoring Service of America is part of the joint venture that is building and operating the new Manzanillo container terminal in Panama.

8. Some shipping companies are also involved in container terminal investment. P&O Australia is present in a number of developing building for the containerized trades, while Sea-Land has invested in container terminal and landbridge operations in Russia and other former Soviet republics.

9. The development of worldwide container port throughput by region is shown in Table 6-1-1 and Figure.6-1-1. It is clear that the world market for container cargo handling has expanded very rapidly with a growth of 109 percent from 1986 to 1994 representing a total throughput from 61.09 million TEUs in 1986 and 127.54 million TEUs in 1994. Growth continues in all major regions, with the most rapid development in Eastern Asia. The region has four of the world's five largest container ports.

Table 6-1-1 Worldwide Container Throughput by Region from 1986 to 1995

unit : million TEU

Region	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
East Asis	19.10	22.24	25.52	29.10	32.42	37.18	42.01	47.42	54.08	61.84
Europe	17.76	19.01	20.90	22.00	23.25	24.64	26.24	27.58	30.28	33.06
North America	13.42	14.24	15.00	16.04	16.49	16.96	17.95	18.48	20.31	21.85
Caribbean/C. America	2.68	3.01	3.06	3.28	3.56	3.08	3.42	4.59	5.05	5.39
South America	1.04	1.21	1.34	1.40	1.44	1.60	2.03	2.39	2.54	2.76
Middle East	2.32	2.36	2.48	2.70	2.90	3.71	4.37	4.77	5.10	5.40
West Asia	1.08	1.27	1.50	1.61	1.83	1.97	2.13	2.55	2.92	3.17
Oceania	1.95	2.02	2.23	2.39	2.33	2.51	2.66	2.88	3.20	3.46
Africa	1.74	1.80	2.01	2.13	2.42	2.74	3.02	3.48	4.06	4.66
Total in the world	61.09	67.16	74.04	80.65	86.64	94.39	103.83	114.14	127.54	141.59

Source : Ocean Shipping Consultants Ltd

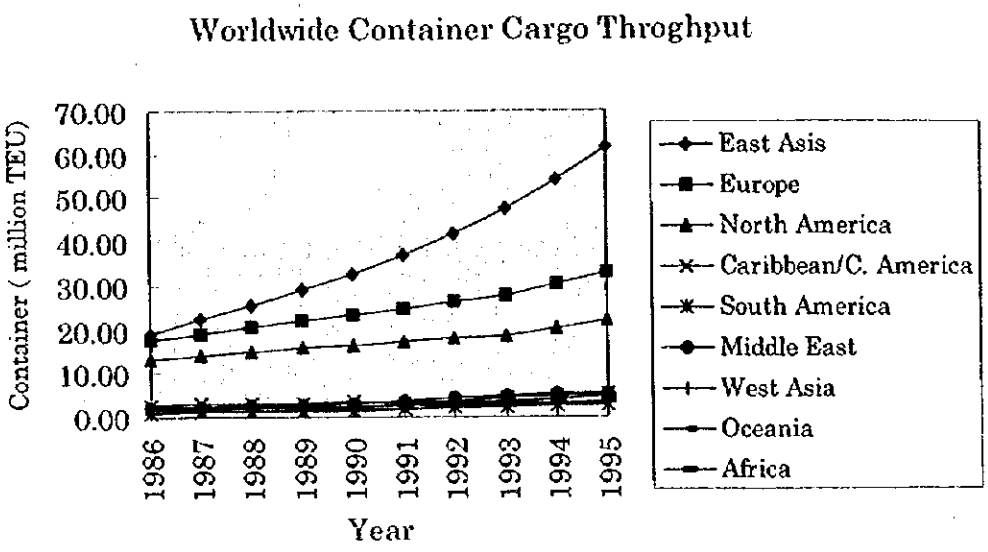


Figure 6-1-1 Worldwide Container Cargo Throughput in 1986 to 1995

6.2 Regional Trend of Container Transportation

1. The 1984 -1995 container throughput in Central America and Caribbean ports is presented in Table 6-2-1. Total container throughput in these ports expanded 117 % between 1984 and 1994, to 5.05 million TEU in 1994. Growth was steady until 1991. In 1991 there was a 13 % decrease concentrated in the Caribbean ports, and caused by the general economic downturn. Since then, however, there has been a steady increase in traffic.

2. The Caribbean is the most significant area of container port demand within this region, accounting for 2.96 million TEU or 59% of regional containers throughput in 1994. Although this is an 85% increase over the 1984 level, it represents a decline in share from 69% in 1984, as container throughput at the less developed container ports in Central America has grown faster.

3. Strong growth in throughput at ports on Central America's Atlantic coast has boosted its share of regional container volumes from 28% in 1984 to 37% in 1994. Mexico, Costa Rica and Panama are the principal markets. Their Atlantic ports moved 390 thousand TEU, 390 thousand TEU and 310 thousands TEU respectively in 1994.

4. Although the total throughput of container at ports on Central America's Pacific coast was 210 thousands TEU in 1994, there have a high potential for increase with a growth of 166% between 1984 and 1994.

Even the container revolution has only recently appeared in the region, new investments seems certain to promote considerable future growth in container traffic. The development of container throughput at ports in the range is shown in Table 6-2-2.

Table 6-2-1 Caribbean and Central America Container Throughput by Main Regions

unit : thousand TEUs

year	Caribbean	Central America Pacific	Central America Atlantic	Total
1984	1,596.8	78.9	647.7	2,323.4
1985	1,689.5	67.6	653.0	2,410.1
1986	1,855.6	83.6	735.9	2,675.1
1987	2,073.9	78.8	853.9	3,006.6
1988	2,095.0	84.4	882.3	3,061.7
1989	2,201.1	99.6	982.1	3,282.8
1990	2,340.9	114.7	1,104.3	3,559.9
1991	1,753.4	145.5	1,185.3	3,084.2
1992	1,784.6	176.2	1,461.0	3,421.8
1993	2,752.8	191.5	1,647.0	4,591.3
1994	2,961.0	209.9	1,876.3	5,047.2
1995	3,153.0	211.0	2,026.0	5,390.0

Source : Ocean Shipping Consultants ltd

Table 6-2-2 Central America Pacific Coast Container Throughput

unit : thousand TEUs

	Mexico		El Salvador	Panama
year	Lazaro Cardenas	Manzanillo	Acajutla	Balboa
1984	N.A	N.A	11.0	53.7
1985	N.A	N.A	10.8	41.8
1986	N.A	N.A	11.2	42.7
1987	9.8	N.A	13.1	18.3
1988	22.7	N.A	13.7	10.0
1989	28.3	N.A	12.4	14.1
1990	26.2	32.8	13.1	10.7
1991	39.2	41.9	12.3	12.5
1992	44.7	50.4	14.8	16.6
1993	59.6	50.9	19.2	20.8
1994	79.0	63.8	24.5	21.9
1995	80.0	65.0	25.0	22.0

Source : Ocean Shipping Consultants ltd

Note : N.A is Not Available

5. The main trend within the region has been the massive expansion of demand at Mexico ports, where volumes increased 11.5 fold between 1984 and 1994, albeit from only a few thousand TEU to 160 thousands TEU. or 78% of regional throughput. The degree of containerization is more limited than on the east coat, but there is great potential for development to match the expected growth of the Mexican economy.

6. Two ports, Lazaro Cardenas and Manzanillo, built container terminals and throughput has increased rapidly at both, but combined it considerably lower than container throughput at Veracruz on Mexico's eastern seaboard. Both have benefited from considerable investment, including the installation of gantry cranes and stacking cranes in preparation for their privatization in 1995, action which is likely to boost volumes still further.

7. At the Mexican port of Manzanillo, container throughput has grown to 64 thousands TEU in 1994. In 1995, the port acquired a private operator, a partnership between the Seattle-based Stevedoring Service of America and the Mexican shipping company Transportation Matitima Mexicana, (TMM) has ambitions to make Manzanillo a regional hub for container traffic.

8. Balboa is the largest Pacific port of Panama and located a the southern end of the Panama Canal. Container volumes declined from over 50 thousands TEU in 1984 to 20 thousands TEU in 1994. With investment concentrated at MIT on the Pacific coast on Panama, it is likely that the port will achieve greater volumes in the near future.

9. Table 6-2-3 shown container port facilities at Central America Pacific coast competitive ports.

Table 6-2-3 Container Terminal Facility Major Central American Ports

	El Salvador	Guatemala			Honduras			Nicaragua
	Acajutla	S Thomas	Quetzal	Barrios	Cortes	S Lorenzo	Castilla	Corinto
Berth								
Number	2	1	1	2	2	2	1	1
Length (m)	256	915	800	609	477	296	150	233
Draft (m)	13.5	8.8	11	7.5-9.5	10.6	9.14	10.0	13.0
Storage Area								
Warehouse (m2)	34,420	51,336	7,680		14,300	5,500	6,000	
Open (m2)	90,500	143,275			32,000	42,000	68,000	
Terminal Area (m2)	105,000	283,000			62,000		80,000	20,000
Container Yard (TEU)	2,247	7,500			2,800		2,500	
Reefer (pts)	6			250	154		190	
CFS		yes			yes			
Container Crane								
Gantry Crane			2/36t		2/45t			1/45t
Mobile Crane	1/60t	1/30t		1/20t	1/90t	1/60t	1/25t	1/15t
	1/30t				6/5-35t	1/30t	1/22t	1/8t
	1/4.75t							
	1/3t							
Stacking/Transport								
Rubber tired gantry crane								
Straddle Carrier	2/30t	6/35t						
Front lift Truck								
Terminal Tractors	7							

Source : Containerrisation International Yearbook 1997
Lloyd' Ports of the World

6.3 Current Situation of Major Ports at Pacific Side of Neighboring Countries

1. Figure 6-3-1 shows location of Ports in Central America.

6.3.1 Port of Quetzal in Guatemala

2. The Port of Quetzal is on the Pacific coast, 62 miles from the capital city of Guatemala. It is protected by two breakwater built in 1983. The length of west breakwater is 1140 m and that of east breakwater is 300 m. The design depth of channel, anchorage and berth are 12 m. The port went into operation in 1984 under the management of Empresa Portuaria Quetzal.. The Plan of Port Quetzal is shown in Figure 6-3-2.

(1) Port Facility

3. There are 3 quays; a Commercial quay, a Service quay and Fish quay. The total length of 3 quays are 1,032 m. The main wharf Commercial quay is located in the eastern part of the installation. It is multipurpose terminal 802 m length.

a) Access Channel
The access channel to the basin provides safely for vessel call. It is 210 m wide and 12 m deep.

b) Commercial Quay
802 m long and 11 m deep, the Commercial Quay handle the break bulk cargo and container cargo. It is equipped with a container crane.

c) Ro-Ro Quay
The Ro-Ro ramp is 30 m length and 25 m wide with a capacity of 100 tons.

d) Service Quay
It's length is 170 m and depth is 5 m, for small vessels

e) Fish Quay
60 m long and 2-6 m deep.

f) Warehouse
The ware house has a surface area of 7,680 m^2.

g) Maneuvering Basin
The circular basin, with a diameter of 400 m and 12 m depth, which facilities the maneuvering of the vessels

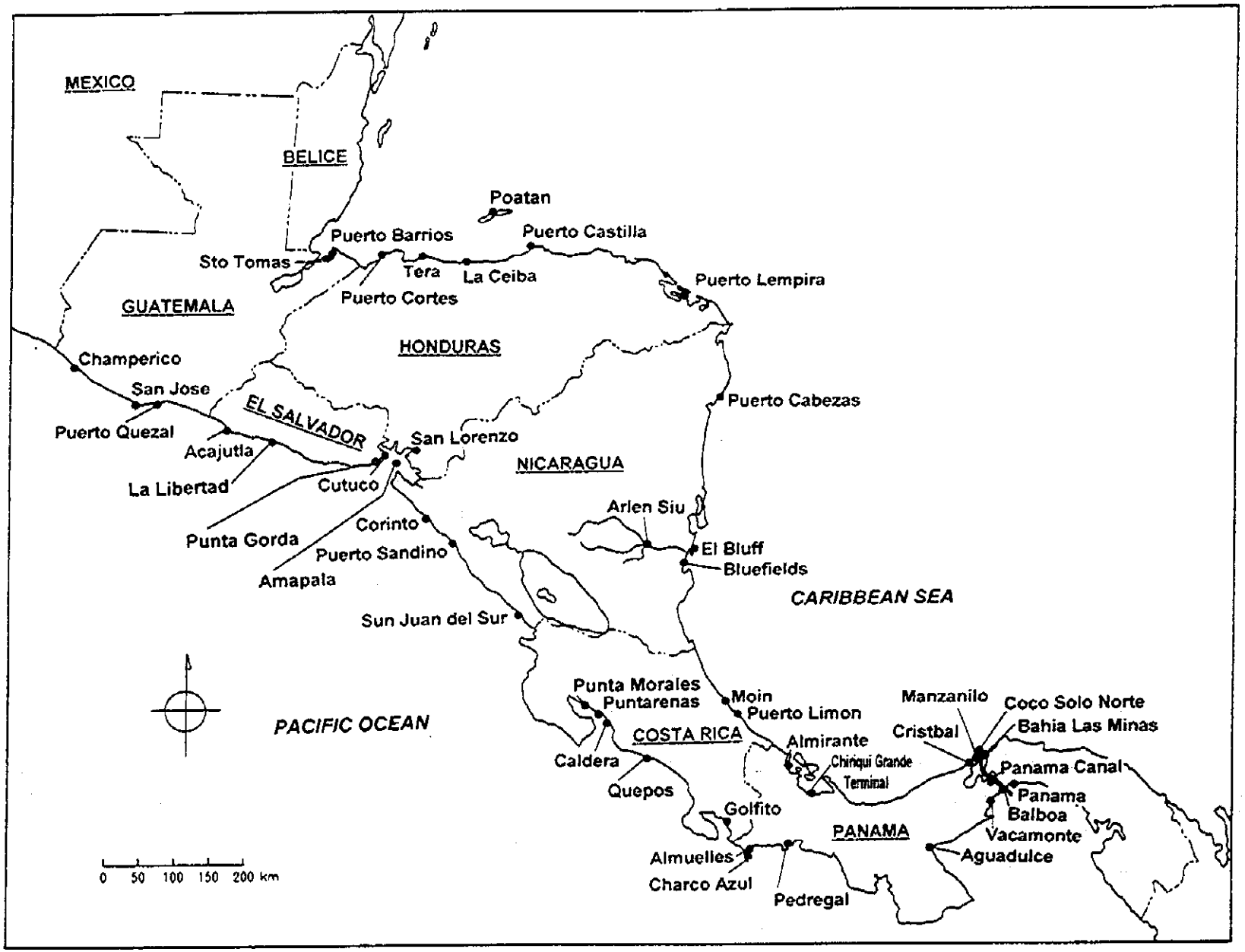


Figure 6-3-1 Location of Ports in Central America

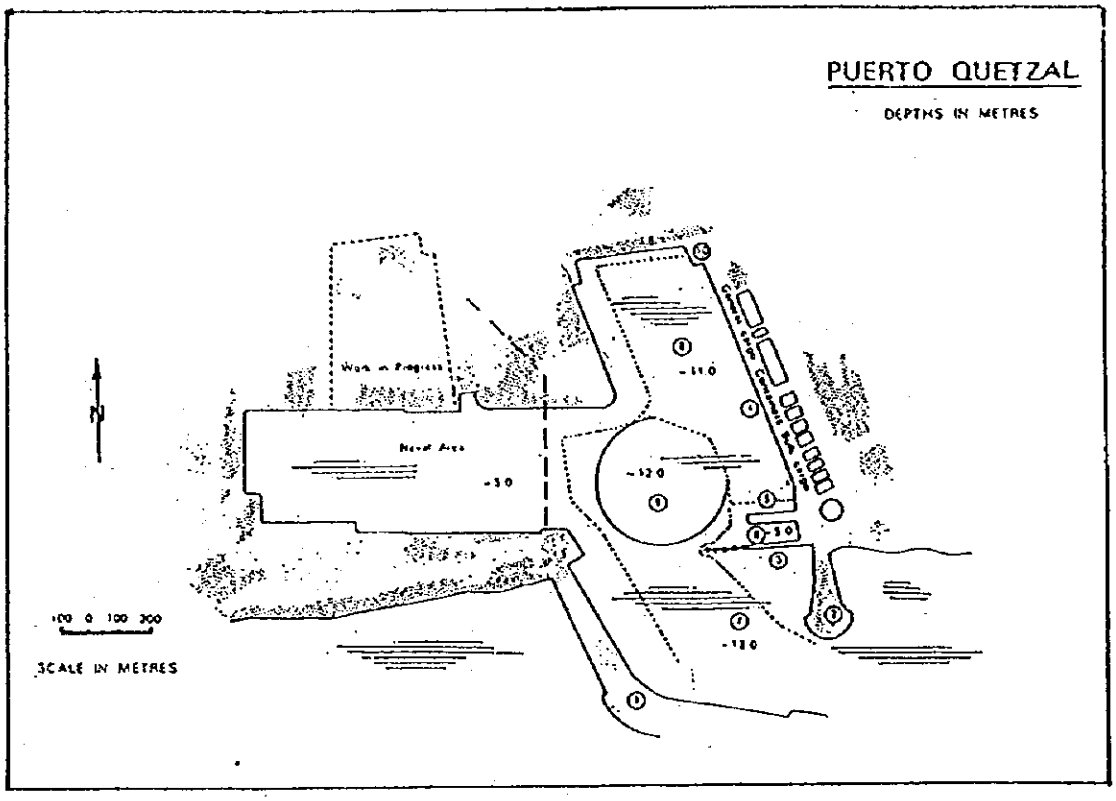


Figure 6-3-2 Plan of Quetzal Port

Table 6-3-1 Quetzal Port Cargo handling Volume Throughput by Commodity

unit : ton

year	1990	1991	1992	1993	1994	1995	1996	1997
Import								
Food	153,679	324,159	271,775	400,534	580,097	583,060	646,597	454,265
Fertilizer	254,566	340,764	291,474	343,461	413,315	351,749	295,307	408,722
Fuel	157	20	247	128,258	174,041	171,431	133,335	93,398
Iron and Steel	84,718	111,126	236,702	190,719	227,672	137,426	149,272	103,488
Industrial Material	0	0	0	0	0	0	125,476	114,172
Other	81,661	80,092	132,836	376,946	563,521	392,880	266,709	151,911
Sub Total	574,781	856,161	933,034	1,439,918	1,958,646	1,636,546	1,616,696	1,325,956
Export								
Sugar	531,861	627,533	598,418	752,664	715,182	969,444	862,643	850,833
Coffee	32,147	38,865	32,605	45,387	40,400	40,702	44,401	32,203
Sesame	3,821	8,403	5,060	5,930	9,327	12,266	10,725	19,353
Fruits	821	258	754	1,287	4,588	6,064	26,496	13,381
Food	0	0	0	0	0	0	26,687	9,951
Other	28,803	21,853	27,556	29,267	35,809	71,551	48,070	36,361
Sub Total	597,453	696,912	664,393	834,535	805,306	1,100,027	1,019,022	962,082
Transit								
Coffee	0	0	0	0	1,543	7,100	340	1,829
Industrial Material	0	0	0	0	3,792	8,320	10	336
Paper	0	0	0	0	16,471	150	1,020	0
Food	0	0	0	0	8,737	1,170	8,980	7,040
General Commodity	0	0	0	0	0	0	6,480	18,552
Other	289,004	7,444	7,795	13,892	22,759	19,940	4,869	33,086
Sub Total	289,004	7,444	7,795	13,892	53,302	36,680	21,699	60,843
Total	1,461,238	1,560,517	1,605,222	2,288,345	2,817,254	2,773,253	2,657,417	2,348,881

Source : Quetzal Port
Note : 1997 data is accumulate by July only

(2) Cargo Traffic Volume

4. It is said that the cargo handling capacity of Port Quetzal is 2,800,000 ton. In 1994, annual cargo traffic volume had reached its capacity in only 10 year since it started operation. Main import commodities are food, fertilizer, fuel, iron and steel, and industrial materials. Agricultural products are the main export commodity . Since 1993, when Sea Land shifted its container cargo operations from El Salvador's shipping port of Acajutla to Port Quetzal, volume of transit cargo has increased although it experienced a slight decrease in 1995 and 1996. The hinterland of Quetzal port is widely spread through the pacific coast of Guatemala, El Salvador, Honduras and Nicaragua, because of the high productivity and high frequency of container vessel calling. Total cargo handling volume throughput is shown in Table 6-3-1 and Figure 6-3-3. Container cargo TEU throughput in 1990 to 1995 is shown in Table 6-3-2

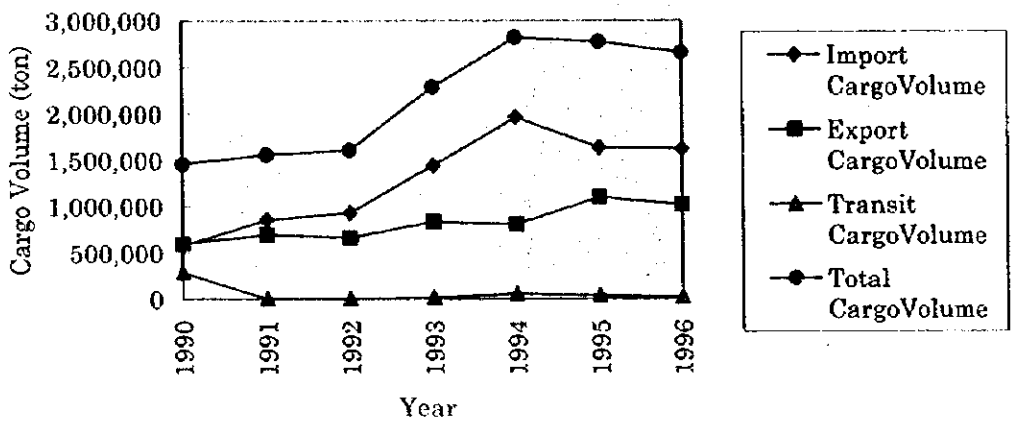


Figure 6-3-3 Cargo Handling Volume Throughput

(3) Vessel Calling

5. Total calling vessel number has stabilized in the range 600 to 640 since cargo traffic volume reached it's capacity in 1994. Calling vessel throughput in 1990 to 1996 is shown in Table 6-3-3. The trend of calling vessels by major types are as follows.

Conventional bulk vessel: The number tends to decrease
Container vessel: The number increased remarkably since 1993
Ro-Ro vessel: The number is stable.
Dry bulk vessel: The number increased remarkably since 1993.
Liquid bulk vessel: The number has fluctuated in the range of 17 to 31.

Table6-3-2 Quetzal Port Container TEU Throughput

year	Import					Export					Transit					Total	
	20'		40'		total	20'		40'		total	20'		40'		total		
	full	empty	full	empty	TEU	full	empty	full	empty	TEU	full	empty	full	empty	TEU	Number	TEU
1990	2,769	2,452	1,107	1,443	7,771	1,939	2,708	804	1,960	10,175	18,234	3,176	3,915	2,270	33,780	42,777	54,276
1991	3,099	753	1,207	312	6,890	2,087	1,803	585	750	6,560	619	231	199	79	1,406	11,724	14,856
1992	3,711	836	2,216	361	9,701	1,945	1,643	541	776	6,222	475	56	105	5	751	12,670	16,674
1993	5,040	1,108	3,068	491	13,266	2,579	2,685	941	1,686	10,518	736	315	518	46	2,179	19,213	25,963
1994	6,169	1,469	5,287	917	20,046	2,982	3,185	2,051	3,249	16,767	2,010	435	1,096	337	5,311	29,187	42,124
1995	7,684	1,292	7,894	1,272	27,308	3,526	3,953	3,669	4,634	24,085	1,429	495	724	589	4,550	37,161	55,943

Source : Quetzal Port

6. The main reason for the above trends seems to be the change of packing style from break bulk cargo to container cargo.

Table 6-3-3 Port of Quetzal Calling Vessel Throughput

year	Conventional	Container	Ro-Ro	Dry Bulk	Liquid Bulk	Other	Total
1990	200	94	34	14	4	39	385
1991	221	109	34	31	4	35	434
1992	179	129	40	31	7	37	423
1993	194	192	32	45	17	26	506
1994	236	276	35	31	17	45	640
1995	157	274	33	84	22	36	606
1996	131	301	34	101	22	46	635

Source : Quezal Port

7. Four container liner operators provide liner service between the Port of Quetzal and North America , the Far East and South America. The service frequency is shown in Table 6-3-4.. The container operator provide geared combination vessels which carry both container and break bulk general cargo. These vessels are well suited to the market which is characterized by small cargo volumes handled at numerous ports with limited container handling equipment.

Table 6-3-4 Container Liner Service

Container Liner	Frequency
NYK	4 times / month
TMM	4 times / month
Sealand & Maersk	weekly
Maruba	1 time / month

Source : Quetzal Port

8. According to the interview of shipping agents, almost 30 to 50 % of the cargo to/from El Salvador is handled in the Guatemala ports of Quetzal on the Pacific coast and Santo Thomas on Atlantic coast. From these ports to El Salvador land transportation plays an active part. Some liner operators shifted the calling port from Acajutla to Quetzal not to be affected by long term swells especially at the change of season.

6.3.2 Port of San Lorenzo in Honduras

9. The port of San Lorenzo is the only Honduran port located on the Pacific coast about 90 km south side of the capital city Tegucigalpa. The port is located in the inner recess of the Gulf of Fonseca. Vessels have to sail the 16 miles long and 300 m wide approach channel through the mangrove forest to enter the port. Because of this, ships heading for port have a rather long journey with compulsory pilotage and thus hesitate to

enter the Port of San Lorenzo. ENP (Empress Nacional Portuaria) constructed the port with financial support of the IDB and started operation in March 1979.

(1) Port Facility

10. The T-Type wharf supported by concrete piles is 297 m long and 38/25 m wide providing 4 berths. The approach trestle of the pier is 160 m long and 15 m wide, and has the same structure as that of the pier. A plan of San Lorenzo port is shown in Figure 6-3-4..

11. Detail of each berth are following.
No.1 berth is 157 m long with 10.7 m deep.
No.2 berth is 139 m long with 10.7 m deep.
No.3 berth is 116 m long with 6.7 m deep.
No.4 berth is 134 m long with 6.7 m deep.

12. There are 3 warehouse with a covered area of 9,700 m^2 and an open stock area of 34,000 m^2. A liquid tank for molasses has 1,600,000 gallons capacity and pumping equipment with capacity 81 metric tons per hour . There is no lighted navigational bouy, so the port can be entered only under day light condition. Maintenance dredging is not necessary.

(2) Cargo Traffic Volume

13. The main export items of Honduras are banana, fruits , coffee, timber and mineral products. Main imports include oil products, wheat, foodstuff, fertilizer, iron and steel. The main market for Honduran products are the U.S.(Gulf and East Coast), the Caribbean countries and Europe. Most of the activity takes place through the country's Caribbean port. Trade with the West Coast of the US and Asian countries is conducted through the port on the Pacific side.

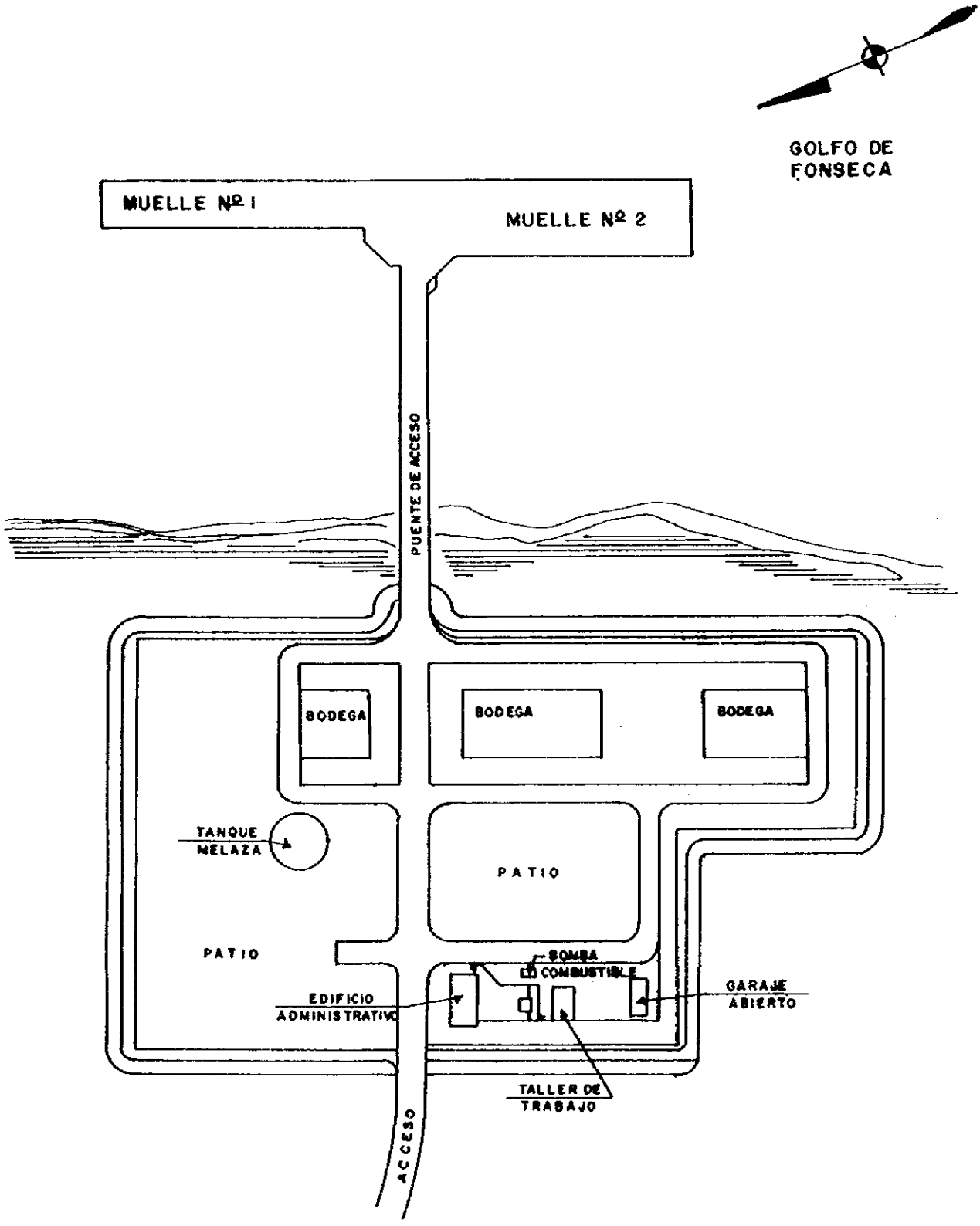


Figure 6-3-4 Plan of San Lorenzo Port

Table 6-3-5 San Lorenzo Port Cargo handling Volume Throughput by Commodity

unit : ton

year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Import										
Wheat	0	0	0	0	0	0	0	0	0	0
Food Products	492	7,687	1,077	2,700	2,998	1,177	6,972	54	1,063	61
Beverage and Tobacco	0	0	8	0	21	20	12	0	0	0
Chemicel Products	4,311	3,437	1,765	1,610	1,369	1,706	1,882	2,906	1,769	2,186
Animal and vegetable oil	0	0	0	0	0	0	0	0	0	0
Fertilizer	15,087	12,052	11,777	10,106	4,870	2,066	4,893	0	0	0
Refined oil	0	0	0	0	0	9	19,219	232,091	292,875	270,752
Iron and steel	12,835	23,283	20,541	34,717	20,665	41,207	27,316	35,046	25,946	40,630
Mchinery transportation	7,449	10,109	7,295	6,593	5,096	8,496	8,198	6,990	8,415	7,275
Paper	0	3	8	32	32	50	11	50	104	51
Other	6,396	4,727	5,254	3,015	3,772	5,411	6,353	5,634	5,706	4,337
Transit	0	0	0	0	0	0	0	0	193	0
Domestic	0	0	0	0	0	0	0	46	0	0
Foreign	0	0	0	0	0	280	208	228	55	290
Total	46,570	61,298	47,725	58,803	38,823	60,422	75,061	283,045	336,128	325,585
Export										
Meat	0	0	0	0	22	91	17	0	33	157
Banana	0	0	0	0	0	0	0	0	408	55
Caffee	0	25	209	1,668	3,561	11,934	10,564	8,466	9,081	7,009
Sugar	8,864	3,360	0	7,330	4,546	0	0	0	0	56
Tobacco	0	0	0	0	0	0	0	0	0	0
Lumber	49,456	40,588	40,466	27,997	27,833	30,909	40,300	39,054	31,625	18,695
Cement	0	0	0	1	0	0	0	0	0	0
Maiz	0	0	0	0	0	0	0	0	0	0
Mineral	0	0	0	0	0	0	0	0	0	0
Fuel	0	0	0	0	63	15,000	10,193	0	18,266	0
Molasses	9,216	5,054	6,000	5,002	5,970	7,711	6,615	10,279	0	20,421
Palm oil	0	0	0	0	0	0	0	0	0	0
Melon	0	0	61	0	0	0	0	0	0	1,387
Coconut	0	0	0	0	6	0	0	0	0	0
Grapefruit	0	0	0	0	0	0	0	0	0	0
Cotton	1,021	0	639	271	0	0	0	1	0	0
Seed	1,268	1,482	1,328	1,434	1,572	3,626	4,856	5,084	6,112	4,829
Other	0	0	137	0	0	368	933	397	1,172	1,566
Total	69,825	50,509	48,840	43,703	43,573	69,639	73,478	63,281	66,697	54,085
TOTAL	116,395	111,807	96,565	102,506	82,396	130,061	148,542	346,326	402,825	379,670

Source : ENP

14. The major trading partners for banana are the U.S and European countries. For coffee, the major trading partners are the U.S, Germany and Japan. The export volume of coffee has increased slightly. The main importers of wood are European countries, the Canary Islands, Caribbean countries and Korea. The export volume of wood shows a tendency to decrease.

15. The cargo handling volume throughput of San Lorenzo port is shown in Table 6-3-5. The port of San Lorenzo total cargo handling volume has been increasing since Petro Sur started the importing petroleum in 1993. The main export commodities are wood, coffee and molasses. The main import commodities are iron, steel, machinery, vehicles and petroleum. The importation of fertilizer stopped in 1994. Imported iron and steel are transported to Cholutaca and Tegucigalpa. The US is the main importer of molasses. Coffee is mainly exported to Japan. The hinterland of San Lorenzo port is the southern region of Honduras included Tegucigalpa.

(3) Container Cargo handling Volume

16. There are 3 ports which handle container cargoes in Honduras. They are port of Cortes, Castilla and San Lorenzo. Container cargo handled in Honduras ports has increased in volume and has expanded the country's share of the total port cargo volume in the region.

17. Container traffic is a new development at the port of San Lorenzo. Prior to 1986, there was no container traffic at the port. The first container received was recorded in 1987. Since then, container cargoes has increased and recorded 2,885 TEU in 1993. Container cargo handling volume at San Lorenzo port is shown in Table 6-3-6. The rate of empty containers is very large for import cargo and very low for export cargo.

18. The main commodity exported by container cargo is coffee and timber from Tegucigalpa and San Pedro Sula. A small amount of agricultural products from Nicaragua are also exported from here. Consumer goods is main import commodity. The peak season for container export is December to May, exclusively for coffee shipment.

19. NYK is the only container liner providing two sailings per month of 1,150 TEU feeder vessel connecting the port of San Lorenzo with Far East directly without transshipment. NYK provides the geared combination vessels which carry both container and break bulk general cargo. These vessels are well suited to the market which is characterized by small cargo volumes handled at numerous ports with limited container handling equipment.

Table 6-3-6 San Lorenzo port Handling Volume of Container Throughput

unit : TEU

year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Import										
Full	513	505	513	433	328	390	580	363	555	403
Empty	5	1	2	17	26	621	891	642	682	564
Total	518	506	515	450	354	1,011	1,471	1,005	1,237	967
Export										
Full	1	0	22	94	189	829	1,109	766	1,075	1,023
Empty	453	426	446	366	259	117	305	288	204	247
Total	454	426	468	460	448	946	1,414	1,054	1,279	1,270
TOTAL	972	932	983	910	802	1,957	2,885	2,059	2,516	2,237

Source : ENP

Table 6-3-7 San Lorenzo port Number of Vessel calling

year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Type of Vessel										
Conventional Cargo	63	69	56	49	45	44	41	34	20	14
Conventional Refrigerator	0	0	0	0	0	0	0	0	1	3
Lumber	19	13	16	11	13	15	19	18	15	7
Dry Bulk	2	1	0	2	1	2	2	0	0	0
Liquid Bulk	2	1	1	1	1	2	2	19	25	31
Container	1	0	0	2	0	30	15	22	30	31
Ro-Ro	19	29	21	26	27	8	20	28	26	24
Ballast	3	13	13	16	6	2	0	1	18	7
Total	109	126	107	107	93	103	99	122	135	117

Source : ENP

(4) Calling Vessel

20. The calling vessel throughput at San Lorenzo port is shown in Table 6-3-7. The total number of calling vessel to San Lorenzo port has fluctuated from 90 to 140 vessels. The trends of calling vessels by major types are as follows. The main reason for the above tendencies seems to be the change of packing style from break bulk cargo to container cargo.

Conventional break bulk vessel:	The number tends to decrease.
Lumber vessel:	Since 1994, the number tends to decrease.
Liquid bulk vessel:	The number increased remarkably in 1994.
Container vessel:	The number fluctuated between 15 to 30
Ro-Ro vessel:	The number has fluctuated between 20 to 30

21. Even though it is the port closet to the capital Tegucigalpa, it has the disadvantage of having a shallow and meandering access waterway from the Gulf of Fonseca, increasing the elapsed voyage time by a half day . This is not well seen on the part of shippers. The port seems to have difficulty servicing new container liner vessels (due to size)needing to expand whafrage and to deepen the long access channel. Thus, the port of San Lorenzo will most likely play its role mainly as a liquid bulk cargo port for small size oil tankers.. Taking into consideration of theses circumstance, there is considerable potential for cargo movement between southern Honduras and La Union of El Salvador, especially for container cargoes.

6.3.3 Port of Corinto in Nicaragua

22. The port of Corinto is the most important port in Nicaragua. The majority of the country's cargo is handled through this port. It is located on the island of Aserradores at the Pacific coast, in the Department of Chinandega 160 km east of Managua the capital. . Land access is by means of road. A Plan of the Port of Corinto is shown in Figure 6-3-5.

(1) Port Facility

23. The port consists of a 610 m long wharf for general cargo and container cargo, and a separate banana terminal and liquid cargo terminal.

a) General Cargo Berth
It was constructed in 1960 and supported by concrete piles. The wharf is 370m long and consists of two berth with a 9 m depth.

b) Container Cargo Berth

It was constructed in 1978. The length of berth is 240 m with a depth of 13 m . It's equipped with a 45 ton gantry crane mounted on rails.

c) Banana Terminal

This is a 100 m long jetty type wharf with 4 berthing platforms at its end. It was constructed in 1971 and located on the south side of the port.

It is used mainly in handling bananas, beef, seafood and other products that are packed in box, as this facility has conveyor belt for loading the cargo.

d) Liquid Cargo Terminal

This jetty type wharf was built in 1978 specifically to handle liquid cargo. The liquid bulk cargo terminal processes different diameter piping for the handling of molasses, oil, diesel fuel, gasoline, lubricants, chemical products and tallow. A vessel up to 25,000 DWT can berth here.

e) Warehouse

The port has 3 in-transit warehouses. One is approximately 2,300 m^2 and is used exclusively for the storage of bananas. The other two are 5,930 m^2 each and are used for the storage of general cargo, both import and export. On site there is one privately owned refrigerated warehouse with a 1,500 ton capacity and privately owned storage tanks for liquid products such as gasoline, molasses, tallow and turpentine. The port has 80,000 m^2 of outdoor storage yards of which 23,000 m^2 are dedicated to container storage. The remaining 57,000 m^2 is for storage of general cargo which does not require protection from the weather.

f) Access Channel and Maneuvering

The access channel is made up of an exterior channel and an interior channel. The exterior channel is 6,000 m long, 150 m wide and 14.6m deep. The interior channel is 3,000 m long, 90 m wide and 13.4 m deep. The maneuvering basin for container vessel is 350 m long and 300 m width. The liquid cargo maneuvering basin is 37,200 m^2 with 13.4 m depth. Maintenance dredging of the access channel takes place every 5 years and the volume of dredging reaches almost 1,000,000 m^3.

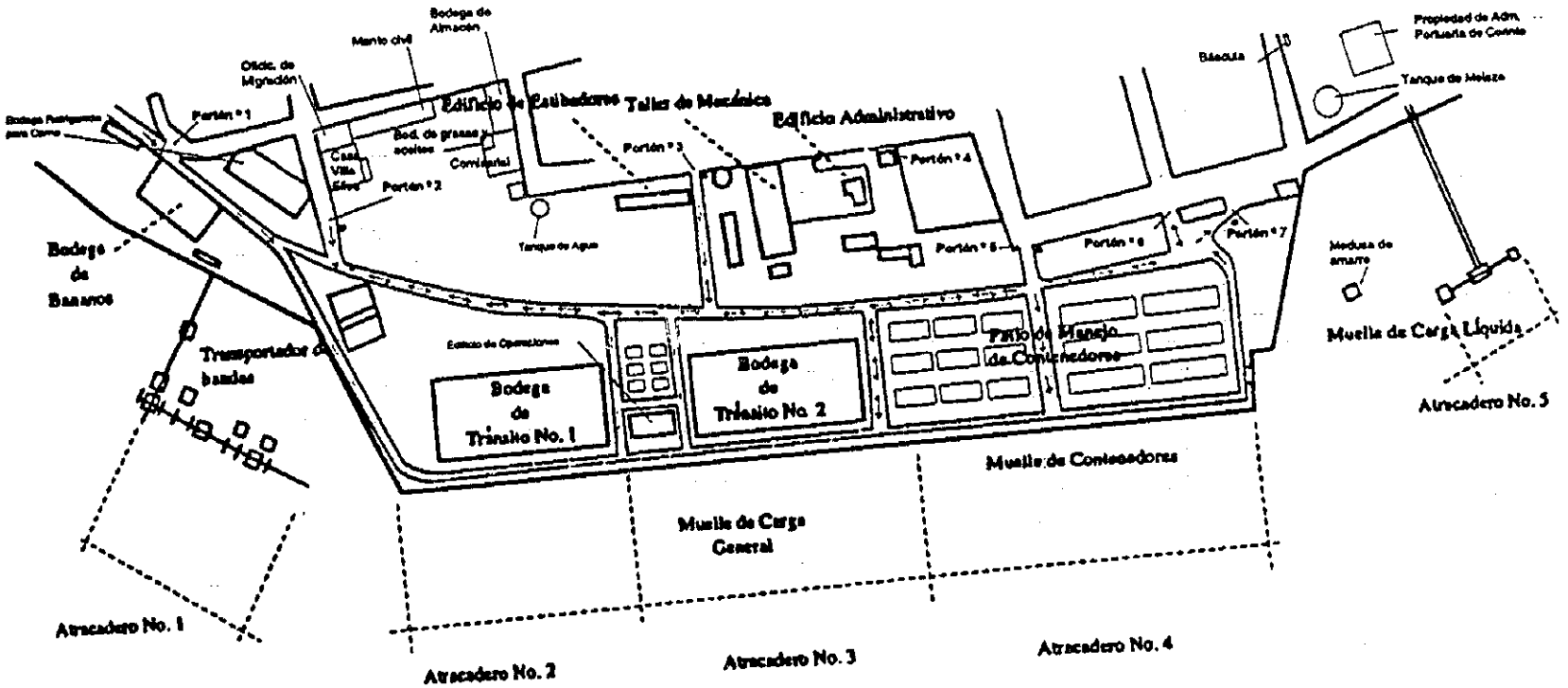


Figure 6-3-5 Plan of Corinto Port

(2) Cargo Traffic Volume

24. The main export commodities of Nicaragua are agricultural products like coffee, sesame seeds, banana, meat, sugar , tobacco, shrimp and wood. The main import commodities are industrial products and consumer goods . According to the statistics of Central Bank of Nicaragua, in 1996, the main trade partner were the U.S with a 40% share in export value and a 32% share in import value, the EU counties with 30% share in export value and a 9% share in import value and Central American countries with a 17% and 21% value respectively.

25. As to Corinto port, the main import commodities are wheat, fertilizer, general goods, manufacturing goods and petroleum. The main export commodities are agricultural products like sugar, coffee, banana and cotton. Wheat and fertilizer travel as dry bulk cargo. Autumotive vehicles travel as general goods from Japan and Mexico. Sugar is exported mainly to USA in increasing amounts. Coffee id exported mainly to European countries as container cargo. The volume of banana exports is decreasing in Corinto as the port of Cortes has increased its exports of this commodity.

26. During the Nicaraguan civil war in 1980', goods from the former Soviet Union activated the port, especially between 1983 and 1986. Total cargo volume reached more than 1,000,000 ton per year. After the war cargo volume decreased, with a recovery effective 1994. It is estimated that cargo volume will reach 800,000 tons in 1997(November 1997 showed an accumulated annual volume of 720,000 tons). Cargo handling volume throughput by commodity is shown in Table 6-3-8.

Table 6-3-8 Corinto Port Cargo Handling Volume Throughput by Commodity

unit : ton

year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Import										
Wheat	61,405	78,911	38,068	46,732	59,634	69,505	58,015	79,873	69,523	84,861
Fertilizer	77,052	128,747	78,314	24,861	71,187	24,272	32,583	64,754	55,394	58,621
Resin	1,548	813	756	3	5	3	9	78	36	0
Grain	46,164	38,821	13,103	104,205	35,373	39,675	24,956	67,035	43,638	31,660
Consumer Goods	313,770	322,039	262,085	232,409	127,833	134,121	137,862	105,036	91,636	89,350
Petroleum	185,112	158,025	52,151	39,942	8,063	11,210	18,178	36,099	97,980	111,747
total	685,051	727,356	444,477	448,152	302,095	278,786	271,603	352,875	358,207	376,239
Export										
Sugar	46,288	23,984	66,667	112,710	103,578	94,411	58,211	57,039	96,403	124,037
Banana	79,570	77,431	90,183	104,739	124,379	63,994	19,277	0	0	18,722
Coffee	37,833	31,707	34,531	36,004	22,148	34,167	2,808	33,723	28,227	32,198
Cotton	51,520	38,127	27,080	24,608	24,431	22,242	328	1	717	1,251
Meat	5,934	10,089	21,156	13,912	25	48	0	0	0	0
Sesami	2,721	2,722	2,965	4,839	5,526	3,857	5,977	3,879	2,376	662
Tobacco	148	424	220	94	65	12	0	0	6	0
Others	32,366	38,720	58,970	59,073	80,733	68,429	48,175	56,745	78,643	63,726
total	256,380	223,204	301,772	355,979	360,885	287,160	134,776	151,387	206,372	240,596
Total	941,431	950,560	746,249	804,131	662,980	565,946	406,379	504,262	564,579	616,835

Source : NAP

(3) Container Cargo Volume

27. Container volume throughput is shown in Table 6-3-9. Both container cargo volume and total TEU have been decreasing. Container cargo is mainly used for the export of coffee and agricultural products and for the import of consumer goods and textile industry raw materials for use in Free Zone.

Table 6-3-9 Corinto Port Container Cargo Volume Throughput

	Number of Container Box			Container Cargo Volume (ton)		
year	20'	40'	Total TEU	Import	Export	Total
1985	8,371	928	10,227	50,427	18,148	68,575
1986	10,167	771	11,709	54,435	17,218	71,653
1987	10,585	477	11,539	57841	20,941	78,782
1988	9,871	947	11,765	50,271	23,936	74,207
1989	9,066	929	10,924	48,870	24,632	73,502
1990	4,812	609	6,030	36,322	59,504	95,826
1991	809	726	4,261	16,226	17,471	33,697
1992	2,567	828	4,223	19,700	20,564	40,264
1993	2,655	532	3,719	13,235	21,019	34,254
1994	3,767	495	4,757	17,266	30,532	47,798
1995	3,183	318	3,819	10,392	21,717	32,109
1996	2,208	303	2,814	11,280	19,386	30,666

Source : NAP

28. TMM provide liner service every 14 days Southbound only from Manzanillo to Puerto Caldera. Because of this, export cargo container volume has not increased. The textiles processed in the Free Zone are shipped as container cargo to the Port of Quetzal in Guatemala. Container cargo from/to Nicaragua has been shifted from Corinto to the port of Cortes in Honduras which has a high frequency of vessel callings.

(4) Calling Vessel

29. In 1995 total 114 vessels called and handled 564,579 tonnage of cargo. In November 1997, 189 number of vessels had called. The container operator uses geared combination vessels which carry both container and break bulk general cargo. These vessels are well suited to the market which is characterized by small cargo volumes handled at numerous ports with limited container handling equipment.

(5) Development Plan

30. A report prepared by a US consultant in 1993on the study rehabilitation and modernization of the port of Corinto was submitted to the Nicaraguan Ministry of Construction and Transport. According to the

study , by the year 2010 total cargo handling volume at Corinto port will reach 673,000 tons, 1,400,000 tons and 2,500,000 tons respectively in a low, medium and high economic growth scenario. Planned actions include deepening the access channel and rehabilitating the berths.

31. With slow economic recovery of Nicaragua, the economic prospect of port hinterland is discouraging. Only agricultural products may be shipped from Corinto as they may not be able to bear the high cost of transportation to another port. As a consequence of stagnant national economy, Corinto has enough cargo handling capacity left over. Therefore, even if the economy of Nicaragua turns around and improves, little potential cargo movement by land transportation is foreseen between Nicaragua and La Union of El Salvador.