3.0 AFFECTED ENVIRONMENT

This chapter describes the actual physical and socioeconomic environment of the project area near the Port of Ponce.

3.1 Introduction

This section describes the existing environmental resources of the areas near the Port of Ponce that would be affected if the Applicant's Preferred Alternative for the development of the PTA is implemented, but limited to those environmental resources that are relevant to the proposed action. The DEIS for the Project published in 2002 includes a detailed analysis of the existing natural resources in the vicinity of the Guayanilla Bay, where the Applicant previously proposed the location for the main elements of the Project. Although one of the alternatives to the Project considered in this SDEIS is the Guayanilla Bay area, readers interested in additional details on the physical and socioeconomic environment of that area are referred to the published DEIS. This section focuses on the Ponce Bay area and the Applicant's Preferred Alternative.

The descriptions include a general overview of the environment of the region, and details of those environmental resources that would be affected by any of the alternatives if they were implemented. In conjunction with the description of the No-Action Alternative, this section provides baseline conditions for determining the environmental impacts of the proposed action and the alternatives considered by the Applicant for its implementation.

3.2 General Environmental Setting

3.2.1 Climate

The climate of the region where the PTA is proposed is typical of the subtropical-dry climatic zone of the south coast of Puerto Rico, as defined by National Oceanic and Atmospheric Administration (NOAA). Average temperatures in the region generally exceed 85 degrees Fahrenheit, while average rainfall is only 31-40 inches per year, as compared to the island average of 76 inches.

3.2.1.1 Temperature and Precipitation

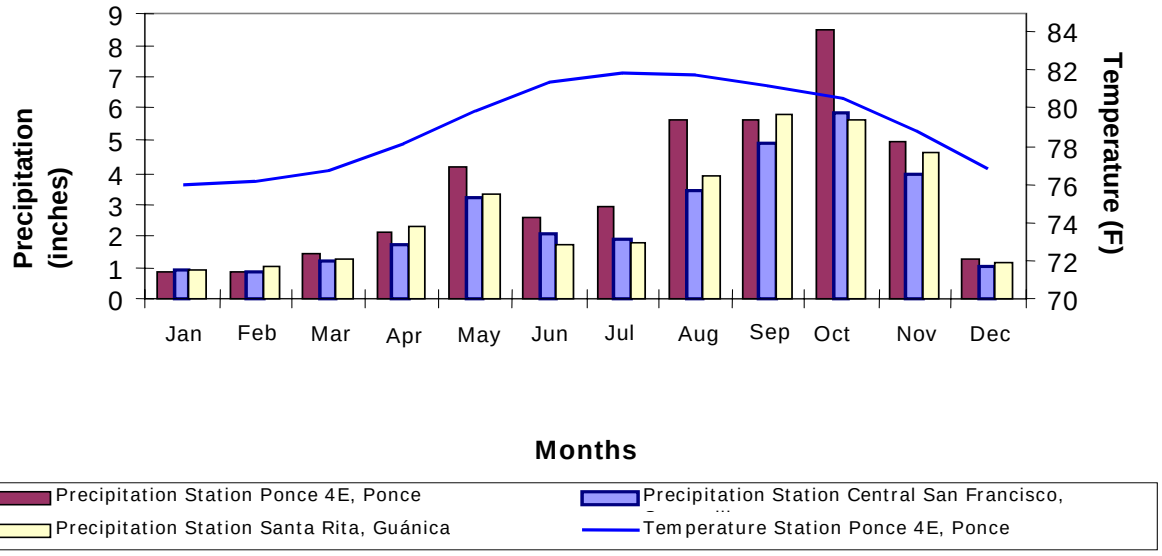
The project area is located in the South Coast Climate Province as defined by the National Oceanic and Atmospheric Administration (NOAA), as is characterized by warm and semi-dry conditions. NOAA divided the Island in climate provinces according to their climatologic characteristics, including temperature. For each of these provinces, the average temperature and rainfall are calculated using data from stations that register these parameters on a daily or continuous basis. NOAA operates 3 climate stations in the project area.

The data from these stations show that temperatures of the south coast region vary throughout the year in a manner similar to the other coastal regions of the Island, decreasing slightly from September through April, and increasing with the summer months. In this region, monthly average temperatures range throughout the year from to 76 to 82 degrees Fahrenheit. Daily fluctuations range from 75 to 98 degrees Fahrenheit.

In Puerto Rico, precipitation varies by season and area. The area variations are due to combinations of topographical traits and prevailing easterly winds. The annual precipitation average varies from less than 40 inches in the southwestern coast to more than 200 inches in the mountainous region of the El Yunque Rain Forest, on the eastern coast near Fajardo. The

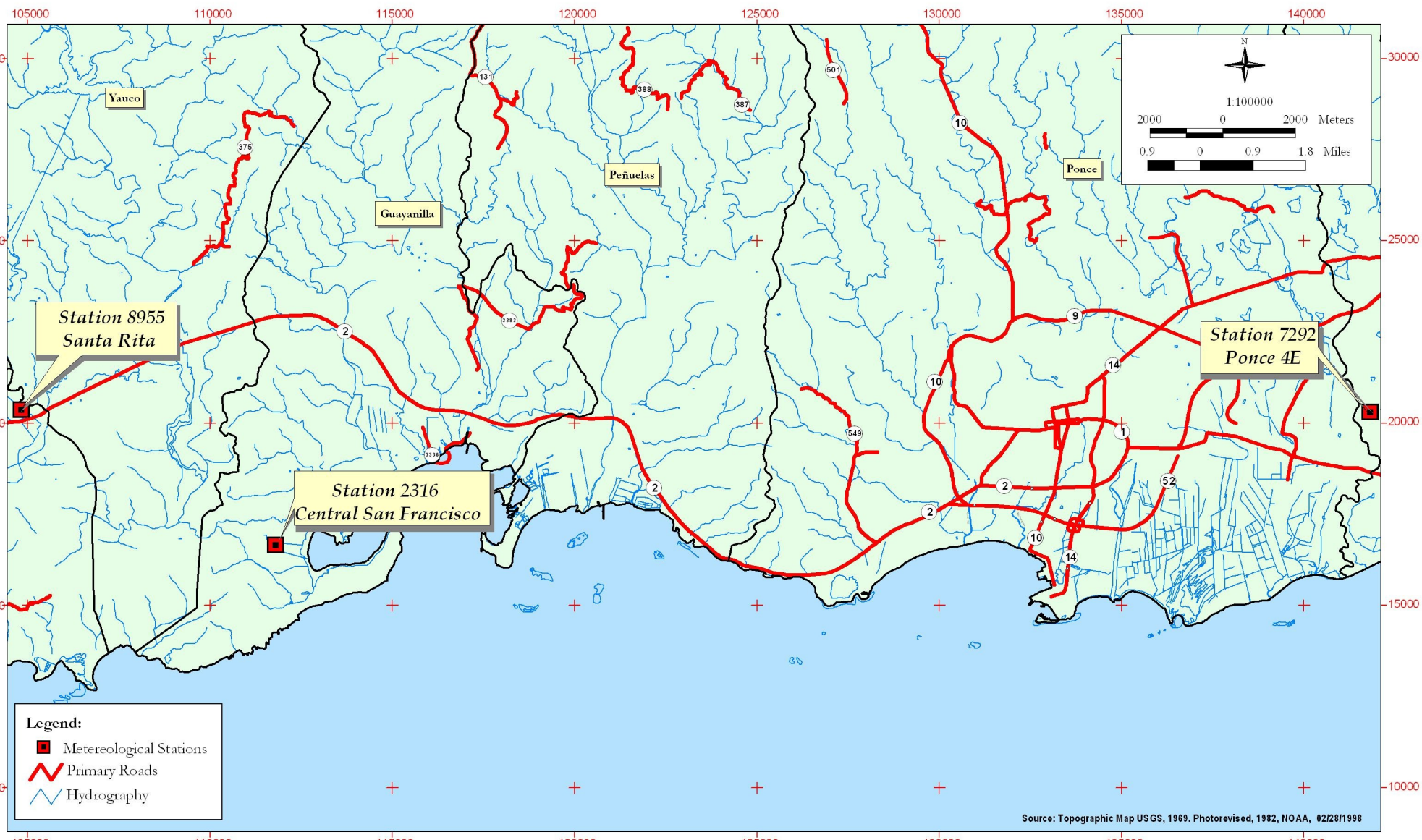
dry season begins in December and ends in March or April, and is followed by a rainy season that extends from April to May. During June until mid-August there is a reduction in precipitation, immediately followed by a rainy season until November, during which 50 percent of the annual precipitation occurs (USGS, Hydrologic Investigations Atlas 730, 1997).

Average annual precipitation within the project area ranges from 31 to 40 inches. Values of the normal, monthly and annual precipitation and temperature at the meteorological stations in the project area are summarized in Table 3-1 and Figure 3-1. These stations include the Central San Francisco station at Guayanilla, Ponce 4E station at Ponce and Santa Rita station at Guánica (Figure 3-2). The normal values represent average statistics for climatic data such as precipitation and temperature, for a specific period of time. NOAA utilizes a 30-year period to calculate normal precipitation and temperature values. The period changes at the end of each decade to reflect the most recent 30-year period. The current normal values represent the time period from 1961 to 1990, since the data for 2000 is not published yet.



Source: NOAA, 1992

Figure 3-1: Normal Precipitation and Temperature at Stations near the project area, for 1961-1990



Coordinates in State Plane NAD 27

Figure 3-2. Location of the Selected Meteorological Stations in the Study Area

Port of the Americas

Puerto de Las Américas
PUERTO RICO

Table 3-1: Normal Precipitation and Temperature (1961-1990) at Climatic Stations near the Project Area (South Coast Climate Province)

	Station Central San Francisco Guayanilla (NOAA # 2316)		Station Ponce 4E Ponce (NOAA # 7292)		Station Santa Rita, Guánica (NOAA # 8955)	
Month	**Precipitation (inches)**	**Temperature (˚F)**	**Precipitation (inches)**	**Temperature (˚F)**	**Precipitation (inches)**	**Temperature (˚F)**
January	0.93	NA	0.85	76.0	0.94	NA
February	0.85	NA	0.84	76.2	1.05	NA
March	1.18	NA	1.44	76.7	1.27	NA
April	1.70	NA	2.12	78.1	2.25	NA
May	3.20	NA	4.15	79.9	3.30	NA
June	2.02	NA	2.55	81.4	1.70	NA
July	1.90	NA	2.93	81.9	1.74	NA
August	3.39	NA	5.68	81.8	3.87	NA
September	4.87	NA	5.69	81.2	5.80	NA
October	5.88	NA	8.51	80.5	5.67	NA
November	3.97	NA	4.97	78.9	4.63	NA
December	1.09	NA	1.25	76.8	1.15	NA
Annual	**30.98**	**----**	**40.98**	**79.1**	**33.37**	**----**

NA – Not available

Source: NOAA. (1992). Station Monthly Normal Temperature, Precipitation and Heating and Cooling Degrees Days 1961 – 1990.

3.2.1.2 Winds

During most of the year, wind circulation in the Caribbean Sea and Puerto Rico is dominated by the trade winds that blow from east to west. These winds originate in high-pressure systems in the vicinity of the Azores Islands, west of the African continent. In the mountainous sectors of Puerto Rico, orogenic effects, such as hills, cliffs and elevated terrain, induce the acceleration or shifting of the direction of the trade winds. However, along the coast line the orographic influence exerted on the trade winds is mild. In general, the prevailing winds in Puerto Rico, including the south coast region and the areas of the Project, are predominately easterly.

An important trait of coastal areas is the temperature adjustment due to the trade winds, caused by the daily ocean and land breezes that form at the coast. Ocean breezes form when the air over the coastal plain is warmer than the air over the ocean. This phenomenon occurs from early morning to late afternoon on days when the land surface is sufficiently warm. During daytime, this heat expands the air and lowers pressures above land to a lesser degree than the ocean. Since air above land flows from higher pressures to lower pressures, an ocean breeze develops. At the higher levels in the atmosphere, the flow inverts, from land to the sea, maintaining the ocean breeze circulation. In the south coast region, the ocean breeze flows northerly most of the time.

The ocean breeze continues to circulate inwardly until the land friction or the prevailing wind flow compensates for the inflowing breeze. The ocean breeze will only weaken or cease to flow when the solar radiation is diminished at sunset or when clouds, stimulated by the ocean breezes, act as shields against the sunrays. The land breeze develops during the night when the difference in the land air temperature and the ocean is inverted. Therefore, the typical pattern during daytime hours is a constant wind flowing from the ocean inland, and at sunset the wind will change direction and flow from land out to sea.

Long-term wind characteristics in the project area, including direction and velocity, are collected at the Tallaboa Meteorological Station operated by the Puerto Rico Electric Power Authority (PREPA). Similar data are also available at the Magueyes station near Mayagüez. The Tallaboa Meteorological Station, located at approximately 0.93 miles (1.5 km) from the Guayanilla-Peñuelas study area and 7.39 miles (11.9 km) from the Port of Ponce, is more representative of the project area than the Magueyes site. The meteorological station measures the wind at elevations at 33 and 250 feet above the land surface. The data registered at this station during the period of January to December 1997 are presented in Table 3-2 and Table 3-3. The wind rose data presented for this station (Figure 3-3, Figure 3-4 and Figure 3-5) shows that the prevailing winds are from the northeast and east-northeast at the indicated elevations of 33 and 250 feet above land, respectively. The average wind velocity is 6.1 and 11.2 miles per hour (MPH) (5.30 and 9.73 knots, respectively) at the indicated elevations.

Stability of the wind patterns is one of the measures of atmospheric disturbances, expressed into three categories: stable, neutral and unstable. A plume of a contaminant would have a greater dispersion under unstable conditions, while under stable conditions it would have a smaller dispersion. Data are available on the stability of the wind at the PREPA meteorological station at Tallaboa (Peñuelas), for the period between 1989 and 1993 (Federal Energy Regulatory Commission, 1996). A frequency analysis of the data on the different stability degrees for this period at the station shows that the wind is generally stable or neutral with very few hours of unstable or extremely unstable conditions.

Table 3-2: Wind Velocity, Direction and Occurrence Data for the Tallaboa Meteorological Station (Elevation 250 Feet above Land)

Direction	Velocity (mph)						Observation Totals by Wind Direction	Average Velocity by Wind Direction	Percentage of Occurrence by Wind Direction
	0.75-3	3-7	7-12	12-18	18-24	> 24			
N	9	33	4	0	0	0	46	4.3	0.525
NNE	10	145	92	19	2	0	268	7.1	3.060
NE	18	495	202	27	2	0	744	6.5	8.495
ENE	12	951	1,425	51	1	0	2,440	7.6	27.860
E	10	231	942	465	35	1	1,684	10.4	19.228
ESE	3	55	315	528	329	53	1,283	15.1	14.649
SE	8	21	115	405	611	131	1,291	18.2	14.741
SSE	2	20	152	404	109	2	689	14.3	7.867
S	3	26	56	7	0	0	92	8.3	1.050
SSW	5	20	14	1	0	0	40	6.2	0.457
SW	3	8	15	6	0	0	32	8.7	0.365
WSW	3	5	4	5	7	7	31	15.0	0.354
W	8	13	8	5	4	0	38	8.2	0.434
WNW	4	11	7	5	0	0	27	7.8	0.308
NW	4	10	5	7	0	0	26	7.5	0.297
NNW	6	10	3	1	0	0	20	5.0	0.228
Observation Totals by Observation Range	108	2,054	3,359	1,936	1,100	194			
Average Velocity by Velocity Range	2.3	5.7	9.1	14.7	20.5	25.5		11.2	
Calm									0.080
Percentage Total									**100.000**

Source: Puerto Rico Electric Power Authority, 1997
Notes: Total Number of Occurrences: 8,758
Number of Hours that data was lost: 2

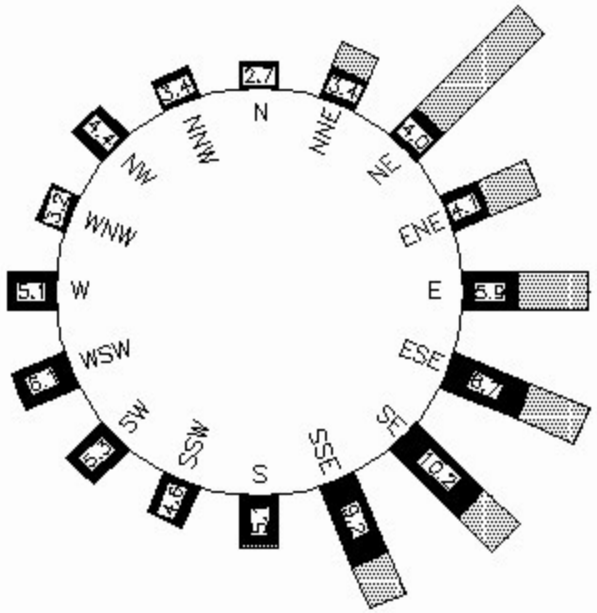
Table 3-3: Wind Velocity, Direction and Occurrence Data for the Tallaboa Meteorological Station (Elevation 33 Feet above Land)

Direction	Velocity (mph)						Total Observances by Wind Direction	Average Velocity by Wind Direction	Occurrence Percentage by Wind Direction
	0.75-3	3-7	7-12	12-18	18-24	>24			
N	25	7	2	0	0	0	34	2.7	0.388
NNE	207	273	7	0	0	0	487	3.4	5.563
NE	359	2,307	15	0	0	0	2,681	4.0	30.623
ENE	146	851	23	0	0	0	1,020	4.1	11.650
E	66	871	373	6	0	0	1,316	5.9	15.031
ESE	16	288	770	125	0	0	1,199	8.7	13.695
SE	9	99	570	245	0	0	923	10.2	10.543
SSE	7	121	635	71	0	0	834	9.2	9.526
S	11	79	9	0	0	0	99	5.1	1.131
SSW	8	27	6	0	0	0	41	4.6	0.468
SW	7	16	4	2	0	0	29	5.3	0.331
WSW	5	9	9	0	0	0	23	6.1	0.263
W	6	9	7	0	0	0	22	5.1	0.251
WNW	9	6	0	0	0	0	15	3.2	0.171
NW	3	9	0	0	0	0	12	4.4	0.137
NNW	6	8	0	0	0	0	14	3.4	0.160
Observation Totals by Velocity Range	890	4,980	2,430	449	0	0			
Average Velocity by Velocity Range	2.4	4.6	9.3	13.1	0	0		6.1	
Calm									0.069
Percentage Total									**100.000**

Source: Puerto Rico Electric Power Authority, 1997
Notes: Total Number of Occurrences: 8,755
Number of Hours that data was lost: 5

VELOCITIES	
RANGES	AVERAGE VELOCITY (M.P.H)
0.75–3	2.4
3–7	4.6
7–12	9.3
12–18	13.1
18–24	0
> 24	0

OCCURRANCE PERCENTAGE	
DIRECTION	PERCENTAGE
N	0.388
NNE	5.562
NE	30.622
ENE	11.650
E	15.031
ESE	13.695
SE	10.542
SSE	9.525
S	1.130
SSW	0.468
SW	0.331
WSW	0.262
W	0.251
WNW	0.171
NW	0.137
NNW	0.160
CALM	0.068



LEGEND:

AVERAGE VELOCITY
OCCURRENCE PERCENTAGE

OBSERVATION PERIOD
FROM JANUARY 1, 1997 TO DECEMBRE 31, 1997

SOURCE:
PUERTO RICO ELECTRIC POWER AUTHORITY

TALLABOA METEOROLOGICAL STATION
(ELEVATION IN THE TOWER 250 FEETS)

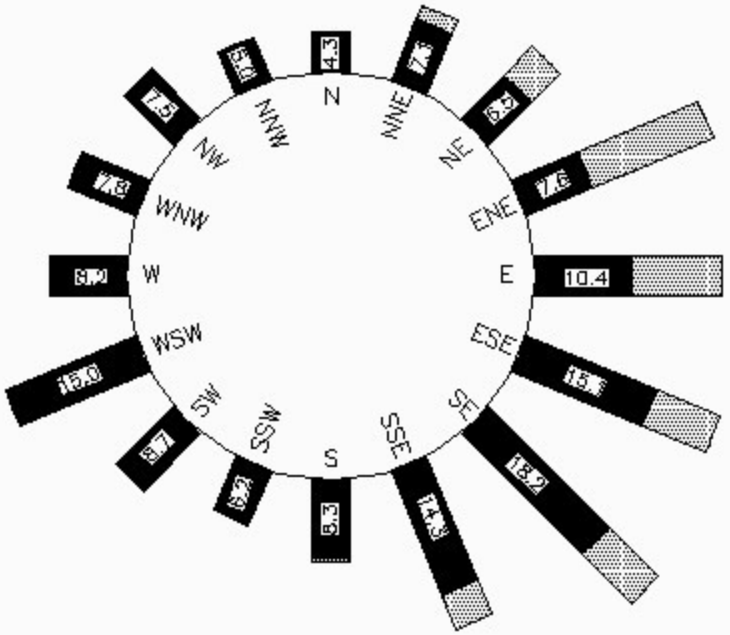
Figure 3-3 Ponce Wind Rose

Port of the Americas

Port of The Americas
PUERTO RICO

VELOCITIES	
RANGES	AVERAGE VELOCITY (M.P.H)
0.75–3	2.3
3–7	5.7
7–12	9.1
12–18	14.7
18–24	20.5
> 24	25.5

OCCURRANCE PERCENTAGE	
DIRECTION	PERCENTAGE
N	0.525
NNE	3.060
NE	8.495
ENE	27.860
E	19.228
ESE	14.649
SE	14.740
SSE	7.867
S	1.050
SSW	0.456
SW	0.365
WSW	0.353
W	0.433
WNW	0.308
NW	0.298
NNW	0.228
CALM	0.080



LEGEND:

AVERAGE VELOCITY

OCCURRENCE PERCENTAGE

OBSERVATION PERIOD
FROM JANUARY 1, 1997 TO DECEMBRE 31, 1997

SOURCE:
PUERTO RICO ELECTRIC POWER AUTHORITY

TALLABOA METEOROLOGICAL STATION
(ELEVATION IN THE TOWER 33 FEETS)

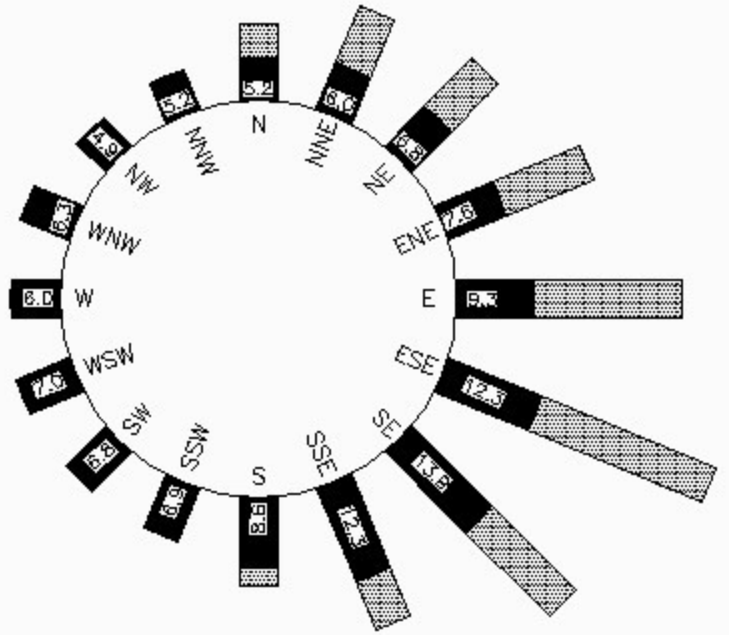
Figure 3-4 Ponce Wind Rose

Port of the Americas

Port of The Americas
PUERTO RICO

VELOCITIES	
RANGES	AVERAGE VELOCITY (M.P.H)
1–3	0.3
4–6	1.5
7–10	2.1
11–16	2.7
17–21	1.5
> 22	0.3

OCCURRANCE PERCENTAGE	
DIRECTION	PERCENTAGE
N	4.0
NNE	7.4
NE	8.1
ENE	11.4
E	18.1
ESE	22.8
SE	14.3
SSE	6.3
S	2.3
SSW	0.7
SW	0.4
WSW	0.4
W	0.4
WNW	0.4
NW	0.5
NNW	0.9
CALM	1.6



LEGEND:

AVERAGE VELOCITY

OCCURRENCE PERCENTAGE

OBSERVATION PERIOD
FROM 1902 TO 1992

SOURCE:
PUERTO RICO AND VIRGINS ISLANDS
CLIMATOLOGICAL CENTER

PONCE METEOROLOGICAL STATION 785203
(ELEVATION IN THE TOWER 30 FEETS)

Figure 3–5 Ponce Wind Rose

Port of the Americas

Port of The Americas
PUERTO RICO

3.2.2 Land Uses and Zoning

Land uses in the project area are predominately industrial, with parcels of wetlands adjacent to the areas proposed for value-added activities near the Port of Ponce. Although residential areas are located near both ports, none of these areas would be directly affected by the alternatives proposed by the Applicant. Land uses in Puerto Rico and the project areas are regulated by the Planning Board and by individual municipalities whenever they are delegated zoning management as part of the Autonomous Municipalities Law of 1980. Overall land use data for the island and the project areas is based on a combination of a map published by the Planning Board in 1977, supplemented by aerial photographs and local information. In the Ponce area, the municipal government adopted a Territorial Plan where zonings were assigned to each parcel of land, including the areas of the Port of Ponce and its vicinity.

3.2.2.1 Ponce Area

Under the preferred alternative of the Applicant, the major components of the Project would be located within the jurisdiction of the Municipality of Ponce. The land uses for the selected site at the Playa Ward in Ponce are primarily industrial. The site is associated with the operations of the Port of Ponce, the second largest dry cargo commercial port in Puerto Rico and includes various storage areas, structures that house different companies that use the port facilities and a scrap iron collection/pick up area. North of the site are two open areas, one is a grassland area and another in which wetlands were identified.

Land Uses: The land located in the vicinity of the Port of Ponce has diverse uses, and includes recreational, hotel and residential parcels (Figure 3-6). The Ponce Hilton Hotel and Villa del Carmen, a large residential development, are located north of the site. The Caribbean Sea and the residential areas of the Playa Ward are located to the west of the site. South of the grasslands within the proposed site, are several warehouses rehabilitated for other uses, including car and equipment repair shops and a cardboard recycling facility. Some of these buildings are abandoned.

The Puerto Rico Planning Board approved and adopted on October 28, 2002 the Land Use Plan for the Autonomous Municipality of Ponce. The Municipality of Ponce, by means of its Master Plan, established the mechanism by which appropriate uses are determined for all municipal land and its adjacent islands. An integral master plan for the totality of municipal land was defined with the fundamental elements for the plan, a work plan, and divided the totality of the land in three basic land use categories: urban, development and rustic.

The Municipality of Ponce Action Program, approved in 1992, identifies the Port of Ponce as one of the areas to be developed with the goal of maximizing its available space, as well as increasing its loading and unloading capacity. The program proposes to reconstruct the existing piers, install a new loading crane, and construct a 2,200 feet long tourist pier, regulate the loading and unloading areas, and the expansion of the port area. For this purpose, the port area was classified as urban land.

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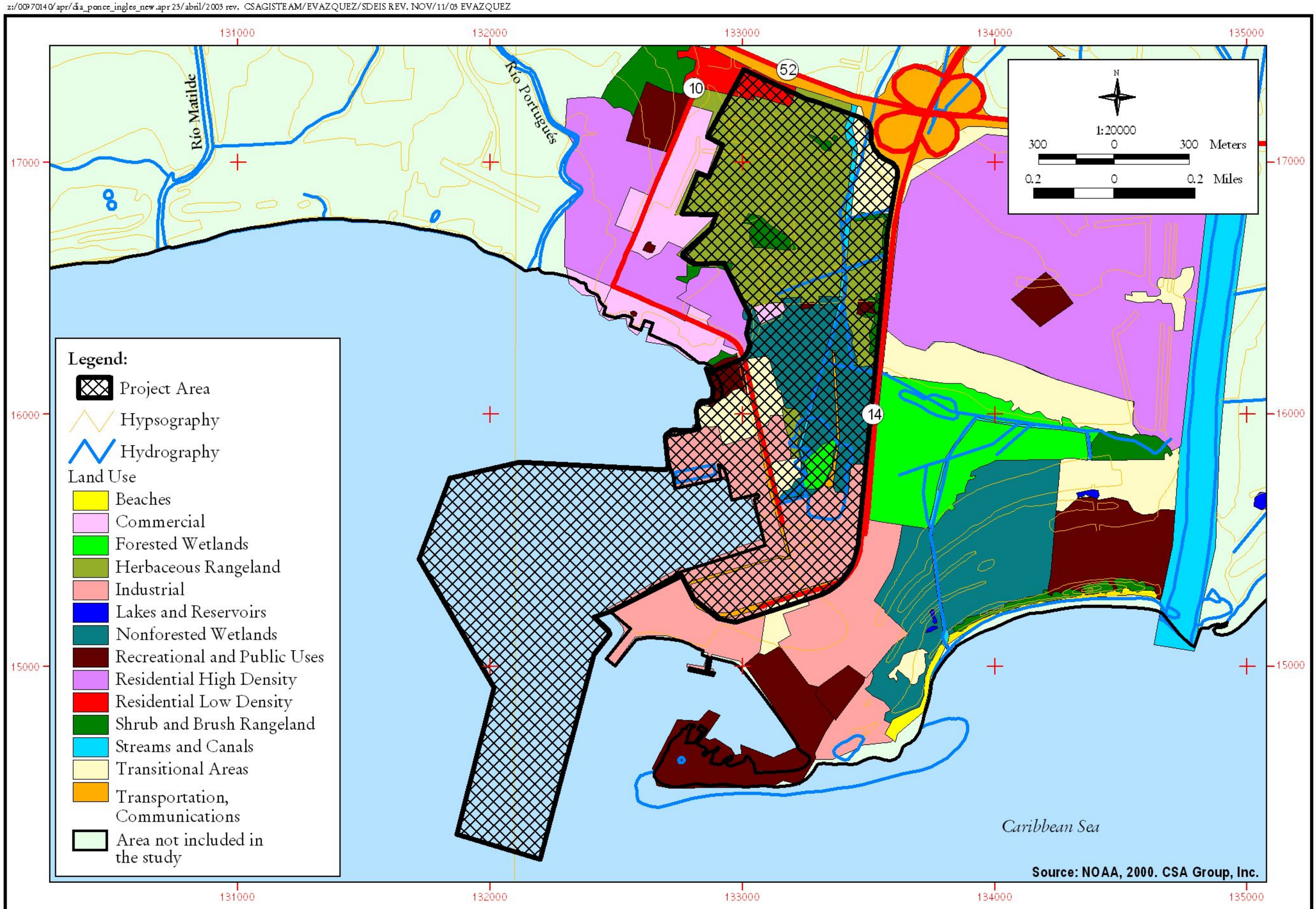

Coordinates in State Plane NAD 27

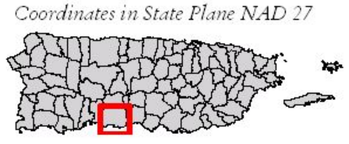

Figure 3-6. Land Use Map: Ponce Area

Port of the Americas

Puerto de Las Américas
PUERTO RICO

Zoning: The urban land classification divides the municipality into fourteen (14) land use districts and three (3) superimposed districts. The Port of Ponce area is classified as land use district *EI*, corresponding to Industrial Construction (*Edificación Industrial*) (Figure 3-7). This district was established to provide the parameters needed to plan the construction of offices, warehouses or manufacturing facilities as separate buildings or as part of an industrial park. The port areas to be developed are classified as a superimposed conceptual development land use districts ("*Desarrollo Conceptual", for its Spanish term*). The purpose of this superimposed district is to facilitate the implementation of conceptual developments in specific areas, one of which is the port.

The Autonomous Municipality Act establishes that all Municipality Land Use Plans will be reviewed at least every eight (8) years. In addition to complying with this legal requirement, the Municipality of Ponce identified various sections of the Municipality Land Use Plan, dated in 1992, which needed to be reviewed. One of these sections was precisely the development of a transshipment port in the southern area, forcing the Municipality to redefine the previously defined infrastructure pattern and land availability.

In 1999, the Municipality of Ponce began reviewing the Municipal Land Use Plan, and proposed the development of a transshipment port in the southern region, developing the Port of Ponce facilities as a world-class maritime center. This effort is in harmony with the Project as proposed in this document. On June 29, 2000, the municipality held public hearings regarding the Statement of Objectives and Work Plan. Presently, the municipality is developing the General Brief and Draft Municipality Land Use Plan.

3.2.3 Topography

The general area for the proposed project consists of the coastal region at the Municipality of Ponce. The limits of the municipality are illustrated in Figure 3-88. The Project is located within the Juana Díaz-Ponce Region, as defined by the USGS (Atlas of Ground Water Resources in Puerto Rico and the US Virgin Islands, USGS, 1996). The physiographic and topographic characteristics for each region are discussed in the following sections.

3.2.3.1 Juana-Díaz-Ponce Region

The Juana Díaz-Ponce Region includes the municipalities of Ponce, Juana Díaz and Villalba. The major surface bodies of water in this region are the Río Cañas, Río Portugués, Río Bucaná, Río Inabón and Río Jacaguas, as well as the Toa Vaca Reservoir. Among the predominant physiographic characteristics in the region are the steep volcanic mountains with elevations as high as to 4,500 feet AMSL, eroded limestone hills and coastal alluvial valleys.

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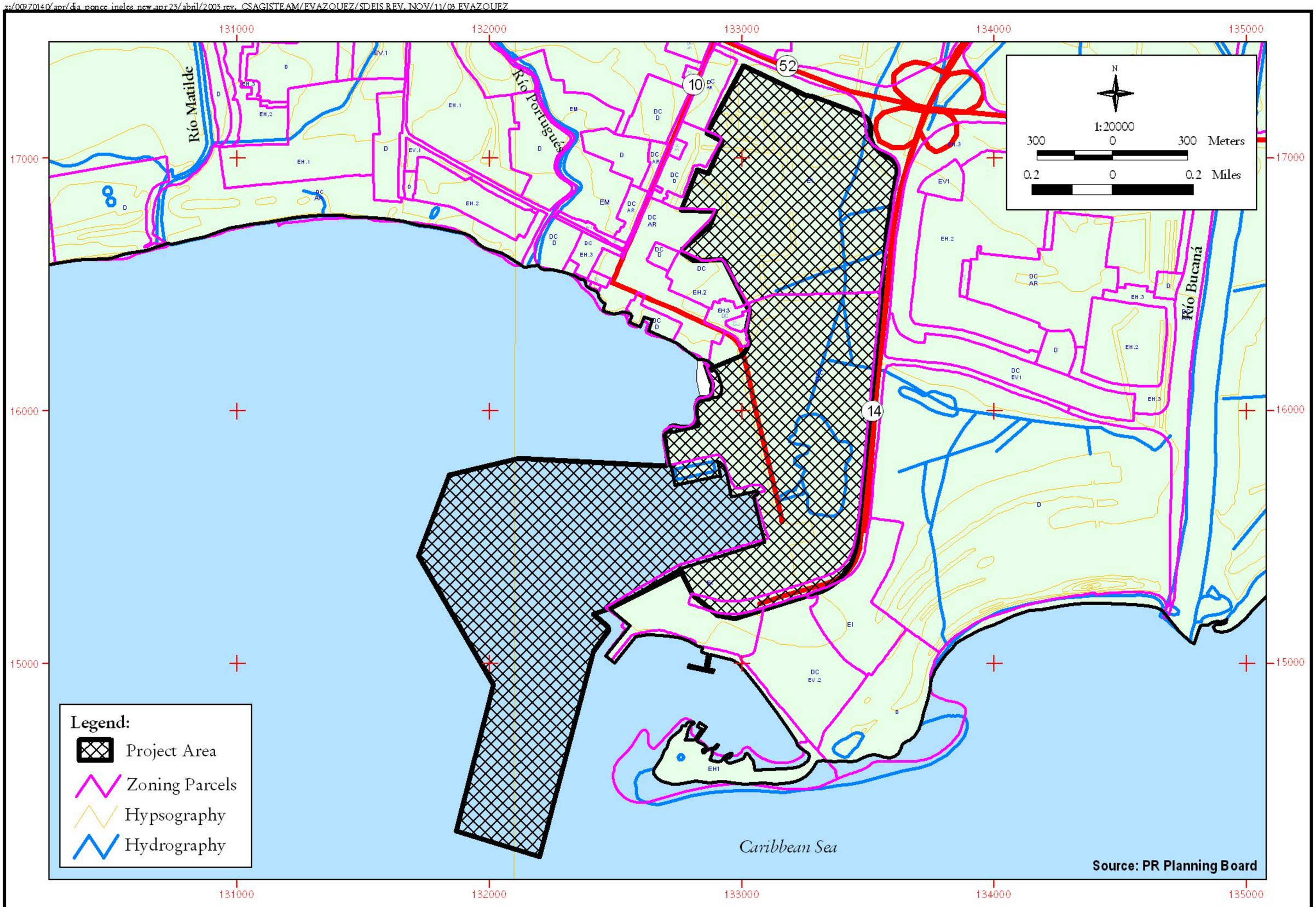


Coordinates in State Plane NAD 27

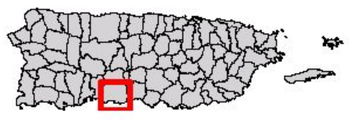
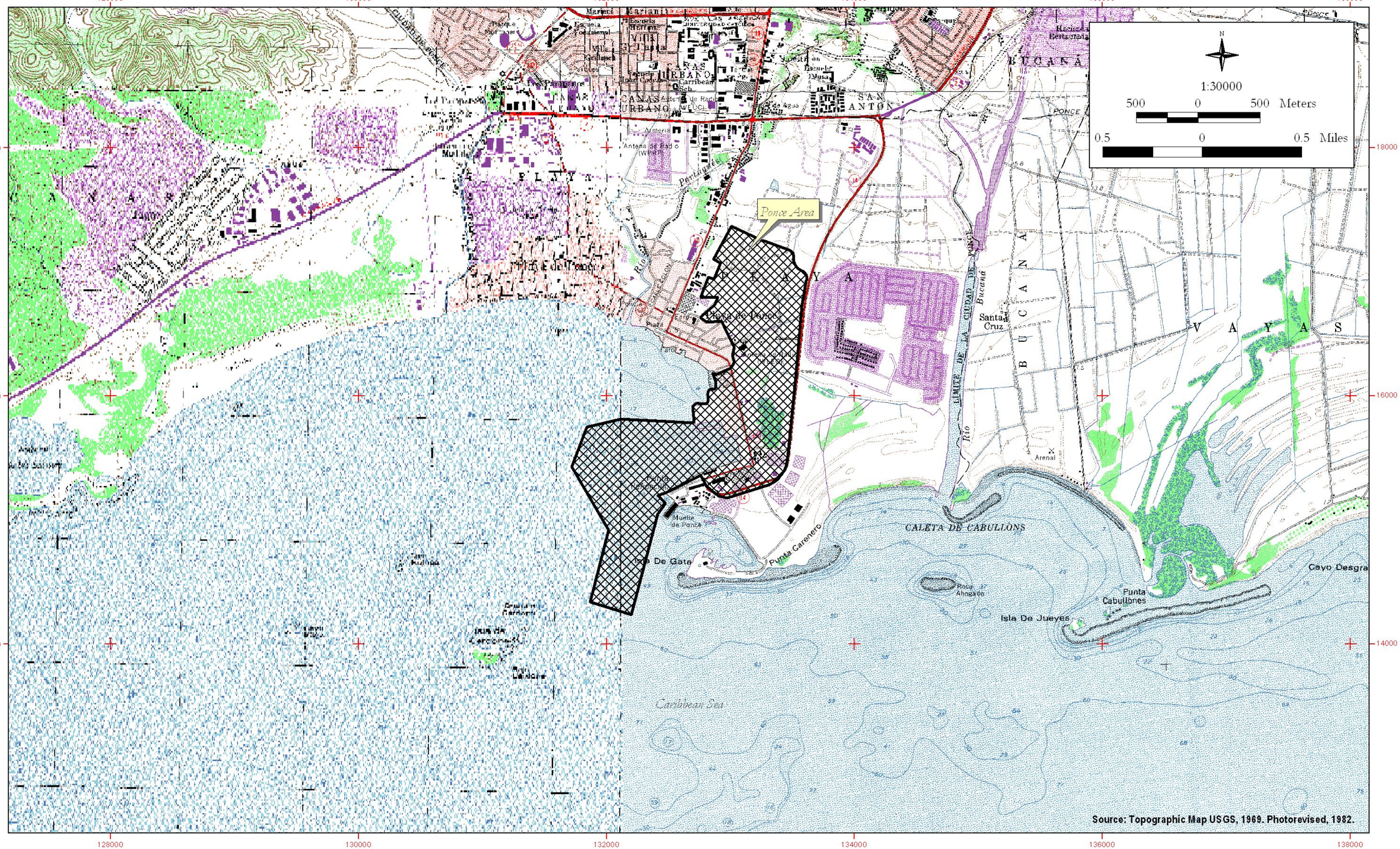


Figure 3-7. Territorial Zoning Map: Ponce Area

Port of the Americas

Puerto de Las Américas PUERTO RICO



Coordinates in State Plane NAD 27

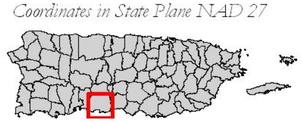


Figure 3-8. Topographic Map: Ponce Area

Port of the Americas

Puerto de Las Américas PUERTO RICO

3.2.4 Soils

This section describes the soil associations in the area proposed for the development of the PTA in the Municipality of Ponce. The descriptions are based on the Soil Survey of the Ponce Area of the US Natural Resources Conservation Service (previously the Soil Conservation Survey (SCS), 1979).

3.2.4.1 Ponce Area

The proposed land for the PTA development in Ponce is located on a peninsula of the coastal plain known as Punta Peñoncillo. This peninsula and adjacent areas include four types of soils:

- Hydraquent Saline Soils (Hy)
- Constancia Silty Clay (Ct)
- Tidal Flats (Tf)
- Teresa Clay (Te)

3.2.4.1.1 Hydraquent Saline Soils (Hz)

The saline soils of the Hydraquent association are located in the west area of the peninsula and cover a small area of the land. According to the Soil Survey (SCS, 1979), these soils consist of lagoon zones or depressions in the floodplains of semiarid areas rivers. These areas are between 50 to 100 acres and consist of saline soils. The water table level is close to the surface for most of the year. The soil varies in color and texture throughout the profile. In addition, organic material from decayed mangrove trees as well as shells, corals and marl are found scattered throughout the profile.

The agricultural productivity of these soils is severely limited, due to its high content of salt and the proximity of the water table to the surface. The rehabilitation of these soils for agricultural use would be extremely costly. Most of what grow in these soils is wetland trees that are used as wildlife habitats for birds, oysters and crabs. The soil has severe limitations for non-agricultural uses and is defined as Capacity Unit VIIIs-1 (SCS, 1979).

3.2.4.1.2 Constancia Silty Clay (Ct)

The Constancia Silty Clay soils are located in the northeast area of the Guayanilla Peninsula and cover a small portion of the land. The Constancia Silty Clay is part of the Constancia series. The soils in this group are leveled at the alluvial fans next to the rivers and springs of the semiarid areas. Generally, they occur in areas of 50 to 200 acres with 0 to 2 percent slopes. These soils can be used for intense farming if adequately drained and irrigated. The soils in this series are subject to floods during certain years and could be saturated after intense rainfall due to its low permeability. Improving these soils is laborious, and leveling of the land would be costly and difficult due to the plasticity and stickiness of the soil. These soils are classified as Capacity Unit IIw-1 with irrigation and III-c without irrigation (SCS, 1979).

3.2.4.1.3 Tidal Flats

Tidal Flats occupy two areas of the proposed site in the vicinity of Ponce, towards the eastern and west-central part of the land. These soils are located in the coastal plains of semiarid, sandy and sterile areas that are periodically flooded by tides. Near the coast, permanent saline ponds remain after each high tide. In the areas that are not permanently flooded, a layer of mud and sandy soils deposited during floods by nearby rivers remains after the tides recede. Salts

accumulate in the soils as the water evaporates. These soils do not have any agricultural value due to their high content of salt in areas with a high water table, and are classified as Capacity Unit VIIIs-1 (SCS, 1979). The upgrading of these soils for agricultural production is not practical.

3.2.4.1.4 Teresa Clay (Te)

The Teresa Clay (Te) (Teresa soil series) occupies part of the northern area of the parcels proposed for the development of the value-added activities close to the Port of Ponce. These soils are located in semiarid areas of coastal plains. The soils are adjacent to the beach in areas of approximately 100 to 200 acres of saline deposits with slopes of 0 to 2 percent. Some areas may contain Serrano sands and Tidal flats, and in a few areas non-saline Meros sands. The runoff is slow and the erosion potential low. Due to its high content of salt, these soils are not appropriate for cultivating or sowing of pasture. A costly effort would be required to condition these soils for agricultural uses, due to their poor drainage. The areas where these soils occur are devoid of vegetation and previous attempts to grow sugar cane in them have failed. These soils have little agricultural value and are classified as Capacity Unit VIs-2 (SCS, 1979).

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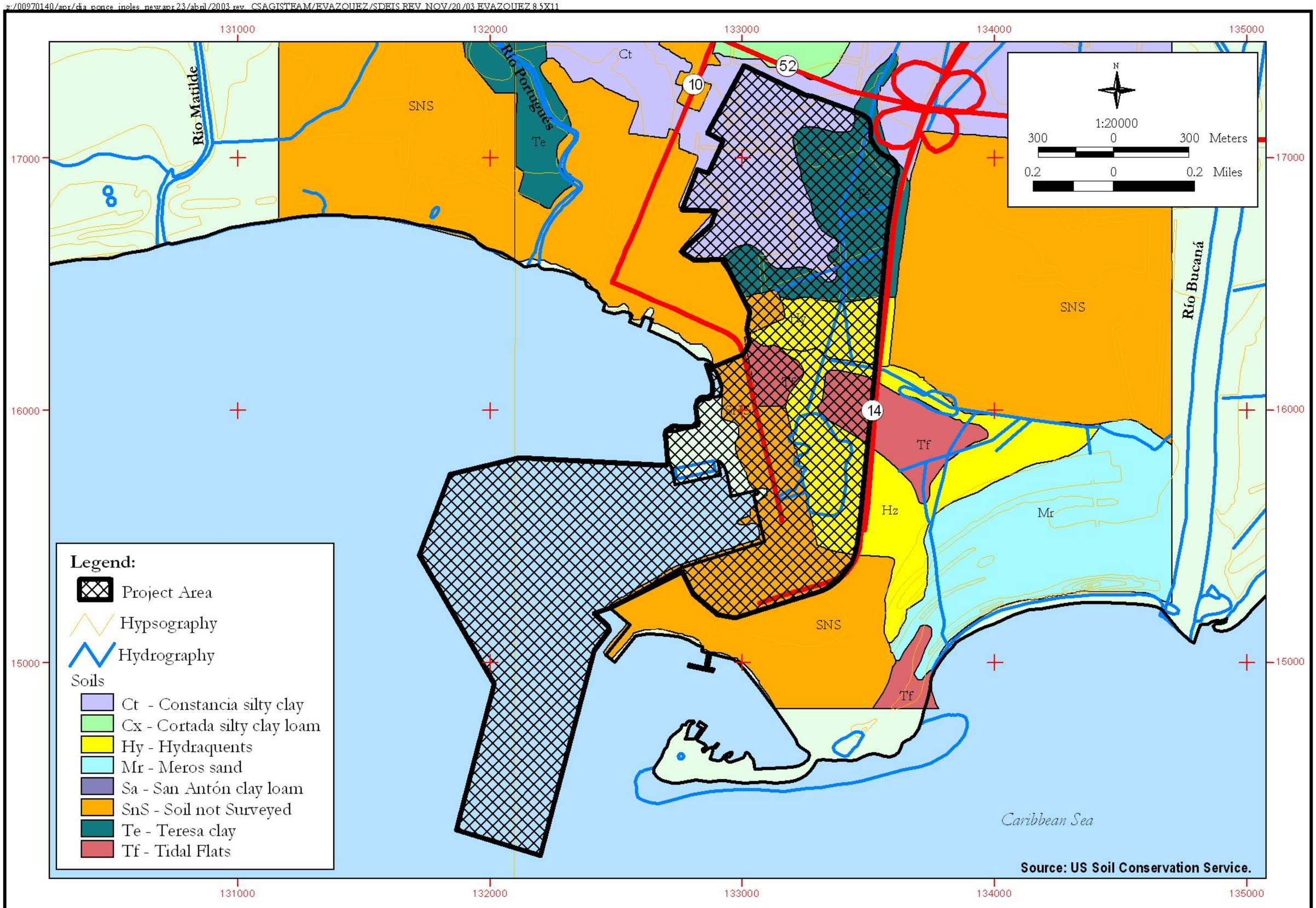

Coordinates in State Plane NAD 27

Figure 3-9. Soils Map: Ponce Area

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3.2.4.1.5 Marine Sediments

As previously indicated, an important component of the PTA facilities would be constructed on water overlying marine sediments. This area is not included in the "Marine Geologic Map of the Puerto Rico Insular Shelf-Guánica to Ponce Area" (Trías, 1991). Nevertheless, the sediments are estimated to be consistent with Unit 2 (silt and fine sand).

3.2.4.1.6 Areas Not Surveyed

The soils in most of the areas adjoining the docks at the Port of Ponce, including the parcels proposed for value-added activities, have not been surveyed, as illustrated in the "Soils Survey of Ponce, Sheet No. 38" (SCS, 1979). It is reasonable to assume that most of the areas presently occupied by man-made facilities were artificially filled. If the same pattern of other coastal deposits occurs in the area, the fill probably overlies marine sediments composed of sand and limestone. The depth of the fill is unknown.

3.2.5 Geology

The regional and local geological context of the project area in the Ponce Region is discussed in the following sections. The information provided in these sections was obtained from USGS publications and maps. Additional information was obtained from environmental and geological studies conducted by private entities in the vicinity of the proposed sites.

3.2.5.1 Guánica-Juana Díaz Regional Geology

The geology of the region from Ponce to Juana Díaz, where the PTA is proposed, is described in the USGS study entitled "*Water Resource Investigations Report 94-4198*" (USGS, 1996). The USGS subdivided the geology of these areas in four basic lithologic types. These are, in ascending order, the following:

- Rocks that include volcaniclastic rocks severely impacted; volcanic; plutonic and limestone rocks from the Superior Cretaceous Period and the Eocene Period. This unit represents 60% of the region.
- The Juana Díaz formation (limestone and basaltic conglomerates) from the Oligocene to Miocene Periods.
- The Ponce Formation (limestone, chalk and marl) from the Miocene Period; and
- Alluvial deposits (consolidated and non-consolidated clay, silt, sand and gravel) from the Quaternary Period.

The regional geology of the study area is described in Figure 3-10.

3.2.5.2 Regional Marine Geology

The marine geology of the greater part of the study area is described in the "Marine Geologic Map of the Puerto Rico Insular Shelf- Guánica to Ponce Area" (Trías, 1991). The proposed areas for the development of the PTA in Ponce are not included in the marine geology maps of the aforementioned study.

100000 110000 120000 130000 140000 150000 160000

40000 30000 20000 10000

Villalba
Peñuelas
Guayanilla
Yauco
Ponce
Juana Diaz
Guánica

N
1:180000
3000 0 3000 Meters
2 0 2 Miles

Legend:
- Rivers

Geology
- Reservoir
- Beach Deposits
- Swamp Deposits
- Alluvial Deposits
- Landslides Deposites
- Ponce Limestone
- Juana Díaz Formation
- Plutonic Rocks
- Volcanic and Volcaniclastic Rocks

Source: USGS. Water-Resources Investigations Report 94-4198. 1996.

Coordinates in State Plane NAD 27

Figure 3-10. Generalized Regional Surface Geology: Guánica-Juana Díaz Region

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The sediments in the study area, from Guánica to Ponce, can be divided into five basic units composed of two major sediment types. A brief description of the sediment units (Units 1 to 5) follows:

- Unit 1: Silt and clay;
- Unit 2: Silt and sand;
- Unit 3: *Halimeda* Sediments, close to the shore;
- Unit 4: Exterior Continental Platform Sand; and
- Unit 5: Hemipelagic Sediments

The major sediment types are:

- Terrigenous sandy mud (Unit 1 and 2) from the bay areas and relatively tranquil areas of the continental insular interior platform areas; and
- Carbonate sands (Units 3, 4 and 5) of the continental insular exterior platform and major carbonate sources.

The regional marine geology of the study area is described in Figure 3-11.

3.2.5.3 Ponce Area

According to the USGS (1996), the geology of the proposed site for the PTA in Ponce is similar to that of the Guayanilla area. The site to be developed is located in a small coastal valley composed of fine sediments, deposited in a similar manner to a peninsula known as Punta Peñoncillo. The valley is bordered by small and rounded hills to the west-northwest and the east-northeast, eroded to the same Ponce Limestone Formation of the Miocene Period. The Juana Díaz Formation borders the northern part of the valley. The Ponce Limestone within the valley are covered by a wedge of non-consolidated piedmontite alluvium, piedmontite alluvium with salt accumulation and marine-lagoonal sediments of shallow water (swamp deposits) of the Quaternary Period, which increase in thickness as it approaches the coast. The piedmontite alluvium is composed of sand, clay and non-consolidated silt of an unknown thickness (USGS, 1971).

According to the geological quadrant of the Playa de Ponce (USGS, 1971), Punta Peñoncillo is composed of piedmontite alluvium of the Quaternary Period, salt accumulations and swamp deposits (lagoonal), with minimal quantities of beach deposits (marine). It is probable that the areas with existing man-made facilities were artificially filled and their thickness is unknown. The proposed Ponce sites are not included in the marine geologic map (Trías, 1991), therefore, a Geophysical Investigation Offshore was performed in order to provide a preliminary, general estimate of the sediment thickness and the depth to key target horizons. Target horizons are those that may represent indurated rock and therefore potentially impact dredging operations. The general geologic sequence within the Ponce survey area consists of three main units: a basal rock or reef unit; a basal shoal and flank unit; and an overlying sediment unit. The two basal units can occur separately or merge in the vicinity of either large shoals or isolated shoals.

- The basal rock or reef unit occurs throughout most of the survey area and is the main horizon of concern (target) regarding potential dredging operations. This unit follows the general bathymetric depth contour and thus deepens progressively in a seaward direction. With no core borings available for ground-truth, it is not certain at this time whether this is a reefal unit or an eroded bedrock unit, or perhaps some combination of the two.

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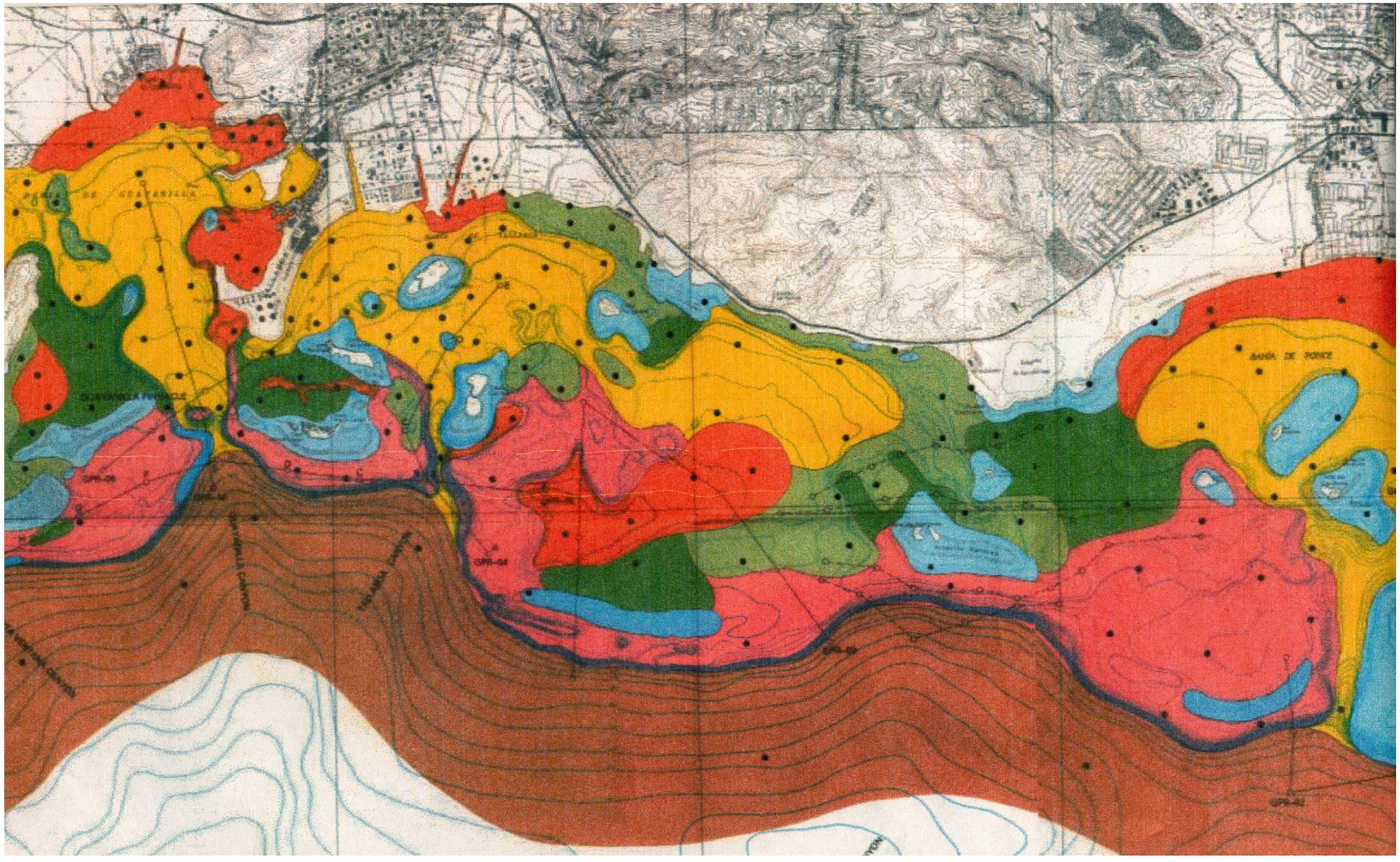

Description of Map Units

- Unit 1 (Silt and Clay)
- Unit 2 (Silt and Fine Sand)
- Unit 3 (Nearshore *Halimeda* Sediment)
- Unit 4 (Outer Shelf Sand)
- Unit 5 (Hemipelagic Sediment)
- Unit 6 (Active Reefs)
- Unit 7 (Submerged Shelf Edge Reefs)
- Unit 8 (Hard Ground)

DRAWING NOT TO SCALE

Source: USGS. Miscellaneous Investigations Series, MAP I- 2263. 1991.

Figure 3-11. Generalized Regional Marine Geologic Map: Guánica-Juana Díaz Region

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- The basal shoal and flank unit occurs where a shoal is exposed at the seafloor, completely buried, or partially buried along its flanks by onlapping sediment. This geologic unit almost certainly represents cemented rock, likely of reefal origin. The shoal flanks usually dip away from the shoal and are covered by sediment in a very short distance from the shoal edge.

- The uppermost geologic unit is the blanket of sediment that covers the survey area. The sediment thickness generally increases from about 10 m in the northern part of the survey area to nearly 20 m in southern part of the survey areas (outside of the above mentioned shoals). Dredging activities of the existing channel to a depth of approximately 12 m has partially removed the upper part of this sediment unit.

- The preliminary geologic assessment concludes that the depth to the main target horizon deepens from north to south from about 15 m to >40 m. Similarly, the sediment thickness also increases from north to south, from about 10 m in the very northern part of the survey area to about 20 m in the south. Isolated shoals occur throughout the survey area, these shoals rise above the surrounding target depth and can form areas of concern.

3.2.6 Hydrology

The surface water resources in the project areas include rivers, creeks and artificial canals. In the Ponce area, the principal rivers are Río Matilde, Río Portugués, and Río Bucaná, which flow into the Ponce Bay. A north to south ditch drains most of the parcels proposed for value-added areas and expansion of the Port of Ponce, also discharging to the bay.

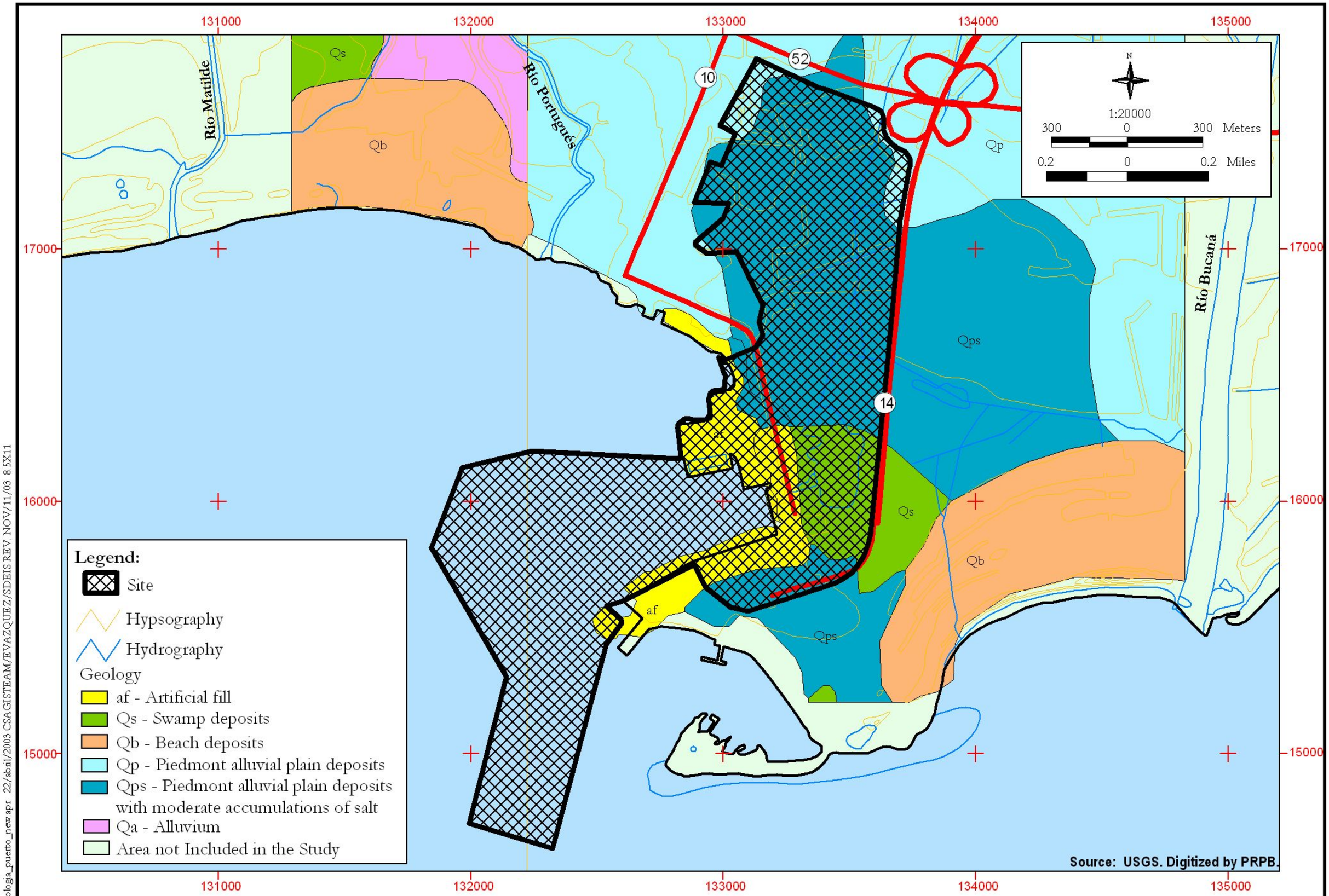
The main features of these elements of the water resources of the area are as follows:

- Río Matilde flows into the Ponce Bay approximately 2.0 kilometers west of the Port of Ponce. The river is formed by the confluence of Río Pastillo, Río Cañas and Quebrada del Agua.

- Río Chiquito and Quebrada Sin Nombre feed into Río Portugués, which flows into the Ponce Bay approximately 1.0 kilometer east of the Port of Ponce. According to a USGS report (USGS, 1999), the drainage area of Río Portugués is approximately 20 square miles (51.8 square kilometers) and the average daily discharge is 34 MGD. A dam is planned for construction upstream from the urban area of Ponce, mostly for flood control and recreation.

- Río Bucaná flows into the Ponce Bay approximately 1.2 kilometers east of the Port of Ponce. This river has a drainage area of 24.9 square miles (64.5 square kilometers), and is mostly channeled for flood control near the Port of Ponce.

- The average discharges at the most important streams flowing into the Ponce Bay are shown in Figure 3-13. Monthly flow data for these key streams in the project area are summarized in Table 3-4. These data were obtained from the network of recording stations operated by the USGS in Puerto Rico.



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Coordinates in State Plane NAD 27

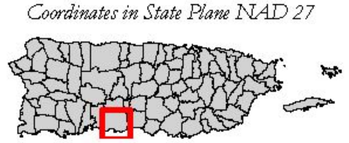

Figure 3-12. Generalized Local Surface Geology: Ponce Area

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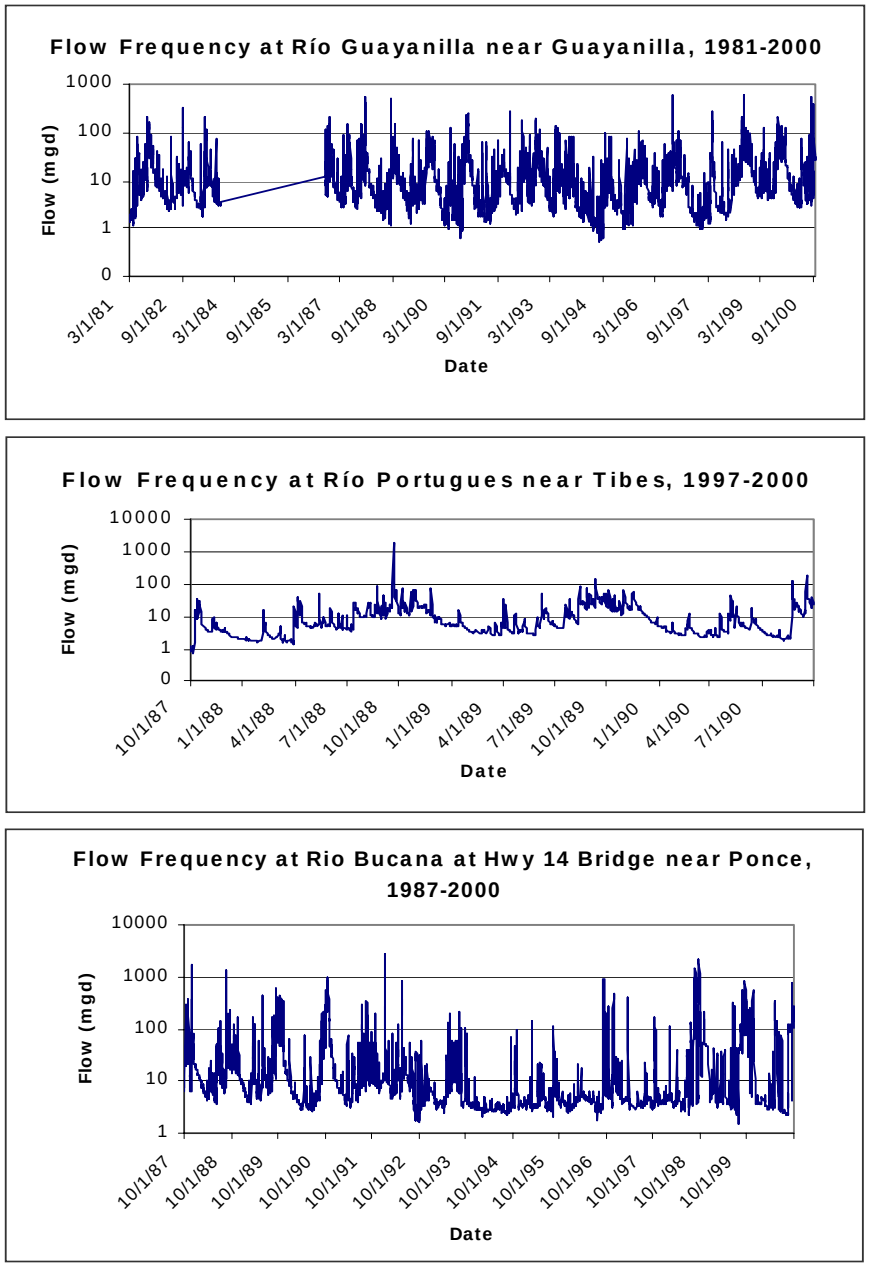
Figure 3-13: Flow Frequency Diagram for the Rivers at the Vicinity of the Project



Source: United States Geological Survey. (1999) Water Resources Data Puerto Rico and the US Virgin Islands Water Year 1999.

Table 3-4: Average Discharge (Cubic feet per second) at Selected Rivers in the South Central Region of Puerto Rico for the Water Year 1998-99

Stations	Months											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Río Portugués at Tibes	41.6	32.9	11.4	9.51	5.66	5.64	11.1	5.96	17.6	14.0	34.5	61.1
Río Bucaná at Highway 14 Bridge near Ponce	129.0	84.5	23.9	14.9	11.3	18.0	30.8	13.8	194.0	21.1	140.0	411.0

Source: United States Geological Survey. (1999) Water Resources Data Puerto Rico and the US Virgin Islands Water Year 1999.

3.2.7 Hydrogeology and Groundwater Resources

The project area is within a hydrogeologic region that extends from Guánica (west of the Guayanilla Bay) to Juana Díaz (east of Ponce). The following sections describe the general hydrogeology of this region, as defined by the USGS, including groundwater levels and movement. Details are also provided about the local hydrogeology of the sites where the elements of the PTA are proposed.

3.2.7.1 Guánica-Juana Díaz Region Hydrogeology

Ground water occurs in the area from Guánica to Juana Díaz occurs in alluvial deposits and in limestone rocks. According to the USGS, the principal aquifers of the region occur under non-confined conditions in alluvial deposits of the Quaternary Period (*Water-Resources Investigation Report*, USGS 1996). The thickness of the alluvial deposits vary from less than one (1) foot along the point of contact with the basement rocks in the foothills to the north, to approximately 300 feet closer to the coast, although it can reach 2,000 feet in depth in areas of existing faults (Gómez-Gómez, Heisel, 1980). Ground water also occurs under non-confined conditions within the limestone rocks of the Ponce and Juana Díaz Formations that predominate towards the north of the alluvial valleys and the coast.

The hydraulic conductivity of the zone was estimated with specific capacity test of wells in the Río Loco and Río Yauco valleys. For these valleys, the hydraulic conductivity can be as high as 300 feet per day, decreasing in proportion to an increase in the content of silt and clay. In a similar manner, the hydraulic conductivity decreases towards the east. The transmissivity of the alluvial aquifer in the Guánica-Juana Díaz Region can be as high as 10,000 square feet per day and generally, increasing inland and upstream, in proportion to increases in the hydraulic conductivity.

Wells drilled into the aquifers of the Ponce Limestone Formation and the Juana Díaz Formation can produce more water in the areas to the north, where ground elevations are higher, than in the lower parts of the valleys toward the coast. The hydraulic conductivity of wells in these formations ranges from 2.7 feet per day to 270 feet per day (USGS, 1996), which are relatively low.

3.2.7.2 Regional Groundwater Movement and Levels

The groundwater levels in the alluvial deposits in the Guánica-Juana Díaz Region vary from 100 feet below mean sea level in elevated areas in the valley, to almost zero feet below mean sea level along the coastline. Groundwater levels in the Region fluctuate seasonally in proportion to the extraction of water for agricultural uses and human consumption.

The recharge and discharge of groundwater in the Guánica-Juana Díaz Region can vary throughout the year as a result of precipitation, pumping and river deviations. Greater stream seepage into the aquifer was observed in upper valley areas during low stream flow conditions although streams are generally gaining, rather than losing water in the lower reaches. The aquifer recharge from stream seepage is affected by the regulation of stream flow at the headwaters and by diversions to irrigation channels in the Río Tallaboa, Río Yauco and the Río Loco. The aquifer recharge due to precipitation is minimal because of the high rate of evapotranspiration and the low frequency, intensity and duration of rain events. Generally, groundwater flows towards the ocean, from the recharge areas to the discharge areas, following the topography and normal drainage patterns of the alluvial valley.

3.2.7.3 Local Hydrogeology

This section describes the local hydrogeology in the zone near the Ponce Bay and adjacent areas to be developed as part of the PTA. The discussion is subdivided in two subsections: the first describes the local groundwater, and the second subsection lists the inventory of wells in the study areas.

3.2.7.3.1 Groundwater

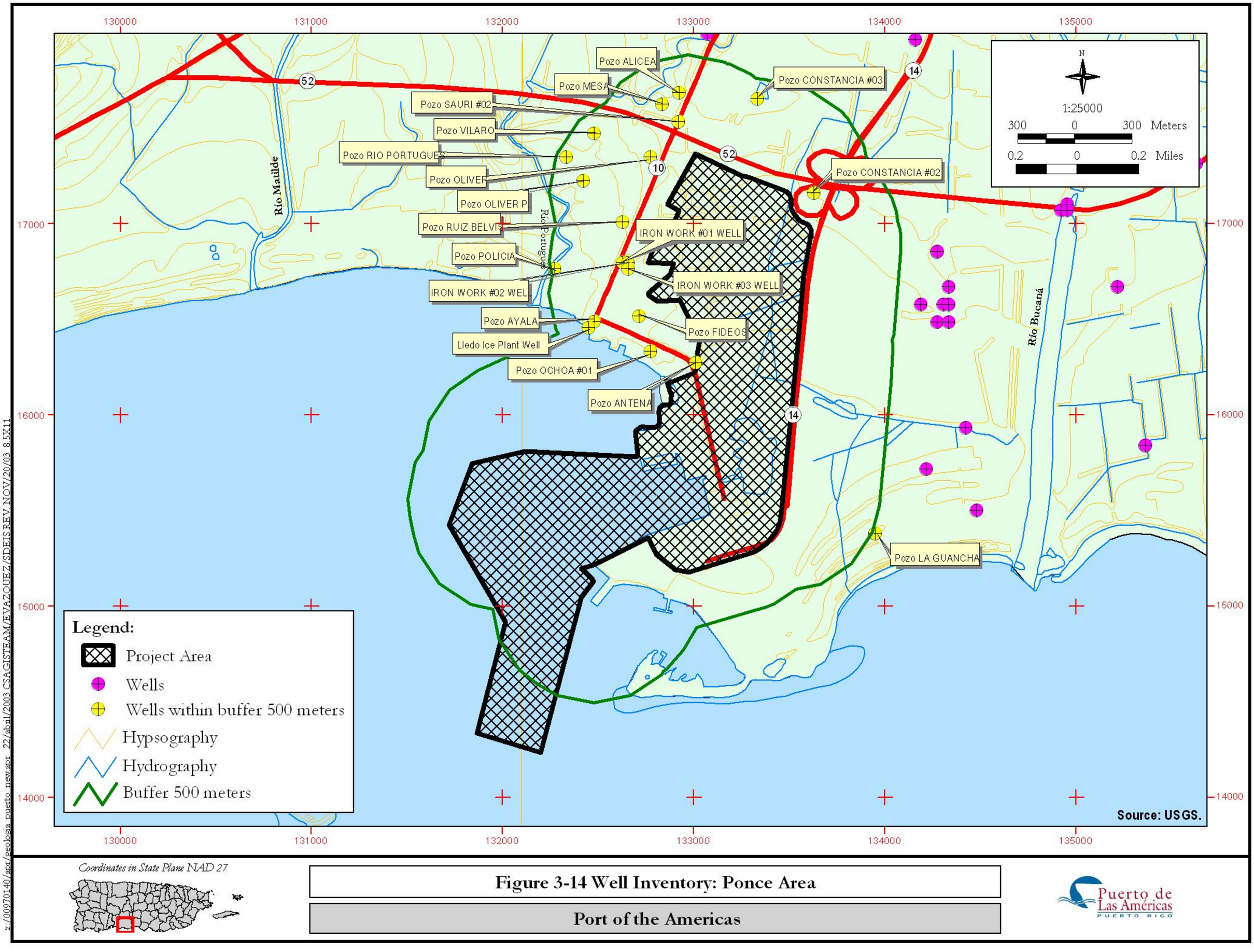
Groundwater is abundant in the alluvial valleys of Río Bucaná and Río Portugués north of the Port of Ponce and the area proposed for development. In the port area itself, ground water is affected by saline intrusion, and is not used as a water supply. The subsurface Quaternary Alluvium and the Ponce Limestone reportedly act as unconfined water bearing units capable of yielding significant amounts of water (Grossman et al., 1972), although artesian conditions have been observed in the Ponce area (McClymonds, 1972). The Ponce Limestone, which presumably underlies the Quaternary Period alluvium in both areas, exhibits variable porosity and permeability, with limited yields to wells.

In the Ponce area, a significant portion of the recharge to the saturated limestone occurs to the north of the Ponce Bay in the limestone mountains that border the basins of the Río Portugués, Río Bucaná and Río Inabón, at a distance of approximately 3 to 5 miles north of the project area. The limestone contains layers of different permeability and therefore, groundwater may flow preferentially down the dip of the strata.

3.2.7.3.2 Well Inventory

An inventory of the wells near the Port of Ponce revealed approximately 22 wells within a similar radius. The wells were identified using USGS and DNER data and are shown in Figure 3-14.

The wells in the vicinity of Punta Peñoncillo at Ponce can reach depths of up to 215 feet below ground level and have a maximum yield of 2,000 gallons per minute. Wells located between 0.50 and 0.75 mile from the coast in the Ponce area are not used as a source of potable water. Many of these wells are used for production or process supply in industrial facilities or for irrigation. Some of these wells are classified by the USGS as domestic, but probably are used for residential lawn irrigation, wastewater systems and other domestic tasks, and not for human consumption.



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Coordinates in State Plane NAD 27

Figure 3-14 Well Inventory: Ponce Area

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3.3 Fish and Wildlife Resources

This section describes the aquatic and terrestrial flora and fauna resources of the project area, determined from studies conducted by the Applicant and from previous investigations related to other projects in the region. Wetlands are discussed in a separate section. The marine fauna investigations were completed according to the procedures established by the Puerto Rico Department of Natural and Environmental Resources (DNER), and the United States Fish and Wildlife Service (USFWS) (USACE, 2002). A significant part of information used to prepare the reports on flora and fauna were obtained from a review of the available scientific data and studies performed in the project areas by other investigators. The Inventory of Critical Species completed by Natural Heritage Program of the DNER was also consulted.

3.3.1 Terrestrial Flora

The terrestrial flora in the areas adjacent to the Port of Ponce is scarce and typical of zones impacted by significant industrial activities. In the corridor between both ports, particularly in the coastal zone of both harbors in areas that are not part of the Project, the vegetation is more abundant and diverse. In this corridor, forested limestone hills predominate toward the north, with floodplains and wetlands in the coastal areas. A great diversity of plants and animals associated with these ecosystems were observed. Also observed were a relative diverse number of plants associated with disturbed areas.

The areas proposed for the elements of the Project in the vicinity of the Port of Ponce are within a commercial zone and port of intense activity. However, important ecosystems occur in the vicinity of the area, including the salt flat to the west of PR-14 and terrestrial and coastal wetlands east of the Port of Ponce and along the coast.

- In the vicinity of the Port of Ponce, 123 plant species were identified. Most of these species are representative of areas impacted by cultural activities, wetlands, or secondary coastal forests.
    - Among the dominant species are grasses (*Poaceae*), sedges (*Cyperaceae*), saltwort, and small trees such as wild tamarind (*Leucaena leucocephala*), wild cotton (*Gossypium hirsutum*), and giant milkweed (*Calotropis procera*).
    - The Ponce coastal areas include the salt flats west of Highway PR-14 and wetlands composed predominately of black mangrove (*Avicennia germinans*), red mangrove (*Rhizophora mangle*), white mangrove (*Laguncularia racemosa*), saltwort, shoreline seapurslane (*Sesuvium portulacastrum*), and southern cattail (*Typha domingensis*).

3.3.2 Aquatic Flora

Studies of the marine communities and benthic habitats in the Ponce area were conducted by the Applicant and summarized in Figure 3-15. The main objective of the studies was to provide a taxonomic characterization and an ecological analysis of the marine communities present in the navigation channel and interior areas of the Ponce Bay. Also, these studies provided information for the Biological Assessment prepared as part of this SDEIS as required under Section 7 of the Endangered Species Act.

- The interior region of the Ponce Bay represents an estuarine system that extends seaward. This interaction with the Caribbean Sea has a direct bearing on the marine communities within the bay. Fresh water and suspended sediments from Río Matilde and Río Portugués discharging into the bay and interacting with marine currents also influence the aquatic flora.

Another factor in the bay is the ocean outfall from the Ponce regional wastewater treatment plant, which discharges an average 14.5 million gallons per day of water with only primary treatment. This partially treated wastewater contains as much as 60 percent of the original solids prior to the primary treatment.

- The marine communities in the navigation channel and interior zones of the Ponce Bay were studied between August 3 and August 5 of 2001. A total of 20 sampling stations were established. Benthic communities were identified from samples collected with fish traps and fresh squid as bait in 20 stations and fish samplings with line and hook in 10 stations. The characterization of pelagic communities was complemented by micronecton collections using a net of 0.5 millimeters in a surface horizontal towing covering the 20 sampling stations of the navigation channel and turning basin areas.

- The communities of seagrasses in the Ponce Bay were studied by García et al. (1985 a, b) in the zones behind the coral reefs of Cayo Arenas and Cayo Viejo. In Cayo Arenas, areas of turtle grass (*Thalassia testudinum)* were growing along side green algae such as *Ulva lactuca*, *Cladorphora* sp. and *Enteromorpha* sp., which are indicators of high dissolved nutrient availability (García et al., 1985 a). The study by García et al. (1985 a) highlights the incidence of mobile macroinvertebrates and fish associated to seagrass beds in Cayo Arenas. From the reports of García et al. (1985 a, b), it can be concluded that the development of seagrasses in Cayo Viejo was associated to the presence of *Halophila decipiens* growing along side a group of macroalgae at depths between 5 and 8 meters in the zones behind the reefs (north). Among the algae associated with the seagrass bed, the following were reported *Caulerpa* spp., *Udotea flabellum*, *Cladophora* sp., *Gracilaria* sp. and *Dictyopteris* sp. (García et al.,1985 a, b).

- Muddy sea bottoms that are sticky and level, completely deprived of vegetation and/or coral reef structures, characterize the study area that includes the navigation channel, turning basin and alternative fill area in the Ponce Bay. Benthic populations typical of muddy, sandy sea bottoms and pelagic estuarine populations that are characterized by the poor diversity of species and low structural complexity prevail. The benthic-sessile biological component is mostly represented by the sea feather, *Stylatula* sp., the gorgonians, *Leptogorgia* sp. and the polychaete worm *Arenicola cristata* (Southern Lugworm). Some debris entrained in the muddy sea bottom demonstrated growth of the hydrozoan *Thyroscyphus ramosus* (Algae Hydroid). Adjacent to this debris, the yellowline arrow crab, *Stenorhincus seticornis*, was observed as well as the shrimp, *Stenopus hispidus* (Banded Coral Shrimp). The fishnets also captured decorator crabs, *Stenocionops furcatus*. The red algae, *Gracilaria* sp., were observed over the sea bottom. These algae were not adhered to a solid substrate, but were free flowing. The branching fire coral, *Millepora alcicornis*, was observed encrusted in a navigational buoy.

- Areas near the navigation channel, turning basin and alternative fill area have predominately unconsolidated sediments (muddy), sticky and mostly deprived of a vegetative sea bottom, except for small areas of seagrass, *Halophila decipiens*. The grass grows in scattered rows that do not form a seagrass bed. On the sea bottom, a great amount of holes and hills possibly produced by the polychaete worm, *Arenicola cristata* (southern lugworm), were observed. The sea feather, *Stylatula* sp., was widely observed growing in the sea bottom. At depths between 6 and 7 meters, the gastropod *Strombus pugilis* (West Indian fighting conch) was observed. This herbivore mollusk is possibly associated to the seagrass *Halophila decipiens*, since the greater densities of both coincided in the same areas. Besides these benthic communities that dominated numerically, the sea bottom of the study area near the navigation channel, turning basin and proposed fill, represent a habitat with

low diversity of species since it is deprived of reefs or other structures that could house complex marine communities.

- The muddy sea bottoms are used as feeding areas by various species of fish, such as trunk fish (*Lactophris* spp., *Acanthostracion* spp.), grey triggerfish (*Balistes capriscus*), snapper (*Lutjanus synagris*) and others (CSA/CH2MHill, 2001). Also, the fishing with line and hook caught a bonefish, *Albula vulpes* and a tarpon (*Megalops atlantica*) was observed.

- The section with the richest diversity of benthic species near the navigation channel was observed near the shoreline, northeast of the proposed fill. Between depths of 1 to 2 meters, a prairie mixed with seagrasses grows, *Halophila decipiens*, and manatee grass, *Syringodium filiforme*, along with calcareous macroalgae (*Halimeda discoidea*, *Penicillum* sp., *Udotea* sp. and brown macroalgae (*Dyctiota* spp.). Both seagrasses were observed completely covered with fine sediments.

3.3.3 Terrestrial Fauna

The fauna in the vicinity of the Port of Ponce includes a diversity of vertebrates, where birds dominate.

- A total of 45 bird species were observed. These species were classified as endemic, resident, migratory or introduced. Among the most common birds are the Antillean nighthawk (*Chordeiles gundlachii*), the black-necked stilt (*Himantopus mexicanus*), several species of egrets (*Ardeidae*), sandpipers (*Scolopacidae and Charadriidae*), columbids and passerids. The herpetofauna consists of seven species of amphibians and reptiles, among them the common coquí, (*Eleutherodactylus coqui*), the white-lipped frog (*Leptodactylus albilabris*), several species of lizards (*Anolis* spp.), and the Puerto Rican common siguana (*Ameiva exsul*). Four species of mammalians were observed, a bat (*Molossus* sp.), brown rats, house mice and Indian mongooses.

- Critical, threatened and endangered species observed in the vicinity of the Port of Ponce area are summarized in Figure 3-16. In this area, only the brown pelican (*Pelecanus occidentalis*) was observed flying over the area of the wharves.

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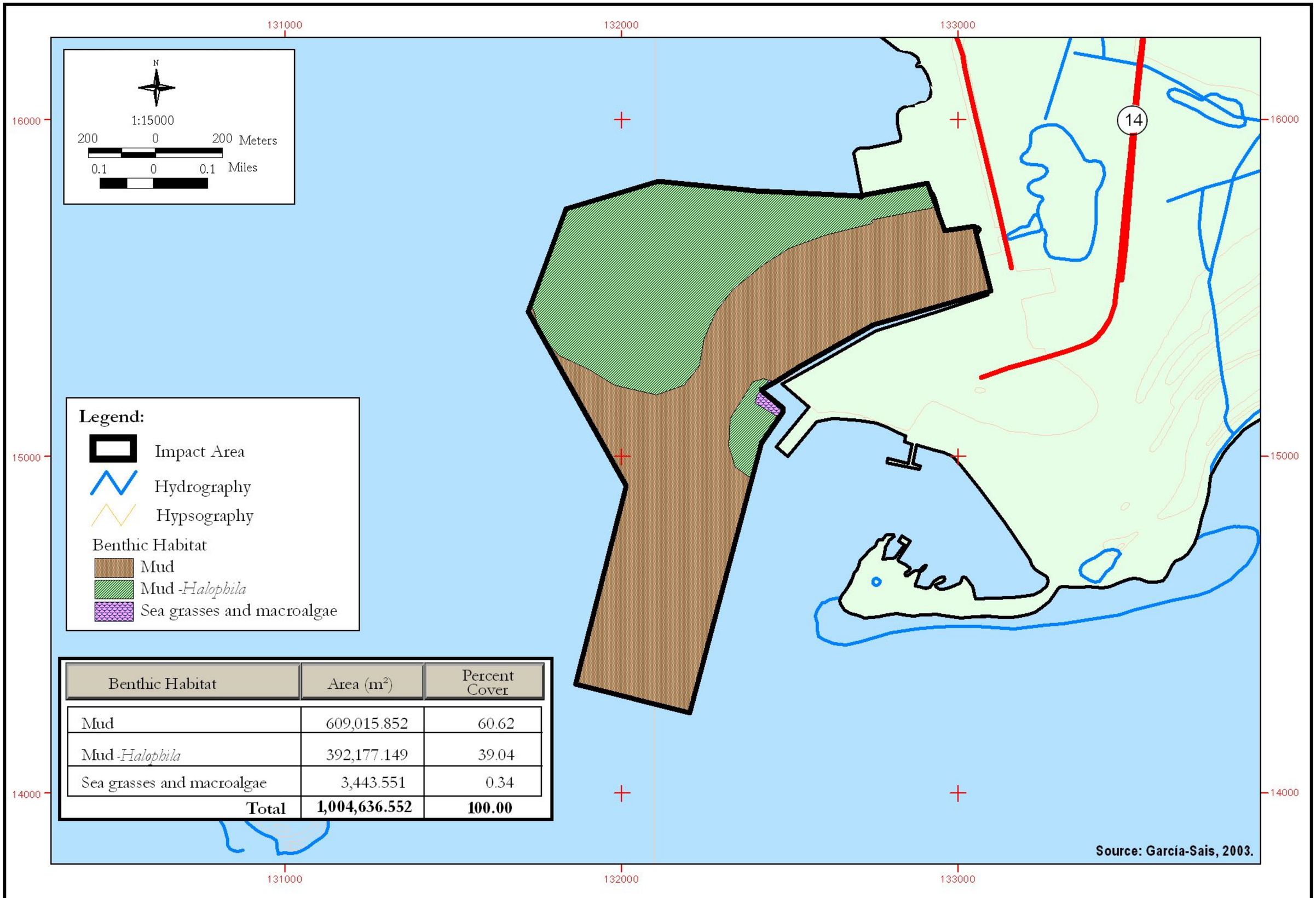

Benthic Habitat	Area (m^2)	Percent Cover
Mud	609,015.852	60.62
Mud -*Halophila*	392,177.149	39.04
Sea grasses and macroalgae	3,443.551	0.34
Total	**1,004,636.552**	**100.00**

State Plane NAD 27 meters

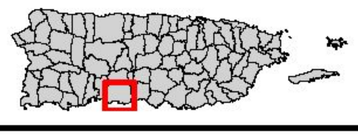

Figure 3-15. Bentic Zones: Ponce Area

Port of the Americas

Puerto de Las Américas PUERTO RICO

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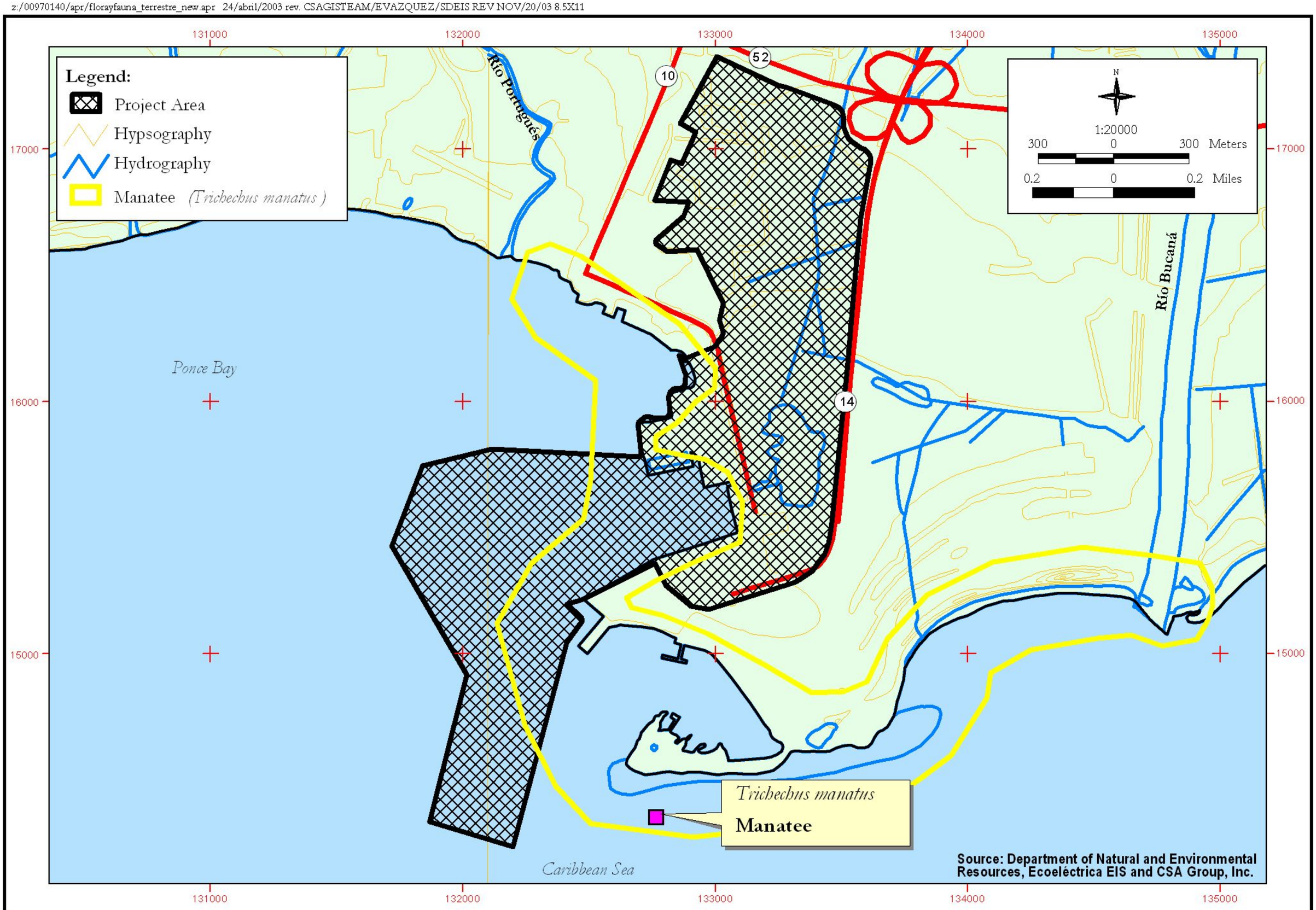


Coordinates in State Plane NAD 27

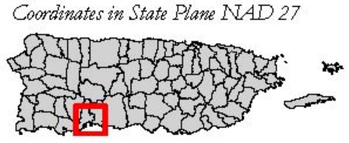


Figure 3-16. Critical, Threatened, and Endangered Elements: Ponce Area

Port of the Americas

Puerto de Las Américas PUERTO RICO

3.3.4 Aquatic Fauna

A study of the marine communities in the Ponce area was completed with the main objective of providing a taxonomic characterization and an ecological analysis of the marine communities present in the navigation channel and interior areas of the Ponce Bay.

- Five (5) communities of coral reefs are present within the perimeter of the Ponce Bay, although none is close to the areas to be filled or utilized for the development of the PTA. These reefs include Cayo Arena and Cayo Ratones, located to the south of Punta Cucharas and Cayo Viejo, Las Hojitas and Isla Cardona, in the center and exterior of the bay.

- The maximum average linear development of corals in the reefs of the Ponce Bay were reported at 18 percent by García et al. (1985b), in the area of Cayo Ratones at depths of 17 to 19 meters. In the reefs of Cayo Hojitas and Cayo Viejo a very limited development of scleractinian coral was observed (less than 5% of linear coverage), with hard substrates mostly covered with layers of algae, sponges and encrusting zoanthides.

- Associated with navigational buoys, juvenile fish from the coral reefs, such as the surgeon fish (*Acanthurus chirurgus*), butterfly fish (*Chaetodon capistratus*), sergeant major (*Abudefduf saxatilis*) as well as small schools of jacks, Atlantic bumberfish (*Chloroscombrus chrysurus*) and leatherjackets, *Oligoplites saurus*, both of which were in juvenile stages. Other biological components associated with the seabed of the navigation channel include fish that feed mostly from the sea bottom, such as lane snapper, *Lutjanus synagris*, rhomboidal mojarra, *Diapterus rhombeus*, and spadefish, *Chaetodipterus faber*, which were captured by fishnets. These fish have feeding habits that include diets based on benthic invertebrates (Randall, 1967).

- The pelagic fauna samples with micronecton superficial tows in the transverse direction of the navigation channel reflect estuarine and shoreline coral reef characteristics. At each of the stations sampled, an abundant component of planktonic copepods (calanoids and cyclopods) and sergestids shrimp were observed, along with an abundant group in the larval stage of invertebrates and estuarine and coral reef fish. The anchovy family (Engraulidae) was represented by eggs and larvae in various stages of development. These fish sustain their complete life cycle in a coastal and estuarine system, contrary to many other species of coral reef fishes, which have a larval pelagic development away from the coast (García et al. 1995; García et al., 1996). Other common species typical of estuarine communities collected in the micronecton were white mullets (Family Mugilidae), larvae of silversides, Family Atherinidae and the ballyhoo (Family Hemiramphidae). Other principal species collected in the micronecton of the navigation channel include postlarval stages of fish from coastal coral reefs, such as the representatives of the damselfish (Family Pomacentridae) and white grunt (Family Haemulidae).

- Larval stages of caridean shrimp (Section Caridea) and portunid crabs (Section Brachyura) were found in all stations on the navigation channel. An important component of the larvae of caridean shrimp includes members from the families Atyidae and Palaemonidae. These are fresh water shrimps that go through larval stages in estuarine or marine zones. The adults remain in the rivers while the larvae are transported downstream (anphydromous). The presence of these larval shrimps in estuaries of Puerto Rico has been reported by several investigators (Ching-Morales, 1982; Montero-Oliver, 1987; March et al., 1998; Holmquist et al., 1998; García, 1998). Larvae of hermitage crab (Section Anomura) were limited to the most seaward stations of the channel. The ctenophor, *Mnemiopsis* sp. (Sea Walnut), a known predator of zooplankton was collected on the navigation channel, so it can

be concluded that they represent an important component of the pelagic fauna in this region of the Ponce Bay.

- The pelagic fauna near the navigation channel at the Port of Ponce, and the area proposed for fill is influenced by high densities of zooplankton, which is characteristic of estuarine zones (García 1990, 1993, 1995; García y Castro, 1995; García et al., 1996). Samples obtained from the micronecton net demonstrate a high percent of calanoids and cyclopods, segestid shrimp and larval stages of caridean shrimp (Section Caridea, including Family Atyidae and Palaemonidae), hermit porcelain crabs (Section Anomura), portunid crabs (Section Brachyura), as well as eggs and fish larvae (Family Engraulidae, Atherinidae, Hemiramphidae and Pomacentridae). Associated to the plankton food chain were the jellyfish (Class Scyphozoa), among which the cube jellyfish *Carybdea alata* (Sea Wasp) was identified as well as the ctenophor *Mnemiopsis* sp. (Sea Walnut).

- Zooplanktivore species of fish were observed in schools throughout all the study area. These pelagic fish schools have great mobility and are being constantly followed by predators of bigger size, forcing them to travel constantly throughout the bay. The zooplanktivore fish observed include the dwarf herring, *Jenkinsia lamprotaenia* and anchovies (Family Engraulidae). Probably the group of zooplanktivore fish includes sardines (e.g. Harengula spp.) and scads (Decapterus spp.), which have been reported previously for similar estuarine systems in Puerto Rico (CSA/CH2MHill, 2001). Psicivore predators are at the top of the food chain, among them including the tarpon (*M. atlantica*), mackerel (*Scomberomorus* spp.) and blue runner (*Carangoides crysos*).

3.4 Marine Resources and Special Aquatic Sites

In Puerto Rico, benthic marine habitats can be classified in four general categories: 1) hardbottoms; 2) coral reefs; 3) seagrass beds; and 4) muddy bottoms.

Hardbottoms generally consist of two categories, namely Hardgrounds and Rock Reef. The term “Hardground” is applied to areas of relatively low relief; such as hard carbonate banks or eolianite terraces dominated by encrusting species such as sponges, turf algae and gorgonians. “Rock Reefs” include nearshore and emergent reefs found along the northern and northwestern coast of the Island, typically consisting of submerged bedrock features of moderate to high relief colonized by encrusting biota, including isolated coral colonies.

Vicente (1999) and García (2000, 2001) conducted marine flora and fauna investigations in the Guayanilla and Ponce project areas, following scientific procedures accepted by the DNER and the USFWS. The purpose of these investigations was to characterize benthic and pelagic marine communities associated with the location of the proposed action, as well as to survey said sites for significant marine resources. Please refer to Appendix E for details on these efforts.

Also, some of the information used to characterize the proposed sites originates from a review of the available scientific data about studies performed in the project’s area and from field observations. Additionally, a consultation was made to the Critical Species Inventory Office of the DNER’s Natural Heritage Program.

3.4.1 Hardbottoms

No hardbottoms are found at the Ponce project site. In the Ponce Bay, the bottom of the harbor and navigation channel consists of soft sticky mud with sparse vegetation (García, 2002).

3.4.2 Coral Reefs

There are no coral reefs associated with the areas of the Ponce site that would be directly impacted by the Project. There are five emergent reefs in the general Ponce Harbor area, namely Cayo Arenas and Cayo Ratones south of Punta Cucharas, and Cayo Viejo, Las Hojitas and Cayo Cardona to the southwest. Maximum coral development (18.0% average lineal coverage) for this area was reported at Cayo Ratones (Garcia, 1985), located over three miles from the project site.

Hojitas and Viejo reefs, located close to the project site, show very limited sclereantinian coral development. These reef systems would not be directly or indirectly affected by project development.

3.4.3 Seagrass Beds

Areas near the navigation channel, turning basin and proposed fill area have a predominately unconsolidated sediments (muddy), sticky bottom mostly deprived of a vegetative sea bottom, except for small areas of mud mixed with seagrass, *Halophila decipiens*. These patches of seagrass are located towards the east-northeast of the proposed fill area, and represent about approximately 10% of the total mixed zone.

A survey of the benthic marine flora in the project areas within the Ponce Harbor was completed by the Applicant (Garcia, 2002). The total area surveyed was approximately 575 acres of marine bottoms. The results of the survey show that most of the area is composed of shallow and deep mud bottoms devoid of vegetation. Individual components include: 25.2 acres of seagrasses (19.7 acres of *Thalassia testudinum*; 3.9 acres of *Halodule wrightii*; and 1.6 acres of *Halophila decipiens*); 144.4 acres of shallow mud (lacking vegetation cover); 40.0 acres of mixed algae and mud; 321.4 acres of deep mud also lacking vegetation; 23.0 acres of sandy bottoms; 3.7 acres of coral rubble; and 13.9 acres of coral reefs (USACE, 2002).

3.4.4 Muddy Bottoms

The bottom of the project areas within the Ponce Bay, including the area proposed for fill, the navigation channel, and the turning basin, have a predominately muddy, sticky and mostly denuded of a vegetative sea bottom. Relatively small areas of mud mixed with seagrass, *Halophila decipiens*, are located towards the east-northeast of the proposed fill area. Seagrass area accounts for approximately 10 percent of the total mixed zone.

3.5 Essential Fish Habitat

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act mandates that the NMFS, Regional Fisheries Management Councils (FMC), and other Federal agencies, identify and protect important marine fish habitat. The Caribbean FMC, with assistance from the NMFS, has delineated “Essential Fish Habitat” (EFH) for federally managed species within the Caribbean waters under the jurisdiction of the US. Federal agencies which fund, permit or carry out activities that may adversely affect EFH, are required to consult with NMFS regarding the potential impacts of their actions on EFH, and respond in writing to NMFS or FMC recommendations.

EFH, as defined in the Magnuson-Stevens Fishery Conservation and Management Act of 1976, includes those waters and substrate necessary to the fish for spawning, breeding, feeding, or growth to maturity. In the Caribbean waters under the jurisdiction of the US, EFHs are identified and described based on areas where the life phases of 17 selected species of fish and coral reefs occur. The 17 selected species are: 1) *Epinephelus fulvus* (coney); 2) *Epinephelus guttatus* (red hind); 3) *Epinephelus striatus* (nassau grouper); 4) *Lutjanus analis* (mutton snapper); 5) *Lutjanus apodus* (schoolmaster); 6) *Lutjanus griseus* (gray snapper); 7) *Lutjanus vivanus* (silk snapper); 8) *Ocyurus chrysurus* (yellowtail snapper); 9) *Haemulon plumieri* (white grunt); 10) *Chaetodon striatus* (banded butterfly fish); 11) *Balistes vetula* (queen triggerfish); 12) *Holocentrus ascensionis* (squirrelfish); 13) *Malacanthus plumieri* (sand tile fish); 14) *Sparisoma chrysopterum* (redtail parrotfish); 15) *Lactophrys qudricornis* (trunkfish); 16) *Panulirus argus* (spiny lobster); and 17) *Strombus gigas* (queen conch).

Since all of these species occur in all habitats within the Caribbean waters under US jurisdiction, the EFH includes all waters and substrates, such as coral reefs habitats, submerged vegetated habitats, unconsolidated bottoms, estuaries, intertidal zones, including adjacent wetlands and mangrove habitats. Therefore, EFH includes virtually all marine waters and substrates from the shoreline to the seaward limits of the EFH. For Puerto Rico and the US Virgin Islands, this represents an area of approximately 76,252 square miles (48.8 million acres).

Muddy bottoms characterize the areas in the Ponce Bay where the PTA activities are proposed. These areas include the navigation channel, where dredging is proposed, turning basin, and the zone adjacent to Pier #8, where extension of the pier and reclamation by fill is considered. Dredging actions (1986-87) previously impacted these areas. Only adult individuals of *Lutjanus analis (mutton snapper), Lutjanus vivanus* (silk snapper) and *Haeumulon plumieri* (white grunt) are present in this type of habitat. For these three species and the remaining selected species of finfish, there are no records of the presence of eggs, larvae, juveniles or spawners in mud bottoms. Similarly, the spiny lobster and queen conch, and each of their life stages, are absent in muddy bottoms. Based on this information, the areas proposed for dredging or construction in the Ponce Bay can be identified as EFH for adult white grunts, silk snappers and mutton snappers.

The proposed dredging and placing of fill at the Ponce Harbor would have temporary effects in the water column, primarily by increasing turbidity due to suspension of bottom sediments. The water column has been identified as EFH for the planktonic life stages of all of the 15 managed finfish species identified by the CFMC. Planktonic life stages refer to the eggs and larvae of the referenced species. All of the selected species have planktonic eggs and larvae, but their distribution is unknown. Except for general descriptions, there is little information on the distribution of eggs and the development of larvae, let alone information on the settling of fish larvae and subsequent development (CFMC, 1988). Most of the information available for these stages is only known at the Family level. Please refer to Appendix E to this SDEIS for more details.

3.6 Threatened and Endangered Species

Following is a description of threatened (vulnerable) or endangered species reported in the vicinity of the project areas, as well as species that are frequent visitors or may occur in the vicinity of the project site at Ponce. A summary of this baseline information is presented at the end of this section in Table 3-5.

3.6.1 Loggerhead sea turtle

The loggerhead sea turtle (*Caretta caretta)* is a species of marine turtle designated as threatened by the USFWS. It is found throughout tropical and temperate seas. This species have not been reported for the project area. It feeds on fish and invertebrates, including coral polyps, sea anemones, and sponges. It is occasionally found in the waters of Cuba, Puerto Rico, and the Eastern Caribbean Sea. In Puerto Rico, it is not as common as the hawksbill turtle and the green sea turtle, and there is no beach known to be used as a nesting site. The main causes for its population decrease are: the destruction of nesting areas, shrimp fishing by trolling, and contamination. Locally, this species is not listed by the DNER. The occurrence of this species in the project area is probable.

3.6.2 Green sea turtle

The green sea turtle (*Chelonia mydas)* is a mostly herbivorous turtle considered as an endangered species by the DNER. In the Federal jurisdiction the green sea turtle is considered as a threatened species. It may be found throughout the Pacific and Atlantic Oceans. In the Atlantic, there are nesting beaches in Surinam, Costa Rica, Florida, the Virgin Islands, and Puerto Rico. The island of Culebra and adjacent keys have been designated as a critical habitat for the green sea turtle. This species has been reported for Guayanilla and Tallaboa bays. The occurrence of this species in the project area is likely. The main causes for this species' population decrease have been the loss of a habitat for nesting, the theft of eggs, hunting, disturbances in nesting beaches, dredging, floating debris, and destruction of feeding areas. It is estimated that there are between 200 and 1,100 female turtles nesting in the coasts of the US.

3.6.3 Hawksbill sea turtle

The hawksbill sea turtle (*Eretmochelys imbricata*) is a marine turtle designated as an endangered species by the USFWS and the DNER. It nests in undisturbed coasts between the months of May to November. The hawksbill sea turtle visits the coral reefs and feeds mostly on marine sponges, although it also feeds on fruits, leaves, and red mangrove (*Rhizophora mangle*) bark as well as from other marine invertebrates. This species is considered as one of the most endangered species in the world. The critical habitat of this species covers the islands of Mona, Culebra, Puerto Rico, and adjacent keys. This species has been observed in the Guayanilla and Tallaboa bays. The occurrence of this species in the project area is probable. Nest looting, and development in the beaches where this turtle nests constitute the main cause for the decrease of this species.

3.6.4 Leatherback sea turtle

The leatherback sea turtle (*Dermochelys coriacea*) is a marine turtle designated as an endangered species by the USFWS and the DNER. It nests between the months of February and August in the beaches of the north, east and west of Puerto Rico. It has also been documented as nesting in the coasts of Mona, Culebra and Vieques. This species has not been reported for the project area, however its occurrence is probable. The species shows a preference for high-energy beaches. Vandalism, egg looting, destruction of adequate breeding areas and coastal development are the main causes for the decrease of this species. The leatherback sea turtle feeds on invertebrates, particularly pelagic jellyfish. At present, there are no nesting areas of the leatherback sea turtle in the vicinity of the project areas.

3.6.5 Brown pelican

The brown pelican (*Pelecanus occidentalis*) is a common resident of Puerto Rico. This bird is designated as an endangered species by the USFWS and the DNER. It is found in the coast, bays and lagoons, but may be seen also in the Island's interior, in fresh-water dams located in the mountains. Its main nesting area is Cayo Conejo in Vieques. It may be observed in mangrove forests along the coast of the Project, both in Guayanilla-Peñuelas and Ponce. Individuals of this species were seen in both sites in the field studies conducted for this PEIS. The occurrence of this species in the project area is likely. It feeds mainly on fish from the sea.

3.6.6 Roseate tern

The roseate tern (*Sterna dougallii*) is classified as an endangered species by the DNER and the USFWS. It is a migratory species that visits the Caribbean during its breeding season. It is found in coastal areas throughout the Caribbean, but the larger populations occur in the Lesser Antilles. It nests normally over scattered vegetation in the islets and small keys close to the coast. In Puerto Rico they nest mostly in the south coast, particularly in the region of La Parguera, Guánica and Guayanilla, from May until September. The occurrence of this species in the project area is probable, within known range.

3.6.7 Puerto Rican nightjar

Both the USFWS and the DNER classify the Puerto Rican nightjar (*Caprimulgus noctitherus*) as an endangered species. It is commonly found in the thick forests of Puerto Rico's southwest coast, particularly in the Guánica State Forest, and areas surrounding Guayanilla Bay, including Punta Verraco and the woody forests to the north of Highway PR-2. The occurrence of this species in the project area is unlikely but likely near potential fill material sources (quarries). Puerto Rican nightjars are nocturnal birds, which feed on insects. They nest and lay eggs directly on the ground.

3.6.8 Yellow-shouldered blackbird

The yellow-shouldered blackbird (*Agelaius xanthomus*) is classified as an endangered species both by the USFWS and the DNER. Yellow-shouldered blackbirds nest in low lands in Puerto Rico and the limestone plateau of Isla de Mona. This species can occur in hills north of Guayanilla. They are commonly found near lagoons and coastal swamps, although they also occur in open areas. They are rarely observed in high or mountainous regions. Yellow-shouldered blackbirds nest frequently in colonies and construct their cup-shaped nests in trees, palms and cactus plants. The occurrence of this species in the project area is probable, but unlikely.

3.6.9 Antillean manatee

The manatee is an endangered species, both by the USFWS and the DNER, of which two subspecies are known, the Florida manatee (*Trichechus manatus latirostris*) and the Antillean manatee (*T. manatus manatus*). The Antillean subspecies is found throughout the coastal zones of the Mar Caribe, the Golf of Mexico, and the Atlantic coast of Brazil. They prefer bays, estuaries, and coastal lagoons. They are also frequent visitors at hot water discharges near industrial areas. They feed on algae and aquatic plants such as Turtle grass (*Thalassia testudinum*), manatee grass (*Syringodium filiforme*), Red mangrove (*Rhizophora mangle*) and Water hyacinths (*Eichornia* sp.). It is estimated that between 2,000 and 3,000 individuals of this species are now in existence, of which approximately 100 inhabit marine coastal areas of

Puerto Rico. It is frequently observed in the Guayanilla and Tallaboa bays. This species has been reported for the Ponce Bay and its occurrence in the project area is likely.

3.6.10 Vahl's boxwood

Vahl's boxwood (*Buxus vahlii*) is a short, endemic Puerto Rican tree (3) classified as an endangered species by the USFWS and the DNER. Mostly found in the karst zone of the central-mountainous, northwest and south central regions, in the areas of Guayanilla and Peñuelas. Although its presence in the project area has not been reported, it may occur in the hills to the north of Highway PR-2, and it may be impacted by ground cover material removal activities. Known in only three localities in Puerto Rico: Punta Higüero in Rincón, Hato Tejas, in Bayamón, and the hills north of Highway PR-2 in Guayanilla. The occurrence of this species in the project area is unlikely except near the quarries that may be used as sources of fill material.

3.6.11 Palo de rosa

Palo de rosa (*Ottoschulzia rhodoxylon*) is a small tree (3) found only in the western part of Puerto Rico and in the Dominican Republic. It is classified as an endangered species by the USFWS and the DNER. Its presence has been reported in the northern limestone (mogotes) area, and in the State Forests of Guánica, Maricao and Río Abajo. Its occurrence in the limestone hills to the north of the proposed Guayanilla-Peñuelas component is probable. The occurrence of this species in the project area is unlikely except near the quarries that may be used as sources of fill material.

3.6.12 Bariaco

Bariaco (*Trichilia triacantha*) is a small shrub or tree endemic to the arid zones of southwest Puerto Rico. It is classified as an endangered species by the USFWS and the DNER. As a shrub it may grow up to 5 feet, and as a tree it can reach a height between 15 and 30 feet. Its presence has been reported in the Guánica State Forest and the Peñuelas area, and it is also probable in the limestone hills to the north of the proposed project, in the Guayanilla Peñuelas site. The occurrence of this species in the project area is unlikely except near the quarries that may be used as sources of fill material.

3.6.13 Humpback whale

The USFWS considers *Megaptera novaeangliae* an endangered species, while the DNER had not listed it. During the spring, summer and fall, North Atlantic humpback whales feed over a vast area of ocean encompassing the west coast of the US (including the Gulf of Maine), the Gulf of St. Lawrence, Newfoundland/Labrador, and the west coast of Greenland. Other foraging areas in the North Atlantic include the waters off Iceland, north Norway and the islands of Bear and Jan Mayen (Christensen et al., 1992). During the summer, humpback whales from all six foraging areas migrate primarily to the Caribbean to breed and take care of their young. In the Caribbean, most of these whales are found in waters off the Dominican Republic, particularly in the Navidad and Silver banks, and in Samaná Bay. They also are present, but to a lesser degree, along the entire Antillean Arc, from Puerto Rico to Venezuela.

Most of the sightings of humpback whales in Puerto Rico have been along the north coast, notably the area around Rincón and the Mona Passage. Sightings are less frequent along the south coast, where the proposed project would be located. According to Mignucci (1989), humpback whales can be found occasionally in the Guayanilla-Peñuelas area. The occurrence of this species in the project area is probable.

3.6.14 Blue whale

Neither the USFWS nor the DNER have listed the blue whale. The blue whale is distributed worldwide and occurs primarily in cold open waters. They mate and calve in tropical-to-temperate waters during winter months and feed in polar waters during summer months. Its distribution in the Western Atlantic generally extends from the Arctic to mid latitudes. They can be found near the coast, usually along the edges of the continental shelf. The blue whale is best considered as an occasional visitor in the US Atlantic EEZ (Exclusive Economic Zone) waters, which probably represents the current southern limit of its feeding range. Little is known about the population size of blue whales. Prewhaling numbers have been estimated at 200,000, and though exact figures are not known, an estimated 5,000 survive today in three populations: North Atlantic, North Pacific, and the Southern Hemisphere. Its presence in the project area is probable, but unlikely, within its known range.

3.6.15 Finback whale

Both the USFWS and the DNER classify *Balaenoptera physalus* as an endangered species. finback whales are distributed worldwide, mostly in temperate waters in the Southern Hemisphere. It is a deepwater species commonly observed within the EEZ north of Cape Hatteras. They are found mostly offshore and tend to be very nomadic. The waters off New England represent an important forage area for this species. In Puerto Rico, finback whales have only been observed in deep waters. The occurrence of this species in the project area is probable, but unlikely within its known range. Between 1984 and 1988 the NMFS reported only three deaths of finbacks attributed to collisions with ships. As with other species of whales, finback whale populations have suffered from many years of hunting. The prehunting population has been estimated at about 30-50,000 in the North Atlantic Ocean. In 1977, the International Whaling Commission estimated only about 7,200 finback whales in Newfoundland and Nova Scotia.

3.6.16 Sei whale

The USFWS considers this whale an endangered species, while the DNER had not listed it. Sei whales are distributed worldwide in deep waters. They are found in the North Atlantic from Iceland south to the northeastern Venezuelan coast, and northwest to the Gulf of Mexico. There are also records from Cuba and the Virgin Islands. This species thrives around islands but rarely close to shore. Its worldwide distribution is estimated at 54,000 individuals. Although its population size within the North Atlantic EEZ is not known, it is believed that it may reach 3,000 in the Western North Atlantic (NMFS, 1998). No deaths or severe lesions to this species due to human actions, including collisions with ships, were reported between 1991 and 1997. The New England Aquarium documented a sei whale carcass hung on the bow of a container ship as it docked in Boston on November 17, 1994. The crew estimated that the whale hung from the bow for approximately four days prior to the ship's arrival into port. This species has not been reported for the study area. The occurrence of this species in the project area is probable, but unlikely within its known range.

3.6.17 Sperm whale

Both the USFWS and the DNER classify this whale as an endangered species. This species has not been reported for the study area. Sperm whales are found in all oceans of the world. The males, alone or in groups, are found in higher latitudes during the summer. In winter they migrate toward lower latitudes, and only the physically mature appear to enter the breeding grounds close to the equator. Females, calves and juveniles remain in the warmer tropical waters of the Pacific, Atlantic and Indian Oceans. In the Caribbean, large and small adults, and

calves and juveniles of different sizes have been reported (Watkins et al., 1985). The occurrence of this species in the project area is probable, but unlikely within its known range.

It is estimated that at one time there were two million sperm whales worldwide. Present population estimates are the subject of controversy, but most experts agree that there may be a minimum of 500,000.

3.6.18 Caribbean monk seal

Both the USFWS and the DNER classify the *Monachus tropicalis* as an endangered species. The Caribbean, or West Indian monk seal inhabited the Caribbean Sea, northwest to the Gulf of Mexico, as well as from the Bahamas to the Yucatán Peninsula, south along the coast of Central America and east to the northern Antilles. There have been no confirmed sightings since 1952. Since 1964 there have been several sightings by fishermen of a seal-like animal in Puerto Rican waters, along the north coast of Haiti and the Dominican Republic, and in the eastern Bahamas. The most recent of these sightings was in 1984. This has led some to believe that remnants of the original population still exist, although most scientists believe this is not the case. A 6,377 km aerial survey of the former range of this species in 1973 yielded no evidence of the presence of Caribbean monk seals, and similar searches, such as one conducted in the Gulf of Mexico and the Mexican Caribbean in 1984, have also proved unsuccessful. The occurrence of this species in the project area is unlikely.

Table 3-5: Threatened and Endangered Species Evaluated in the DEIS

Item	Species	Distribution	Probability of Occurrence in the Area	Status		Reported at Ponce	Comments
				Federal	Locally		
1	Loggerhead sea turtle (*Caretta caretta*)	Worldwide in tropical and temperate seas and oceans. Nests in Culebra.	Probable	Threatened	Threatened	No	Not known to nest in Puerto Rico. Nests in Culebra. Not present in the action area.
2	Green sea turtle (*Chelonia mydas*)	Worldwide in tropical and temperate sea and oceans. Generally found on shallow water. Nests in Puerto Rico and Culebra.	Likely	Threatened	Endangered	No	Nests in Mona and Caja de Muertos. Have been reported for Guayanilla and Tallaboa bays. Not present in the action area.
3	Hawksbill sea turtle (*Eretmochelys imbricata*)	Tropical seas. Nests on Mona.	Probable	Endangered	Endangered	No	Nests in Mona, Humacao, Culebra, Caja de Muertos, Mayaguez-Añasco. Have been observed in Guayanilla and Tallaboa bays. Not present in the action area.
4	Leatherback sea turtle (*Dermochelys coriacea*)	Tropical, temperate and sub polar. Nests in Culebra.	Probable	Endangered	Endangered	No	Nests in Culebra, Mona, Guánica, el Tuque, Ballena Bay, Mayaguez-Añasco, Arecibo, Luquillo, Fajardo, Maunabo. Not present in the action area.
5	Brown pelican (*Pelecanus occidentalis occidentalis*)	Bahamas, Greater and Lesser Antilles down to Monserrat. South coast of North America, Central America and northern South America.*	Likely	Endangered	Endangered	Yes. Was seen flying over the wharves area.	Feeds in Guayanilla. Roosts on Cayos María Langa y Palomas, near the Project, Montalva Bay, Vieques, and the USVI. Primary nesting area in Cayo Conejo, Vieques. Present in the action area.
6	roseate tern (*Sterna dougallii*)	Tropical and temperate coasts of the Atlantic and East Africa.	Probable	Threatened	Threatened	No	Nests around La Parguera. Present in the action area.
7	Puerto Rican nightjar (*Caprimulgus noctitherus*)	Endemic to Puerto Rico. Locally common only around Guánica Forest.	Unlikely, except near some quarries.	Endangered	Endangered	No	Found around Guánica and Susúa forests. Not present in action area.
8	Yellow-shouldered blackbird (*Agelaius xanthomus*)	Lower regions of Puerto Rico and Mona Island.	Possible within known range.	Endangered	Endangered	No	Not present in action area.
9	Antillean manatee (*Trichechus manatus*)	Southeast coast of US, Caribbean Sea and South America.	Likely	Endangered	Endangered	Yes	Ocasional visitor to Ponce Bay.

Item	Species	Distribution	Probability of Occurrence in the Area	Status		Reported at Ponce	Comments
				Federal	Locally		
10	Vahl's boxwood (*Buxus vahlii*)	Central karst zones of Puerto Rico, northwest and south central mountains in Guayanilla y Peñuelas.	Unlikely, except near some quarries.	Endangered	Endangered	No	Not present in action area.
11	Palo de rosa (*Ottoschulzia rhodoxylon*)	Puerto Rico and Dominican Republic.	Unlikely, except near some quarries.	Endangered	Endangered	No	Reported for Susúa, Maricao, and Río Abajo Forests. Not present in action area.
12	Bariaco (*Trichilia triacantha*)	Southwest Puerto Rico.	Unlikely, except near some quarries.	Endangered	Endangered	No	Not present in action area.
13	Humpback whale (*Megaptera novaeangliae*)	Widely distributed in all oceans. Inquisitive and shows little fear of boats. Mates and breeds in the Caribbean.	Probable	Endangered	Not Listed	No	Seen near Guayanilla and Tallaboa bays.
14	Blue whale (*Balaenoptera musculus*)	Worldwide distribution, primarily in cold waters and open seas. Found at edge of continental shelf and near polar ice caps.	Probable, but unlikely.	Endangered	Not Listed	No	Rare in Caribbean waters.
15	Finback whale (*Balaenoptera physalus*)	Worldwide in temperate waters and in southern hemisphere. Least common in the tropics.	Probable, but unlikely.	Endangered	Endangered	No	Observed in deep waters around Puerto Rico.
16	Sei whale (*Balaenoptera borealis*)	Worldwide in deep waters. Occurs around islands but in open waters.	Probable, but unlikely.	Endangered	Not Listed	No	Observed in Puerto Rico in deep waters.
17	Sperm whale (*Physeter macrocephlus*)	Wide oceanic distribution in offshore waters. May occur near continental shelves.	Probable, but unlikely.	Endangered	Endangered	No	Reported in the southeastern Caribbean.
18	Caribbean monk seal (*Monachus tropicalis*)	Caribbean Sea, northwest to the Gulf of Mexico, as well as from the Bahamas to the Yucatán Peninsula, south along the coast of Central America and east to the northern Antilles.	Unlikely	Endangered (Extinct)	Endangered (Extinct)	No	No confirmed sightings since 1952.

Source: CSA Group, 2002
Note: * Observed during field surveys (USACE, 2002).

3.7 Ecologically Sensitive Areas

The south coast of Puerto Rico, and the general vicinity of the areas where the proposed project would be developed, includes numerous ecologically sensitive areas. These include coastal uplands, mangrove forests, marshes, seagrass beds, coral reefs and offshore cays between Punta Verraco and Ponce Harbor. These systems could be subject to indirect and/or cumulative impacts resulting from additional developments induced by the Project. High on this list of sensitive areas are Punta Verraco, and the hills north of Highway PR-2 near Peñuelas, which are discussed first in the following paragraphs.

Federal and local conservation experts have recognized Punta Verraco as an area of high ecological value (DNER Heritage Program). Punta Verraco is a high headland with well-developed dry forest underlain by highly erodible soils. According to the USFWS, the point is fringed with red mangroves and has a basin mangrove forest in its western end. The density of seagrasses in Guayanilla Bay is higher and healthier around Punta Verraco (Plate Number 58 of the Environmental Sensitivity Atlas, NOAA, 2000). The area was slated for port development some time ago, but to date remains reasonably intact. Recently, a project was proposed by the owner of the parcel to generated electric power at Punta Verraco using windmills. An access road leading to the Point has partially cut off the flow of water to the basin mangrove forest and has resulted in a mangrove die off. This site offers an excellent opportunity for mangrove restoration. Also, the federally listed Puerto Rican nightjar, a ground nesting bird restricted to southwestern Puerto Rico, is known to occur in the Punta Verraco area.

Caves and sinkhole structures characterize the limestone hills north of Highway PR-2 near Peñuelas, also a known habitat of the Puerto Rican nightjar. In these areas, several quarries operate providing crushed limestone that is used for construction fill. The Applicant has indicated that the material for the proposed fill in one of the alternatives to the Project would be obtained from operating quarries in the region from Peñuelas to Juana Díaz. Only quarries that have the required permits from the DNER would be utilized. Furthermore, at the request of the USFWS, the Applicant conducted a detailed analysis of the sensitivity and potential for these quarries to provide habitat for the Puerto Rican nightjar (USACE, 2002), and agreed not to utilize certain areas and quarries, eliminating any potential impact to this species.

According to the Environmental Sensitivity Index (Plate Number 58, 59 and 60) (NOAA, 2000) several sensitive coastal resources occur between Punta Verraco and Ponce Harbor, including seagrass beds, coral reefs, mangrove fringes, and marshes. Seagrass beds occur mainly adjacent to Punta Verraco and to several cays along the segment between Punta Verraco and Ponce Harbor, including:

- Cays located south of Tallaboa Bay, which include Cayo Paloma, Cayo María Langa and Cayo Caribe.
- Cays in the area of Punta Cucharas, which includes Cayo Arenas and Isla Ratones.

Several marshes occur along the aforementioned coastal segment. One of the most relevant one is a salt brackish water marsh in La Esperanza north of Punta Cabullones in Ponce. This wetland has an approximate area of 500 acres. Another important wetland area is located at an old shrimp farm east of Tallaboa Bay and Laguna Las Salinas just to the east of Punta Cucharas. The lagoon functions as a nursery area and its associated wetlands provide habitat for a variety of wading birds, shorebirds and other coastal avifauna. These wetland areas represent excellent opportunities for a wetland conservation easement.

The following cays occur in the coastal segment between Punta Gotay in the Guayanilla Bay and Punta Carenero in Ponce: Cayo Mata, in the Guayanilla Bay; Cayo Palomas, Cayo María Langa, Cayo Río, Cayo Caribe and Cayo Parguera in the Tallaboa Bay and Cayo Arenas, Isla de Ratones and Isla de Cardona to the South-Southeast of Punta Cucharas.

Mangrove fringes and coral reefs occur along the coast of the majority of the aforementioned cays (Plates Number 58, 59 and 60 of the Environmental Sensitivity Atlas, NOAA, 2000). Other relevant coral reefs are: Unitas, Guayanilla and Fanduco, southeast of Punta Verraco and Las Hojitas in the Ponce Bay area.

3.8 Wetlands

Wetlands are defined as those areas that are flooded or saturated with surface or underground water at a frequency and duration enough to sustain, and in normal circumstances, maintain prevailing typical vegetation adapted to living in saturated soil conditions (USACE, 1987b). In general, an area must meet three criteria to be regulated under Section 404 of the Clean Water Act of 1977: hydrophitic vegetation, hydric soils, and wetland hydrology (Clean Water Act, 1969).

From April 16 to April 27, 2001, an investigation was completed by the Applicant to identify and delineate the limits of the wetlands within the project areas. Wetland Delineation for the Ponce site was approved by the USACE on May 21, 2003, and a Preliminary Wetland Delineation for the Guayanilla site was approved on March 13, 2002.

The project area in the vicinity of the Port of Ponce includes approximately 321 acres. The area is bounded by Highway PR-52 to the north and Highway PR-14 to the east, Punta Peñoncillo and the Ponce Bay to the south, and the Port of Ponce and Highway PR-10 to the west. Río Bucaná and Río Portugués are at distances of approximately 1.0 and 0.4 kilometers to the east and west respectively from the boundaries of the project area. Figure 3-17 shows the National Wetland Inventory information for the Ponce project area. Table 3-6 and Table 3-7 summarize the wetlands classifications as well as the predominant vegetation found at the Ponce site.

Approximately 59 acres of jurisdictional wetlands were identified within the project area near the Port of Ponce. Figure 3-18 summarizes the findings of this assessment.

Table 3-6: Wetland Classifications within the Project Area in Ponce

Wetlands Classifications	Description
E2EM1P	Estuarine, intertidal, emergent, persistent, irregularly flooded
E2FO3M	Estuarine, intertidal, forested, broad-leaved evergreen, irregularly exposed
E2FO3P	Estuarine, intertidal, forested, broad-leaved evergreen, irregularly flooded
E2US2/3P	Estuarine, intertidal, unconsolidated shore, sand/mud irregularly flooded
E2US3M	Estuarine, intertidal, unconsolidated shore, mud, irregularly exposed

Source: National Wetland Inventory, US Fish and Wildlife Service

Table 3-7: Predominant Vegetation in Wetlands

Scientific Name	Common Name
Batis maritima	Saltwort
Sesuvium portulacastrum	Sea purslane
Sporobolus virginicus	Sea-shore rush grass
Avicennia germinans	Black mangrove

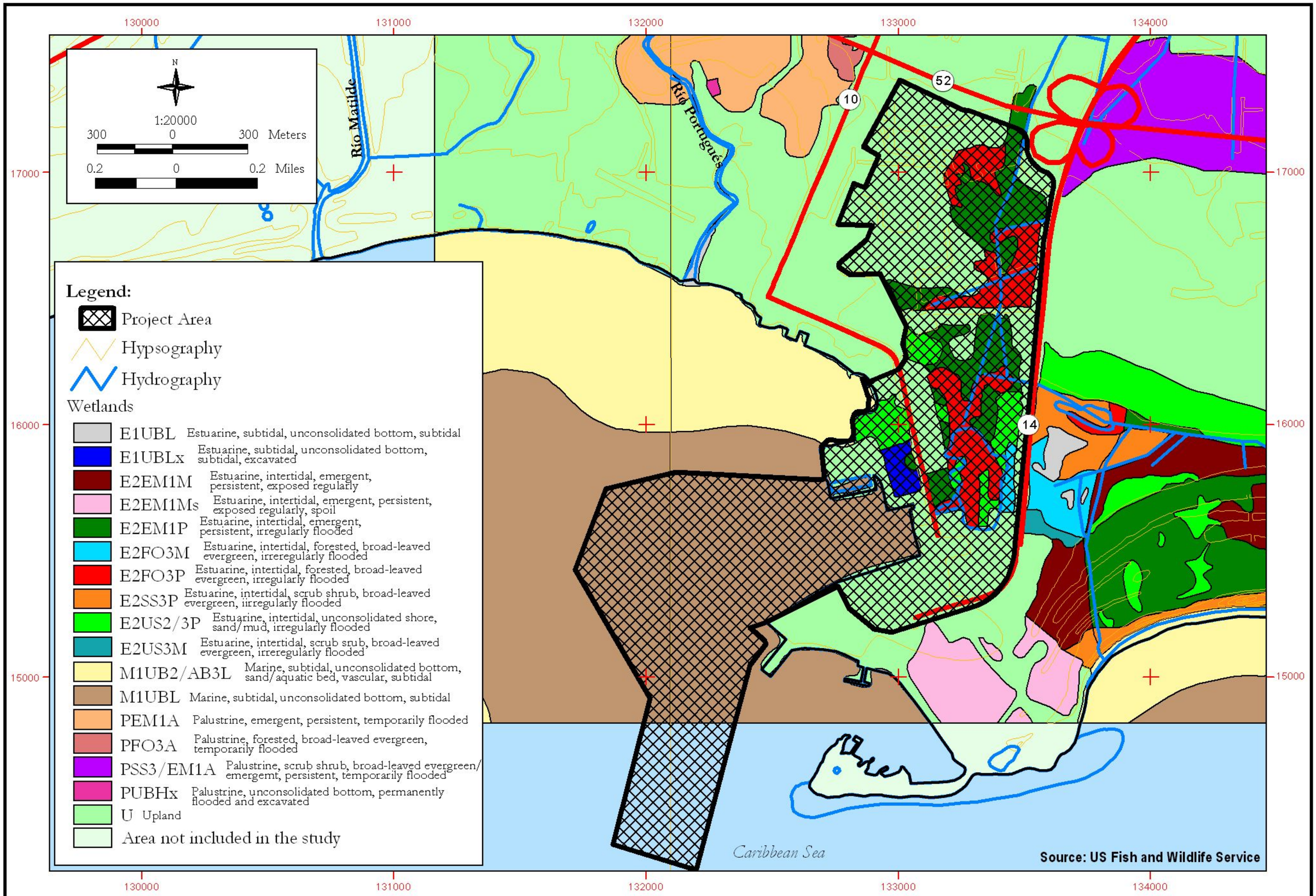
Source: Wetland Jurisdictional Determination.

The prevailing vegetation in the wetlands identified within the project area is presented in Table 3-8. These species are commonly found in estuarine wetlands subject to the tides.

Table 3-8: Prevailing Vegetation in the Wetlands

Scientific Name	**Common Name**
Leucaena leucocephala	Wild tamarind
Chloris inflata	Swollen fingergrass
Andira inermis	Angeline tree
Cyperus odoratus	----------
Sporobolus virginicus	Seashore rushgrass
Sesuvium portulacastrum	Sea purslane
Batis marítima	Saltwort
Avicennia germinans	Black mangrove
Rhizophora mangle	Red mangrove
Lancularia racemosa	White mangrove

Source: Wetland Jurisdictional Determination



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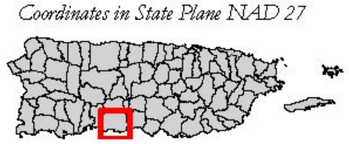

Figure 3-17. National Wetland Inventory Map: Ponce Area

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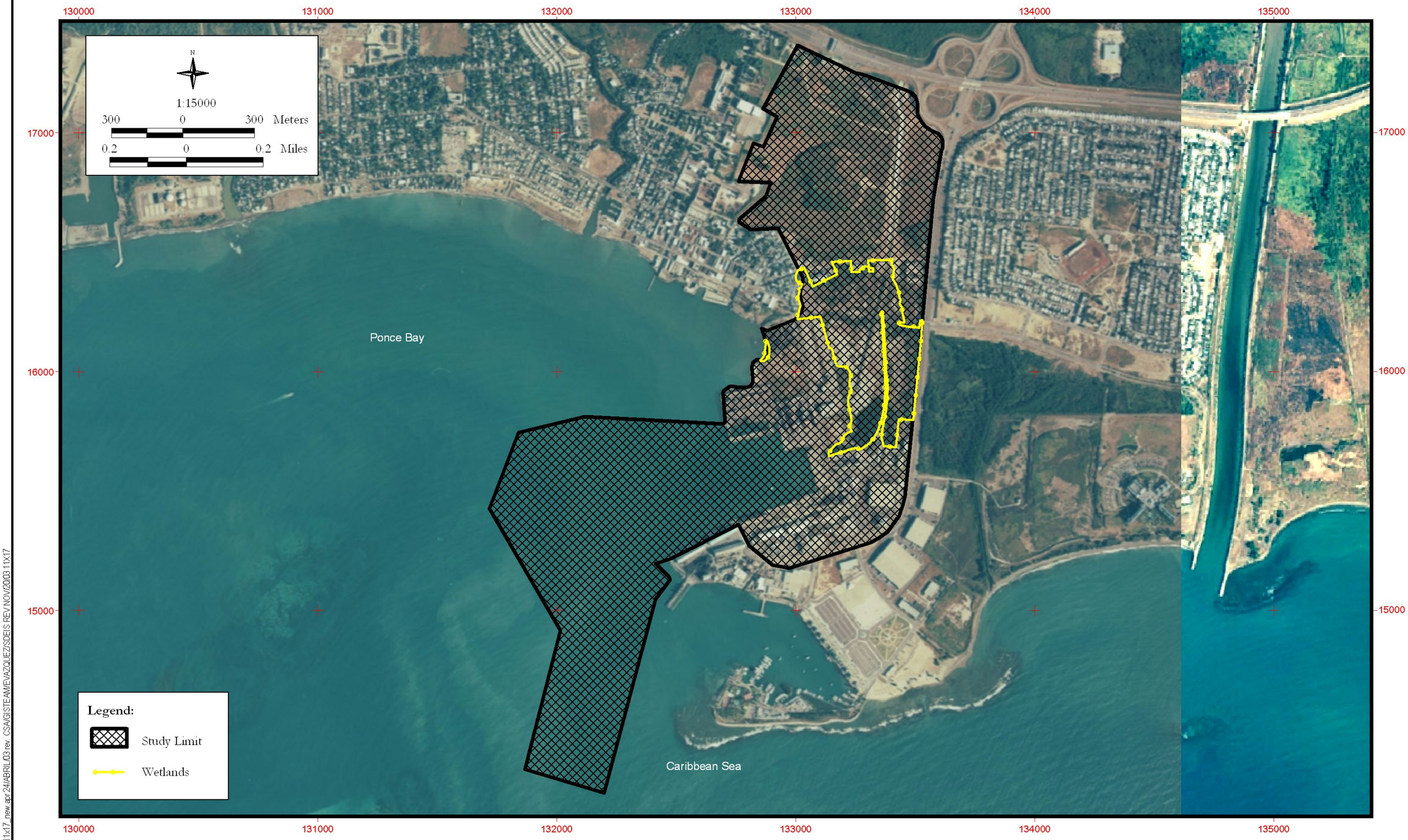

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Figure 3-18. Jurisdictional Wetland Delineation Map: Ponce Area

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3.9 Coastal Zone

In response to the intense pressures for development in the coastal zone, and its importance of the welfare of the US, Congress passed in 1972 the Coastal Zone Management Act (CZMA). The Act affirms a national interest in the effective protection and development of the coastal zone by providing assistance and encouragement to coastal states and territories to develop and implement regional programs for managing their coastal zones. The purpose of the CZMA was to establish a national policy and develop a national program for the management, beneficial use, protection and development of the land and water resources of the Nation's coastal zone. The Puerto Rico Coastal Zone Management Program (PRCZMP) was approved in September 1978.

The term "*Federal consistency*" refers to the requirement in Section 307(c) of the CMZA that identifies several types of Federal actions that must be consistent with the approved Coastal Zone Management Program. In Puerto Rico, the Planning Board is the agency designated to administer Federal consistency procedures.

All Federal projects to be carried out in the coastal zone are subject to consistency review. The Act also requires that any non-Federal applicant for a Federal license or permit to furnish a consistency certification that the proposed activity would comply with the local coastal zone management program. Generally, no permit would be issued until the Planning Board has concurred with the non-Federal Applicant's certification.

In 1981, the US Flood Insurance Act of 1968 (Public Law 90-448) was amended by the U. S. Congress to forbid issuing new Federal flood insurance in favor of new construction or substantial improvements to structures located in areas designated as "undeveloped coastal barriers". The purpose of this Law was the elimination of Federal incentives for developments in these coastal areas, with the purpose of avoiding the loss of life and property, minimizing Federal expenses, and protecting fish and wildlife habitats.

In addition to the limitation of flood insurance, the Act also prohibited Federal disbursements and economic aid for activities or projects that promote their development. The legislation ordered the Secretary of the Interior to designate coastal barriers as per their definition in the Act and to submit recommendations to add other areas. Coastal barriers are coastal landscape formations, which protect the coast against the wind, waves and tides. Following the Secretary's recommendations, in the fall of 1982 Congress approved the Coastal Barriers Resources Act (CBRA Public Law 97-384).

The act established a Coastal Barriers Resources System, which originally included 186 units, representing 666 miles of coastline and 452,834 acres of unprotected and undeveloped land in the Atlantic Coasts and the Gulf of Mexico. Later, the System was expanded and new sites have been added to it. At present, the system has 585 units in 1,200 coastline miles with an extension of approximately 1.3 million acres of unprotected and undeveloped land.

The Coastal Barriers Resources System includes 41 units in Puerto Rico. The local units are somewhat different from the sandy coastal barriers that are usually found in the east coast and in the Continental United States part of the Gulf of Mexico. Along the Island's north coast, a line of cemented sand dunes that runs parallel to the coast mainly defines coastal barriers. In other areas, cemented sand deposits present in layers along the beaches define barriers. Fringe mangroves represent another type of coastal barrier. In tropical and semitropical regions, fringe mangroves and their associated coral reefs are considered coastal barriers because the

protection they offer to inland aquatic systems is similar to the protection offered by coastal sand barriers in the continent.

There are no Coastal Barriers Resources System units in the project area. The units nearest to the Project are Punta Cabullones (PR-56), Punta Cucharas (PR-57) and Punta Ballena (PR-59). None of these units would be affected by the proposed project.

3.10 Flooding

Historically, the City of Ponce, including the areas in the vicinity of the Port of Ponce, experience significant recurrent floods due to overflowing of the Bucaná, Portugués and Matilde rivers (USGS, 1967). These streams discharge into the Ponce Bay, with Río Bucaná and Río Portugués closer to the Port of Ponce and the project areas. Flooding has been reduced in recent years with the completion of the Cerrillos Dam and the channelization of Río Bucaná.

Although flood records in the area have been compiled since 1852, the flood that occurred on August 8, 1899 was the first event for which water levels were recorded. During this flood, the water level at the streets near the Plaza Degetau, the economic center of Ponce Town, reached elevations of 1 to 2 meters. Other important floods in the area were the floods of 1954 during which the water levels overflowed the banks of Río Bucaná to the northeast of Ponce. The water flowed toward the southeast and entered Río Portugués upstream of PR-183. The 1958 event flooded approximately 10 square miles of residential, industrial, commercial and agricultural areas west of the city.

Flood Zones near the Port of Ponce: The flood maps prepared by the Planning Board for the Bucaná River show that the pier area at the Port of Ponce is classified as Zone 1M, or storm surge zone (Puerto Rico Planning Board and FEMA, 1999). The portion of the parcel where value-added activities would be located is classified as Zone 2 (Figure 3-19). This flood zone is established from detailed studies of the elevations of the 100-year flood. Construction of structures in this zone is allowed subject to elevation of the ground floor above the limit of the 100-year flood. Therefore, development of the value-added area as proposed would not be hindered by flood zones restrictions.

In contrast, the flood maps prepared by FEMA classify the areas near the existing piers of the Port of Ponce as Zone A, with a small portion classified as Zone VE and Zone C (*Flood Insurance Rate Map* (FIRM) (panel 7200000281B, July 19, 1982). Zone A includes coastal areas prone to floods with a 100-year recurrence, determined by approximation. Zone C includes those areas with minimal flooding located outside the flood limits with a recurrence period of 500 years. The FEMA maps classify the areas proposed for value-added activities as Zone A, which is equivalent to the Zone 2 of the Planning Board maps. Please refer to Figure 3-20 for details.

It is important to point out that the Río Bucaná and Río Portugués flood-control projects have changed substantially the flood patterns in the vicinity of the Port of Ponce. During Hurricane Georges (September 21, 1998) the Río Bucaná and Río Portugués basins received a cumulative 27 inches of precipitation. Preliminary estimates made by FEMA (FEMA Information on Federally Declared Disasters, updated March 4, 1999) indicate that potential damages totaling an estimated $100 million were avoided due to these flood control projects. The majority of the losses caused by Hurricane Georges were prevented by the successful operation of the Cerrillos Dam and the Bucaná and Portugués channels. Levels at the Cerrillos Reservoir increased 30 feet in 15 hours. It is estimated that, without the Cerrillos Dam and the

flood-control channels at the Río Bucaná and Río Portugués, flood levels would have reached 4.5 feet in downtown Ponce.

Figure 3-21 shows the worst-case scenario of hurricane storm tide floods at Ponce (USACE, FEMA, 1992). The information therein contained in the surge limit map should be used in connection with risks for emergency management and evacuation purposes only, and not as a basis for permitting. The FEMA Flood Insurance Rate maps (FIRM) and Planning Board flood maps must be used for the latter purpose.

3.11 Water and Sediment Quality

3.11.1 Marine Waters

An investigation of the water quality in the Ponce and Guayanilla bays was completed by the Applicant as part of the environmental studies for the initial DEIS. This study was designed to evaluate the current water conditions and their compliance with the water quality standards established by EQB. Water samples were collected at 10 stations in the Guayanilla and Ponce harbors to define current water quality conditions. The samples were analyzed for a total of 168 parameters, including dissolved ions, nutrients, metals, pesticides, polychlorinated biphenyl compounds (PCBs), and volatile and semi-volatile organic compounds (VOC/SVOC).

The main findings of the study are summarized below:

- Dissolved oxygen concentrations in both bays ranged from 5.0 to 5.9 milligrams per liter (mg/L), complying with the minimum standards of 4.0 mg/L for coastal waters established by EQB.
    - At the Ponce Bay, of 168 parameters analyzed, only 26 were detected in concentrations exceeding their respective detection limits. These were:

Chlorophyll-a	Sulfates	Copper (total/dissolved)
Fecal coliforms	Total nitrogen (TKN)	Total manganese
Total coliforms	Total phosphorous	Nickel (total/dissolved)
Enterococci	Turbidity	Selenium
Color	Total arsenic	Zinc (total/dissolved)
Fluoride	Total barium	Asbestos
Nitrate + Nitrite	Total boron	Bromoform
Suspended solids	Total cadmium	

At the Ponce site, the water quality standards established for coastal waters were exceeded for two (2) of these parameters. The parameters exceeding their respective water quality standards were sulfates and boron, which occur naturally in marine waters.

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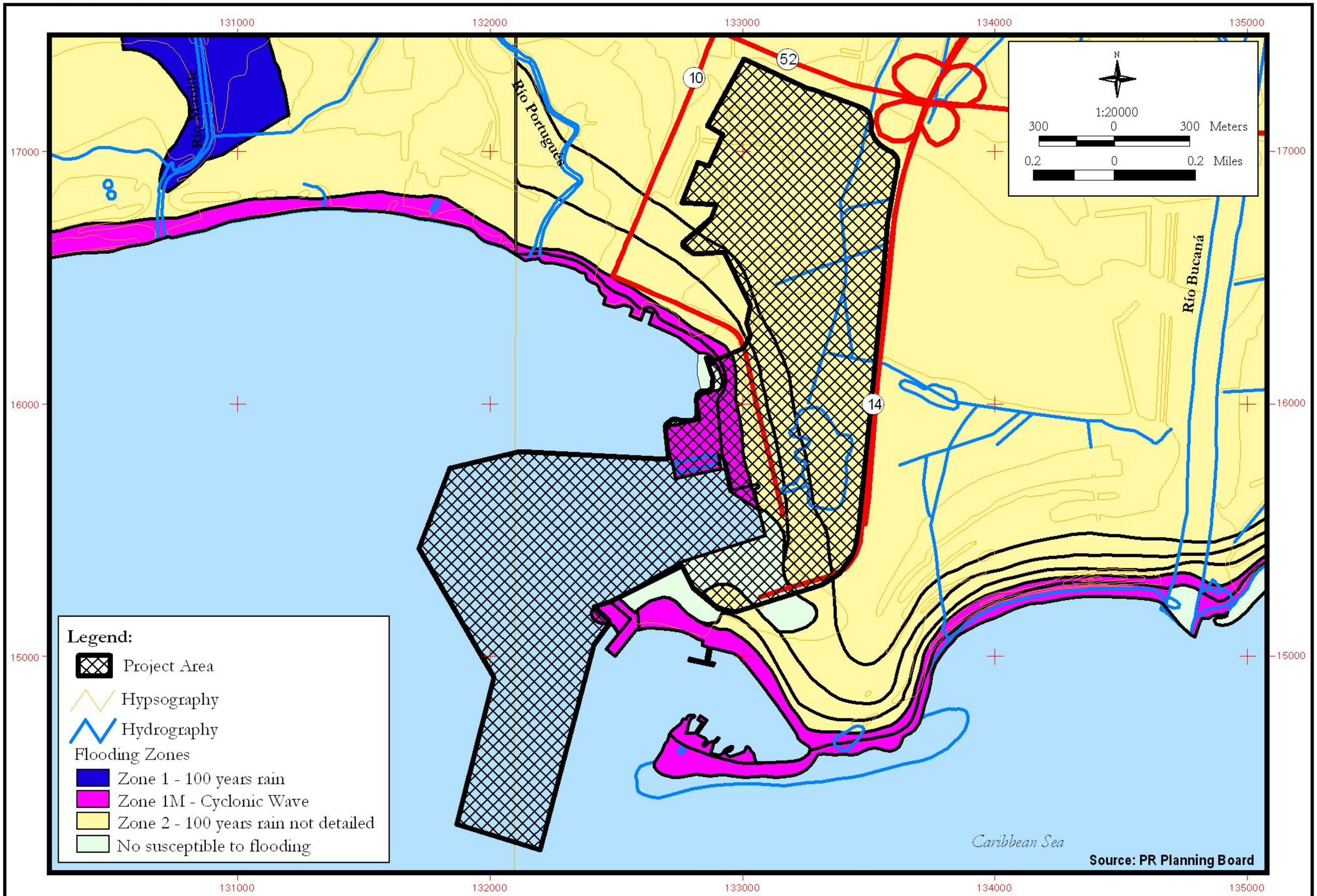

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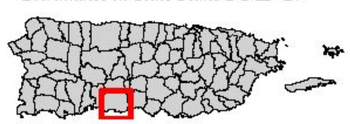

Figure 3-19. Hydrography and Zones Susceptible to Flooding (PB): Ponce Area

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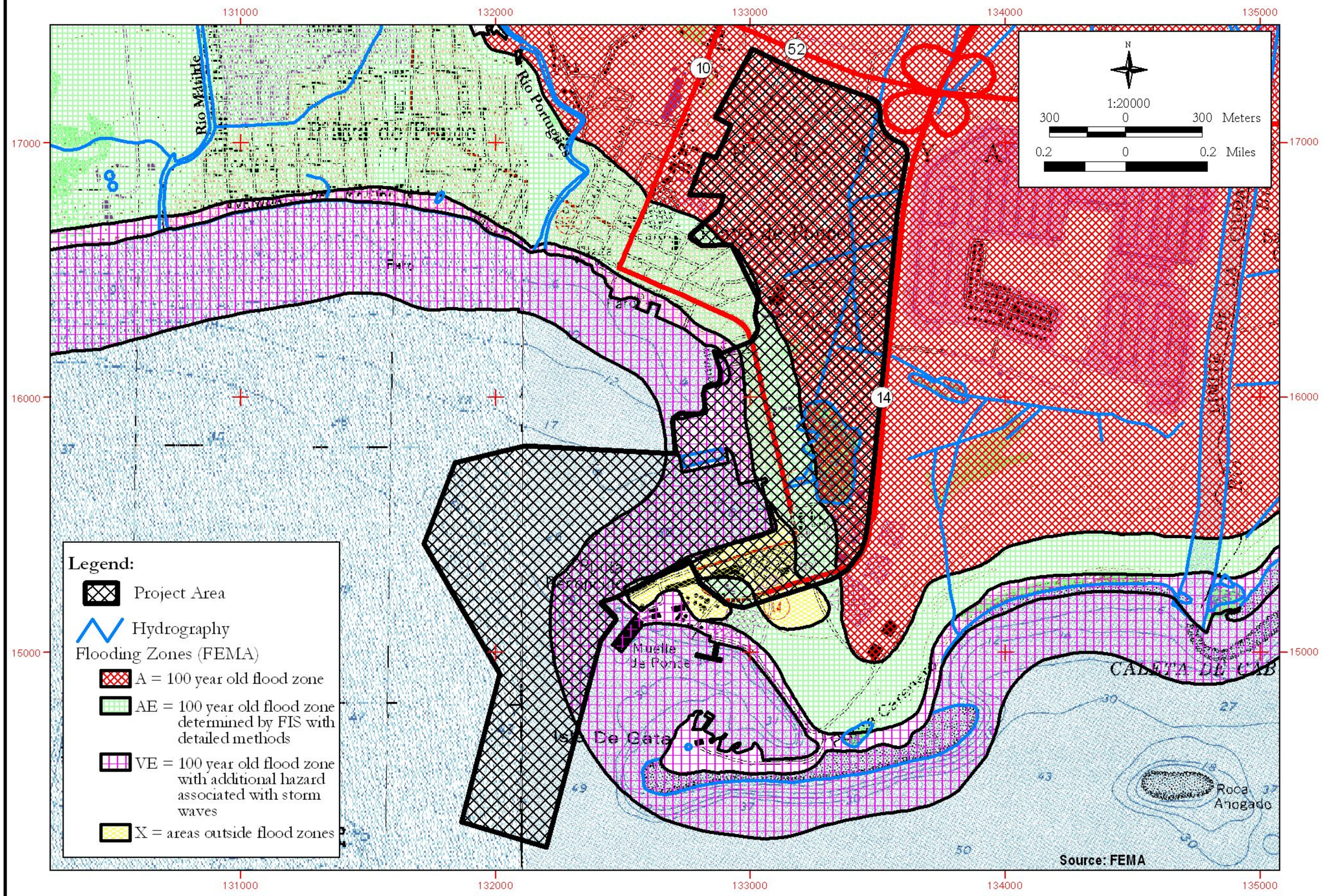

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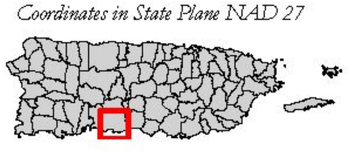

Figure 3-20. Hydrography and Zones Susceptible to Flooding (FEMA): Ponce Area

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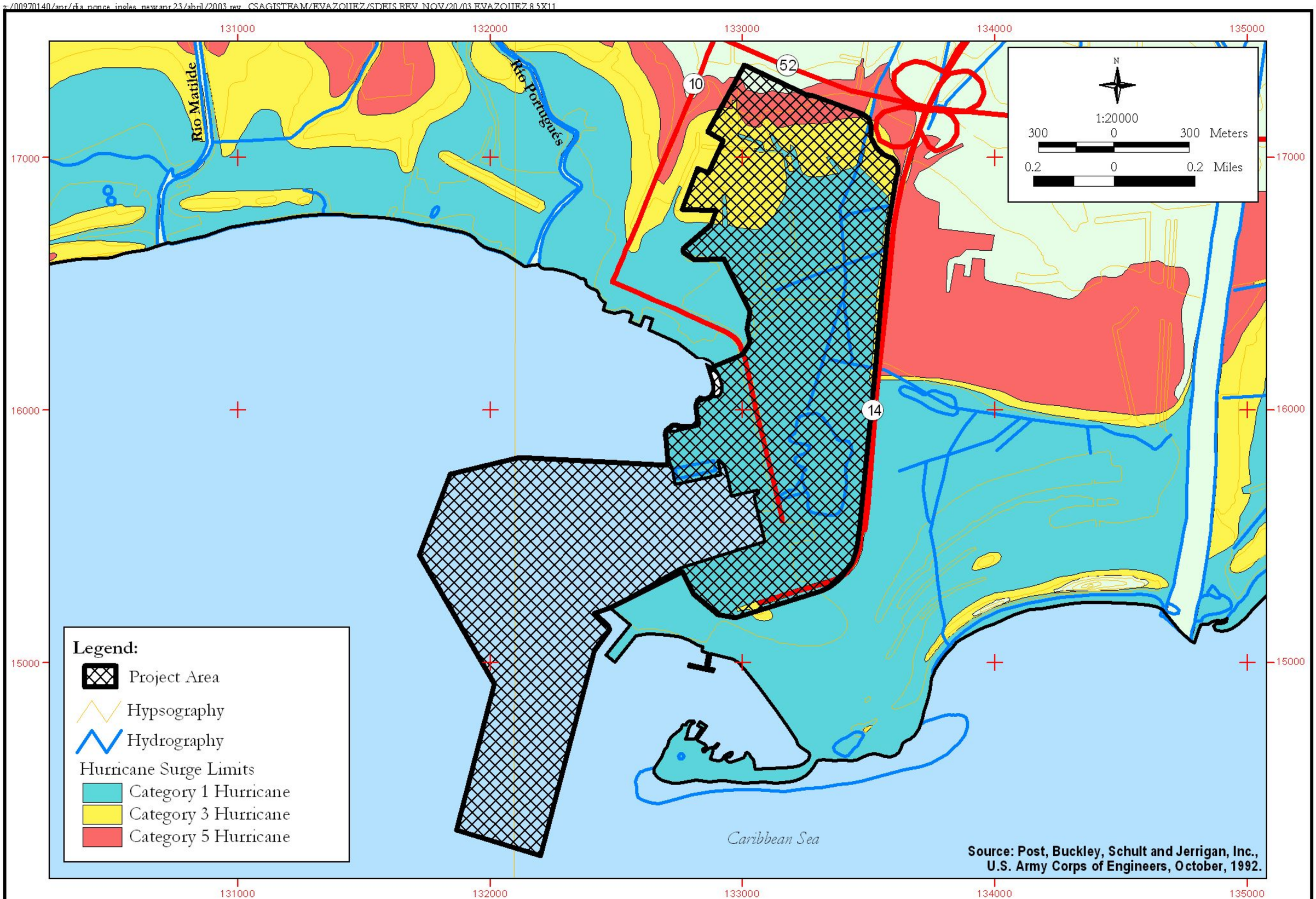

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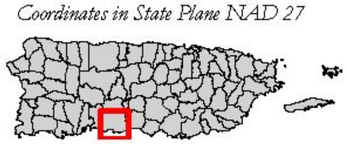

Figure 3-21. Category 1, 3, 5 Hurricane Surge Limits: Ponce Area

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3.11.2 Ground Water

According to the USGS (Grossman et al., 1972), the coastal area of Ponce is affected by an increase in the intrusion of saline water from the sea. This phenomenon has adversely affected the fresh water well supplies. In Ponce, the interface between fresh and saline water is generally located 0.50 miles away from the coast. Moreover, the shallow underground water is being replaced by deeper underground water with a higher concentration of dissolved solids and chloride (Gómez-Gómez, 1991). Along the coastal area of Ponce, the saline water intrusion is present in the west end of the alluvial plain (near the Río Jacaguas mouth) and in the southeast part of the Salinas alluvial fan.

- Due to the proximity of the coast, the local population in the areas surroundings the premises to be developed in Ponce does not depend on underground water as its main potable water supply. In many areas the chloride concentration is higher than 1,000 mg/L; therefore, the underground water is inappropriate for irrigation use or livestock consumption (Grossman et al., 1972).

- As in the Ponce component, the local population surrounding the project area in Guayanilla-Peñuelas does not depend on ground water as the principal potable water supply. The chloride concentration in the shallow underground water in the aquifers located at 0.75 miles from the sea is usually higher than the level regulated by the Safe Drinking Water Act. For human consumption, the chloride level is 250 milligrams per liter (mg/L). In many areas of the aquifer, the chloride concentration is more than 1,000 mg/L, making underground water inappropriate for irrigation or for livestock consumption (Grossman et al., 1972).

3.11.3 Sediment Quality

One of the Project alternatives include the fill of approximately 76 acres of semi-shallow waters in the Ponce Bay adjacent to the proposed extension of Pier Num. 8. Also, all the alternatives considered include the dredging of approximately between 248 and 309 acres of the navigation channel and turning basin of the Ponce Harbor. These activities would result in disturbances to the sediments in the bottom of the bay.

These activities could result in environmental impacts to the quality of the water in the Ponce Bay if the disturbed sediments were to contain any contaminants that could be suspended and dissolved. Also, since the Applicant proposes the discharge into the Caribbean Sea of most of the material to be dredged from the Ponce Harbor, the presence of any contaminants in the sediments could adversely impact the marine life in the ocean disposal zone.

At present, there are no compulsory compliance quality standards for sediments. However, the EPA published several criteria to evaluate the concentration of certain substances in sediments. These criteria include maximum recommended values but they do not represent compliance standards. Two of these criteria were used to compare the concentrations of the compounds reported by the laboratory: TEL (*Threshold Effects Level*) and ER-L (*Effects Range Low*).

The TEL represents the higher concentration levels of the contaminant where the cases not having noticeable toxicological effects (e.*g*. the minimum effects range) prevail. Within this range, the contaminant concentrations in the sediment are not considered a significant risk for aquatic organisms. The TEL is the most conservative of the two types of criteria used in this analysis. The ER-L represents the contaminant level for which 90% of the samples show no significant effects in bioassay testing. This is based in the same database as the TEL and is slightly less restrictive.

Investigations of the chemical and physical characteristics of the sediments in the Ponce Bay were conducted by the Applicant during 2002 and 2003. These investigations were designed to determine if any contaminants were present in the sediments in concentrations higher than the local and Federal standards or guidelines.

The investigations included a reconnaissance of the quality of the sediments in the Ponce inner harbor and navigation channel was conducted on April 2001 (ERTEC, 2001). Results show that the sediment layer between 40 to 60 feet below the surface of the inner harbor consists of soft, dark gray, silty clays of organic origin. In the navigation channel, the sediments are composed of fine sand and organic silty clays. Analytical results of the sediment samples from these two locations indicate that the subsurface soils are non-hazardous.

In addition to the preliminary investigations of the quality of the sediments conducted by the Applicant in the Ponce Harbor as part of the original DEIS, a further investigation of the sediments in the Ponce Harbor was completed in 2003. This study was completed as part of the requirements for the potential disposal in the ocean of material proposed to be dredged from the navigation channel and turning basin at the Port of Ponce. Ocean disposal of dredged material at a designated ODMDS requires a characterization of the material to ascertain it meets the EPA criteria for marine disposal as specified under Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972.

- Samples of the sediments and water column in the Ponce Harbor were collected at sites approved by the EPA, including the areas proposed for dredging in the navigation channel and turning basin.
- Samples were also collected of the water column at the designated ODMDS for the Ponce Harbor.
- Analyses of the water and sediment samples were performed at an EPA-certified laboratory.

The results of the analyses of the samples collected from the Ponce Harbor show that the sediments are suitable for ocean disposal. Although the concentration of several components was above the detection limits, none were at levels that would result in adverse effects to the marine environment.

3.12 Air Quality

The Federal Clean Air Act regulates ambient air quality and the EPA, under this statute, establishes National Ambient Air Quality Standards (NAAQS) as baseline amounts to determine the quality of air. As part of these NAAQS, a set of primary standards have been developed to preserve the public health, including the well being of sensitive individuals such as asthma patients, infants and the elderly.

Secondary air standards were developed as well to protect and preserve the health from known and anticipated adverse effects. Primary standards include contaminants like sulfur dioxide (SO_2), particulate matter with a size of 10 microns or less (PM_{10}), nitrogen oxides (NO_X), carbon monoxide (CO), ozone (O_3), and lead (Pb). These standards are detailed in Table 3-9.

Table 3-9: National Ambient Air Quality Standards

Contaminant	Standard Type	Period	Limit[1]	
			($\mu g/m^3$)	(ppm)
SO_2	Primary	Arithmetic yearly average	80	0.030
	Primary	24-hour average	365	0.140
	Secondary	3-hour average	1,300	0.5
NO_2	Primary & Secondary	Yearly average	100	0.053
CO	Primary	8-hour average	10 mg/m^3	9
	Primary	1-hour average	40 mg/m^3	35
Ozone (O_3)	Primary & Secondary	1-hour average	235	0.12
Particulate Matter (PM_{10})	Primary & Secondary	Arithmetic yearly average	50	
Particulate Matter (PM_{10})	Primary & Secondary	24-hour average	150	
Lead	Primary & Secondary	Quarterly average	1.5	

Source: http://www.epa.fov/airs/criteria.html

[1] To protect public health.

In general terms, air quality in Puerto Rico remains relatively clean. Currently, the Island is classified as a regulatory attainment zone for all air pollutants, with the exception of the Municipality of Guaynabo, which does not comply with the PM_{10} criteria.

The EQB operates various ambient air-sampling stations throughout the Island. Monitoring stations are located in the municipalities of Barceloneta, Carolina, Cataño, Fajardo, Guayama, Manatí, Ponce, Río Grande, San Juan and Yabucoa. These stations screen the following parameters: PM_{10}, CO, NO_2, SO_2 and O_3.

The closest sampling station to the proposed PTA is located at the Civil Defense building in the San Antonio neighborhood near the City of Ponce. This station has been in operation since December 1998 (personal communication, PREQB) and was originally located at the Fireman Station on Christina Street in Ponce. PREQB gathers samples at this station to determine the concentration of particulate matter with a diameter of 10 micrometers or less (PM10). The station is located approximately 13.7 kilometers north of the Port of Ponce and 16 kilometers southwest of the Guayanilla-Peñuelas Harbor.

In 2000, this station reflected a PM_{10} annual arithmetic mean of 40 $\mu g/m^3$. The highest 24-hour average for that same year was 94 $\mu g/m^3$. Both of these values are at levels that comply with the PM_{10} NAAQS standard of 50 $\mu g/m^3$ and 150 $\mu g/m^3$, respectively. Table 3-10 presents the air quality data for EQB Station No. 4 with respects to PM_{10} in a tabular format while Figure 3-22 presents it graphically.

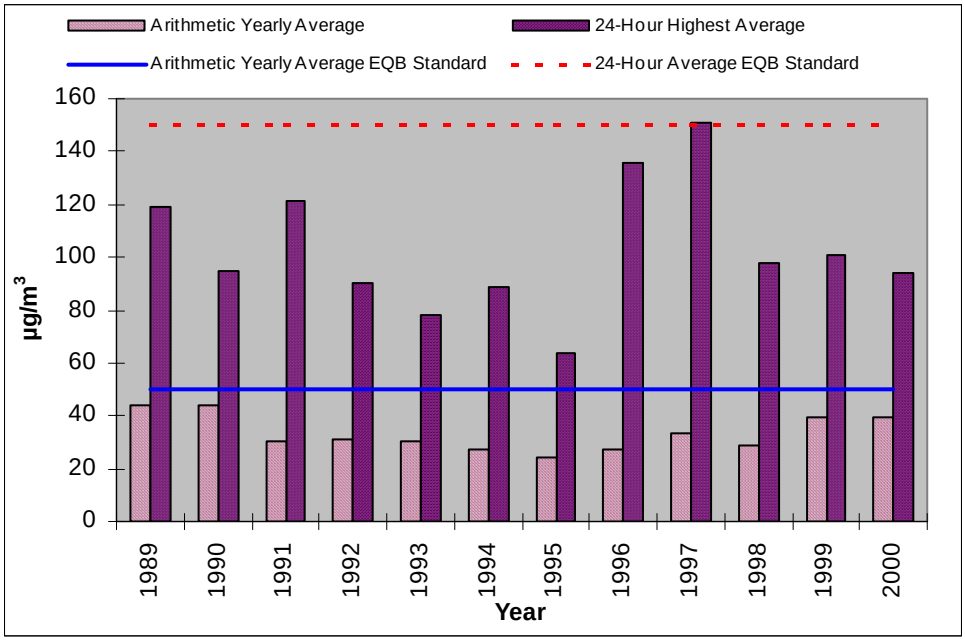
Table 3-10: Air Quality Data: EQB Station No. 4 - PM_{10}

Year	Arithmetic Yearly Average (mg/m^3)	24-hour Highest Average
1989	44	119
1990	44	95
1991	30	121
1992	31	90
1993	30	78
1994	27	89
1995	24	64
1996	27	136
1997	33	151[2]
1998[1]	29	98
1999[1]	39.4	101
2000[1]	39.7	94

Source: EQB- 1997 Air Quality Data Summary

[1] EQB, personal communication

[2] Sample exceeded the primary and secondary standard of 150 $\mu g/m^3$ in a 24-hour period.



Source: EQB

Figure 3-22: Air Quality Data: EQB Station No. 4 -PM_{10}

In the past, PREPA operated an air sampling station in the Municipality of Guayanilla that monitored levels of SO_2, and was located in the Municipal Government Building. Table 3-11 summarizes SO_2 data for the years 1993 through 1997, while Figure 3-23 presents the same data graphically.

Table 3-11: Air Quality Data: PREPA Station Guayanilla Gov. Center - SO_2

Year	Highest value for the 3-Hour Maximum Monthly Mean (ppm)	Highest value for the 24-Hour Maximum Monthly Mean (ppm)	Yearly Arithmetic Mean (ppm)
1993	0.048	0.020	0.002
1994	0.080	0.012	0.002
1995	0.035	0.008	0.001
1996	0.056	0.016	0.003
1997	0.051	0.019	0.003

Source: PREPA.

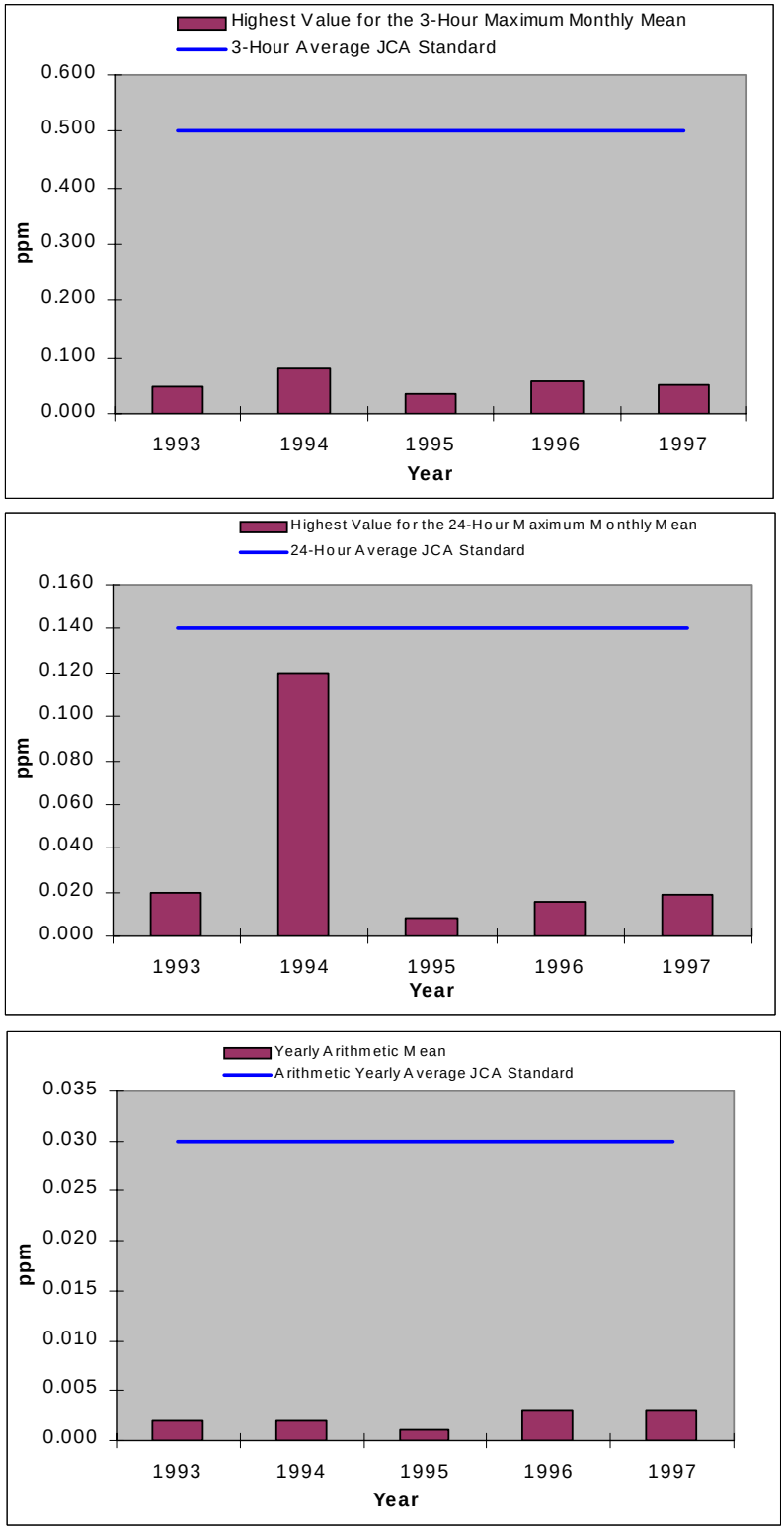


Figure 3-23: Air Quality Data: PREPA Station Guayanilla Gov. Center - SO_2

3.13 Cultural Resources

3.13.1 Archaeology

3.13.1.1 Terrestrial Archeology

A Phase IA Terrestrial Archaeological Investigation was conducted in the general areas adjacent to the Ponce Bay, to characterize the cultural or historical resources of the region (USACE, 2002). The results of the investigation served as the basis to determine the level of archaeological sensitivity of the areas in the vicinity of the Ponce and Guayanilla bays. The study concluded that there are no cultural or historical resources within the areas to be impacted by the Project near the Port of Ponce or its vicinity, an archaeological find representative of the ceramic period of the prehistory of Puerto Rico was identified on the banks of Río Tallaboa. This find is east of the Union Carbide parcel, outside of the areas considered for inclusion in the value-added activities as part of the Project. The stratigraphy of the profile of the west bank of the river reflects that the cultural residues of this find are about one meter deep. The site is exposed to floods and damage. The Applicant provided the results of the investigation to the Institute of Puerto Rican Culture (ICPR) as required by the local and Federal laws and regulations.

In the evaluation of the cultural resources in the Ponce area where the Project is planned, consideration was given to the geographical, topographical and ecological characteristics of the zone, as well as data on known archaeological findings in the area. This is a region where alluvial valleys, rivers, wetlands and the coastal zone converge. These geographical and ecological characteristics define the region of the Ponce coast and of the valleys between the hydrographic basins of the Río Portugués and Río Bucaná, as ideal areas for the support of communities during the prehistory of the zone. Equally, these conditions promoted the siting of colonial Spanish settlements during the first centuries of the Island's history.

The analyses of the area near the Port of Ponce also show that there are no cultural or historical resources within the areas planned for development. Currently, there is evidence of some 11 precolumbine archaeological finds (Figure 3-24) within a radius of five kilometers from the area where the Port of Ponce is located, including the finds Po-10, Po-8 and Po-6, which contain evidence of precolumbine settlements dating from the "salaloid" period to the "chicoide" period of our prehistory (400-1,500 d.C.). The archaeological evidence in the archives shows that this area can be considered highly sensitive in terms of archeology. The historical register of the area where the port would be expanded included a building occupied by a radio station.

3.13.1.2 SubAquatic Archaeology

A Phase IA Subaquatic Archaeological Investigation was conducted in the areas proposed for development at the Ponce and Guayanilla bays. This was necessary since, as described in the DEIS, the Applicant initially proposed the reclamation by fill of approximately 110 acres of shallow waters in the Guayanilla Bay near Punta Gotay and construction of a 6,000 feet long pier. The Phase IA investigation included the Port of Ponce, since construction of a 3,000-feet long pier and dredging of the Ponce Harbor was originally proposed. The investigation included a compilation of the published literature related to submerged archaeological deposits within the project areas, historical and prehistorical, including inspection from the shore and dives in the area. Said studies document extensive coastal and maritime human activity at the Guayanilla and Ponce bays potentially extending 5,000 years into the past. The south coast in general has a high potential for the presence of preceramic and ceramic prehistoric sites.

In terms of actual sites within the project area, the investigation concluded that there are no known subaquatic archaeological resources within the areas proposed for the Project at or near the Ponce Bay area. Nevertheless, the study also concluded that there is a high probability of the occurrence of archaeological resources, potentially eligible to the National Register of Historic Places, including the following:

- Submerged prehistoric sites due to eustatic changes in sea level
- Aboriginal canoes, including prehistoric and historic eras
- Historic shipwrecks
- Historic port discards, 16th to early 20th centuries

After the Applicant modified the Project as now proposed, with the main terminal at the Ponce Harbor, the USACE consulted the SHPO to determine if additional investigations of the subaquatic archeology of the Port of Ponce were necessary. Since the Applicant considered the fill of approximately 75 acres in the Ponce Bay adjacent to Pier # 8, SHPO concluded that an additional Phase IB investigation was necessary. The Applicant conducted this Phase IB investigation during December of 2002

- The Stage IB archaeological evaluation consisted of three activities: remote-sensing reconnaissance with proton magnetometer and side-scan sonar, visual inspection of selected targets, and excavation of test pits.
- The remote sensing identified seven areas with potential for containing underwater archaeological resources. The visual inspection of magnetic anomaly areas demonstrated there was a group of materials that could belong to the remains of a wooden ship of historic significance. The materials collected suggest a time frame between the second half of the 19th century and the first quarter of the 20th century. The test excavations demonstrated the presence of a possible residual area with materials product of port activities.

A Phase II archaeological evaluation soon followed during the period between 22 and 30 March 2003, to determine the significance, integrity and research potential of the two sites identified at the Ponce Harbor. The main objective of the Phase II study was to determine if the finds from the Phase IB had the potential for eligibility to the National Register of Historic Places in compliance with 36 CFR Part 800.4 and local legislation for the protection of underwater archaeological resources.

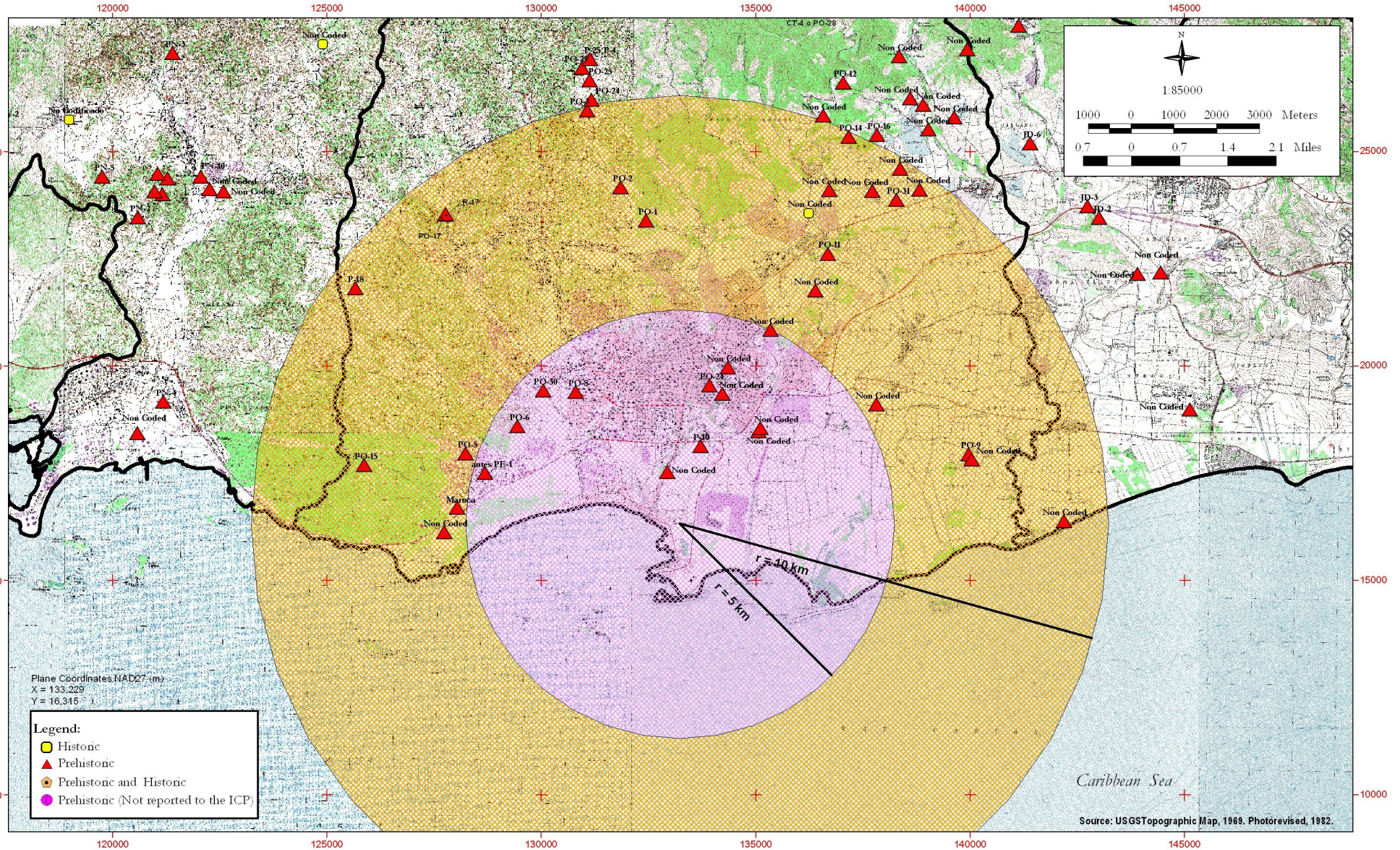
- The site of the potentially significant anomaly, identified during a previous Phase IA and IB remote sensing survey and diver target assessment, was relocated using a Wide Area Augmentation System[1] (WAAS) corrected global positioning system. Material exposed on the bottom surface corresponded to the previously reported concentration of ballast stones, iron pipes, bottles and ceramics. That location was buoyed and SCUBA equipped archaeologists verified that material exposed on the bottom surface was the same as that previously identified.

[1] WAAS is designed to improve the accuracy and ensure the integrity of information coming from GPS satellites. WAAS testing has confirmed accuracy performance of 1 – 2 meters horizontal and 2 –3 meters vertical throughout the majority of the continental U.S. and portions of Alaska.

- After confirming the site location, archaeologists conducted a systematic survey of the bottom surface to identify additional cultural material in the vicinity of the anomaly. Additional clusters of ballast stone and artifacts were tied to the buoyed cluster by light line. That area covered approximately 18,700 square feet. The primary baseline and survey web was replicated to scale in AutoCAD and served as the base map for plotting material on the surface.

- Using the web as a control, each concentration of exposed material was mapped using trilateration and underwater video. A limited number of artifacts were recovered for examination and dating.

- Examination of the Ponce Harbor target site produced no evidence of shipwreck remains. Material on the bottom surface proved to be a combination of debris associated with the normal activities of a port. Based on the evidence generated by the Phase II investigation, no shipwreck remains are associated with material on the bottom surface. The site examined does not appear to meet any of the criteria for nomination to the National Register of Historic Places and no additional investigation is recommended in conjunction with the proposed project. In any event, the Applicant's Preferred Alternative for the Project does not include fill of any submerged lands in the Ponce Bay, where any historical artifacts could occur.



Coordinates in State Plane NAD 27

Figure 3-24. Archeological Resources: Ponce Area

Port of the Americas

Puerto de Las Américas PUERTO RICO

3.14 Socioeconomic Conditions

The Applicant updated the socioeconomic study conducted as part of the original DEIS. The update reflects recent data on the population of Puerto Rico released by the US Census Bureau. The new data includes the population census of 2000 with estimates of 2002, providing a more recent picture of the socioeconomic conditions in the Island. The updated study (USACE, 2002) provides the basis to analyze the direct and indirect impacts of the proposed developments on the socioeconomic conditions in the areas near the Port of Ponce. It also provides de basis to determine if the Project complies with the requirements of a Presidential Executive Order on environmental justice. The updated assessment evaluates certain social and economic variables in each of seven municipalities that compose this region: Ponce, Yauco, Juana Díaz, Guayanilla, Peñuelas, Santa Isabel and Guánica and is based from data from the 1990 and 2000 Census effort.

The wards at the coast of the Municipality of Ponce constitute the immediate context of the proposed facilities for which there are available data. The target of this socioeconomic study was to present a clear frame of the socioeconomic situation of these areas and to determine if in the selection of the site proposed for the construction of the facilities there was discrimination because of social or economic reasons. The wards included in the analysis were: Bucaná, Cañas, Capitanejo, Playa and Vayas in Ponce. The proposed project sites are located in the Playa Ward of Ponce.

A Cost/Benefit assessment was performed for the proposed action (USACE, 2002). The purpose of this study was to measure the costs and benefits of Port of the Americas. The Project would be developed in the Ponce-Guayanilla region and would concentrate on export-import and transshipment activities. The study was divided into four main components:

- Demand Analysis
- Supply Analysis
- Impacts Analysis
- Social Profitability Analysis

Demand analysis includes an estimate of demand for containers in the region and possible market share to be absorbed by the Port. Demand was estimated in terms of transshipment demand and external trade activities. This analysis included a price analysis, which combined with demand estimation, allowed for the calculation of revenue streams.

Supply analysis included the estimation of construction investment and operation costs. Impact analysis considered following elements:

- Impacts of Construction Activity
- Impacts of “Value-Added” Operations

3.14.1 Socioeconomic Variables for the Municipality of Ponce Compared with the Municipalities of the Region

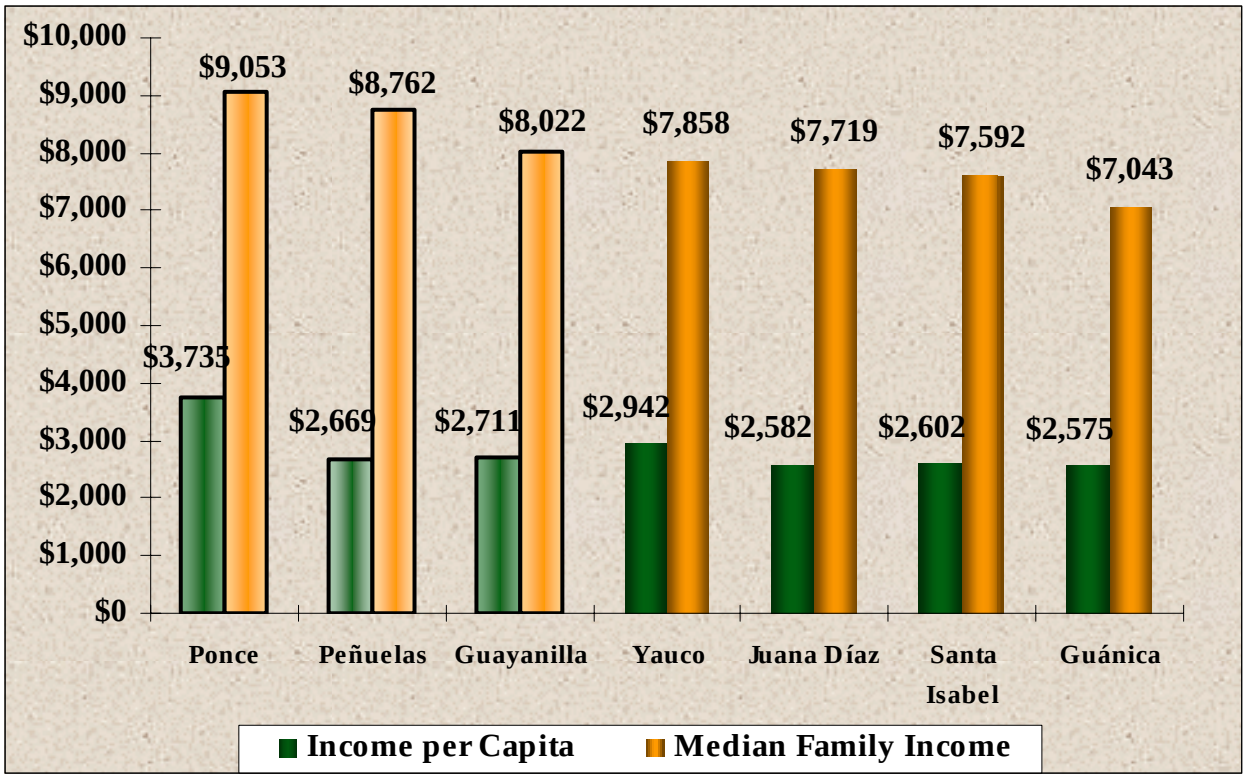
3.14.1.1 Income Indicators

The per capita income, median family income and the families below poverty levels for the seven municipalities in the vicinity of the Project are shown in Table 3-12 and Figure 3-25.

Table 3-12: Income Indicators

Municipality	Population	Per Capita Income	Median Family Income	Families Below Poverty Level	
				Number	Percentage
Ponce	187,749	$3,735	$9,058	26,855	58.8
Peñuelas	22,515	$2,669	$8,762	3,517	67.8
Guayanilla	21,581	$2,711	$8,022	3,368	65.5
Yauco	42,058	$2,942	$7,858	7,077	67.4
Juana Díaz	45,198	$2,582	$7,719	7,170	69.4
Santa Isabel	19,318	$2,602	$7,592	3,124	67.4
Guánica	19,984	$2,575	$7,043	32,568	72.8
Region	**356,403**	**$3,242**	**$8,477**	**54,679**	**63.3**

Source: Population Census, 2000



Source: Population Census, 2000 from Estudios Técnicos, 2001.

Figure 3-25: Income Indicators

The per capita income for the region was $3,242. For the municipalities that comprise the region, Guayanilla had the third highest per capita income with $2,711, Peñuelas had the fourth one with $2,669, and Ponce had the highest per capita income with $3,735.

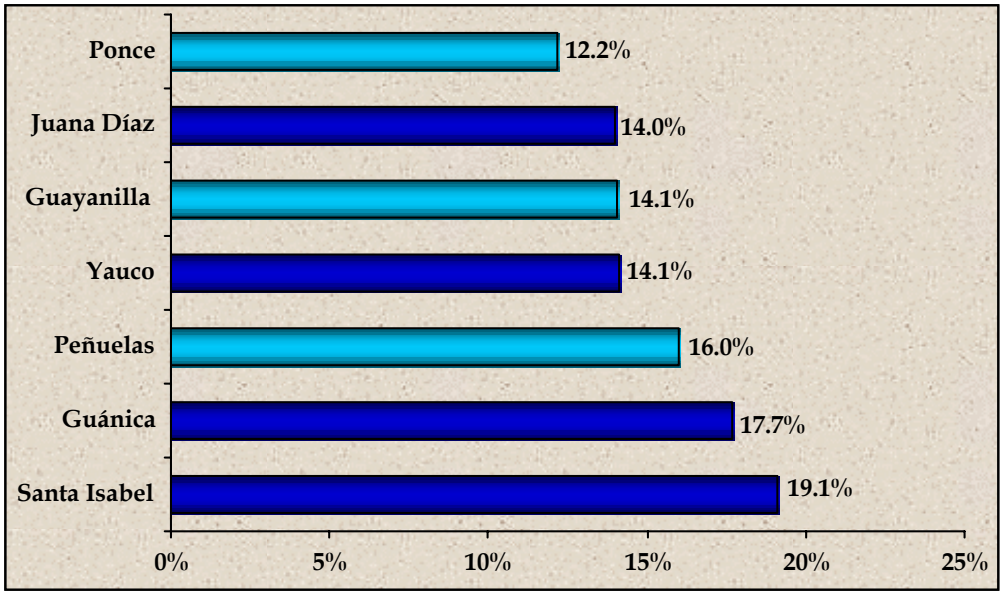
- The median family income for the Region was $8,477. The median family income for the Municipality of Ponce was $9,053, which was the highest in the region, followed by Peñuelas and Guayanilla with $8,762 and $8,022, respectively.

- Sixty-three percent of families in the municipalities of the region lived below poverty levels, according to Federal standards. The municipalities of Ponce and Guayanilla have the lowest poverty levels in the region with 58.8 percent and 65.5 percent, respectively. Peñuelas has a poverty level higher than the municipalities of Ponce and Guayanilla with 67.8 percent.

In Ponce, the average salary was reduced 14.23%, while in Guayanilla and Peñuelas it increased 16.67% and 12.98%, respectively. Income per capita showed almost no change compared to 1990 levels, which suggests that salaries in the vicinity of Ponce have increased in absolute terms at a higher pace that inflation.

3.14.1.2 Unemployment Rate

The workforce of the municipalities that comprise the region consisted of 116,600 people, as of June 2000. Figure 3-26 shows the unemployment rates for the seven municipalities that comprise the region.



Source: Department of Labor and Human Resources, June 2000 from Estudios Técnicos, 2001.

Figure 3-26: Unemployment Rate (Percentage)

The unemployment rate for the region was 13.6 percent in 1990. The study indicates that this rate is 3.5 percent higher than the rate for Puerto Rico (10.1 percent). Of the municipalities that comprise the region, Ponce reflected the lowest unemployment rate with 12.2 percent, followed by Juana Díaz with 14 percent and Guayanilla in third place, with 14.1 percent. The Municipality of Peñuelas reflected an unemployment rate of 16 percent.

In 2001, municipalities in the Ponce region experienced an average increase in unemployment rate of 8.1%. For the components of the Project (Ponce, Guayanilla, Peñuelas), the increase was lower, averaging 2%.

3.14.1.3 Population Growth 1990-2000

The population growth experienced by the region during the period of 1990 to 2000 was 5.1 percent. Table 3-13 presents supporting data with regards to this issue.

Table 3-13: Population in the Region

Municipality	Population 1990	Population 2000	Percent Growth
Peñuelas	22,515	26,719	18.7
Santa Isabel	19,318	21,665	12.1
Juana Díaz	45,198	50,531	11.8
Yauco	42,058	46,384	10.3
Guánica	19,984	21,888	9.5
Guayanilla	21,581	23,072	6.9
Ponce	187,749	186,475	-0.7
Region	**358,403**	**376,734**	**5.1**

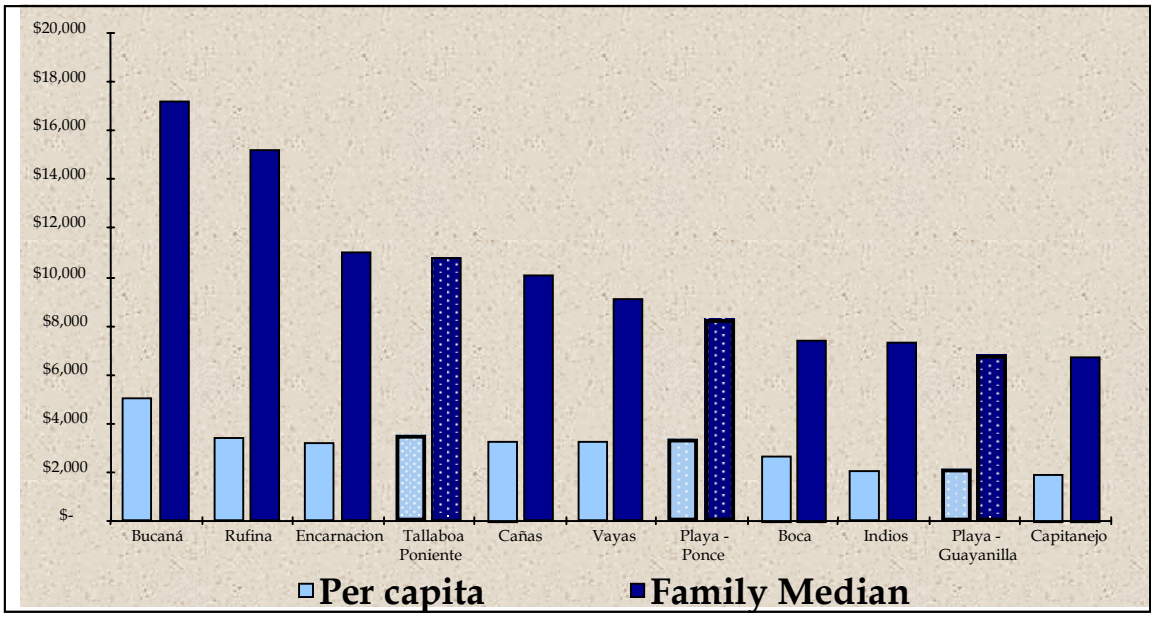
Source: Population Census 1990 and 2000, from Estudios Técnicos, 2001.

- The Municipality of Ponce exhibited the lowest population growth during the last decade, with a decline of about –0.7 percent while Peñuelas exhibited the highest population growth during the same period, with an increase of 18.7 percent.

3.14.2 Evaluation of Socioeconomic Indicators at the Ward ("Barrio") Level

3.14.2.1 Income Indicators

The per capita income in the study area as a whole was $2,942. The information for the individual wards evaluated is as follows. Corresponding data is presented in Figure 3-27.



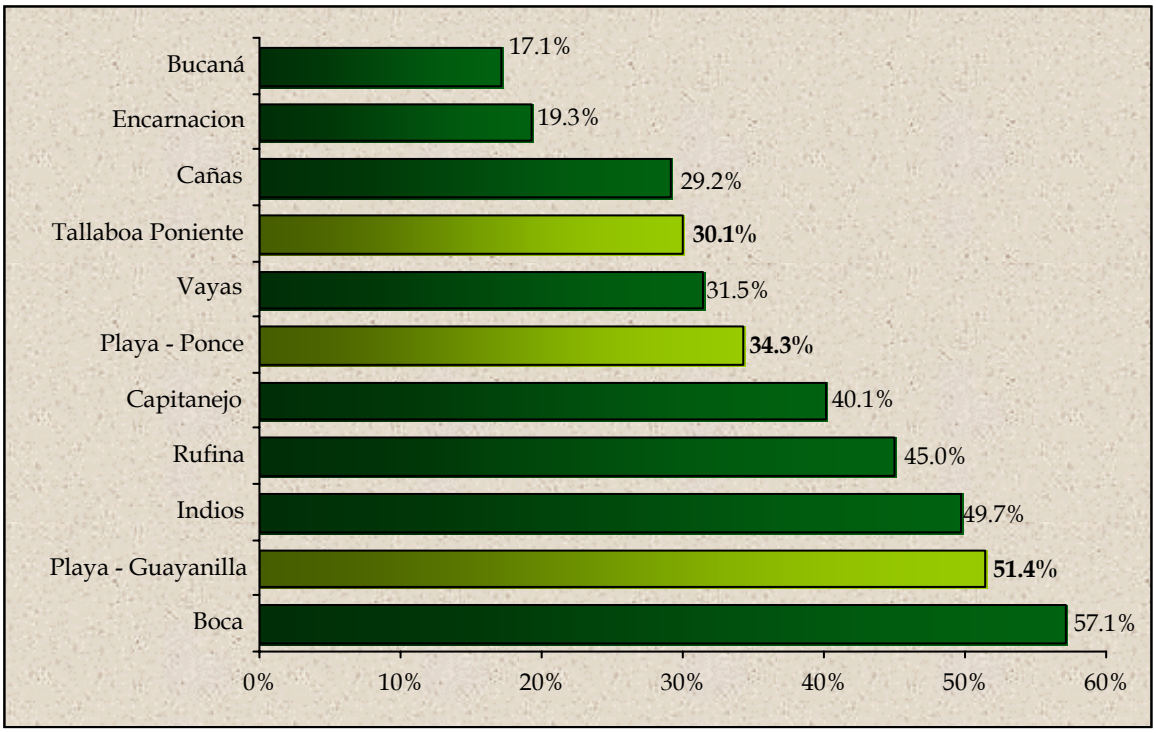
Source: Population Census 2000, from Estudios Técnicos, 2001.

Figure 3-27: Per-Capita Median Family Income

- In terms of the per-capita income, the Bucaná Ward in Ponce shows the highest value, with $5,077 per year, exceeding significantly the rest of the study area. The Playa wards at Ponce and Guayanilla exhibit per capita incomes of $3,361 and $2,177, respectively, ranking fourth and ninth respectively among all the areas considered. The Tallaboa Poniente Ward is second, with a per-capita income of $3,558.
- Relative to the median family income, the Bucaná Ward of Ponce also shows the highest value, with $17,242 per year, exceeding by a substantial margin the median income of the entire study area ($7,858).
- The variable related to the poverty level shows a pattern similar to the income at the ward level, with the Bucaná Ward in Ponce showing the lowest percent of families with incomes below the poverty level.

3.14.2.2 Public Assistance

As shown in the socioeconomic study, the variability by ward of the number of people receiving public assistance is a significant parameter. About 32.0 percent of the homes in the study area receive public assistance. The pertinent information about this parameter is shown in Figure 3-28.



Source: Population Census 2000, from Estudios Técnicos, 2001.

Figure 3-28: Families that Receive Public Assistance (Percent)

The Playa wards at Ponce and Guayanilla reflect a larger percent of families that are recipients of public assistance, when compared with the study area, with 34.3 percent and 51.4 percent, respectively. In the Tallaboa Poniente Ward (Peñuelas), the percent is lower than the average in the study area, with 30.1 percent.

3.14.2.3 Population Growth by Wards, 1990-2000

The population of the study area increased about 7.3 percent from 1990 to 2000. Data on the population growth for the wards evaluated are included in Table 3-14.

Table 3-14: Population Growth, 1990-2000

Wards	Population 1990	Population 2000	Growth 1990-2000 (Percent)
Capitanejo	1,089	1,404	28.9
Cañas	29,146	34,065	16.9
Encarnación	1,156	1,344	16.3
Vayas	1,153	1,338	16.0
Tallaboa Poniente	641	697	8.7
Indios	2,318	2,339	0.9
Playa (Guayanilla)	1,326	1,317	-0.7
Bucaná	4,053	3,963	-2.2
Rufina	220	210	-4.5
Boca	1,330	1,263	-5.0
Playa (Ponce)	18,027	16,926	-6.1
Study Area	**60,459**	**64,866**	**7.3**

Source: Population Census of 1990 y 2000, and Estudios Técnicos, 2001.

- The Playa Ward at both Guayanilla and Ponce experienced a negative population growth of -0.7 percent and -6.1 percent, respectively. On the contrary, the Tallaboa Poniente Ward in Peñuelas reflected a population increase of about 8.7 percent, the largest in the study area.
- The lowest population growth occurred in the Playa Ward.

3.15 Hazardous, Toxic and Radioactive Waste

The Project includes several sites in, and at the vicinity of, the Ponce Bay that have been or are presently used for light and heavy industrial activities. Small amounts of hazardous wastes, or chemical products that generate them, have been used or are currently used as a result of this activity. The PTA's development includes the use of land that meets local and Federal requirements concerning the management and disposal of this class of materials.

Several parcels near the Ponce are currently occupied by the Port of Ponce, as well as approximately 172 acres of adjacent lands. Several industrial warehouses, a free port zone and industrial facilities are located south of the site. Additional warehouses (both active and abandoned), auto and general equipment repair shops, commercial establishments, and metal recycling facilities operate at the Playa Ward, west of the Ponce Harbor.

- According to the Puerto Rico Ports Authority (PRPA), the development of what today is known as the Port of Ponce began around 1911, with a basic setup to handle mostly bulk cargo. During the decade of 1940 the port area grew significantly. Beginning in 1960, additional growth resulted on the expansion of the land area and berthing infrastructure, with a gradual shift in the type of cargo handled at the Port to incorporate and expand container traffic, reducing the bulk cargo activities. This transition resulted in the overall improvement of the facilities to accommodate gantry cranes as well as additional storage and transit areas.

- Land uses in the area of the Port of Ponce are predominately industrial. These uses are mostly associated to the main operation of the Port, now the second largest dry-cargo commercial port in the Island. The facilities include areas for loading and unloading merchandise, storehouses, support facilities, and a metal recycling operation. These operations occupy the southwest portion of the site along with the administrative offices, parking and terminal facilities of the PRPA. A radio station and a cardboard recycling facility are located to the west of the site and just north of the port facility.

- Two vacant lots are located north and east of the parcel, respectively. These lots are mostly composed of grasslands and wetlands. A stormwater channel drains these areas. Located to the southeast are the administrative facilities of the Luis Ayala Colón Sucrs. (LACS) ship and stevedoring company. Also, Empire Company Inc, which rents and repairs heavy equipment, and supports LACS, is located in this portion of the proposed area for the PTA. Chemex Corp, a company devoted to the distribution of industrial chemicals, which are handled in-house by a railway and wagon system is located to the south. A portion of a water treatment plant located at the former National Pack Company is also located at the southern sector of the parcel. Other facilities include the receipt area of the Ponce Cement Company, Romaguera & Sons, PR Fuels (propane and molasses), Liquilux Gas Corp (liquefied petroleum products), Aljoma Lumber (wood warehouse), Leopoldo Fontanillas (shipping and stevedoring brokerage), and the former Caribe Tuna.

- The recreational area of La Guancha and the Club Náutico de Ponce are located south of the Port. The Ponce Hilton and a residential development (Villa del Carmen) are located to the east. The Caribbean Sea and the commercial and residential sector at the Playa Ward are located west of the property. The commercial area accommodates old warehouses that have been renovated to house car repair shops, commercial businesses, and government offices, among others.

A screening of the environmental databases of the area showed that two of the operations in the area are listed by the EPA Envirofacts database as hazardous waste handlers:

- PR Ports Authority-Ponce, 506 St. & 1, Ponce, Puerto Rico.
- Chemex Corp, State Road PR-10 Km. 1 Pier 7 Playa, Ponce, Puerto Rico.

3.16 Dredging and Disposal of Dredged Material

The Applicant proposes dredging and filling operations at the Ponce Harbor. This section discusses historical actions related to these activities.

A dredging project for the Ponce Harbor was authorized by resolutions of the US Senate and House Public Works Committees on October 1, 1976 and September 23, 1976 respectively, under provisions of Section 201 of the Rivers and Harbors Act of 1925, as amended (PL 89-298). The project authorization provided for a 600-foot-wide by 36-foot-deep channel from the Caribbean Sea to the Ponce Harbor, thence a 400-foot-wide by 36-foot-deep channel into the harbor. It also provided for a 36-foot-deep irregular-shaped turning basin with a diameter of 950 feet; and the deauthorization of an 18-foot project area outside the authorized project limits. About 1,200,000 cubic yards of material were excavated from the harbor and transported to an interim offshore disposal area designated and authorized by the USEPA specifically from dredged material from the Ponce Harbor. Excavation was by barge-mounted dragline and clamshell scoops, with material placed on bottom-mounted barges or scows for removal to the disposal area.

Dredging started on December 1988 and was completed in April 1989. The total length of the project was 3.4 miles. Modification of the harbor was considered necessary to provide safer navigation for existing traffic and to accommodate deeper draft bulk lumber vessels and containerships resulting from new port construction and expansion of existing facilities. Construction dredging was based on two vessel sizes, a 30,000 d.w.t. bulk cargo carrier 635 feet long and 84 feet wide, and a 10,000 d.w.t. containership with a length of 520 feet and a beam of 72 feet.

The ocean disposal site for dredged material from the Ponce Harbor, designated by USEPA as the Ponce Ocean Dredged Material Dumping Site (ODMDS) is located approximately 4 nautical miles from the nearest coastline or any significant breeding, spawning or nursery habitat of coastal living resources. There is no evidence to suggest that the site has any unique importance to feeding or passage areas of biota because it is typical of nearby well-flushed open ocean locations (EPA, 1988). No recent or historical large-scale filling operations have taken place at the vicinity of the Ponce site.

3.17 Navigation

This section describes the physical setting for navigation at the proposed project site at the Port of Ponce. These include port physiography, actual conditions, current industrial and port operations, transit characteristics, and safety stipulations. The Applicant also performed a Marine Safety and Risk Assessment to assess the potential risks associated with the increase in maritime traffic that would be brought about by the Project (USACE, 2002).

The Port of Ponce is the most important commercial port in the south coast of Puerto Rico, and the second largest in volume of commercial dry cargo in the Island. The bay is protected

against the prevailing trade winds from the east by Punta Peñoncillo and Isla de Gata, and by nearby coral reefs, but is exposed to the southern swells. The port installations are located to the east of the bay, which is about 3.5 miles wide.

The principal entrance to the port is located to the east of Isla Cardona, and consists of a navigation channel 600 feet wide and 36 feet deep. An interior channel, 200 feet wide and 36 feet deep, traverses towards a turning basin of circular shape, with a diameter of 950 feet. The entrance channel is marked with navigation buoys and an illuminated navigation target adjusted to 015 degrees. A mooring area with depths that fluctuate between 30 to 50 feet occurs northeast of Isla Cardona, while a second one occurs to the northeast of Las Hojitas, with depths averaging between 30 and 40 feet.

Various construction projects have taken place at the Ponce Harbor Federal Channel throughout its history. The following table summarizes the channel's condition as of September 30, 1996.

Table 3-15: Ponce Harbor: Condition of Improvement

Acts	Work Authorized	Documents
3 Mar 1925	Dredging 3 contiguous areas, aggregating 153 acres, to depths of 30, 18, and 9 feet, and construction of a seawall costs to be shared by US and local interests.	H. Doc. 532/67/4
30 Aug 1935	Modified conditions of local cooperation to provide that US undertake all dredging at Federal expense and return local funds previously contributed for dredging, all other portions of the improvement hereafter at the expense of local interests.	R. & H. Comm. Doc. 18/72/1
2 Mar 1945	Eliminated previously authorized 9 feet dredging area. Provided for dredging 30 feet depth area of 18 acres off the municipal pier and for construction of the breakwater off Punta Carenero.	H. Doc. 94/532/2
S.R. 1 Oct 1976 H.R 23 Sep 1976	Channel 36 feet deep by 600 feet wide from the Caribbean Sea to the harbor; thence a channel 36 feet deep by 400 feet wide into an irregular shaped turning basin, with a 950 feet turning diameter adjacent to the municipal bulkhead; deauthorization of the previously authorized 18 feet depth area of 47 acres; modification of the authorized 30 feet project to include the 36 feet channel and turning basin and to deauthorize the remaining portion of the 30 feet project in that area except that area surrounding the municipal pier.	H. Doc. 94/532/2

Source: http://www.saj.usace.army.mil/digitalproject/dpn/sajn_052.htm

The Port of Ponce handles principally general cargo, wood, coal, liquids, and steel. Its installations cover an area of approximately 315 acres, and include among others, 9 piers, 6 terminal buildings, parking and open areas as well as a crane to load and unload containers. The traffic is composed of ships, barges and tugboats. During Fiscal Year (FY) 1998-99, the port completed 329 combined operations, while it had 310 during the 1999-2000 FY. Cargo ships represent the largest operations, with an average movement of 16 ships per month.

Table 3-16 summarizes the movement of vessels for the period 1998 to the present day.

Table 3-16: Vessel Movement at Port of Ponce during 1998-2000

Month	Ships	Barges	Tugboats	Total	1998-99	1999-2000
July	14	3	3	20	26	29
August	18	2	2	22	21	34
September	12	2	2	16	21	31
October	15	3	3	21	23	28
November	14	3	3	20	27	24
December	14	2	2	18	28	26
January	13	6	5	24	22	23
February	12	4	5	21	32	24
March	14	3	3	20	32	21
April	16	1	1	18	32	23
May	-	-	-	-	32	23
June	-	-	-	-	33	24
Total	**142**	**29**	**29**	**200**	**329**	**310**

Source: Municipality of Ponce, 2002.

3.18 Infrastructure

This section describes the existing infrastructure in the project area, including port facilities, potable water supply, wastewater, stormwater collection systems, electricity, roads and highways, solid waste and other utilities.

3.18.1 Existing Port Facilities

The Port of Ponce is property of and is operated by the Municipality of Ponce. The Port includes a 610-feet-long container dock capable of accommodating vessels up to 800-feet long, and six general-cargo berths. The port also operates two specialized berths to unload coal and to manage rail freight. These nine berths have a total linear length of approximately 4,362 ft. The Port Captain, under the jurisdiction of the Puerto Rico Ports Authority, controls the Port of Ponce operations. Pilot services are offered at the port during day and night hours. The customhouse services are under the jurisdiction of the Ponce Customhouse Offices.

3.18.2 Potable Water Supply

Water supplies in the Ponce area are abundant, with PRASA facilities supplying about 34.72 MGD of potable water from filtration plants and deep wells (Table 3-17).

Table 3-17: Average Water Production for the Ponce Area, Years 2000-2001

Municipality	Facility	Average Production, MGD[1]
Ponce	Ponce Filtration Plant (Old)	5.00
	Ponce Filtration Plant (New)	20.00
	Wells	9.24
	Rural Water Filtration Plants	0.48
TOTAL		**34.72**

[1] Data compiled by CSA Group, 2001.

3.18.3 Wastewater Treatment Plants within the Region

PRASA provides treatment to all the wastewater collected in the Region from Guayanilla to Ponce through three (3) wastewater treatment plants (WWTP). The name, location, capacity and current load of each of the plants are summarized in Table 3-18, (Black & Veatch, 1999 and PRASA's Yauco Area and Ponce Area Offices, 2001). The existing wastewater collection systems are mainly gravity trunk systems with pump stations available when necessary. The plants serving Guayanilla and Peñuelas are small facilities that provide secondary treatment discharging to nearby rivers, since most of these two municipalities are not serviced by sanitary trunk systems. The Ponce area is served by a Regional Wastewater Treatment Plant, which provides primary treatment discharging to the Caribbean Sea through a marine outfall under an interim waiver to the Federal requirement of secondary treatment (Section 301h of the Clean Water Act of 1972 (amendments of 1982). Nearly 50 percent of the population in the Region uses septic tanks for the disposal of domestic sanitary wastes.

Table 3-18: Wastewater Treatment Plants at Ponce

Location	Facility Name	Design Capacity (MGD)	Current Load (MGD)	Outfall Location
Ponce	Ponce Regional Primary WWTP	18.00	14.5	Caribbean Sea

Source: Black & Veatch, 1999, and PRASA, Yauco Area and Ponce Area, 2001.

3.18.4 Stormwater

The areas at Ponce proposed for development of value-added activities, and the zone of the Port of Ponce, are equipped with stormwater collection systems. These systems consist of a combination of pipes and ditches discharging to a series of canals in the area, or directly to the coastline and the Caribbean Sea. Upgrading of these systems would be required as part of the Project, while a new stormwater collection system would be required for the area reclaimed from the Ponce Bay for storage of containers.

3.18.5 Electric Power System

The Puerto Rico Electric Power Authority (PREPA) operates the Central Costa Sur Power Plant south of Punta Gotay adjoining the Guayanilla Port. This facility has a generation capacity of 1,090 MW using oil of several grades as fuel. Also operating from the southern tip of Punta Guayanilla is the EcoEléctrica co-generation plant, with a capacity of 467 MW. Power to the project areas at Guayanilla-Peñuelas and Ponce is supplied as described below:

Near the Port of Ponce, a radial transmission line of 38 KV serves the Port of Ponce area. Also, there is a transmission line of 38 KV, which runs along PR-52 toward the west of the site where the value-added areas would be developed, and a line of 115 KV which runs from the Río Portugués area to the west toward the north of the site (Figure 3-29).

3.18.6 Roads

The elements of the PTA at the Ponce Bay area are connected with the rest of the region by two main roads: Highway PR-52 and the State Road PR-2 (Figure 3-30).

- Highway PR-52 is a principal road in the region, traversing the Island from north to south connecting San Juan to the south region and Ponce. The highway is operated by the Puerto Rico Highway and Transportation Authority (PRHTA) as a toll road, with four (4) to six (6) lanes.

- State Road PR-2 provides regional and long distance access to other southern towns and the north coast towards San Juan. In the south coast, PR-2 crosses through the urban areas from Guayanilla to Ponce.

- State Road PR-1, which runs parallel to PR-52 from Ponce to Salinas. PR-1 runs parallel with PR-52 through the municipalities of Caguas, Cayey, Salinas, Santa Isabel and Juana Díaz, connects San Juan with Ponce and intersects PR-2 in the city of Ponce.

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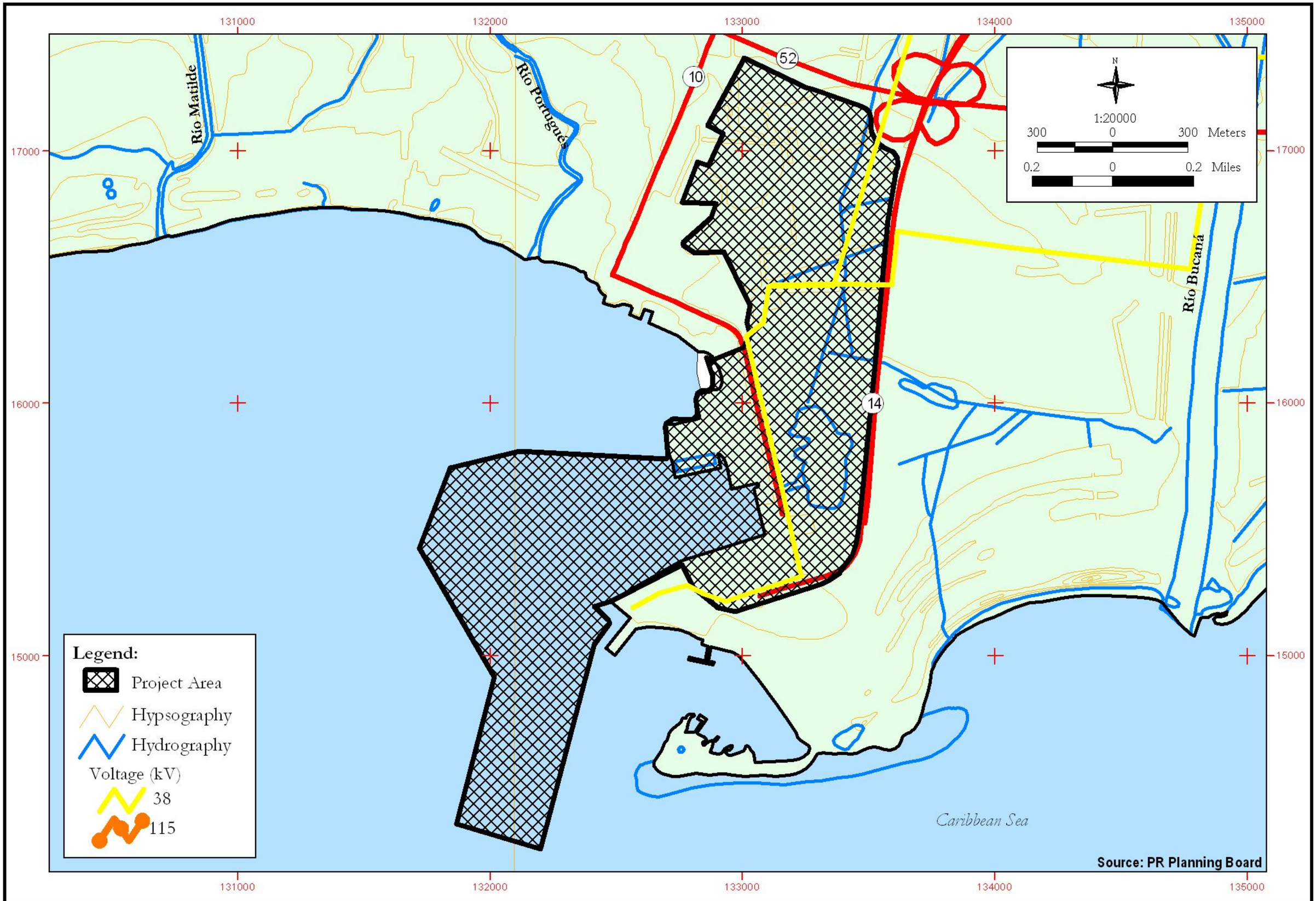

Coordinates in State Plane NAD 27

Figure 3-29. PREPA Facilities : Ponce Area

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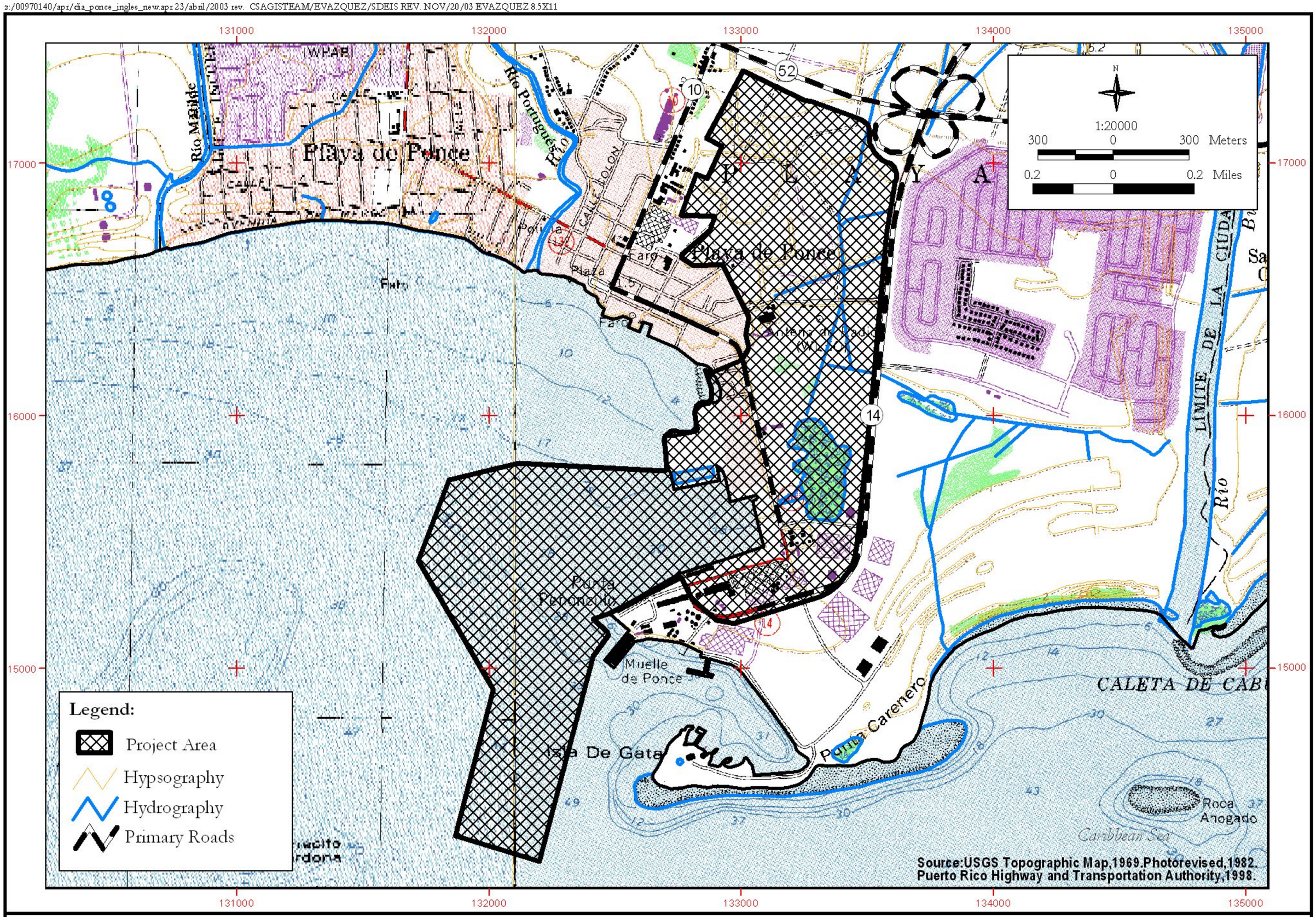

Coordinates in State Plane NAD 27

Figure 3-30. Existing Roads: Ponce Area

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3.18.7 Non-Hazardous Solid Wastes

Sanitary landfills in the Region and its vicinity operate in the municipalities of Ponce, Jayuya, Juana Díaz and Yauco. These landfills operate under permits issued by EQB and service areas designated by the Puerto Rico Solid Wastes Management Authority (SWMA) as described in Table 3-19.

Table 3-19: Landfills in Operation at the Ponce Region

Municipality	Address	Service area	Loading (Tons Per Day)
Jayuya	Street 140 km 10.5, Collores Ward, Canalizo Sector.	Jayuya, Adjuntas	134
Juana Díaz	Street PR-150, Amuelas Ward.	Juana Díaz, Coamo, Villalba and private companies	420
Ponce	Baramaya Final Avenue, Cañas Ward, La Cotorra Sector.	Ponce, Adjuntas, Peñuelas, Guayanilla, (Aguas Buenas and Cidra occasionally)	1,200
Yauco	Street 335, Barinas Ward, La Joya Sector.	Yauco, Santa Isabel, San Germán and Sabana Grande	425

Source: Solid Waste Management Authority, 2002

The Ponce Municipal Landfill is the preferred facility for disposal of the non-hazardous solid wastes that would be generated from the Project. Currently, a private company operates the landfill and it serves the municipalities indicated in the previous table.

3.18.8 Other Services

Telephone Services: The Puerto Rico Telephone Company provides telephone services in the project area, and most of the rest of the Island. There are several companies that offer cellular phone services.

Medical Services: Most of the medical and hospital services are located at the Municipality of Ponce. Ponce has eight (8) hospitals and dispensaries that accommodate approximately 1,049 patients. Moreover, there are four (4) hospitals and medical private clinics that can accommodate 446 patients.

Emergency Medical Services: Emergency Medical Services are provided by three (3) primary sources: (1) Licensed ambulance service is provided by the large regional hospitals located in Ponce; (2) Ponce Fire Department provides the emergency rescue services (these emergency services can be reached by dialing the 9-1-1 phone number); (3) Emergency disaster relief in cases of large local accidents/emergencies, storms or earthquakes is provided by the Civil Defense regional offices or Headquarters, depending on the magnitude of the emergency. There are two regional Civil Defense offices in Ponce

Police and Fire Services: Commonwealth and local police services in the project area are located at Ponce, Peñuelas, Guayanilla and Yauco. The regional headquarters for the Commonwealth Police are located in Ponce and provide coverage to the entire south district. The towns of Peñuelas, Guayanilla and Ponce provide the fire protection services closest to the project site at Guayanilla. Ponce has two fire department stations, while Peñuelas, Guayanilla and Yauco have one fire station each. The Port of Ponce is reached in about 5 minutes from the main fire control garage.

3.19 Marine Currents

Marine currents in the project areas were defined from existing data from previous investigations, and from a detailed study conducted by the USACE in 2002 (Appendix B). The following are the general conditions in the area from Guayanilla-Peñuelas to Ponce and within the Ponce Harbor:

- The North Equatorial Current, one of the principal currents in the world, is the principal oceanic current affecting Puerto Rico (Bush et al., 1995). Its flow is generally from east to west. Near the shoreline, headlands and embayments disrupt regional patterns generating local currents that may flow in any direction. Island wide, the difference between high and low water is relatively small, averaging about a foot. Tides in Puerto Rico are predominantly semi diurnal, except in the south coast where they are diurnal.

- Surface currents are regulated by the wind. Wind-driven currents are generally confined to the first 10 feet of depth, and their movement is from east to west, following the prevailing wind direction. During the daytime surface waters are pushed towards the bay by the prevailing winds from the southeast, while at night, northeast winds move the water in the opposite direction towards the Caribbean Sea. Current speeds vary between 0.1 and 0.3 knots, reaching 0.5 knots on occasions (Capella, 1995). The general westward transport of surface waters induces localized upwelling along the eastern portion of the bay. This movement of subsurface waters replenishes the wind-driven westward flowing waters. The depth interval between 10 and 15 feet is a transition zone between wind-driven surface currents and tide-driven subsurface flow.

- Subsurface flow below 15 to 21 feet is tide-driven. At those depths, water flows into the bay during the flood tide and out of the bay during the ebb tide. Capella (1995) estimated the speed of the tidal currents in 0.2 knots.

The Coastal and Hydraulics Laboratory of the US Waterways Experiment Station (WES) was requested by the Jacksonville District of the US Army Corps of Engineers (USACE) to determine how proposed deep-draft facility expansions of the harbors of Ponce and Guayanilla along the south coast of Puerto Rico may impact the hydrodynamics of the surrounding coastal environment. The ADCIRC long-wave hydrodynamic model was used to estimate tidal propagation and storm surge in each of the harbors for both preconstruction existing conditions

and postconstruction future condition deep-draft harbors. Impacts of the proposed harbor expansions were determined by computing surface elevation and current differences between pre and postconstruction. Events selected for simulation were a typical 28-day lunar month, Hurricane Georges, and an extratropical event of March 1993. The investigation was completed during the summer of 2001 by the WES staff and included in the DEIS for the Project. As part of this SDEIS, WES updated the indicated study to consider potential changes in the currents in the Ponce Harbor resulting from the elimination of the fill previously proposed and the addition of the docking channel (Appendix B).

The Ponce Harbor has a southern exposure to winds and currents that is partially protected by offshore islands and shallow regions. Offshore bathymetry drops to over 600 meters within 5-10 kilometers of the entrance to the harbor. Because of the exposure, and lack of an offshore shelf, tides and storm surges do not become well developed but remain small. For example, spring tides (without wind) in either harbor are less than 0.2 meters in amplitude, and the maximum storm surge for Hurricane Georges was less than 0.4 meters. Therefore, surface elevation impacts of the proposed harbor are small.

Wind-driven currents within the bay represent the most potential long-wave threat to the coastal infrastructure resulting from the passage of a tropical or extratropical event, according to the WES investigation. For this reason, change in hurricane surge currents as a result of construction of the harbor expansions was identified as the best measure of construction impact. Pre and postconstruction differences in current magnitudes were computed as a means of demonstrating reductions or increases in current as a result of the proposed landfill. The analyses with the updated model of the currents in the Ponce Harbor demonstrated that the proposed changes would not induce any significant changes in the circulation or currents in the harbor.

3.20 Noise

In Puerto Rico, EQB establishes acceptable maximum noise levels by means of the Regulation for Noise Pollution Control. This regulation establishes that no one will cause or will allow, from any noise emission source, the emission of noise levels that exceed the standard limits for a period longer than ten percent (10 percent) of the time (L_{10}), in any sampling period. Table 3-20 details the noise standard limits as defined by EQB. This sampling period cannot be less than 30 minutes. Residential areas are classified as Zone I, commercial area as Zone II, industrial areas as Zone III, and tranquility areas as Zone IV.

It is expected that the major noise source related to the proposed facilities would result from the loading/unloading activities at warehouse areas for the Port of Ponce, and from the operation of the proposed cranes at both terminals. These elements are considered the most significant noise emission sources of the Project and would be classified as industrial noise sources (Zone III).

Industrial facilities, several residences and commercial facilities surround the proposed project site at the Ponce Harbor. The Applicant performed an assessment of the existing background noise levels in the vicinity of the proposed site.

Table 3-20: Noise Emission Limits of the Puerto Rico Environmental Quality Board

	Receiving zones							
Noise Emission Source	**Zone I (Residential)**		**Zone II (Commercial)**		**Zone III (Industrial)**		**Zone IV (Tranquility)**	
	Day Time	**Night Time**	**Day Time**	**Night Time**	**Day Time**	**Night Time**	**Day Time**	**Night Time**
Zone I (Residential)	60	50	65	55	70	60	50	45
Zone II (Commercial)	65	50	70	60	75	65	50	45
Zone III (Industrial)	65	50	70	65	75	75	50	45

Source: Regulation for Noise Pollution Control, EQB, 1981.

The noise survey previously conducted by the Applicant in the Ponce and Guayanilla-Peñuelas project areas and included in the DEIS was updated to include only the Ponce Bay area and the changes in the Project now proposed (Appendix F of this SDEIS) Receptors that may potentially be affected by the Project were selected. The location of each receptor was based on sensitivity and proximity to the noise emission sources in the area. Figure 3-31 shows the location of these receptors for which background noise levels were measured.

Five receptors (5) were identified for the Ponce project site.

- Receptors R1 and R3 are the residential zones close to the proposed east and west site boundaries. R3 includes also a commercial area.
- R2 is the industrial zone closer to the proposed south site boundary.
- R4 represents a residential area where a school is also located.
- R5 is a geriatric center, which represents the closest tranquility zone to the project site.

Table 3-21 summarizes the noise levels exceeded 10% of the measurement period (L_{10}) and the noise limits established by the EQB, for each receptor.

Table 3-21. Noise Level Exceeded 10% of the Measurement Period (L_{10})

RECEPTOR	DIURNAL PERIOD		NOCTURNAL PERIOD	
	Existing	Adjusted Limit	Existing	Adjusted Limit
1	76.7	70.0	69.4	55.0
2	70.7	78.0	57.9	75.0
3	70.1	70.0/75.0	60.0	55.0/65.0
4	72.2	70.0	68.2	55.0
5	72.0	55.0	64.5	50.0

Existing background noise conditions during the diurnal and nocturnal periods exceed the established limits for four out of the five selected receptors.

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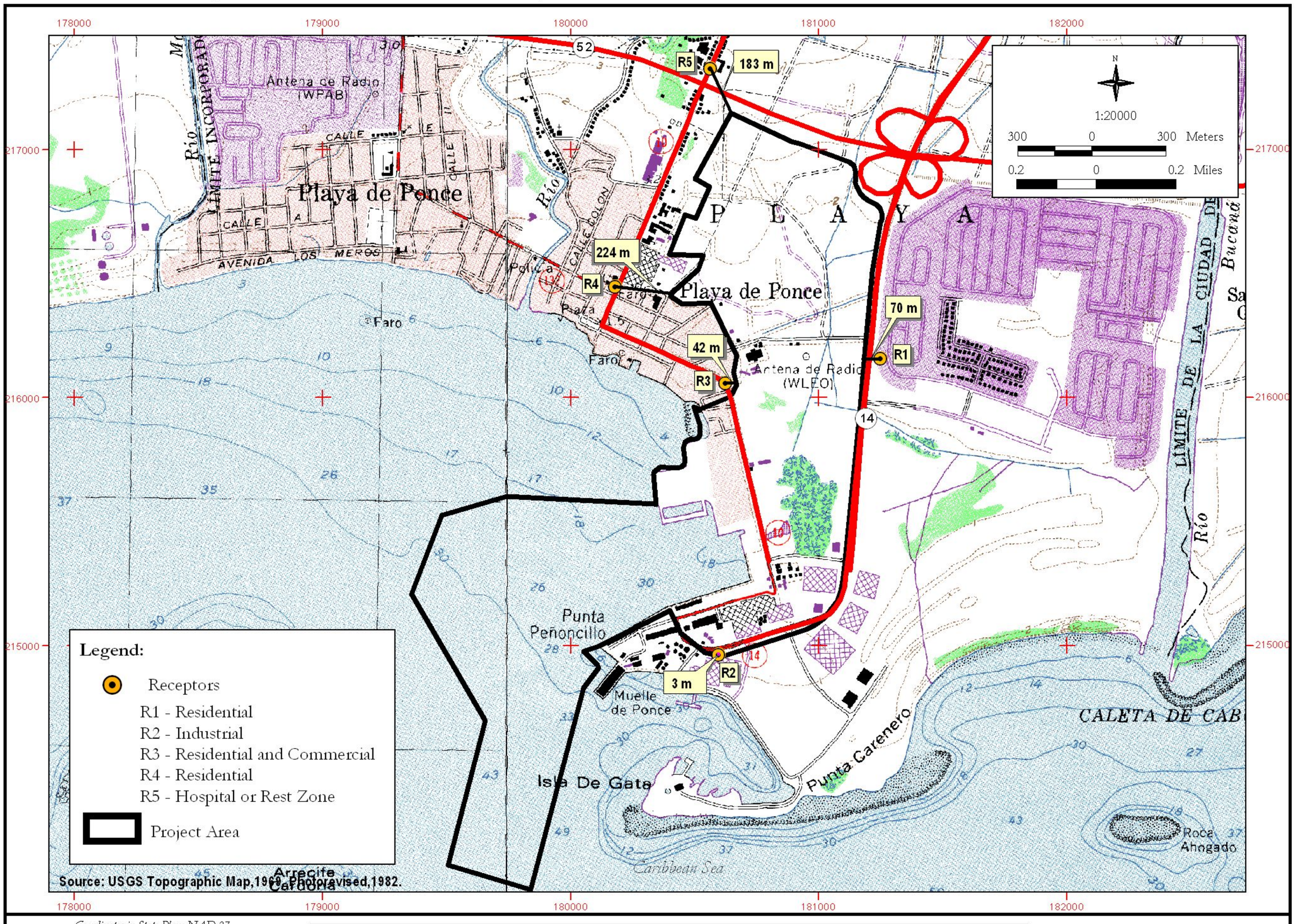

Coordinates in State Plane NAD 27

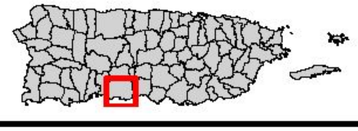

Figure 3-31. Location of Sources and Receptors used in the Ponce Noise Study

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