GREAT POND and GREAT POND BAY AREA OF PARTICULAR CONCERN (APC)

and

AREA OF PRESERVATION AND RESTORATION (APR)

A COMPREHENSIVE ANALYTIC STUDY

V.I. DEPARTMENT OF PLANNING AND NATURAL RESOURCES
Coastal Zone Management Program

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APC/APR *COMPREHENSIVE ANALYTIC STUDY*
TABLE OF CONTENTS

1.	**INTRODUCTION**	**1**
1.1	General	1
1.2	Relationship to Other Plans and Regulations	2
1.3	Historical Perspective and Overview	3
1.4	Other Classifications	3
2.	**DESCRIPTION OF THE SITE**	**4**
2.1	APC Boundary	4
2.2	Ownership Summary	5
2.3	Physical Environment	6
2.3.1	Climate	6
2.3.2	Geological Setting	6
2.3.3	Hydrological Setting	7
2.3.4	Coastal Environment	7
2.4	Biological Environment	8
2.4.1	Terrestrial	8
2.4.2	Marine	11
2.4.3	Endangered Species	12
2.5	Cultural Resources	12
2.5.1	Prehistoric	12
2.5.2	Historic	12
2.6	Built Environment	13
2.6.1	Roads and Ports	13
2.6.2	Water Systems	13
2.6.3	Wastewater Systems	13
2.6.4	Energy Systems	13
2.6.5	Solid Waste Disposal Systems	13
3.	**RESOURCE USE, USE CONFLICTS, AND ADVERSE IMPACTS**	**14**
3.1	Resource Use	14
3.2	Use Conflicts	14
3.3	Adverse Impacts	15
3.3.1	Water Quality	15
3.3.2	Air Quality	15
3.3.3	Noise	16
3.3.4	Impacts to Biological Resources	16
4.	**MANAGEMENT RECOMMENDATIONS**	**17**
4.1	Policy Framework	17
4.2	Planning, Permitting	17
4.3	Legislative Change	21
4.4	Institutional Development	22
5.	**CONCLUSION**	**22**

LIST OF KEY ACRONYMS

Area of Particular Concern	APC
Area of Preservation and Restoration	APR
Buck Island Reef National Monument	BIRNM
Coastal Barrier Resources System	CBRS
Coastal Zone Management Act	CZMA
Department of Housing, Parks, and Recreation	DHPR
Department of Planning and Natural Resources	DPNR
Department of Public Works	DPW
Division of Archaeology and Historic Preservation	DAHP
Division of Coastal Zone Management	DCZM
Division of Environmental Protection	DEP
Division of Fish and Wildlife	DFW
Federal Emergency Management Agency	FEMA
National Flood Insurance Program	NFIP
National Marine Fisheries Service	NMFS
National Park Service	NPS
Outstanding National Resource Waters	ONRW
Sea Level Rise	SLR
Significant Natural Area	SNA
Territorial Pollutant Discharge Elimination System	TPDES
U.S. Army Corps of Engineers	USACOE
U.S. Coast Guard	USCG
U.S. Environmental Protection Agency	USEPA
U.S. Fish and Wildlife Service	USFWS
U.S. Geological Survey	USGS
Water and Power Authority	WAPA

LIST OF FIGURES

1. Location Map
2. APC/APR Boundary Map
3. CBRS Map
4. Land Ownership Map
5. Rain Fall Map
6. Soil Type Map
7. Watershed Map
8. Pond Configuration Map
9. Land Use Map
10. Use Conflict Map\Resource Availability
11. Federal Emergency Management Agency (FEMA), Flood Insurance Rate Map (FIRM)
12. Existing Zoning

1. INTRODUCTION

1.1 General

Great Pond Bay is one of 18 Areas of Particular Concern (APC's) designated by the Planning Office in 1979 after public nominations and comment had been received (Figure 1). It lies along the south coast of St. Croix at latitude 17o43'N, longitude 64o39' W (see Figure 1).The Great Salt Pond (GSP) is situated within the shallow-sloping plain between Mt. Fancy on the east and Milord Pt. on the west. Great Pond Bay, approximately 2 km long and 1 km wide, is confined seaward by a barrier reef and landward by the baymouth bar which separates the bay from the Great Salt Pond.

The pond is surrounded mostly by agricultural land, and has a residential subdivision to the north east, north of Rt. 60. The road system (Rt. 60 to the east, Rt. 624 to the north and Rt. 62 to the west) circles the bay and salt pond making an effective physical border between the upland and lowland areas (Figure 2).

The pond, which serves as a settling basin for runoff from an upland drainage area of about 1165 acres, has substantial mangrove stands along the beach berm, is a habitat for birds both resident and migratory, and is probably important as a nursery for juvenile fish stock. A further 760 acres of surrounding watershed area drains directly into Great Pond Bay.

Activities in the area include a boy scout camp on the western side of the bay, a public campground on the eastern side, a shooting range south of the boy scout camp, and dairy grazing on the fields surrounding the pond. As well, fishermen use the bay as a staging point, some small game hunting occurs in the littoral forest, and a few fishermen harvest the crabs from the pond mudflats. Illegal garbage dumping occurs along the eastern mudflats.

On July 26th, 1991, the CZM Commission adopted the 18 APC's recommended in the Final Environmental Impact Statement (USDOC, 1979), which accompanies the Virgin Islands CZM Act. The Final Environmental Impact Statement notes "the importance of the entire coastal zone", but declares that "certain areas are of yet greater significance." It also establishes the criteria for the designation of Areas of Particular Concern which are as follows:

Significant Natural Areas
Culturally Important Areas
Recreation Areas
Prime Industrial and Commercial Areas
Developed Areas
Hazard Areas
Mineral Resource Areas

In September of 1991, the Coastal Zone Management (CZM) Commission met and held public hearings on all three islands on the boundaries for all 18 APC's. The Commission met again on October 1, 1991 and, based upon public input and staff recommendations, approved the boundaries of the APC's.

APC management requires knowledge of an area's ecosystem dynamics, energy linkages, historical development, and traditional uses, and an action-oriented plan for the area's future utilization. This Comprehensive Analytic Study and proposed management plan is intended to serve as the overall planning and management framework within which the various regulatory entities carry out their respective decision-making duties under their authority.

The APC's planning effort recognizes that permit decision-making is most often reactive; that is, the decision to approve or disapprove a proposed development is made in response to a permit request, not in advance of it. The general goal of developing an APC management framework is to be able to make *a priori* decisions about the allowable extent of modification of an entire landscape unit or marine ecosystem. In other words, to raise the level of decision-making from the site-specific to that of functional ecosystems and the maintenance of a wide array of interactive resource uses.

1.2 Relationship to Other Plans and Regulations

The Great Pond Bay APC Draft Comprehensive Analytic Study was prepared under the authority of the Coastal Zone Management Commission. The Comprehensive Analytic Study and proposed management plan is intended to serve as the overall planning and management framework within which the various planning and regulatory entities carry out their respective authorities. It is intended that the policy framework contained herein be incorporated into the policies and review criteria of those entities, including, but not limited to, the Department of Planning and Natural Resources (DPNR), the Department of Housing, Parks and Recreation (DHPR), the Port Authority, the Water and Power Authority (WAPA), the Department of Public Works (DPW), the National Park Service (NPS), the U.S. Fish and Wildlife Service (USFWS), the U.S. Army Corps of Engineers (USACOE), the U.S. Environmental Protection Agency (USEPA), and the Department of Property and Procurement. This Study and proposed plan will serve as a guide for future decisions concerning the area. Future development activity should be consistent with Study and proposed management plan.

The intent of this Study is for all participating territorial and federal agencies to utilize the broad policy framework to guide planning and permit decisions with respect to their own authorities. For those agencies that issue permits or review and comment on permit applications, the Study and proposed management plan does not eliminate the authority of those agencies, but increases the predictability and timeliness of the permitting process since many of the issues that must be addressed in a specific permit application are already addressed in the Study and proposed plan.

The issues surrounding any proposed use or activity within the coastal environment are complex. A proposed use immediately outside the boundary of the APC planning area may result in significant adverse impacts on the APC and impair the goals of the APC management framework described herein. This Plan contains several different forms of guidance, all of which should be considered in evaluating impact on an APC. Both the individual property owner who is considering a specific proposal and the decision-maker who is evaluating the proposal should follow the guidance of this Plan.

1.3 Historical Perspective and Overview

The Virgin Islands Coastal Zone Management Program and Final Environmental Impact Statement (VICZMP & FEIS), 1979, gave the following description of the Great Pond Bay area:

> Great Pond is the second largest salt pond in the Virgin Islands with black mangroves rimming most of the pond. In addition to serving as a large sediment trap between upland and Great Pond Bay, Great Pond is a significant wildlife area. Offshore is a barrier reef/turtle (sic) grass meadow system. The close proximity of these three natural systems makes the Great Salt Pond and Bay a unique natural area.

The pond itself is important as a silt trap for upland runoff, a means of protection for the offshore reef and seagrass beds, a productive nursery area for juvenile fish, and an important resting and foraging ground for resident and migratory avifauna.

1.4 Other Classifications

The Great Pond APC has been designated a Significant Natural Area (SNA), an Area for Preservation and Restoration (APR) and is included within the Coastal Barrier Resources System Act (CBRS) (site # VI-07). The area was recommended for conservation development by the US Department of the Interior/National Park Service (DOI) in 1960, by the VI Territorial Park System (VITPS) study by John Alexander (1981) and by the VI Territorial Park System Planning Project (VITPSPP) by Island Resources Foundation(1991.)

The following development recommendations were made for the Great Pond Bay area:

> DOI (1960): "Acquisition and conservation development of 500 acres with limited foot trails for nature study, wildlife protection and scientific research are proposed. Other facilities should be restricted to shelters, observation points and informative signs along the foot-trail system."
>
> CZMP & FEIS (1979): "The Great Salt Pond and Bay area should be preserved as a wildlife, educational, and natural area."
>
> VITPSPP (IRF, 1991): "Land around the pond should be secured by the Virgin Islands Government for inclusion within a Territorial Park System and developed as a natural attraction and educational resource with nature trails and interpretive centers."

Coastal Barrier Resources Act

Great Salt Pond has been included within the Coastal Barrier Resources System (CBRS), designated as site number VI-07 (Figure 3). This program was established to protect the natural coastal barriers remaining within the USA and its territories. CBRS designation will help protect some of the Great Pond and Bay wetlands from development in other than park-like projects.

Great Salt Pond is listed on the final CBRS list (site VI-07). Because CBRS is extended to a portion of this APC, development projects within the designated CBRS portion cannot receive federal funding or insurance.

The Federal Coastal Barrier Improvement Act of 1990 established areas in the Virgin Islands as part of the Coastal Barrier Resources System. The three purposes of this system are:

(1) to halt development in low-lying areas subject to natural disasters (flooding hurricanes);
(2) to stop wasteful federal expenditures in these areas; and
(3) to protect valuable natural resources from being destroyed by unwise economic development.

By law, any kind of federal expenditures (e.g., grants,loans), including federal flood insurance, is prohibited for any development projects within the designated CBRS site. The law does not, however, prevent projects from going forward with private backing. Certain exemptions are included for park lands, recreational areas, public recreation infrastructure, and land acquisition; federal funds can be used under certain circumstances with U.S. Fish and Wildlife Service approval. The Federal Flood Insurance Program (FFIP), insuring structures built in flood-prone areas which are not designated as CBRS sites, lost more than $657 million during the period of 1978 to 1987. Repeat claims involved only 2 percent of insured properties, but accounted for 32 percent of total losses (Millemann, 1991).

Some states have adopted similar laws restricting state expenditures in areas that are part of the CBRS. The Virgin Islands may wish to consider similar legislation in the APC's/APR's (Nathalie Peter, NOAA OCRM, 1992, written communication).

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) (figure 11) identify and classify areas subject to flooding and denote the boundary limits for projected 100-year and 500-year floods for those areas. Flooding may be caused by both inundation of the sea and/or by concentrated runoff from the surrounding watershed during storm periods. The flood hazard designations shown on the map relate to the frequency and severity of the flooding that can be expected to affect any one area. These flood hazard designations are used to determine flood insurance rates for properties within the designated flood zones.

The FEMA FIRM covers a greater area than the designated CBRS area, so both maps should consulted before further development occurs in the area.

Further wetlands management and protection should be addressed in a Territorial Wetlands Management Plan, which should be sanctioned by the VI CZMP.

2. DESCRIPTION OF THE SITE

2.1 APC Boundary

Beginning at Milord Point, the boundary extends northwesterly following the ridge line to Nugent Hill; then continues along the ridge line to Route 62; then extends east along Route 62

to a point where the road turns north; then proceeds northerly along Route 62 one thousand (1000)ft; then northeast four thousand (4000) ft; then east to Route 60, enclosing the wetlands; then in an easterly direction along Route 60 to Mt. Fancy; then south to the outer shelf edge or three mile limit (whichever is closer); then westerly along the outer shelf edge or three mile limit to a point directly south of Milord Point; and then due north to Milord Point, the point of origin.

2.2 Ownership Summary

The land surrounding Great Pond Bay and bounded by highways 62, 624 and 60 is in multiple ownership -- some is owned by the Boy Scouts, other tracts, including the salt pond itself, are in Virgin Islands Government ownership, while the remainder is privately held (Figure 4).

Parcel #3 Est. Fareham, at the western end of the bay out to Milord Point, is owned by the Boy Scouts of America, and can be used by the public through Boy Scout recreational and educational activities. The southern portion of the Boy Scout's land, at Milord Point, is occupied by the St. Croix shooting range. The almost 19 acres on this parcel provide open space along the western shore of Great Pond Bay. Access into the property is obtained from a road exiting from Route 62.

The shoreline from the boundary of the Boy Scout land eastward to the salt pond is part of a large estate owned by Howard Wall, Jr. There are subdivision boundaries shown on tax assessor maps dividing the beach property of Mr. Wall to the west of the salt pond into 3 sections: sections 1 and 2 abutting the Boy Scout parcel total 1.69 acres; section 3 is a 4.39 acre strip adjoining the smaller parcel toward the east. Ownership of a 7.67 acre parcel, comprising most of the baymouth bar, is undetermined (Wall or VI Government).

The Wall property spans 296.60 inland acres in Estate Hartman, surrounding most of the pond, over 260 acres in Estate Great Pond, on the east side of the pond and includes the 10.10 acre parcel (Remainder Estate Great Pond) immediately adjacent to the east side of the salt pond, from Route 60 south to the shore. Although the government owns the 40.81 acre salt pond, access to the pond and/or protection of the pond must be negotiated with the owner of the surrounding parcels.

East of the pond and east of Wall's 10.10 acre parcel, south of Route 60, land ownership is as follows: The 10 acre parcel, #4 Great Pond, is owned by the O'Reilly family. Thesecond and third parcels, # 5 and #6 Great Pond, which run from the Route 60 to the shoreline, are owned by the Virgin Islands Government and total almost 15 acres. Camp Arawak is on that property. Finally, a wedge of Estate Great Pond (about 11 acres), east of the remaining Wall property and abutting Estate Mount Fancy, is in private ownership, subdivided into 18 lots ranging from .36 acres to .99 acres.

Mixed land ownership in the Great Pond Bay area would make outright purchase of land difficult and costly for the Virgin Islands Government. The best option for the Government is to negotiate access easements or conservation easements on properties that would be under consideration for protection.

2.3 Physical Environment

2.3.1 Climate

Rainfall in the Virgin Islands generally increases with increasing elevation and exhibits a trend on each island of a dry-to-wet cline from east to west. Average rainfall data, compiled from several years of records at various stations can be misleading in that it probably poorly represents the available precipation at a particular area in any given year. The U.S. Virgin Islands receive an average of 41 inches of rain per year (Bowden,1970). The wettest months are September to December; the dry season is February to July (Island Resources Foundation, 1977). The Great Pond Bay area of St. Croix receives an average of about 40 inches of rainfall. The island on the whole receives an average of about 45 inches of rain per year. Most of the rainfall comes in brief showers. Heavy rainfall sometimes occurs during the passage of an easterly flowing tropical wave.

Temperatures average an annual 79 degrees Fahrenheit, with the winter low averaging 76 degrees F and the summer high reaching an average of 84 degrees F. The temperature and climate are moderated by near constant onshore breezes.

The Virgin Islands lies within the "easterlies" or "Tradewinds" which are predominantly out of the east-northeast and east (Island Resources Foundation, 1977). Trade winds average about 15 to 20 knots and vary seasonally, but most significantly during the late summer months when tropical depressions may form resulting in storms and or hurricanes. The hurricane season is from June to November, with peak activity occurring in September. The annual probability of a hurricane event in the Territory is once every 16 years (Bowden, 1974).

2.3.2 Geological Setting

The hills to the north of Great Pond are formed of sedimentary and igneous rocks of the Caledonia Formation, which were laid down more that 69 million years ago during the late Cretaceous period. Sediments in the alluvial plain are of quaternary origin. Depositional sequences of the sediments in Great Pond and the Great Pond Bay lagoon and baymouth bar provide evidence of sea level rise and shoreline retreat during the Holocene. As interpreted from Soil Conservation Service maps, the soils of the Great Pond alluvial plain are primarily represented by San Anton clay loam (SaA), Cornhill gravelly clay loam (CoA) and Coamo clay loam (CaB). Tidal flats (Tf) surround the pond, tidal swamp (Ts) comprises the beach berm and a thin band of Jaucas sand (JuB) lies along the western portion of the beach (Figure 6).

In soil engineering studies, SaA clay loam shows high compressibility and poor compaction for building foundations and has moderate to severe limitations for septic tank filter fields.

CoA gravelly clay loam has severe limitations for building foundations due to poor stability and very high shrink-swell potential. CoA also has severe limitations for septic tank filter fields due to slow permeability.

CaB clay loam has fair stability for building foundations and slight limitations for septic tank filter fields.

Overall, the soils on the shallow sloping Great Pond Bay alluvial plain are moderate to poor as substrates for building and have severe limitations for septic tank filter fields which should be limiting factors in defining housing density. These soils are best suited for grazing land, with good pasture management in order to permit grasses to reseed.

Historical seismicity in the USVI

As a result of convergence between the Caribbean and North American tectonic plates the Virgin Islands are located in one of the most earthquake prone regions of the world. During the past 450 years, damage has occurred from earthquakes and associated tsunamis. Destructive tsunamis occurred in the U.S. Virgin Islands in 1867 and in 1918; the latter resulted in 116 deaths and economic losses estimated at $4 million (in 1918 dollars) (USGS, 1984).

Potential human and economic losses for a similar event occurring today would be several orders of magnitude higher. Scientists report high seismic potential for a major fault rupture in the Puerto Rico Trench north of Puerto Rico and the Virgin Islands (USGS, 1984). Seismic hazards to the built environment can be ameliorated with appropriate siting and design criteria.

2.3.3 Hydrological Setting

The Great Pond Bay APC receives runoff from a watershed of about 1600 acres (Figure 7). The runoff from about 1165 acres of the surrounding area is channeled directly into the Great Salt Pond, which acts as a settling basin for the eroded sediments carried in the runoff. The pond also receives nutrients associated with the adjacent cattle grazing fields.

Nutrient enrichment of near shore waters can be significant in causing stress to corals and other marine life - as important as increased stress to marine ecosystems caused by excessive sedimentation, for example. Increased nutrients cause an increase in macro algal growth which, if not kept in check by the usual grazing fish and urchins, can cover the existing substrate, smother existing corals and effectively occupy substrate that would otherwise be available for the recruitment of new coral colonies.

2.3.4 Coastal Environment

Since the early formation of St. Croix, geologic activity has resulted in alterations to the coastline, including erosion of sediments and the formation of brackish ponds, beaches, reefs, and beach - rock. These geological processes continue to shape the coastline.

The Great Pond Lagoon (Great Pond Bay)is approximately 1 km. wide and 2.5 km. long with its long axis trending NE/SW. The lagoon is bordered to the south by a barrier reef and the open sea and to the northeast by Milord Pt. and Mt. Fancy respectively, and to the north by a vegetated baymouth bar separating it from Great Pond. A small tidal channel approximately 1.5 meters deep connects the lagoon with the pond. Offshore is a barrier reef/turtle grass meadow system.

The offshore barrier reef has a natural opening of approximately 1,500' through which boat traffic enters into the inshore portion of the lagoon.

The inshore portion of the lagoon is floored with a carpet of seagrass (mostly Thalassia testudinum, with lesser amounts of Syringodium filiforme). Seaward of that, the majority of the lagoon is floored by sand .... Scattered patches of Syringodium occur along with the algae Dictyota and Penicillus (Bruce, et al.,1989.)

Great Pond is a large (about 123 acres), shallow, essentially enclosed pond with poorly mixed, variable depth water. (In 1974 its average water depth was measured to be 18 cm compared to 30 to 50 cm in 1989.) During the wet season, the water in the pond is brackish, turning to hyper saline during the dry season. Usually the super saline (brackish after heavy rains) water is bordered by tidal flats on all sides except along the south where it is bounded by a vegetated baymouth bar. Over time, the area and depth of the pond has changed considerably as has the location and width of the narrow channel connecting it to the lagoon (Lu et al., 1972 in: Multer and Gerhard, 1974), (Figure 8).

2.4 Biological Environment

Great Pond Bay serves as a settling basin for runoff from an upland drainage area of about 1165 acres, and 760 acres of surrounding watershed area also drains directly into the pond. The pond has substantial mangrove stands along the beach berm, is a habitat for birds - both resident and migratory, and is important as a nursery for juvenile fish as stock. Local fishermen use the pond for frequent fishing activities. This section provides a sketch of the biological resources as synthesized from various sources.

2.4.1 Terrestrial

The pond is rimmed by black (Avicennia nitida and red(Rhizophora mangle) mangroves, the latter playing a majorrole in trapping sediments from runoff. Many of these were severely damaged during the passage of Hurricane Hugo in September of 1989, but the recovery process has been good.Manchineel, seagrape and Thespesia are among the species of trees found in the littoral forest along the beach berm.

Hurricane Hugo in September of 1989 devastated the island of St. Croix. Property losses were tremendous, but the full extent of the damage afflicted on the natural resources of the Virgin Islands is more difficult to quantify.

A 1990-91 post-Hurricane Hugo assessment of natural resources damage (Island Resources Foundation, 1991) found that the near shore mangrove community on the eastern side of Great Pond exhibited 15-20% mortality of red mangroves,while crown dieback was considerable. Branches of red mangroves showed sufficient regeneration. Mature black mangroves showed almost 100% mortality. Root and shoot coppices were abundant, however, and asexual regeneration is assured. White mangroves suffered almost total crowndieback, but stem coppicing was profuse on nearly all individuals.

The pond mangrove community exhibited greater damage than the near shore mangrove trees, and a distributional shift of the population may occur. Between 30 and 40% of the black mangroves died as result of Hugo. Black mangrove seedlings were just getting started at the time of the survey. They were sparse, but widely distributed, and a large seed crop was reaching maturity. Very few red mangroves in the lagoon area were killed by the storm, but crown damage was severe. Branch coppicing was moderate. Numerous younger red mangrove saplings were regenerating within the pond. White mangroves showed nearly 100% crown dieback. Approximately 50% of the white mangrove trees were regenerating.

The western beach showed greater storm-related alterations than the eastern beach. Larger trees on the beachhead were undercut with roots exposed. A manchineel grove located on the seaward edge of the pre-Hugo berm was blown out, with numerous mortalities. Seagrape trees were also damaged, but no dead trees were observed. Thespesia trees were only slightly damaged, and branches were regenerating. Overall,the beach berm either shifted landward or was eroded on its seaward edge.

The west side mangrove, completely separated from the sea by a broad beach berm, showed over 50% dieback and considerable mortality of black mangrove trees on the pond perimeter. Mortality of isolated black mangrove stands within the pond was over 80%. Black mangrove seedlings were evident in high numbers along the pond's perimeter.

The tendency to develop even-aged stands of species like mangroves and manchineel becomes clear when viewing the Great Pond situation. Mature individuals suffered severe mortality, but younger trees are recovering and the canopy destruction has provided light for dense stands of seedlings. The importance of the seed resource to hurricane recovery cannot be overemphasized. If the seed crop had been raked and removed, for instance, there would be virtually no regeneration of some species.

The effects at the Boy Scout camp appeared dramatic because the huge manchineel forest was tipped and broken with severe mortality of large trees. The front of the beach berm was scoured, exposing peat and soil banks held by large trees,and sand has been added to the back of the berm.

During a site investigation by IRF staff during October,1990, numerous waders and shorebirds were seen at the pond although it was early in the migration season, indicating that the hurricane damage did not fundamentally change the importance of the pond as a bird site. Fiddler crab populations appeared abundant.

The effect of sediment transport, flushing, and defoliation by Hurricane Hugo is uncertain, but better overall watershed drainage management is essential to reduce flood hazards and protect the ecosystem.

(Figure 10, #5) Great Salt Pond acts as the main sediment sink for runoff waters received from the surrounding watershed. Sediment studies done during 1973 by West Indies Lab researchers indicate that Great Pond has two sources of sediment: 1) alluvium from sheet wash or cliff undermining in the upland watershed, and 2) sediment transported into the pond by tidal action and/or by tropical storm overwash of the baymouth bar. The first source predominates. Gretchen L. Bruce et al., 1989, did studies of the sedimentary environments of Great Pond Bay.These studies indicate that the pond is gradually filling with terrestrial sediment, which is being trapped by the red mangroves (Rhizophora mangle). The study states that pond sediment sources are mostly terrestrial, while sediments in the

open bay are mostly marine, indicating the importance of the pond as a sediment trap, protecting the offshore reef systems.

While the gradual infilling of the pond from terrestrial sediments has been detrimental to some marine and estuarine life forms needing high oxygen levels, the shallow mudflats provide a resting and foraging area for thousands of resident and migratory birds.

Salt Ponds

The salt ponds in this APC and throughout the Virgin Islands differ appreciably depending upon the amount of freshwater and seawater flowing into the pond. In general, salt ponds have a complex and dynamic ecology. Common animals are fiddler crabs and the large land crabs (Cardisoma guanhumi). Several kinds of insects which prefer saline environments live or breed there, including flies and several kinds of midges. Mosquitoes may breed in salt ponds during brief periods when heavy rains sufficiently lower salinity levels. Several kinds of microscopic algae float in the water, sometimes giving it a green, pink, orange, brown, or red color. Other micro-algae grow as mats on the shallow margins.

A number of wading birds (stilts, sandpipers, etc.) feed along the edges of the ponds on crabs, insect larvae, and other small animals. Salt ponds frequently contain large numbers of brine shrimp which are in great demand throughout the world as food for aquarium fish, cultured fish, and for research purposes. Thick blooms of these shrimp can give the pond water a brownish-pink tinge. If the pond is or has been recently open, it will contain fish (sennet, small barracuda, mullet, tarpon, snook, etc.) and marine crabs. These are fed upon by kingfishers, herons, and ospreys. Kingbirds, martins and swallows frequently feed on flying insects over the water.

The local animals and plants associated with salt ponds are not well known, and the complex ecology of the ponds can only be inferred in simple outline. They have never been studied properly. It is known that salinity changes over a very wide range. It may be concentrated to more than three times that of sea water (over 100 parts per thousand) or be depressed by heavy flooding to almost freshwater (depending on the volume of flood water, the size of the pond and the permeability of the pond-bay barrier). Periodic changes of even one-third of this magnitude will cause significant changes in the types and numbers of organisms inhabiting the pond. Slow changes, as by evaporation concentrating the salt, promote a gradual die off of some forms of animal life and gradual invasion and development of others. There is a constant, slow modification of the natural community in response to this change.

Sudden changes in salinity, caused by flood water, for example, result in catastrophic changes to the biota. Masses of halophilic (salt-loving) forms are killed while other types, suited to the new, less saline environment, quickly invade the pond and become established. Following heavy flooding, many ponds contain large amounts of dead halophilic algae, insects, etc. These often account for the occasionally bad odor found in a pond.

Other environmental characteristics of salt ponds include high concentrations of hydrogen sulfide, especially in the sediments (from the decay of dead organic matter), high temperature (from insolation with lack of shade), low dissolved oxygen (from high temperature, salinity and BOD), and high turbidity (from large concentrations of land and pond-derived solids).

Although no specific data are available, it is probable that ponds also contain higher concentrations of pollutants than, for example, their adjacent associated bays. This is likely because of the natural ecosystem function of salt ponds as buffer zones and swamps. Located between the bay and its upland watershed, they receive and trap most of the runoff from the land, thus protecting the bay.

Sediment coring in several local ponds has revealed thick layers of terrigenous (land-derived) mud and silt interbedded with layers of organic muck, algal mats, and occasional sand lenses. The latter may have been deposited when the pond was open to the sea, or when a hurricane or other violent storm broke open the pond or threw over the berm bringing sea sand into the pond.

Most of the upper layers of pond sediment are largely organic and have been anaerobically decomposed. Disturbing these sediments usually releases obnoxious sulfide odors. When these materials are dispersed, they use up the available oxygen rapidly. This can kill animals and plants in the pond.

Attributes and Use Options for Salt Ponds

1. Act as natural catchment and settling basins to protect marine resources.
2. Provide feeding places for wading birds, including birds feeding on insects, crustaceans and fish.
3. Low in dissolved oxygen, frequently less than 4 parts per thousand.
4. Biota limited to a relatively few organisms which are tolerant of high and changeable salinity.

Use Limitations

1. Sediments unstable for foundations, pilings almost always required.
2. Sediments - fine, toxic, and with high oxygen demand - can be dangerous to adjacent marine biota if released.
3. Modification may adversely alter drainage and runoff patterns and result in sedimentation of adjacent marine waters.
4. If filled, the weight of overburden may , depending on the nature of pond sediments, extrude these sediments at certain point. Overburden bay be plastic.
5. Nature of sediments may limit use of deep-rooted vegetation on overfill.
6. Modification will alter or destroy habitat for associated birds, crabs, etc.

Tolerances of the system appear to be wide, but this needs to be v verified by scientific studies. All systems and their components have tolerance limits. Obviously, massive inputs of toxic material will destroy the ability of any ecosystem to function. Filling a pond will completely destroy its function as a catchment basin and aquatic habitat. Artificially opening the pond to the sea will significantly change its ecological function a perhaps that of the adjacent bay.

2.4.2 Marine

Although salt ponds are generally perceived as stagnant, smelly, breeding grounds for mosquitos, this is not the case. Local fisherman collect blue crabs (Callinectes) from Great Pond during high tides and sell them to local tourist restaurants. The pond is a haven for resident and migratory birds and is likely a nursery for juvenile fish.

The bottom of the pond is mostly covered with a branching, filamentous algae, which is also found floating on the surface. The pond bed has an average of 30 cm. of black, [hydrogen sulfide-rich] mud lying on hard, green/brown clay substratum (H. Gray Multer, 1974. Summary of the Holocene Geology of the Great Pond Area, Southeast St. Croix, USVI.)

The estuarine functions of the pond regulate freshwater and inputs to the seagrass and coral reef systems which support an active fishery.

2.4.3 Endangered Species

The Federal Endangered Species Act defines "endangered species" to mean a species or subspecies that is in imminent danger of extinction throughout all or a significant portion of its range. "Threatened species" are those likely to become endangered in the foreseeable future unless current trends are reversed. Such species are protected by Federal Law; neither the whole animal or any products from it may be taken, sold or possessed. Alteration of the habitat in which any of these species occurs may be prohibited or constrained.

Great Salt Pond is a resting/foraging area and possibly a roosting area for many species of birds, and the bay is a foraging area for many different marine animals. Some of the wildlife using the area are included in the Federal List of Endangered Species. See the attached list of endangered species.

2.5 Cultural Resources

2.5.1 Prehistoric

DPNR/Historic Preservation Division provided information that was listed in the National Register of Historic Places, which discussed excavations conducted by Gary Vescelius, Allen Croft and Colin Eisler under the auspices of Yale University's Peabody Museum of Natural History. Substantial remains dating to the Lonford Stage (Saladoid, A.D. 300-700) and additional remains from the Richmond Stage (Ostionoid, A.D. 700-900) were located in the area.

2.5.2 Historic

There is cartographic evidence of one historic feature in the area on parcel No.55. The USCGS field map of 1920 depicts a fan mill, labeled "Great Pond Bay Mill" just north of Great Pond. The name indicates that it is associated with the Great Pond plantation although it is situated on the Hartmanns property.

There is evidence also of an eighteenth century road within the area, along with five (5) 18th century settlement sites.

2.6 Built Environment

2.6.1 Roads and Ports

There are no boat marinas in operation within the APC.

The major roads which pass through the APC (Route 62) and (Route 60) are known as the Southshore Road. Several undesirable smaller roads lead to the beach and the pond mudflats.

2.6.2 Water Systems

Individual rain water catchment systems are utilized throughout the APC; Although St. Croix has desalinated seawater plants, there is no municipal potable drinking water distribution system in the APC.

2.6.3 Wastewater Systems

Development roads have been in place in the Estates Union and Mount Washington subdivision area but extensive home building has not yet occurred. The area is divided into more than 200 building lots ranging upward from about one third acres. There appears to be no plan for the installation of a sewage collection system and wastewater treatment facility for the subdivision.The soil types in the area, shallow sloping Coamo clay loam and Cornhill gravelly clay loam, have slight to severe limitations for septic tank filter fields. This will become problematic as the housing subdivision becomes more developed. Sheet runoff across the area is heavy during peak storm periods and will quickly saturate the soil. As the volume of septic effluent increase in the soils, the rain-induced saturation will result in effluent surfacing, contaminating cisterns and causing health problems.

2.6.4 Energy Systems

Electrical energy is available throughout the APC from the Water and Power Authority (WAPA). WAPA currently generates power for the entire island of St. Croix from its diesel powered generators located at Estate Richmond near Christiansted. A new 22 MW power plant will be constructed for WAPA during 1993. It will be located within the APC at a site east of VIALCO and west of the Containerport.

2.6.5 Solid Waste Disposal Systems

Solid waste is collected in the APC, as elsewhere in the Territory, by the Solid Waste Division of DPW. Private citizens are required to dispose of their household wares in dumpsters located along the roadside at various points throughout the island. Commercial businesses must provide for their own privately contracted waste disposal. Solid waste is currently disposed of at the municipal landfill located at Estate Anguilla.

3. RESOURCE USE, USE CONFLICTS, AND ADVERSE IMPACTS

3.1 Resource Use

The following list identifies the known and interpreted land and water uses of the Great Pond Bay Area of Particular Concern as indicated on the Land Use Map (Figure 9). Land use was interpreted from aerial photography and groundtruthed for accuracy. The classification system, based on the Teytaud/U.S.Geological Survey (TUSGS) land use/land cover classification system (DCCA-CZMP,1981), is hierarchical, with three levels of categories, increasing in specificity from level I (e.g., 100 series [the most general] - Urban or Built-up Land) to level II (e.g., 110 series - Residential) to level III (e.g., 111 - Single unit, low density [less than 2 DUPA], the most detailed):

3.2 Use Conflicts

The Boy Scouts Council was the prime challenger of the proposed Great Pond Bay Realty Trust development plan (Figure 10, #7). The plan, originally calling for a 500-room hotel, 1,100 condominium units and a 100-slip marina, was scaled down to a 350-room hotel, a conference center, 600 condominium units and an 18-hole golf course. The rezoning submission for the project received near-unanimous approval by the senate (8-29-89) after the Boy Scouts Council withdrew its objections to the proposal. The developer's modifications to the original plans included an addition of a 40 foot setback for the hotel from the beach and creation of a preservation zone with a grove of trees and settling pond. The original marina plan was also dropped.

At this time, it is unclear whether the project will go ahead, but the development is clearly within the marked coastal zone, which is described as a 500-foot band around the pond.

The ease of road access to the beach and the pond mudflats has caused some problems in the Great Pond Bay area. Instances of beach erosion and sedimentation of nearby coastal waters has occurred following disturbance of the natural, beach-stabilizing vegetation by vehicles. It is possible that vehicular access to the area has interfered with bird nesting, including such species as the least tern which is on the Federal Rare and Endangered Species List. Vehicle tracks reach well into the mudflats, and vehicles have been seen parked on the beach, which indicates varying degrees of vehicular intrusion into the natural area.

Road access to the beach is desirable for many reasons, but access should be kept to one or two key areas (Figure 10, #1). The Great Pond Bay area is commonly used by fishermen as a base of operations.

Frequently, the shallow-sloping beach is used as a boat launching ramp. The commonly used "ramp" area near the Boy Scout campground should be upgraded, with a specific location designated as a water access ramp. A similar access point should be marked at the east side of the channel into the salt pond (Figure 10, #1, #4). No other vehicle-water access points need be designated at GPB, and driving along the beach (and other beaches in the Virgin Islands) should be entirely dissuaded because frequent vehicular traffic damages berm vegetation, possibly reducing the storm-protection capabilities of the beach berm system.

3.3 Adverse Impacts

3.3.1 Water Quality

Class B standards have been designated for Great Pond Bay waters under the Clean Water Act. The waters of the Great Pond Bay APC are required by the Clean Water Act to meet the Class B ("fishable/swimmable") water. The water quality in this bay has usually been well within the acceptable range, of class B waters. Bays and ocean water designated Class B must meet the following criteria:

Dissolved oxygen: Not less than 5.5 mg/l from other than natural conditions.
Bacteria: Shall not exceed a geometric (log) mean of 70 fecal coliform per 100 ml. by Millepore Filter (MF) or Most Probable Number (MPN) count.
Color and turbidity: A secchi disc shall be visible at a minimum depth of one meter.

There is one DPNR, Division of Environmental Protection (DEP) water quality monitoring (WQM) site, #13a, within the APC which is located near the salt pond entrance. The nearest sampling site upcurrent (east) from Great Pond Bay (GPB) is at Robin Bay (station #13b, about 1 mile away) and downcurrent (west) at Halfpenny Bay (station #14b, about 3 miles away).

The GPB site has been sampled infrequently during the past eight years and has generally proven to be well below the lower limits of the WQM standards set (for Class B waters), indicating overall very good water quality. However, water quality monitoring records received from DPNR/DEP indicate that DPNR has not had an aggressive water quality monitoring program on St. Croix since 1983, which increases the possibility of short-term water quality violations, either in the past or future.

The present sampling frequency for many of the more remote sites indicates that the marine water quality monitoring program is a low priority within the DPNR/DEP. The Division reports to the EPA on a regular schedule (once every two years), but it is not collecting enough data to do meaningful analyses of conditions. Reasons offered for this continuing situation are lack of funding and equipment.

Water monitoring is important to ensure acceptable public health standards are met. Additionally, given the importance of water sports to the heavily tourism-based economy, a more regular water sampling regime needs to be implemented to ensure that the marine environment is healthy and safe and to quickly identify and rectify problems. More funding should be allocated to DPNR/DEP's WQM program for acquisition of adequate equipment and use of needed water craft for sampling tasks. Sampling results should be made public in regular reports to the local media.

3.3.2 Air Quality

Air quality within the APC is generally considered to be excellent. Occasional brush fires on hillsides and rare fires in illegally-dumped waste material might cause smoke over portions of the area. Any problems would be short-lived, however, since the GPB area experiences a fairly strong prevailing easterly breeze.

3.3.3 Noise

Aside from the typical levels of noise associated with motor vehicles, there are no known major sources of noise pollution within the APC.

3.3.4 Impacts to Biological Resources

(Figure 10, #4) The eastern mudflats of the pond have been used extensively as an illegal solid waste dump for some time. Following Hurricane Hugo in September of 1989, the US Army Corps of Engineers (ACOE) used the site as a refuse dump for building debris like wood and corrugated steel roofing. Much of the garbage at the site now is domestic trash including large pieces of furniture. There are also many abandoned, wrecked vehicles. A warning sign stating "No Dumping" was placed on one derelict vehicle.

Illegal solid waste dumping in the GPB area is a continuing problem (Figure 10, #4). Derelict vehicles dumped at the site are a potential source of groundwater and soil contamination from leaking crankcase and other lubricating oils, brake fluids, and heavy metals. Of particular concern is the potential for lead contamination from lead-acid car batteries.

Sediment-laden runoff is an increasing problem in most watersheds in the Virgin Islands. With development proceeding at an unrelenting pace in many areas, more and more topsoil has been exposed. This, combined with the steep slopes of many areas under construction, greatly aggravates erosion of the topsoil.

While Great Pond Bay is a center of local fishing activity, the lack of support facilities has caused some adverse human impacts. Boats are launched from trailers at various points along the beach, causing damage to the natural beach vegetation and resulting in minor erosion along the berm. Anchor use from some of the boats using the bay has caused localized damage to the seagrass beds. As well, the eastern shore of the bay is heavily littered, and cutting for firewood has damaged many trees.

Much of this abuse is probably not attributable to the fishermen, but they are in a position, as users of the area, to be vigilant for perpetrators.

The major historic human impact in the Great Pond area may have been salt mining in the pond. The 1791 Oxholm Survey map refers to the pond as the "Store Salt Pan" (Multer and Gerhard, 1974). Other maps depict the pond with a western outlet, no outlet, and the present eastern outlet (see Figure 8).

The extent of human alterations in the GPB area is unclear. Over time, tree harvesting, land clearing for crop cultivation and grazing, and brush fires have altered the landscape within the watershed, affecting the pond ecosystem. More runoff and erosion resulting from these activities have increased the sedimentation rate with a tendency towards filling the pond and elevating the nutrient load to the waters.

4. MANAGEMENT RECOMMENDATIONS

4.1 Policy Framework

Decision making must be focused in a manner that addresses the effect of cumulative and secondary impacts, on an area.

Land use policy should also incorporate societies needs for open and recreational space, and to promote density patterns that will allow for such needs. As with any coastal area, the public's right to physical and visual access to the coastline and the sea must be maintained (Beller, et al., 1970).

Land use policy should also address Best Management Practices for construction, agriculture and land clearing. It is important to minimize earth change work and the removal of vegetation, in order to minimize nonpoint source pollution effects.

Wetlands, mangrove communities, other diverse upland vegetation communities, rocky shorelines, beach/intertidal zones and reefs should be given priority for conservation areas. These areas provide a diverse habitat for the various aquatic and wildlife species found within the APC.

4.2 Planning and Permitting

The Great Pond Bay Area had been zoned as W-1, A-1 and R-1, however, in 1989 a zoning change was applied for and granted. The area is currently zoned as W-1, R-1 and R-3

DPNR/Comprehensive and Coastal Zone Planning staff have been preparing a Comprehensive Land and Water Use Plan that will re-designate all lands and water in the territory as one of ten (10) new designations, known as "intensity districts". The purpose of the proposed Comprehensive Plan is to allow the territorial Government to begin providing public services and facilities concurrent with the demand for those services and facilities, that is, to ensure that the quality -of-life for island residents is maximized by guiding the location and type of future growth through the provision of public facilities.

Due to the potential for adverse impacts to marine resources in the event of sediment runoff, all permitted development should be required to strictly follow Best Management Practices (BMP's) for nonpoint source pollution control. Nonpoint source pollution is a significant contributor to the overall degradation of nearshore environments in the Virgin Islands (Tetra Tech, 1991). Although the islands have no perennial streams or rivers, episodic events of intense rainfall deliver pulses of fresh water laden with sediments, nutrients, organic matter, and potentially toxic chemicals to nearshore receiving waters. Control of nonpoint source pollution may have significant positive effects on pristine and otherwise valuable marine habitat. DPNR/CZM is currently working to assess the enforceability of existing regulations with respect to control of nonpoint source pollution.

Permitted development should be required to maintain an adequate distance from critical landscape features (such as guts, salt ponds, beaches, etc.). The setback distance (or buffer zone) should be determined through consideration of slope, aspect, vegetative cover, and other relevant factors. DPNR/CZM has drafted specific regulations as it pertains to steep slope development and is awaiting passage by the legislature.

Natural Hazard Mitigation

There is a need in the Territory for an effective coastal storm hazard mitigation policy and plan. The siting os facilities along the coast increases a cumulative threat potential with respect to three types of coastal storm impacts: (1) threats to public health, safety, and welfare; (2) costs to tax payers for disaster relief and protection; and (3) losses of irreplaceable natural resources (Godschalk, et al., 1989). Compounding the potential for catastrophic losses due to coastal storms is the possibility of significant sea level rise (SLR) in the decades ahead.

While average SLR over the last century has been less than one foot (10-15 cm), an increase in that much or more (10-20 cm) is projected by 2025, and of between 1.5 and 6.5 feet (50-200 cm) by the year 2100 Using an average of 1 meter of shoreline erosion per centimeter of SLR (an average rate which may or may not represent the Great Bay area's actual erosion vulnerability), the resulting average by 2025 would be 33 to 66 feet (10-20 meters) (Godschalk, et al., 1989).

Strategies must be adopted to mitigate coastal storm hazards and SLR impacts. There are three strategies that can be adopted in this regard. First, the natural coastline can be " hardened" by using designed protective structures, such as bulkheads, revetments, gabions, etc.. Second, facilities and structures built in high hazard areas can also be hardened through the use of stricter building standards to achieve increased wind and/or flooding resistance. These strategies often require resorting to and preparing for excavation of people during a storm event, with its incumbent risk to human life.

Third, and a better approach, coastal development can be redirected away from high hazard areas through the use of shoreline setback standards and/or rezoning of high hazard areas to achieve simultaneous risk reduction and other objectives such as open space preservation or wildlife management.

A coastal storm hazard mitigation policy and implementation regulations should be developed for the Territory, and for the Great Pond Bay Area. A "development management" alternative to hazard mitigation is the recommendation for the APC, and will require that implementing legislation be enacted soon in preparation for the next natural hazard.

MANAGEMENT RECOMMENDATIONS

Water

Great Pond Bay waters are normally much better than the lower limits of the Class B designation. In order to guarantee continued good water quality within the bay, more stringent runoff and erosion control to minimize soil should be observed by builders as home building in the Estate Union and Mount Washington subdivision increases. As well, more careful septic system building and management must occur to minimize nutrient enrichment of the runoff water. A more rigorous water quality monitoring schedule should be applied at the site as a check measure.

Air

Any event causing air pollution should be addressed as quickly as possible, rectified and citations issued to violators.

Transportation

The mudflats have suffered from fairly extensive auto and truck traffic which compacts the mud and damages crab-foraging habitat. The crabs are an important part of the ecosystem at the pond, and also have been a minor commercial resource for some fishermen. Vehicle use on the mudflats, except for a roadway along the side, should be disallowed.

No further expansion of roadways (leading to the fishermen's shanties) along the beach berm (baymouth bar) should be allowed (Figure 10, #2).

Solid Waste

Illegal dumping in the Virgin Islands needs to be discouraged through better enforcement of existing laws. Posted "No Dumping" signs should also state the amount of fine for violations and environmental officers need to be more vigilant in issuing citations to violators. The citizenry must be able to report instances of illegal dumping in confidence, without fear of reprisal. Ideally, residents of the Great Pond Bay area will then be more vigilant concerning waste dumping in their "backyard."

Dumped garbage should be removed from the Great Pond Bay area and disposed of at an approved landfill site as soon as possible. Access through the eastern mud flat area to the sea is required for some fishermen using the GPB area, but the area should be spot-checked periodically to determine if illegal dumping is continuing.

Local conservation groups should coordinate with school officials to prepare and distribute environmental education materials in the schools. Special public awareness activities like Coastweeks should be used to publicize cleanup campaigns at Great Pond Bay (and other areas in the Virgin Islands).

Erosion/Runoff

The Great Pond Bay area receives runoff from a 1165 acre watershed which drains onto a broad alluvial plain. The volume of runoff in storm-flood conditions should be evaluated, and sediment trapping mechanisms used to help reduce the volume of sediment entering Great Pond. Drainage control should be required for any construction project in the area.

Groundwater

Groundwater in the GPB area is not a significant resource at this time. There is one well in the GPB area identified on the USGS well inventory maps (Judy Steiger, USGS, 1991, written communication), and it is only used for "yard" purposes.

Groundwater contamination is not a major issue at this time, but with increased building at the Union and Mount Washington residential development just northeast of the APC boundary, there is potential for nutrient contamination related to septic pit discharge. There is no sewage treatment facility for the housing development at the present time, nor is one projected.

The capacity of the soils in the GPB area to safely dissipate septic effluent is limited. Effective, single-home septic treatment plants are available, and should be installed prior to the issuance of occupancy permits for new houses in the area. Older homes within the GPB watershed should be retrofitted with a more complete sewage treatment system than the traditional septic tank systems commonly in use.

Alternatively, a wastewater collection system and sewage treatment plant could be built to treat wastewater from all houses in the area. Or all residences in the watershed could be connected to a pump system, pumping effluent to an existing wastewater treatment plant in Christiansted.

Artisanal Uses

(Figure 10, #2) There are several fishermen's shanties in the brush on the beach berm at Great Pond Bay. An access road runs along the back of the berm parallel to the beach to service the shanties. While these shanties do not pose a great threat to the berm ecosystem, additional building on the berm should not be allowed.

Should the recreational potential and use of the Great Pond Bay area be expanded, conflicts between fishermen using the shanties and landowners might arise.

Dialogue between fishermen and land owners should be initiated to identify operational strategies which take into
consideration the economic needs of the fishermen and the overall recreational approach projected for the area.

Poaching

Evidence of ground dove trapping and firearm use was found in the bush along the berm area during 1990 IRF field studies (IRF, 1991). Efforts should be made to eliminate poaching in this area. Communication between area residents and wildlife officials will aid in the control of illegal hunting activities.

Recreational

Figure 10, #3, 7. The Howard Wall Boy Scout Camp is located at the west side of Great Pond Bay, just north of the shooting range by Milord Point. The camp is underutilized by the boy scouts and could be developed into a better training and educational facility, given adequate funding.

Figure 10, #8 The St. Croix Marksman's Association has a skeet shooting and target shooting range at the west side of Great Pond Bay, near Milord Point, on land leased from the Boy Scouts. Shooting is directed southeasterly over the bay. A target range is cut into the side of the hill for rifle and

handgun use. This activity is relatively harmless except for the two minor negative impacts at the site. Frequently, clay pigeon pieces are found along the beach, and fragments with sharp edges could cut a wader's or swimmer's foot. Noise might also be a problem for the neighbors especially for the Boy Scouts - but since the shooting range only operates during daylight hours, conflicts should be minimal.

Promotion of special recreational events for the Great Pond Bay area could include skeet shooting as an extra attraction for viewers and for participants.

The area should be developed as a nature site, and scientific study area, with the Boy Scouts camp as the focal point for building facilities. Walking tours along the beach berm and to various places along the south shore of the pond could be organized by various local groups like the St. Croix Environmental Association (SEA) or the UVI Cooperative Extension Service.

Camp Arawak, on the eastern side of Great Pond Bay, can be upgraded as a campground, and the Great House and other historic buildings on the site should be refurbished as an attraction and potential historic park site.

Residential Development

To minimize further environmental damage to Great Pond and Great Pond Bay, from erosion and from increased nutrient loading of the ground water and runoff water, new residential building projects in the watershed should minimize exposed soils and use best available technology for sediment control and runoff water management on the property. Also, the building of a wastewater collection and treatment or pumping system should be considered to replace the existing septic tank system of wastewater treatment.

Commercial Development

Commercial hotel development within the Great Pond area is not recommended at this time, primarily because of current, stagnant economic conditions.

Additionally, the original building setback of 40 feet from the beach, as proposed by developers, is not adequate to ensure protection of structures from storm force winds and wave action. Also, the Great Pond Bay area is a CBRS site, and development within a CBRS site is ineligible for federal funding or federal flood insurance protection.

4.3 Legislative Change

Legal, social, political and environmental factors favor the acquisition of some of the Great Pond area for park use. Efforts should be made to secure the area blocked out by Routes 62, 624 and 60. This would serve as a buffer area to guard the pond's ecological integrity and prevent development activities within the out-lined flood zone. Agriculture training and experimentation would be appropriate land uses for the area. The seagrass beds in Great Pond Bay and the offshore reefs provide potential for educational and recreational marine activities. A Great Pond Park would give Virgin Islanders immediate multiple benefits and opportunities, secure essential fish and wildlife habitat, and enhance a primary training and recreational area for school children and others.

Recommended Land Acquisition

The most desirable land holding situation for the VI Government relative to the Great Pond Bay area would be for the Government to acquire the entire shoreline expanse and those portions of Estates Hartman, Petronella and Great Pond bounded by Routes 62, 624 and 60, which surrounds the pond, adding to Government ownership of the pond itself (Figure 4).

This would allow the placement of parking and staging areas, concessions, inland camping facilities, and interpretative trails along the beachfront and around the salt pond.

The following recreational development scenarios for the Great Pond Bay area are recommendations from the 1991 VirginIslands Territorial Park System Planning Project (IRF,1991).

1) Minimal Development

Minimal development at this site should include a day use area and beach with associated parking and a rest room. Costs for this type of development are approximately $110,000.

2) Optimal Development

The expansive, shallow-sloping land would facilitate the development of a major campground and recreational area for St. Croix. The offshore reefs are easily reached from the beach and could be included in overall park planning through development of a snorkeling trail system. Optimal development would include the addition of a campground, additional parking, another rest room, underwater signs, a maintenance building, more trash cans, an environmental trail and an information kiosk for a total of $460,500. This would bring the total development costs of the site to $570,000.

4.4 Institutional Development

Successful management of the great pond Bay APC will come about quicker and with more lasting results if the area is managed from a holistic point of view taking in all the natural, cultural, social, and economic resources. DPNR must ensure that BMP's are followed at all times.

5. CONCLUSION

The overwhelming single recommendation for the site, taken from several sources, is to preserve the Great Pond Bay area in as natural a state as possible.

Much damage has already been done to the site, especially to the pond. Most of the damage is related to pollution from illegal dumping and sedimentation from upland runoff. The effects of the damage can be minimized and overcome with better solid waste management practices and more careful earth moving and construction practices. Restoration of Great Pond to a healthier state is attainable if several guidelines are followed.

A follow-up investigation to the Post-Hurricane Hugo - Territorial Park Planning project should be done to assess the quality and amount of regeneration during the four years since the passage of Hurricane Hugo. Additionally, the CBRS boundary for the site should be re- evaluated and probably extended, especially to the west, to reflect the full extent of the area that could potentially be inundated by storm serge at Great Pond. This should be done in conjunction with a FEMA-sponsored update for the FIRMs.

As the density of housing increases in the Union and Mount Washington residential subdivision, the increased septic discharge will adversely affect groundwater quality. In order to minimize impact on the groundwater in the Great Pond Bay area, a wastewater collection system should be designed and built to accept wastewater from all new and most existing buildings in the Great Pond Bay watershed, and the wastewater should be treated at a wastewater treatment plant to be built in the area, or pumped to an existing wastewater treatment plant in Christiansted.

The Great Pond Bay APC boundary should be extended to include all the land bordered by Routes 60, 624, and 62.

An educational program should be implemented to educate the community that the salt pond is not a legal dump site, and to encourage them to transport all derelict vehicles to the Anguilla dump site.

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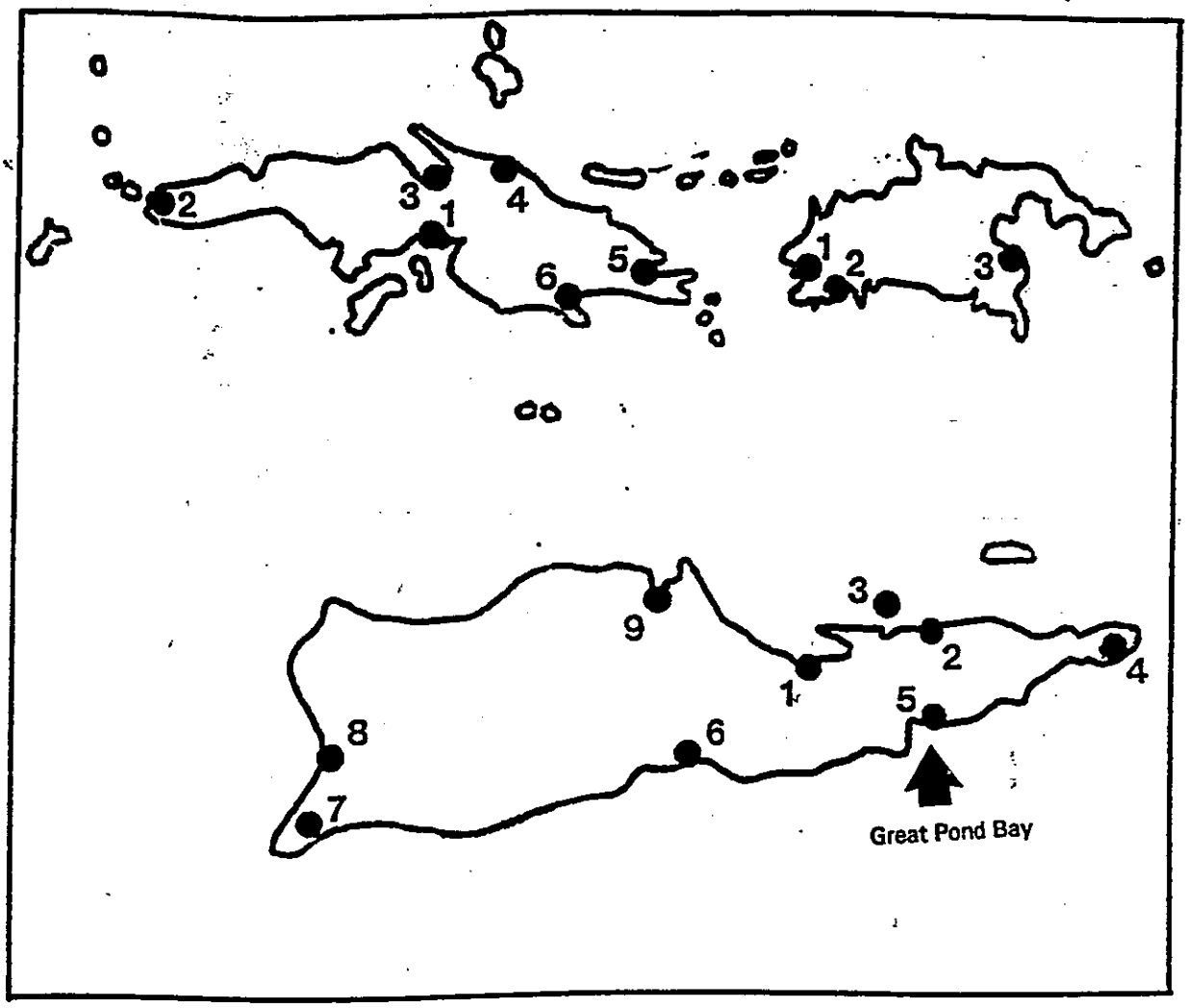
AREAS OF PARTICULAR CONCERN



AREAS OF PARTICULAR CONCERN

St. Thomas

1) St. Thomas Harbor and Waterfront
2) Botany Bay (APR)
3) Magens Bay and Watershed
4) Mandahl Bay (APR)
5) Vessup Bay - East End
6) Mangrove Lagoon - Benner Bay (APR)

St. John

1) Enighed Pond - Cruz Bay
2) Chocolate Hole - Great Cruz Bay (APR)
3) Coral Bay (APR)

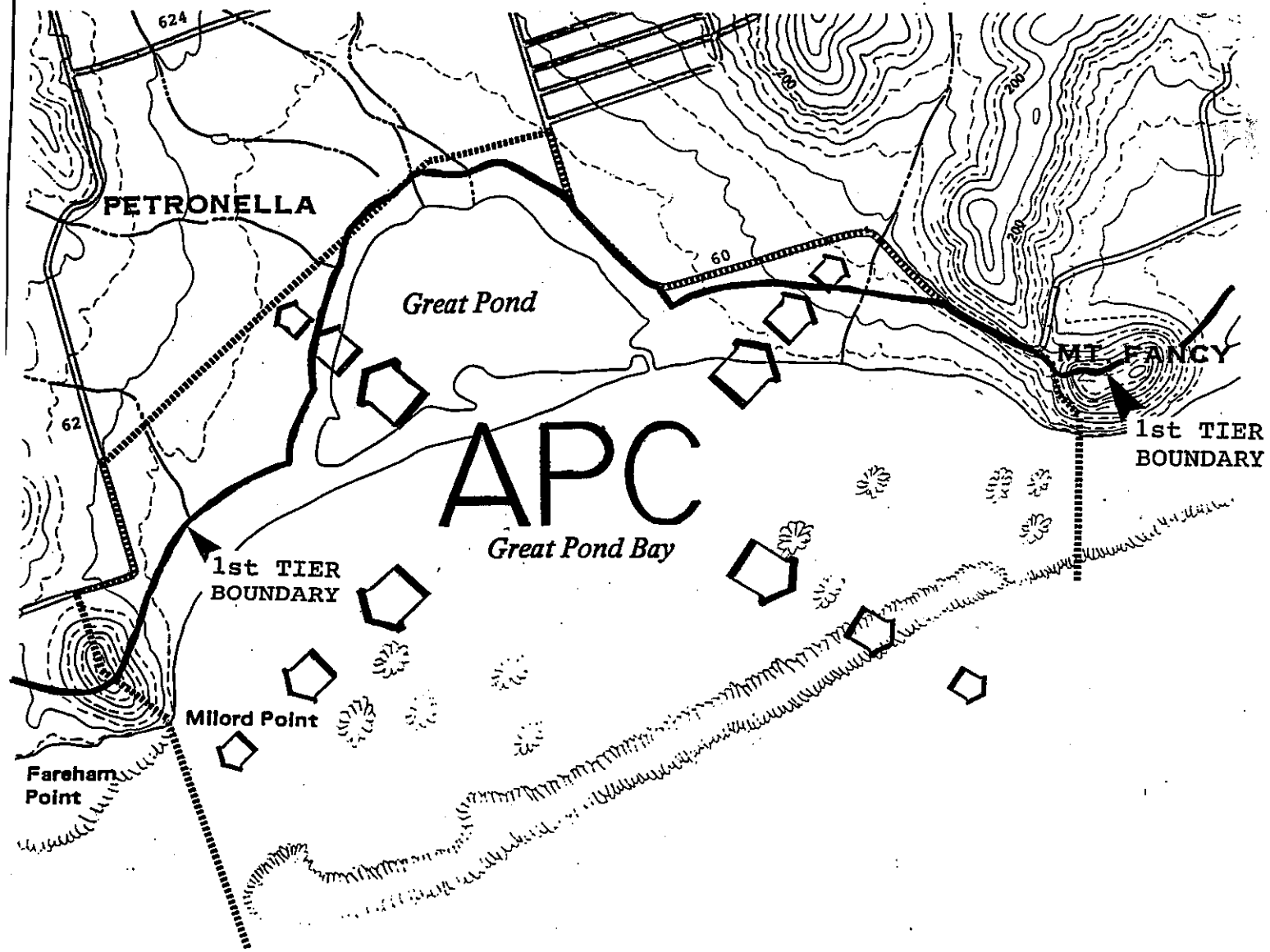
St. Croix

1) Christiansted Waterfront
2) Southgate Pond - Chenay Bay (APR)
3) St. Croix Coral Reef System (APR)
4) East End (APR)
5) Great Pond and Great Pond Bay (APR)
6) Southshore Industrial Area
7) Sandy Point
8) Frederiksted Waterfront
9) Salt River Bay and Watershed (APR)

Figure 1
Regional APC Map
Adapted from: USDOC, 1979

Great Pond Bay APC/APR

APC/APR Boundary Map



APC BOUNDARY
1ST TIER BOUNDARY

Figure 2
APC/APR Boundary Map
Adapted from: BC&E/CH2M Hill, 1979
Island Resources Foundation, 1992

1,000'

Great Pond Bay APC/APR

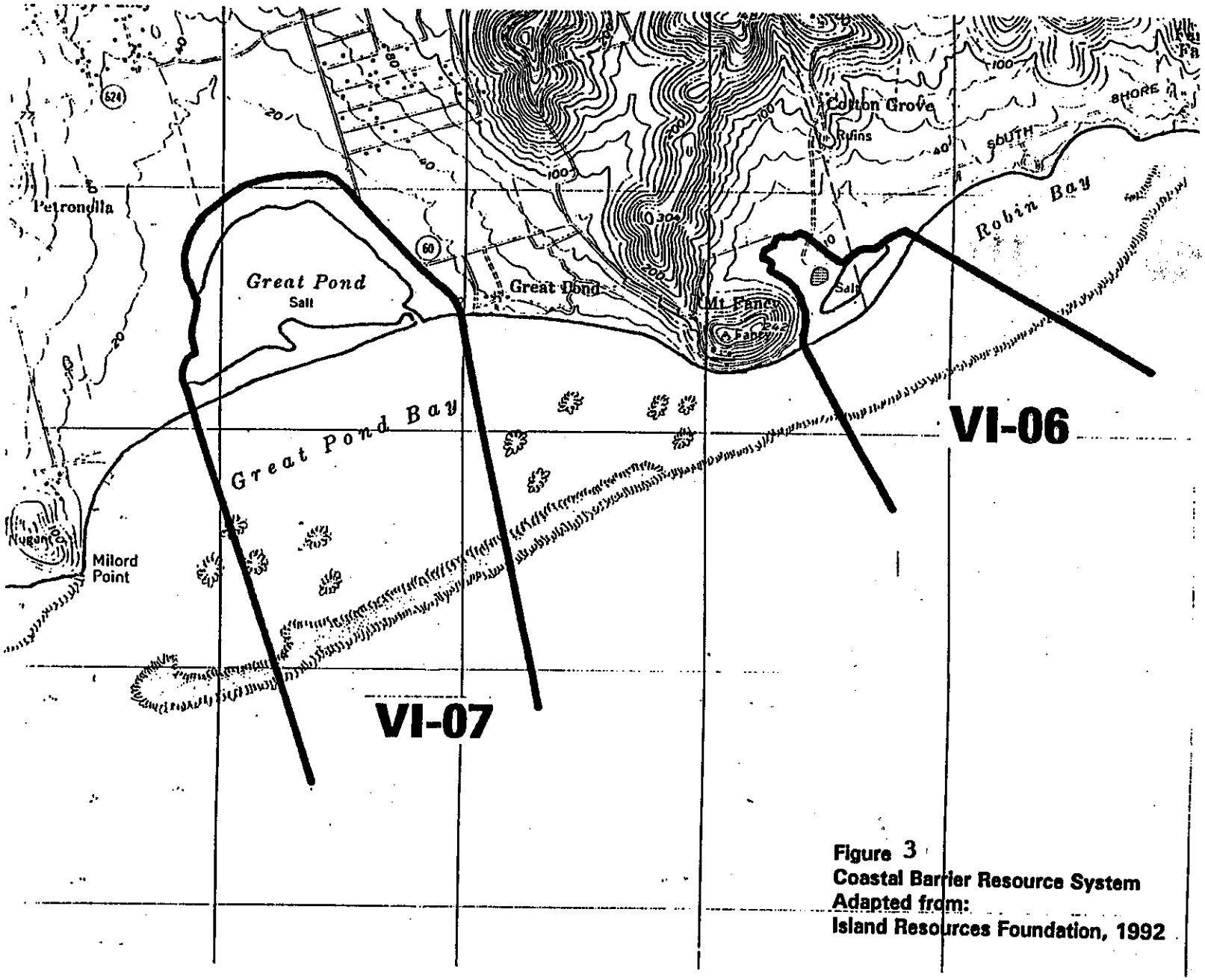


Figure 3
Coastal Barrier Resource System
Adapted from:
Island Resources Foundation, 1992

COASTAL BARRIER RESOURCES SYSTEM

Great Pond Bay APC/APR

Land Ownership Map

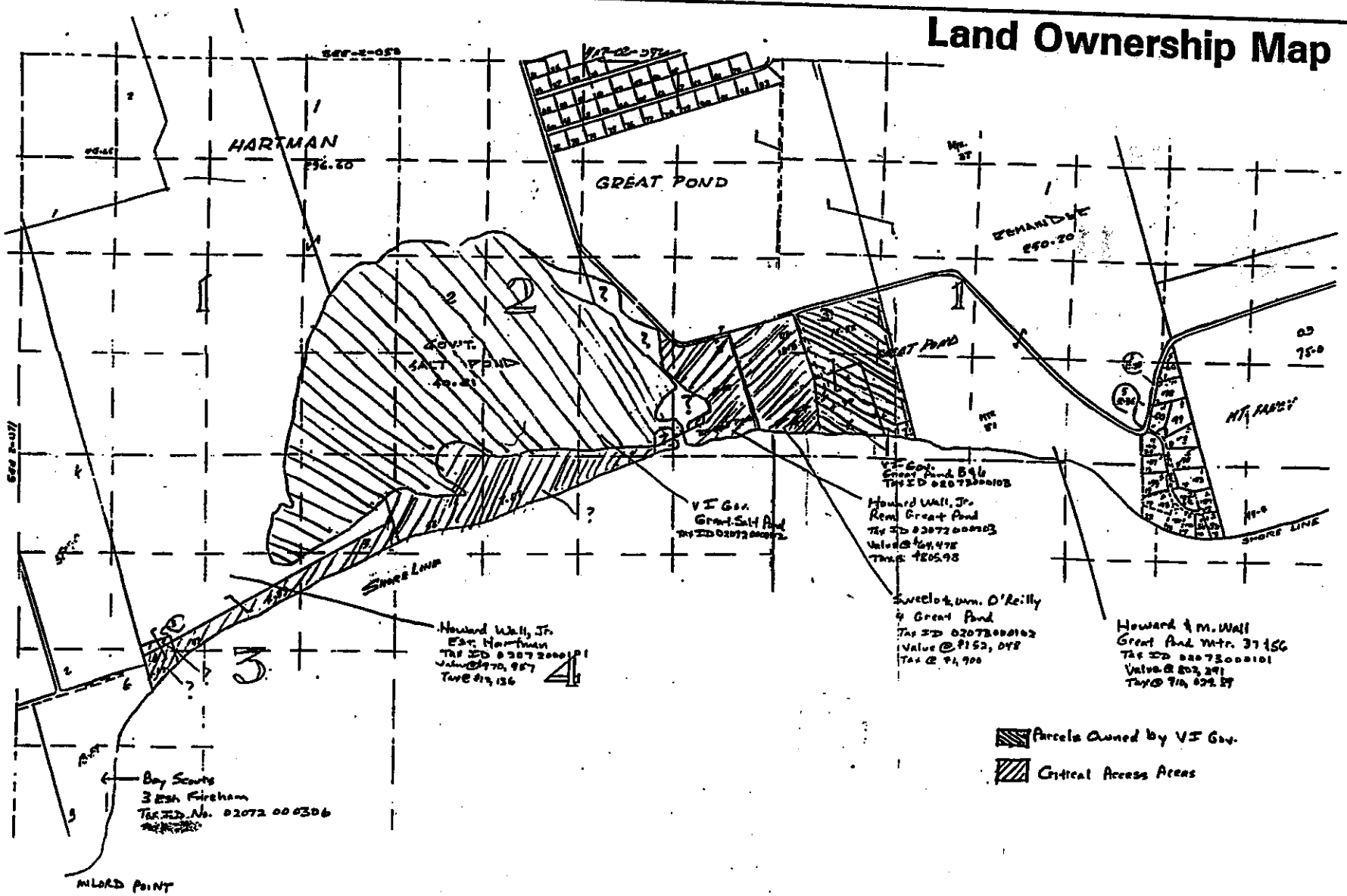
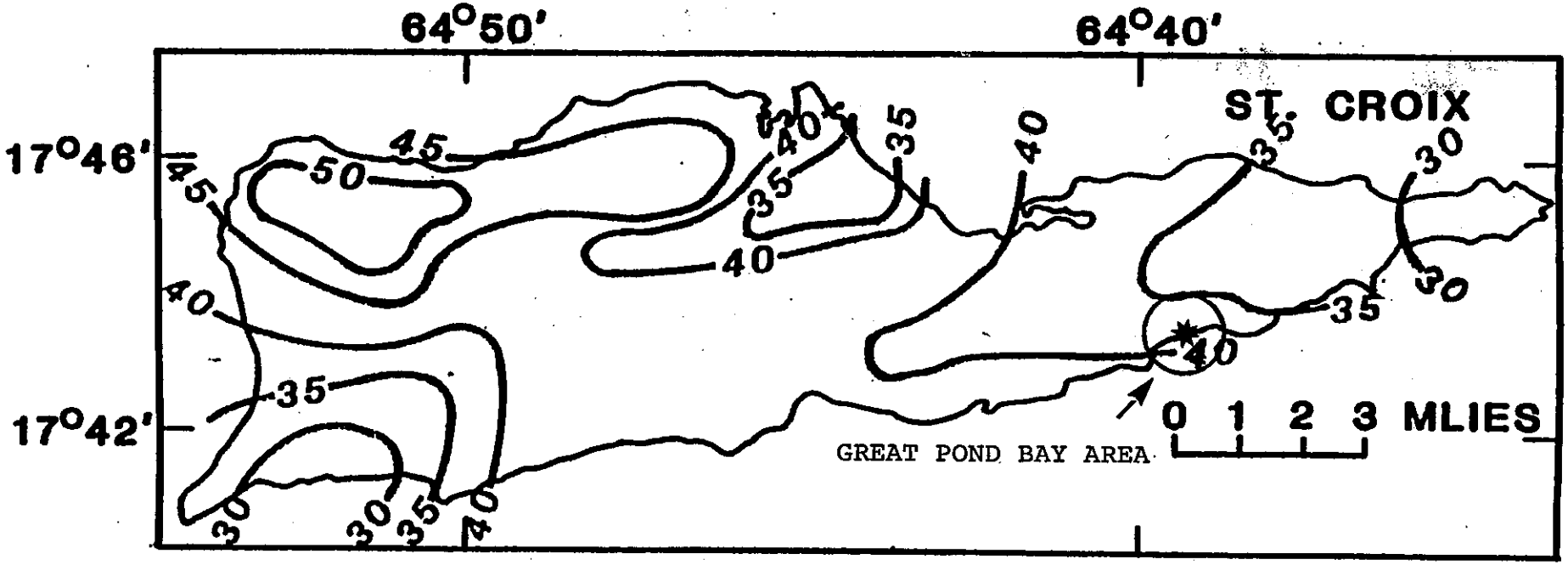


Figure 4
Land Ownership Map
Adapted from:
Island Resources Foundation, 1992

Rain Fall Map



EXPLANATION

—35— LINE OF EQUAL RAINFALL IN INCHES

Figure 5

Great Pond Bay APC/APR

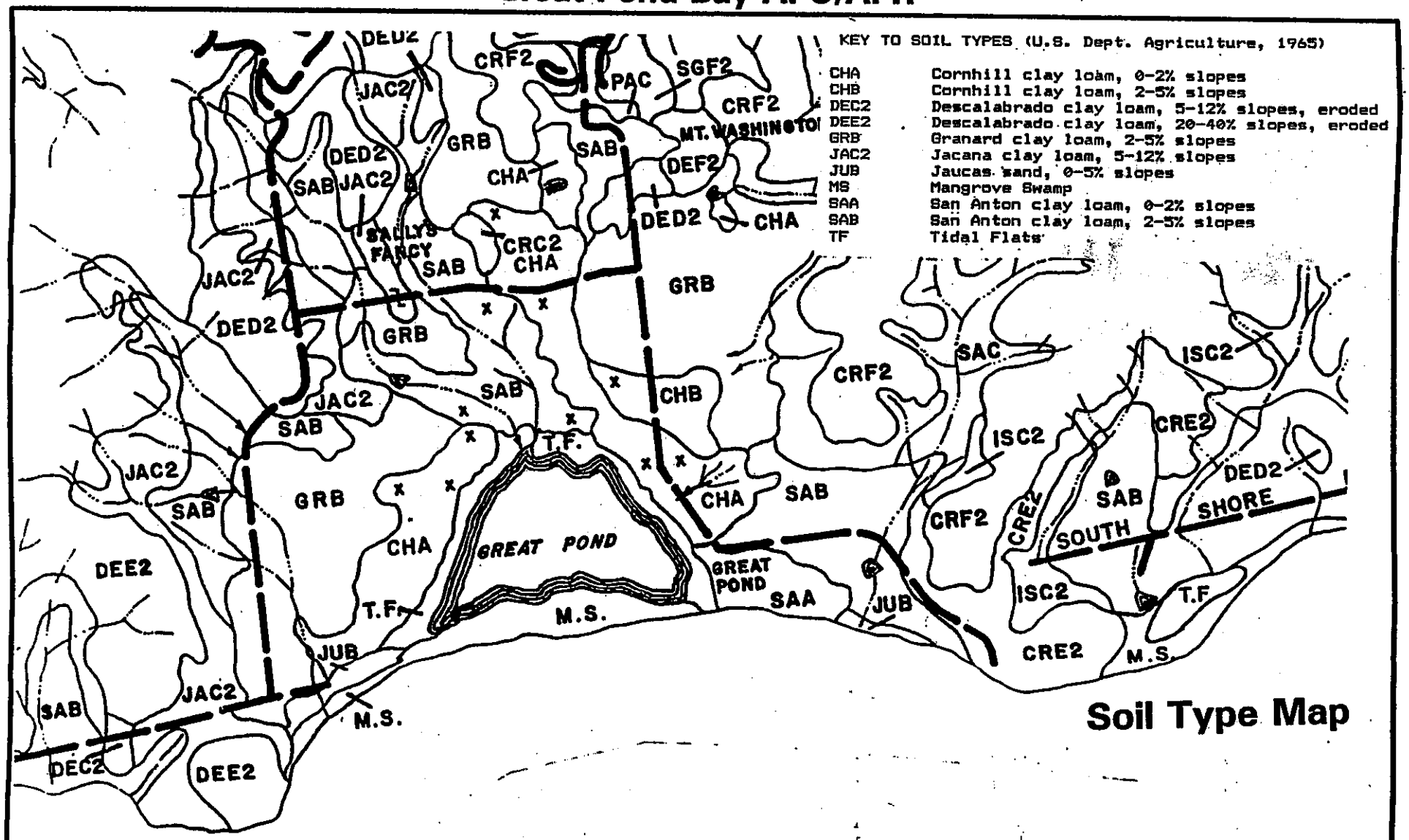


Figure 6
Soil Type Map
Adapted from: US Dept of Agriculture, SCS, 1965
Island Resources Foundation, 1992

Great Pond Bay APC/APR

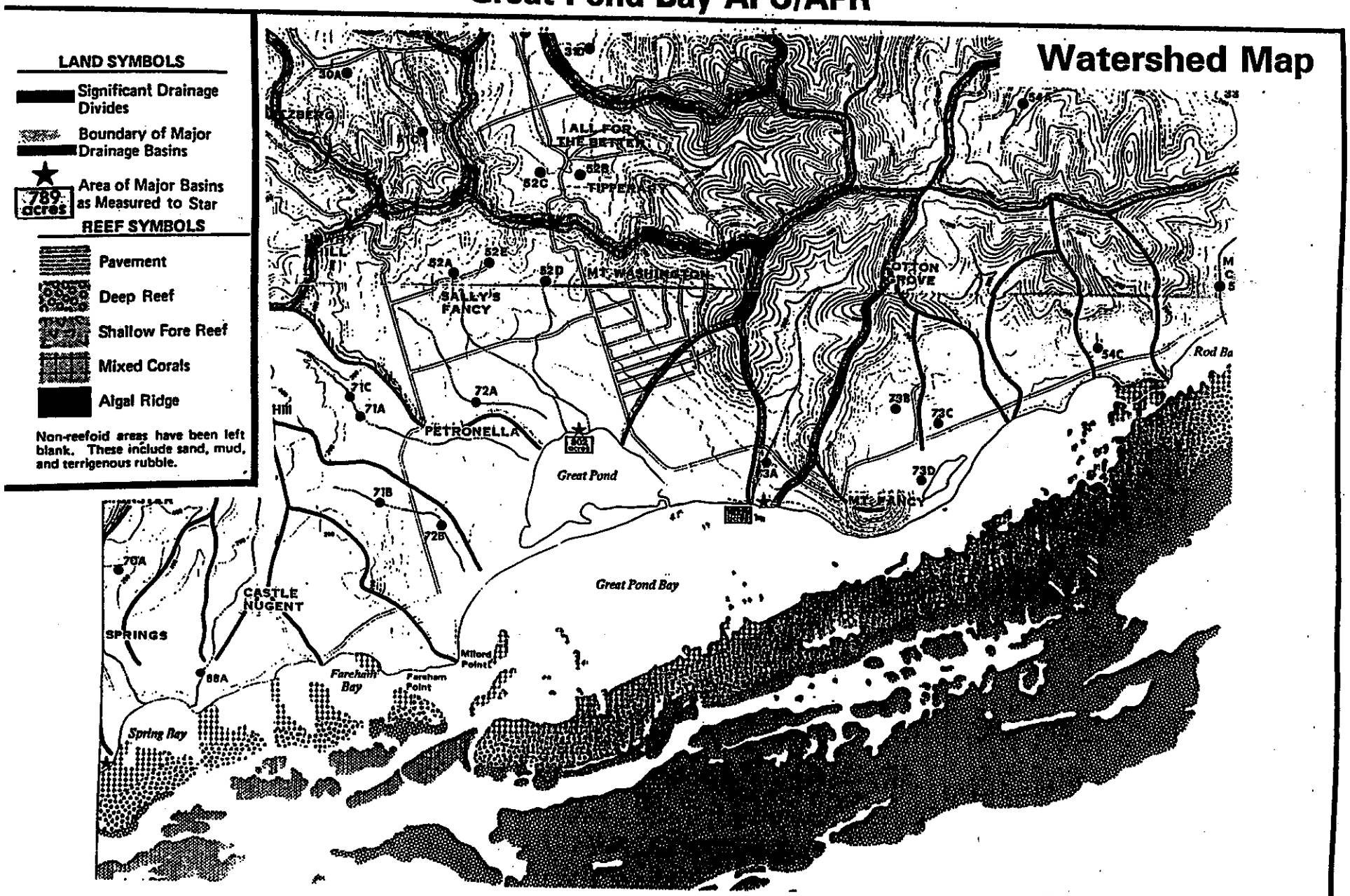


Figure 7
Watershed Map
Adapted from: BC&E, 1979
Island Resources Foundation, 1992

Great Pond Bay APC/APR

Pond Configuration Map

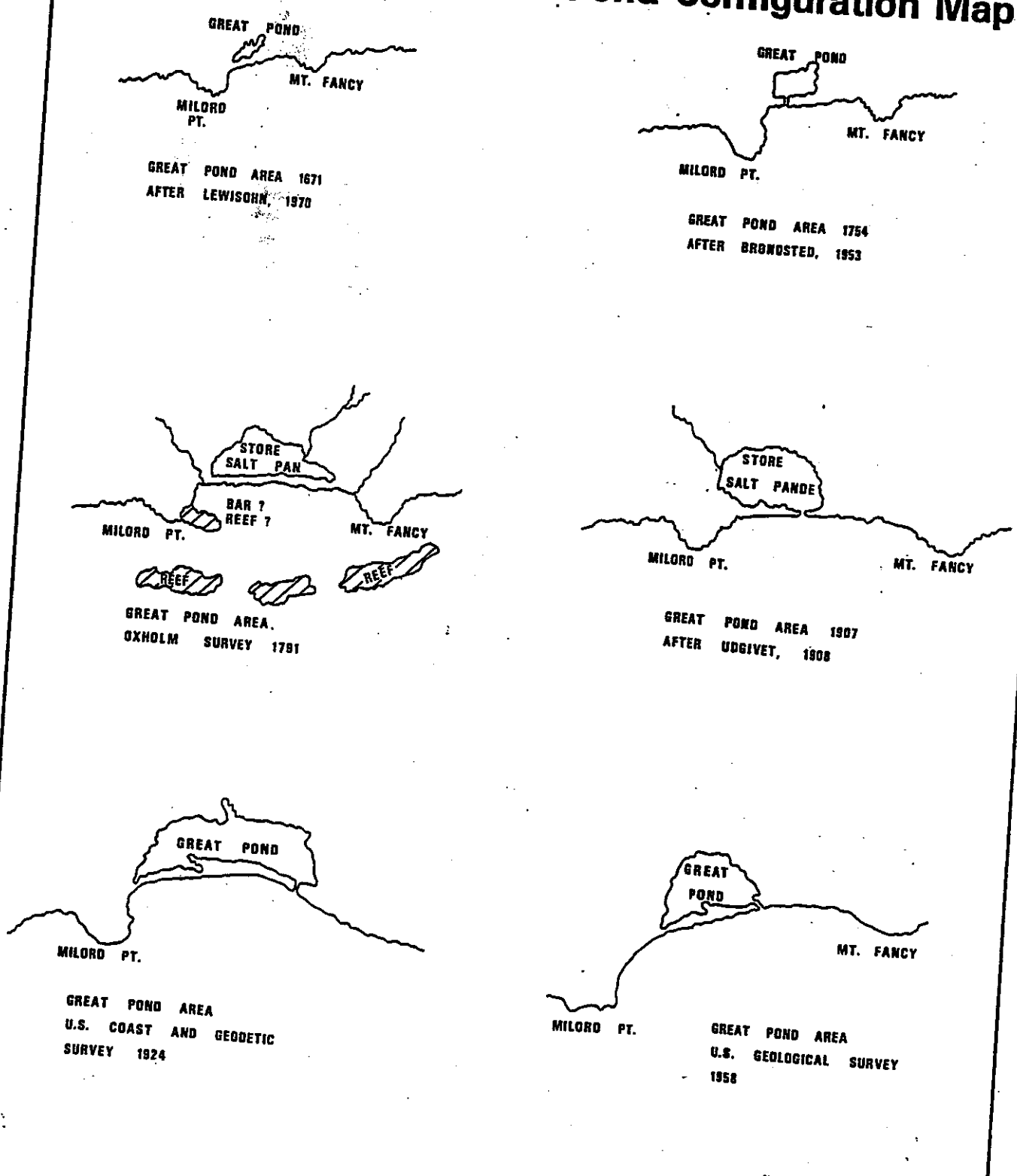
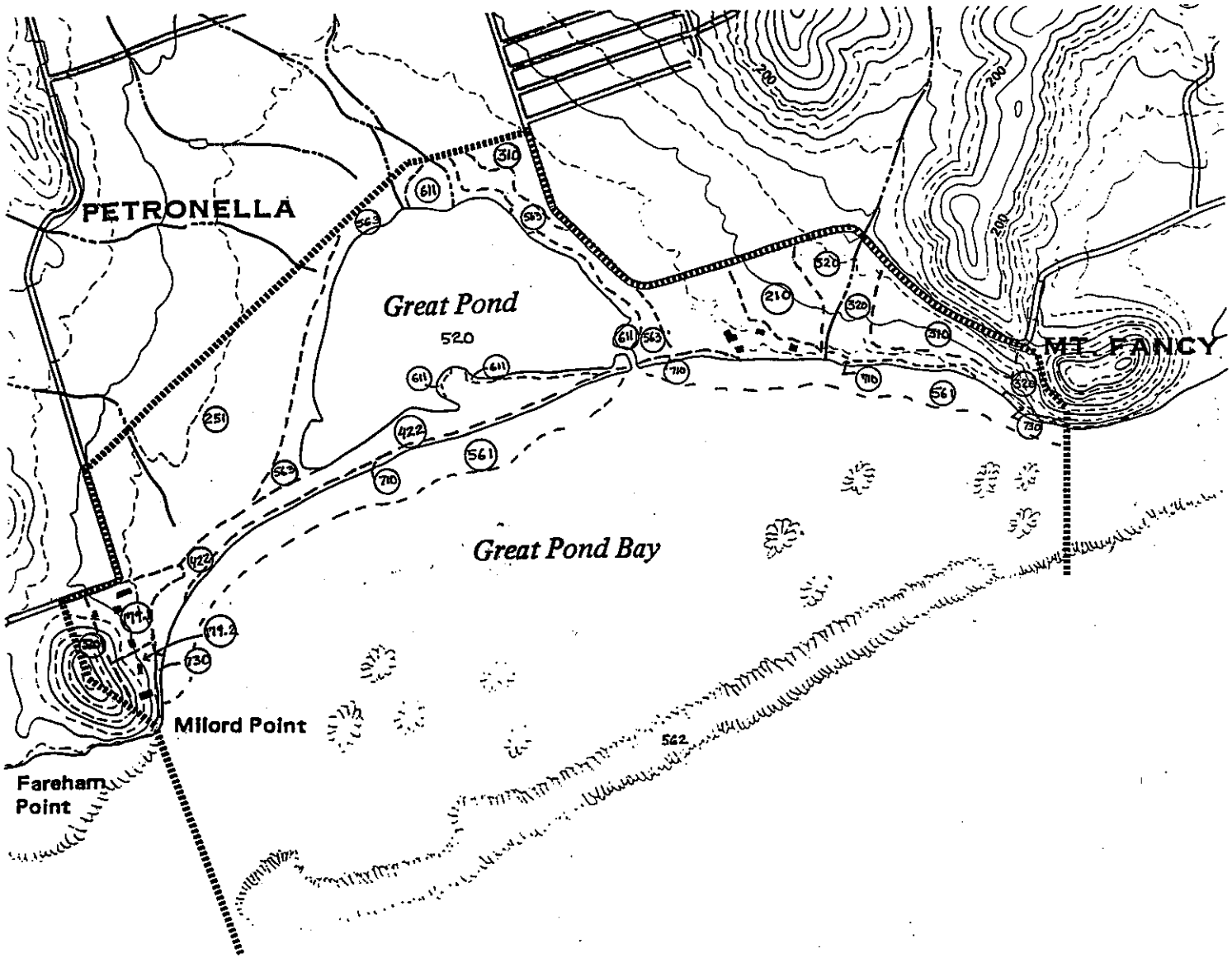


Figure 8
Pond Configuration
Adapted from: Multer, H. Grey, 1974
Island Resources Foundation, 1993

Great Pond Bay APC/APR

Land Use Map



LAND USE / LAND COVER

☐	RECREATIONAL	179.1	Camp Ground
		179.2	Shooting Range
☐	AGRICULTURE	210	Cropland/Pasture
		251	Inactive
☐	RANGELAND	310	Grassland
		320	Scrub/Brushland
☐	WOODED AREAS	422	Barrier beach woodland
☐	MARINE	520	Salt pond
		561	Seagrass beds
		562	Coral reefs
		563	Sand/Mud flats
☐	WETLANDS	611	Mangroves
☐	Barren	710	Beach
		730	Exposed rocky shore

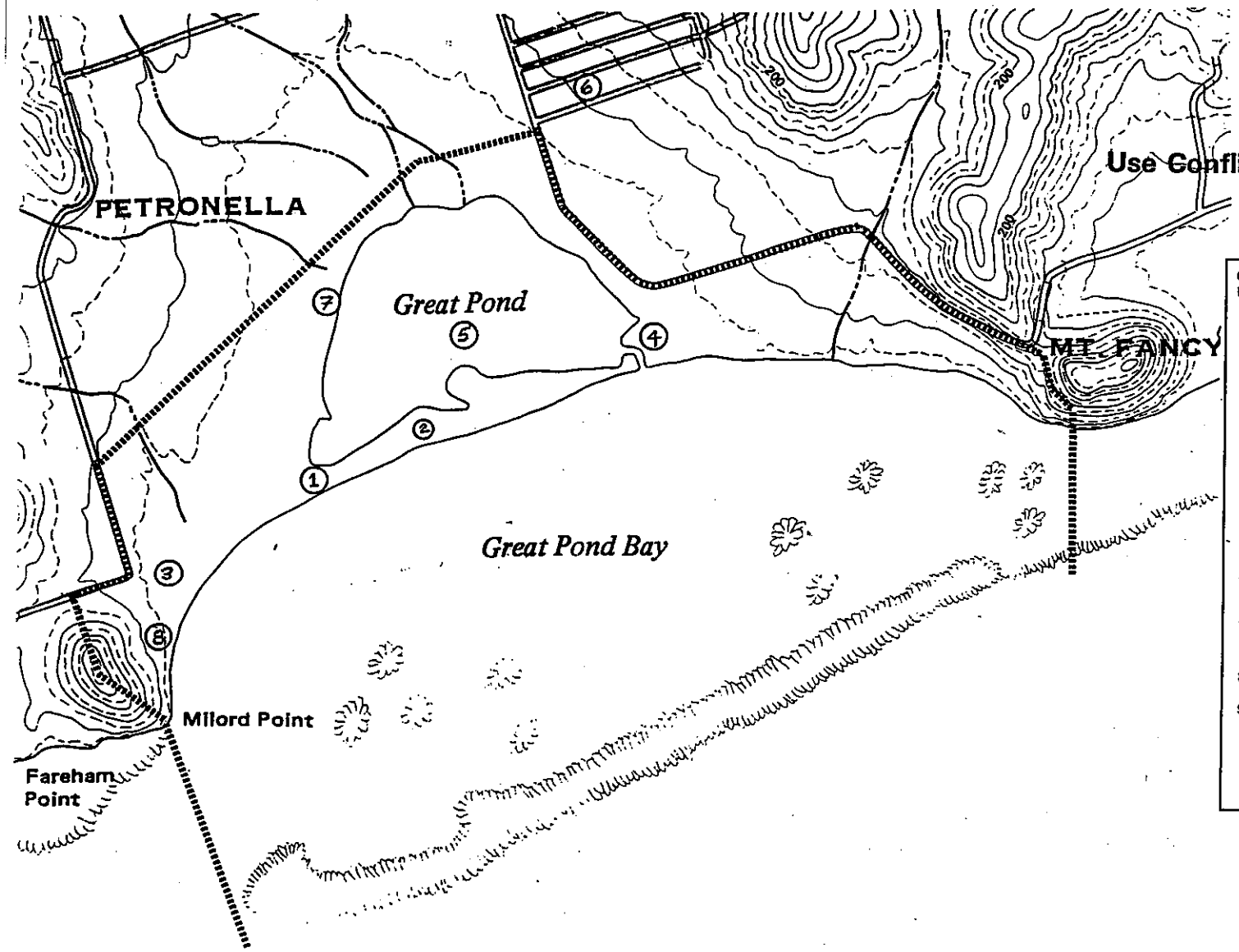
Classification system: Teytaud, 1981.

Figure 9
Land Use Map
Adapted from: BC&E, 1979
Island Resources Foundation, 1992

1,000'

Great Pond Bay APC/APR

Use Conflict/Resource Availability Map



GREAT POND BAY APC/APR
USE CONFLICT MAP (IRF AUG/91)

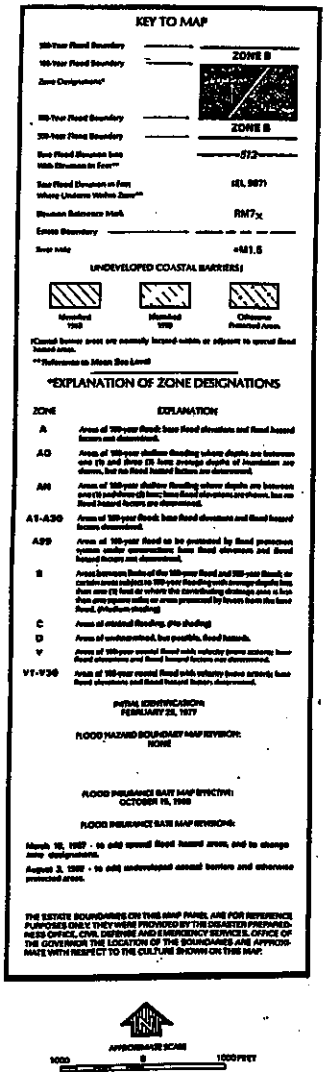
1. Use of beach as a boat ramp - Jeeps and boat trailers seen frequently on beach.
2. Several "fish shanties" are set up on the beach berm with road along back of berm, some litter around.
3. Boy Scout camp - facilities could be expanded and directed for more public use and as a staging area for a system of nature trails around the pond area.
4. Dumping of storm - debris after Hugo by ACOE. These mud flats have seen auto traffic in the past as well as garbage dumping.
5. Salt Pond in fairly good condition, has had past threats by dumping; receives runoff from surrounding area (+1000 acres) which might be silt laden due to development.
6. Housing development (more than 300 lots identified) - roads in place but individual buildings not being built.
7. Great Pond Realty 1988 development proposal (condo/marina/ hotels/golfcourse) has been rejected so far might be re-submitted.
8. St. Croix Marksman's Association skeet shooting range.
9. Suggest moving APC boundary north to Route 624 north of Great Pond, recommend that a vegetation buffer be maintained between shore of road and edge of grazing field as a silt and nutrient trap.

Figure 10
Use Conflict/Resource Availability Map
Adapted from:
Island Resources Foundation, 1991

1,000'

Great Pond Bay APC/APR

Flood Insurance Rate Map



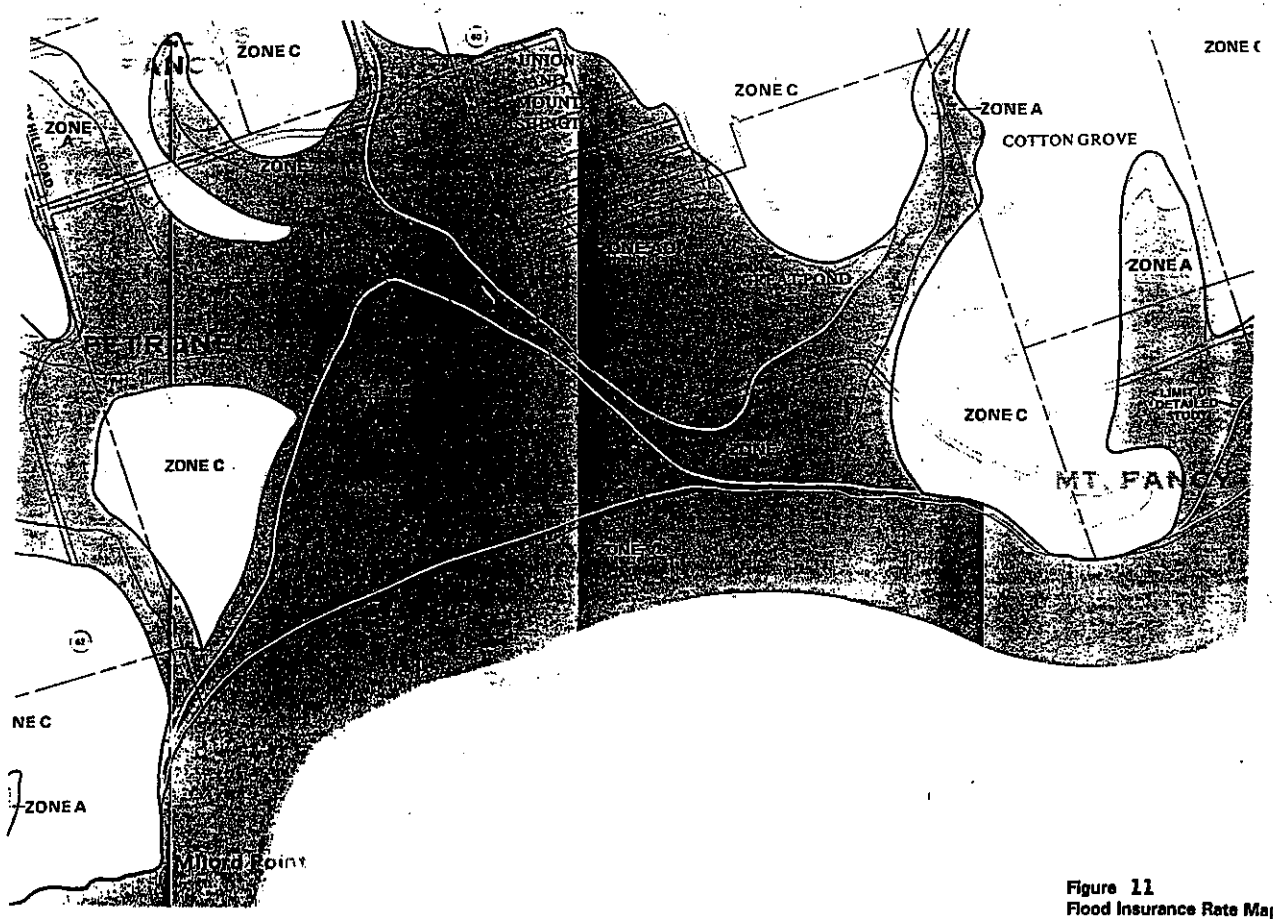
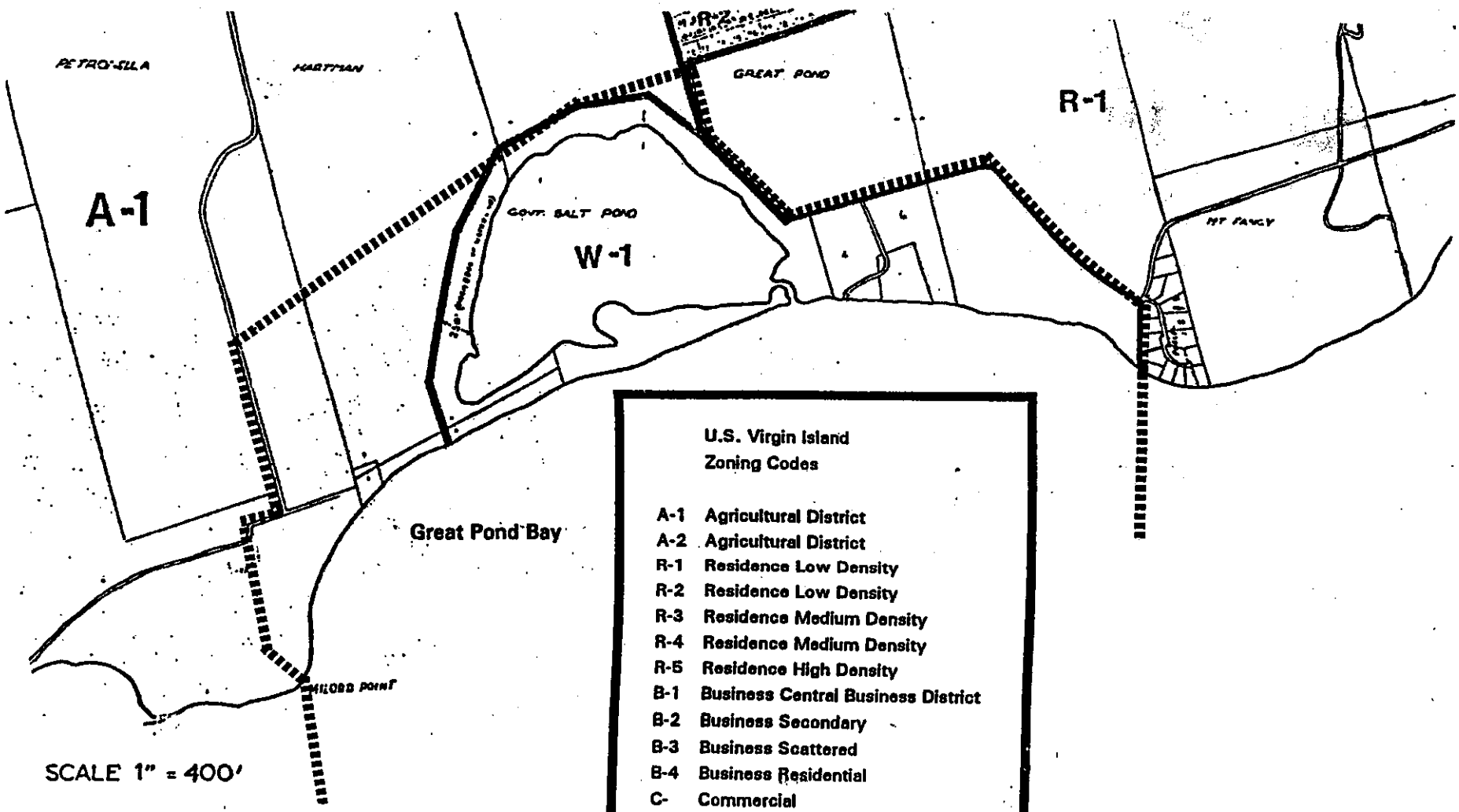


Figure 11
Flood Insurance Rate Map
Adapted from: Federal Emergency Management Agency National Flood Insurance Program, 1987
Island Resources Foundation, 1992

Great Pond Bay
Existing Zoning



U.S. Virgin Island
Zoning Codes

A-1	Agricultural District
A-2	Agricultural District
R-1	Residence Low Density
R-2	Residence Low Density
R-3	Residence Medium Density
R-4	Residence Medium Density
R-5	Residence High Density
B-1	Business Central Business District
B-2	Business Secondary
B-3	Business Scattered
B-4	Business Residential
C-	Commercial
I-1	Industry Heavy
I-2	Industry Light
W-1	Waterfront Pleasure
W-2	Waterfront Commercial-Industrial
P-	Public

Figure 12
Existing Zoning
Adapted from: Real Estate
Data Inc., 1987
Island Resources Foundation, 1993

GREAT POND and GREAT POND BAY
AREA OF PARTICULAR CONCERN
(APC)

and

AREA OF PRESERVATION AND RESTORATION
(APR)

A COMPREHENSIVE ANALYTIC STUDY

V.I. DEPARTMENT OF PLANNING AND NATURAL RESOURCES
Coastal Zone Management Program

September 21, 1993

Draft Prepared By:
Island Resources Foundation
under Contract PC PNR-330-92

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The University of the
Virgin Islands

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GREAT POND AND GREAT POND BAY
APC/APR *COMPREHENSIVE ANALYTIC STUDY*
TABLE OF CONTENTS

1.	**INTRODUCTION**	**1**
1.1	General	1
1.2	Relationship to Other Plans and Regulations	2
1.3	Historical Perspective and Overview	3
1.4	Other Classifications	3
2.	**DESCRIPTION OF THE SITE**	**4**
2.1	APC Boundary	4
2.2	Ownership Summary	5
2.3	Physical Environment	6
2.3.1	Climate	6
2.3.2	Geological Setting	6
2.3.3	Hydrological Setting	7
2.3.4	Coastal Environment	7
2.4	Biological Environment	8
2.4.1	Terrestrial	8
2.4.2	Marine	11
2.4.3	Endangered Species	12
2.5	Cultural Resources	12
2.5.1	Prehistoric	12
2.5.2	Historic	12
2.6	Built Environment	13
2.6.1	Roads and Ports	13
2.6.2	Water Systems	13
2.6.3	Wastewater Systems	13
2.6.4	Energy Systems	13
2.6.5	Solid Waste Disposal Systems	13
3.	**RESOURCE USE, USE CONFLICTS, AND ADVERSE IMPACTS**	**14**
3.1	Resource Use	14
3.2	Use Conflicts	14
3.3	Adverse Impacts	15
3.3.1	Water Quality	15
3.3.2	Air Quality	15
3.3.3	Noise	16
3.3.4	Impacts to Biological Resources	16
4.	**MANAGEMENT RECOMMENDATIONS**	**17**
4.1	Policy Framework	17
4.2	Planning, Permitting	17
4.3	Legislative Change	21
4.4	Institutional Development	22
5.	**CONCLUSION**	**22**

LIST OF KEY ACRONYMS

Area of Particular Concern	APC
Area of Preservation and Restoration	APR
Buck Island Reef National Monument	BIRNM
Coastal Barrier Resources System	CBRS
Coastal Zone Management Act	CZMA
Department of Housing, Parks, and Recreation	DHPR
Department of Planning and Natural Resources	DPNR
Department of Public Works	DPW
Division of Archaeology and Historic Preservation	DAHP
Division of Coastal Zone Management	DCZM
Division of Environmental Protection	DEP
Division of Fish and Wildlife	DFW
Federal Emergency Management Agency	FEMA
National Flood Insurance Program	NFIP
National Marine Fisheries Service	NMFS
National Park Service	NPS
Outstanding National Resource Waters	ONRW
Sea Level Rise	SLR
Significant Natural Area	SNA
Territorial Pollutant Discharge Elimination System	TPDES
U.S. Army Corps of Engineers	USACOE
U.S. Coast Guard	USCG
U.S. Environmental Protection Agency	USEPA
U.S. Fish and Wildlife Service	USFWS
U.S. Geological Survey	USGS
Water and Power Authority	WAPA

LIST OF FIGURES

1. Location Map
2. APC/APR Boundary Map
3. CBRS Map
4. Land Ownership Map
5. Rain Fall Map
6. Soil Type Map
7. Watershed Map
8. Pond Configuration Map
9. Land Use Map
10. Use Conflict Map\Resource Availability
11. Federal Emergency Management Agency (FEMA), Flood Insurance Rate Map (FIRM)
12. Existing Zoning

handgun use. This activity is relatively harmless except for the two minor negative impacts at the site. Frequently, clay pigeon pieces are found along the beach, and fragments with sharp edges could cut a wader's or swimmer's foot. Noise might also be a problem for the neighbors especially for the Boy Scouts - but since the shooting range only operates during daylight hours, conflicts should be minimal.

Promotion of special recreational events for the Great Pond Bay area could include skeet shooting as an extra attraction for viewers and for participants.

The area should be developed as a nature site, and scientific study area, with the Boy Scouts camp as the focal point for building facilities. Walking tours along the beach berm and to various places along the south shore of the pond could be organized by various local groups like the St. Croix Environmental Association (SEA) or the UVI Cooperative Extension Service.

Camp Arawak, on the eastern side of Great Pond Bay, can be upgraded as a campground, and the Great House and other historic buildings on the site should be refurbished as an attraction and potential historic park site.

Residential Development

To minimize further environmental damage to Great Pond and Great Pond Bay, from erosion and from increased nutrient loading of the ground water and runoff water, new residential building projects in the watershed should minimize exposed soils and use best available technology for sediment control and runoff water management on the property. Also, the building of a wastewater collection and treatment or pumping system should be considered to replace the existing septic tank system of wastewater treatment.

Commercial Development

Commercial hotel development within the Great Pond area is not recommended at this time, primarily because of current, stagnant economic conditions.

Additionally, the original building setback of 40 feet from the beach, as proposed by developers, is not adequate to ensure protection of structures from storm force winds and wave action. Also, the Great Pond Bay area is a CBRS site, and development within a CBRS site is ineligible for federal funding or federal flood insurance protection.

4.3 Legislative Change

Legal, social, political and environmental factors favor the acquisition of some of the Great Pond area for park use. Efforts should be made to secure the area blocked out by Routes 62, 624 and 60. This would serve as a buffer area to guard the pond's ecological integrity and prevent development activities within the out-lined flood zone. Agriculture training and experimentation would be appropriate land uses for the area. The seagrass beds in Great Pond Bay and the offshore reefs provide potential for educational and recreational marine activities. A Great Pond Park would give Virgin Islanders immediate multiple benefits and opportunities, secure essential fish and wildlife habitat, and enhance a primary training and recreational area for school children and others.

Recommended Land Acquisition

The most desirable land holding situation for the VI Government relative to the Great Pond Bay area would be for the Government to acquire the entire shoreline expanse and those portions of Estates Hartman, Petronella and Great Pond bounded by Routes 62, 624 and 60, which surrounds the pond, adding to Government ownership of the pond itself (Figure 4).

This would allow the placement of parking and staging areas, concessions, inland camping facilities, and interpretative trails along the beachfront and around the salt pond.

The following recreational development scenarios for the Great Pond Bay area are recommendations from the 1991 VirginIslands Territorial Park System Planning Project (IRF,1991).

1) Minimal Development

Minimal development at this site should include a day use area and beach with associated parking and a rest room. Costs for this type of development are approximately $110,000.

2) Optimal Development

The expansive, shallow-sloping land would facilitate the development of a major campground and recreational area for St. Croix. The offshore reefs are easily reached from the beach and could be included in overall park planning through development of a snorkeling trail system. Optimal development would include the addition of a campground, additional parking, another rest room, underwater signs, a maintenance building, more trash cans, an environmental trail and an information kiosk for a total of $460,500. This would bring the total development costs of the site to $570,000.

4.4 Institutional Development

Successful management of the great pond Bay APC will come about quicker and with more lasting results if the area is managed from a holistic point of view taking in all the natural, cultural, social, and economic resources. DPNR must ensure that BMP's are followed at all times.

5. CONCLUSION

The overwhelming single recommendation for the site, taken from several sources, is to preserve the Great Pond Bay area in as natural a state as possible.

Much damage has already been done to the site, especially to the pond. Most of the damage is related to pollution from illegal dumping and sedimentation from upland runoff. The effects of the damage can be minimized and overcome with better solid waste management practices and more careful earth moving and construction practices. Restoration of Great Pond to a healthier state is attainable if several guidelines are followed.

A follow-up investigation to the Post-Hurricane Hugo - Territorial Park Planning project should be done to assess the quality and amount of regeneration during the four years since the passage of Hurricane Hugo. Additionally, the CBRS boundary for the site should be re- evaluated and probably extended, especially to the west, to reflect the full extent of the area that could potentially be inundated by storm serge at Great Pond. This should be done in conjunction with a FEMA-sponsored update for the FIRMs.

As the density of housing increases in the Union and Mount Washington residential subdivision, the increased septic discharge will adversely affect groundwater quality. In order to minimize impact on the groundwater in the Great Pond Bay area, a wastewater collection system should be designed and built to accept wastewater from all new and most existing buildings in the Great Pond Bay watershed, and the wastewater should be treated at a wastewater treatment plant to be built in the area, or pumped to an existing wastewater treatment plant in Christiansted.

The Great Pond Bay APC boundary should be extended to include all the land bordered by Routes 60, 624, and 62.

An educational program should be implemented to educate the community that the salt pond is not a legal dump site, and to encourage them to transport all derelict vehicles to the Anguilla dump site.

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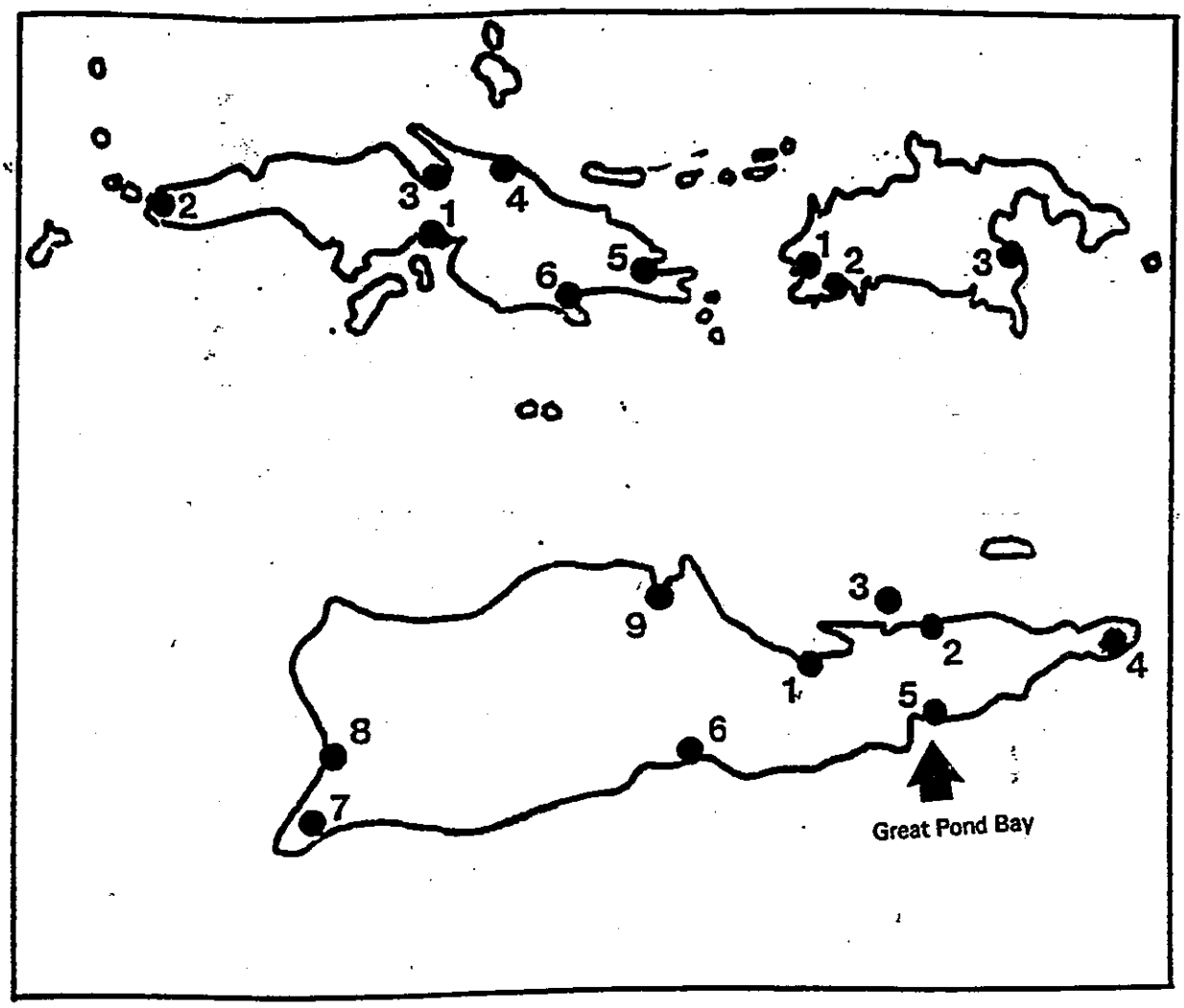
AREAS OF PARTICULAR CONCERN



AREAS OF PARTICULAR CONCERN

St. Thomas

1) St. Thomas Harbor and Waterfront
2) Botany Bay (APR)
3) Magens Bay and Watershed
4) Mandahl Bay (APR)
5) Vessup Bay - East End
6) Mangrove Lagoon - Benner Bay (APR)

St. John

1) Enighed Pond - Cruz Bay
2) Chocolate Hole - Great Cruz Bay (APR)
3) Coral Bay (APR)

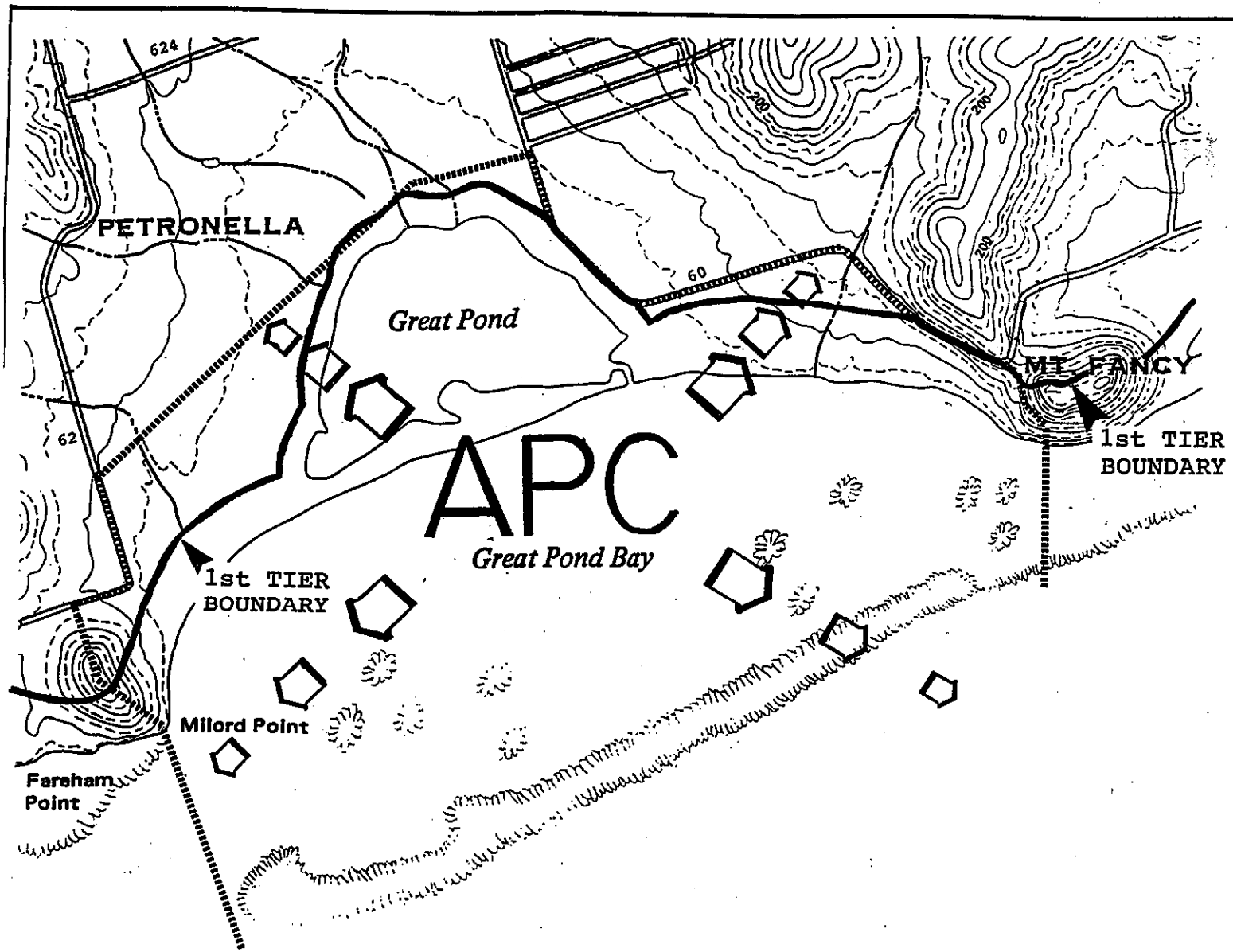
St. Croix

1) Christiansted Waterfront
2) Southgate Pond - Chenay Bay (APR)
3) St. Croix Coral Reef System (APR)
4) East End (APR)
5) Great Pond and Great Pond Bay (APR)
6) Southshore Industrial Area
7) Sandy Point
8) Frederiksted Waterfront
9) Salt River Bay and Watershed (APR)

Figure 1
Regional APC Map
Adapted from: USDOC, 1979

Great Pond Ba
APC/APR

APC/APR Boundary Map



APC BOUNDARY
1ST TIER BOUNDARY

Figure 2
APC/APR Boundary Map
Adapted from: BC&E/CH2M Hill, 1979
Island Resources Foundation, 1992

1,000'

Great Pond Bay APC/APR

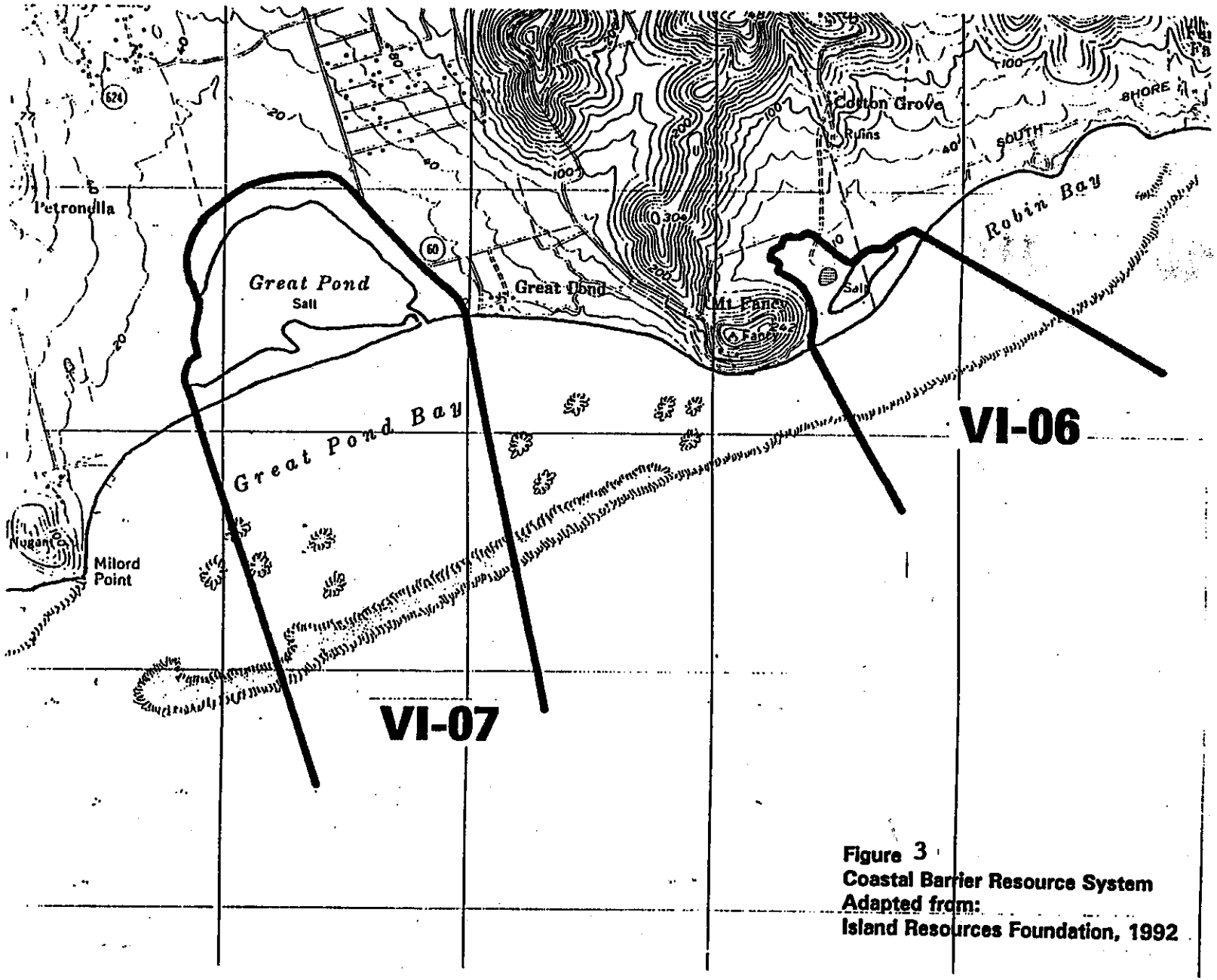


Figure 3
Coastal Barrier Resource System
Adapted from:
Island Resources Foundation, 1992

COASTAL BARRIER RESOURCES SYSTEM

Great Pond Bay APC/APR

Land Ownership Map

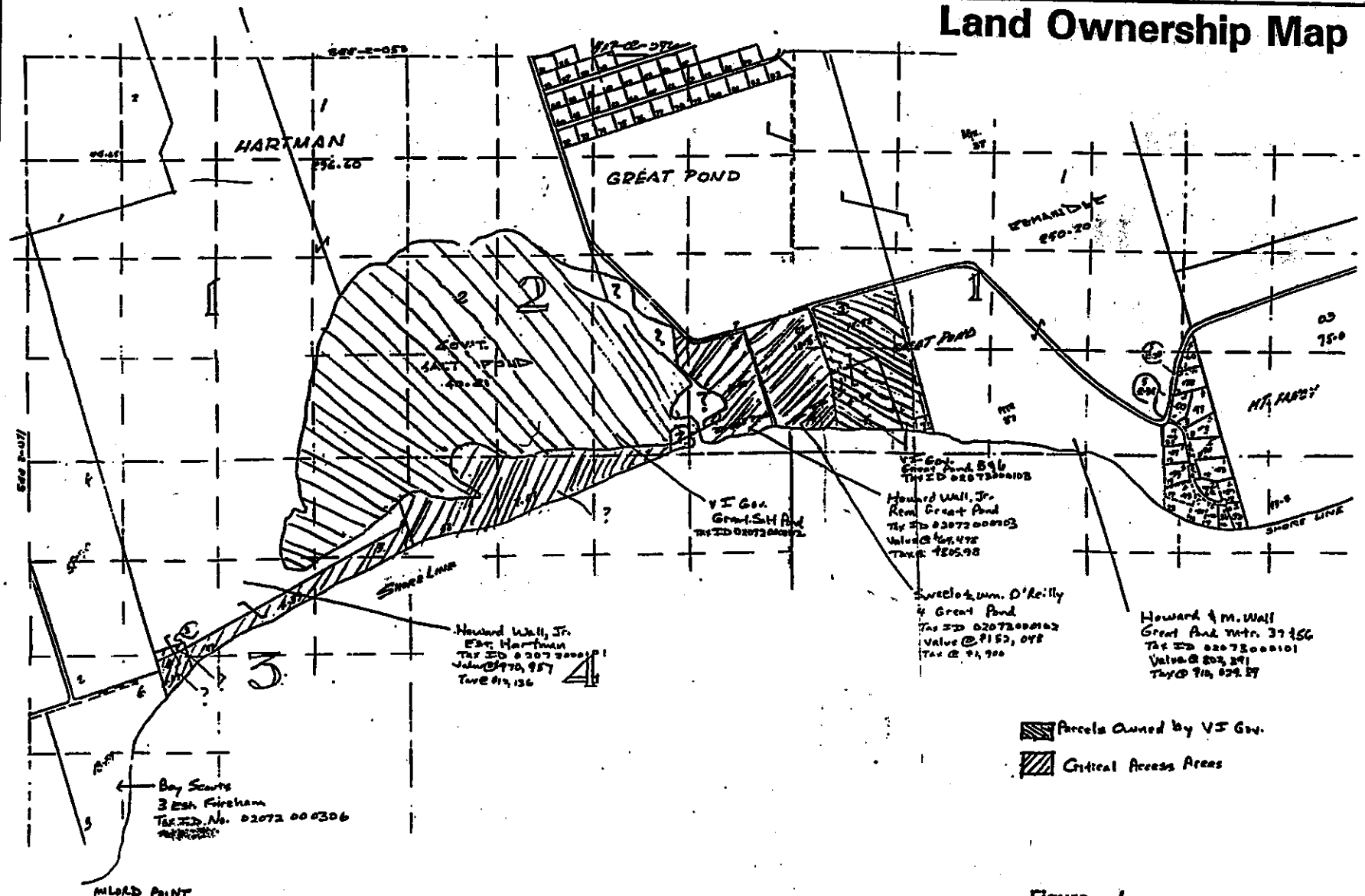
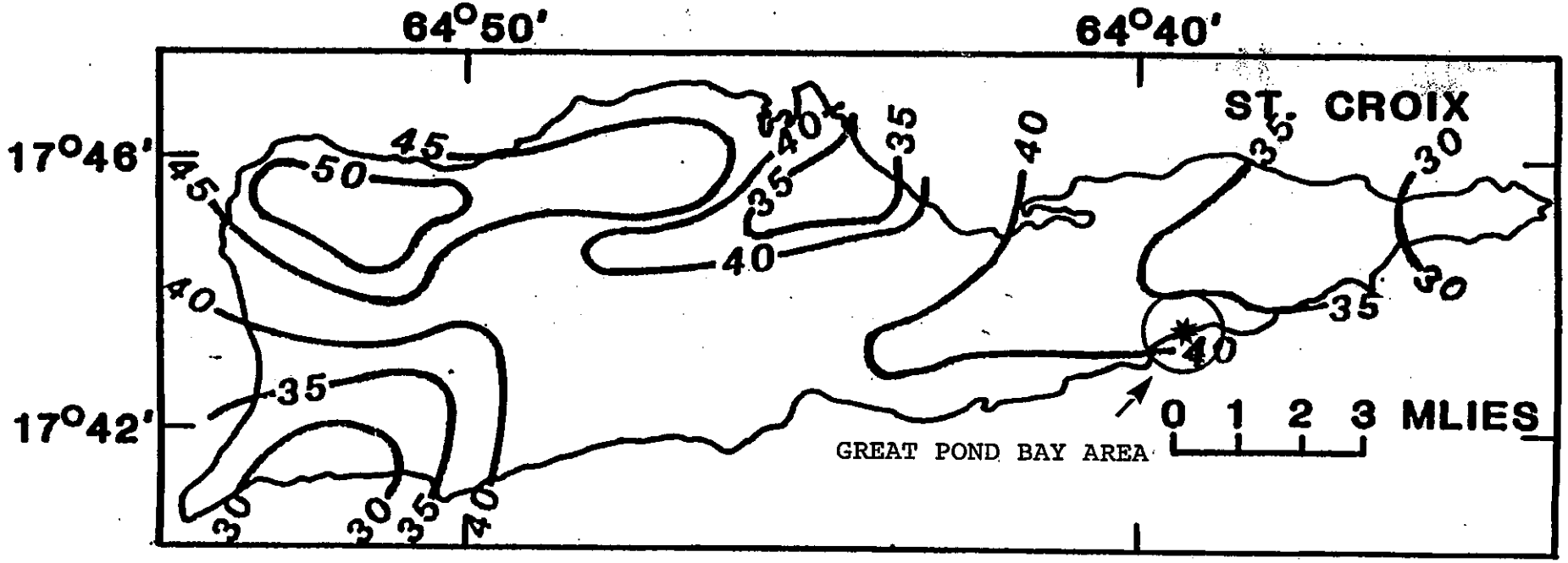


Figure 4
Land Ownership Map
Adapted from:
Island Resources Foundation, 1992

Rain Fall Map

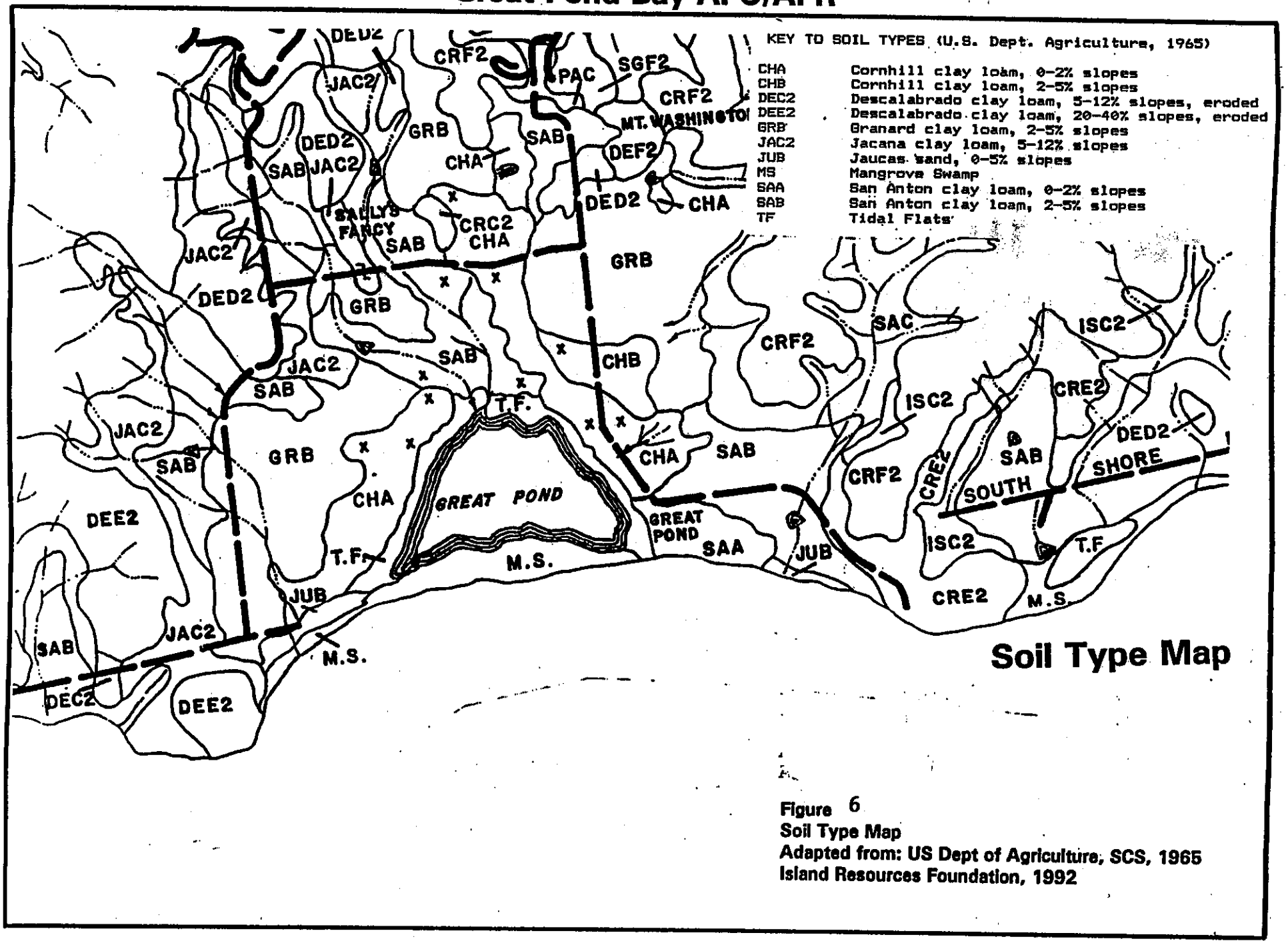


EXPLANATION

—35— LINE OF EQUAL RAINFALL IN INCHES

Figure 5

Great Pond Bay APC/APR



Soil Type Map

Figure 6
Soil Type Map
Adapted from: US Dept of Agriculture, SCS, 1965
Island Resources Foundation, 1992

Great Pond Bay APC/APR

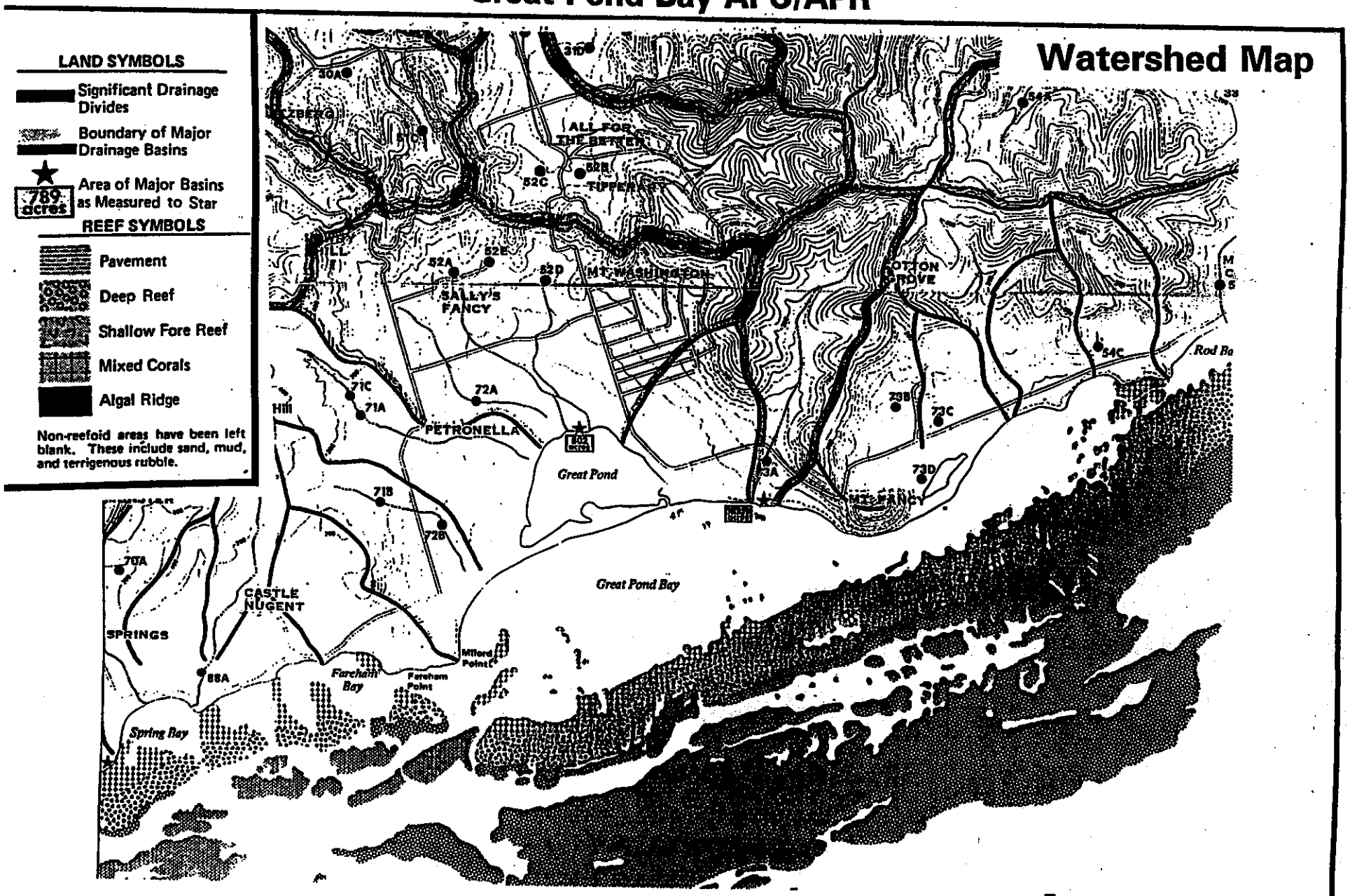
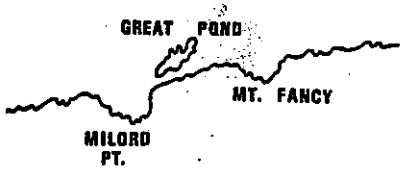
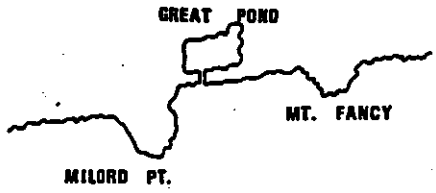


Figure 7
Watershed Map
Adapted from: BC&E, 1979
Island Resources Foundation, 1992

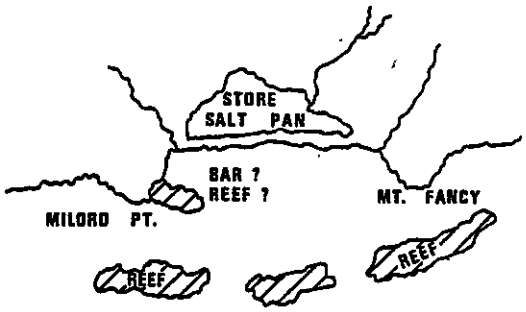
Pond Configuration Map



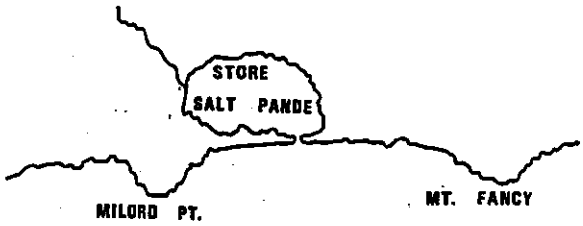
GREAT POND AREA 1671
AFTER LEWISOHN, 1970



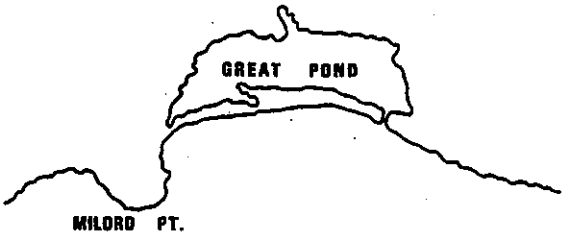
GREAT POND AREA 1754
AFTER BRONDSTED, 1953



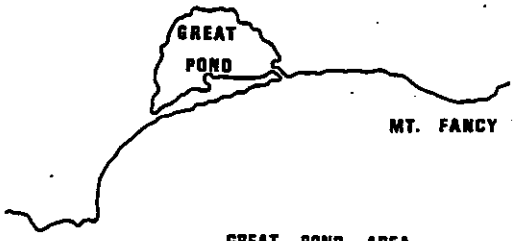
GREAT POND AREA.
OXHOLM SURVEY 1791



GREAT POND AREA 1907
AFTER UDGIVET, 1908



GREAT POND AREA
U.S. COAST AND GEODETIC
SURVEY 1924



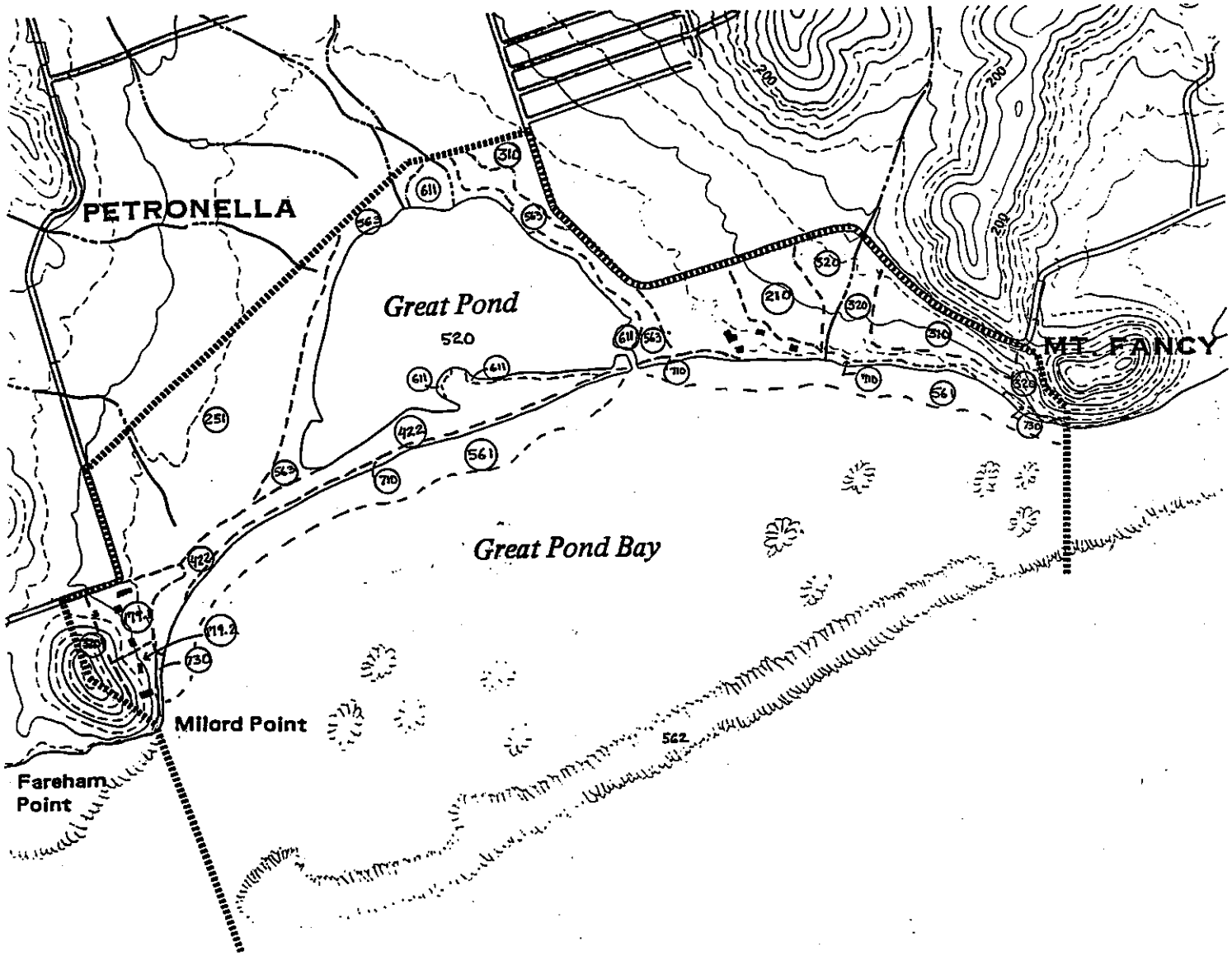
GREAT POND AREA
U.S. GEOLOGICAL SURVEY
1958

N

Figure 8
Pond Configuration
Adapted from: Multer, H. Grey, 1974
Island Resources Foundation, 1993

Great Pond Bay APC/APR

Land Use Map



LAND USE / LAND COVER

☐	RECREATIONAL	179.1	Camp Ground
		179.2	Shooting Range
☐	AGRICULTURE	210	Cropland/Pasture
		251	Inactive
☐	RANGELAND	310	Grassland
		320	Scrub/Brushland
☐	WOODED AREAS	422	Barrier beach woodland
☐	MARINE	520	Salt pond
		561	Seagrass beds
		562	Coral reefs
		563	Sand/Mud flats
☐	WETLANDS	611	Mangroves
☐	Barren	710	Beach
		730	Exposed rocky shore

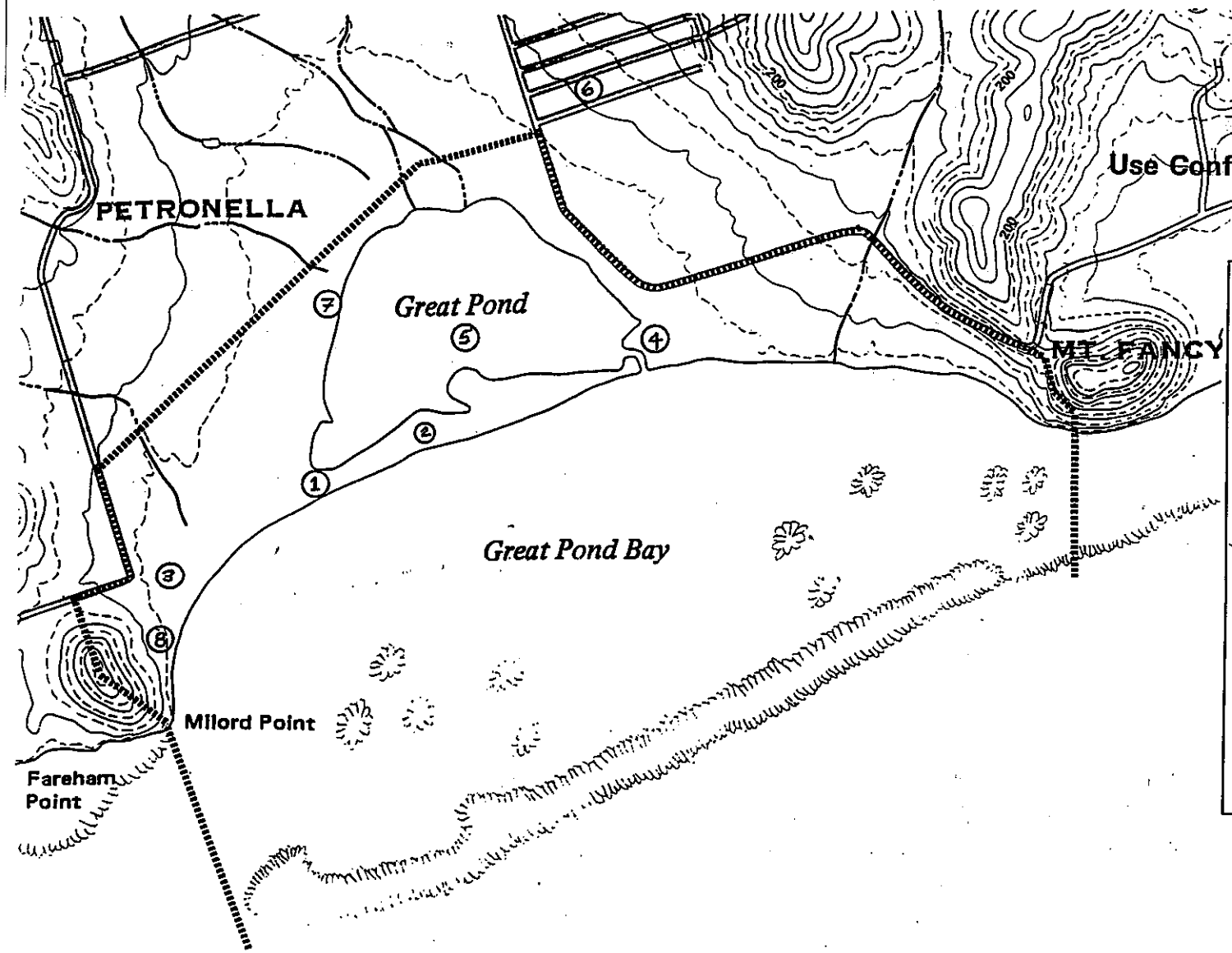
Classification system: Teytaud, 1981.

Figure 9
Land Use Map
Adapted from: BC&E, 1979
Island Resources Foundation, 1992

1,000'

Great Pond Bay APC/APR

Use Conflict/Resource Availability Ma



GREAT POND BAY APC/APR
USE CONFLICT MAP (IRF AUG/91)

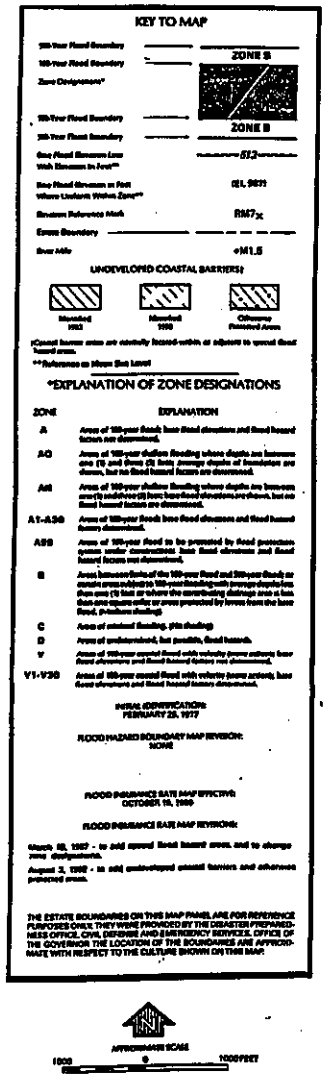
1. Use of beach as a boat ramp - Jeeps and boat trailers seen frequently on beach.
2. Several "fish shanties" are set up on the beach berm with road along back of berm, some litter around.
3. Boy Scout camp - facilities could be expanded and directed for more public use and as a staging area for a system of nature trails around the pond area.
4. Dumping of storm - debris after Hugo by ACOE. These mud flats have seen auto traffic in the past as well as garbage dumping.
5. Salt Pond in fairly good condition, has had past threats by dumping; receives runoff from surrounding area (+1000 acres) which might be silt laden due to development.
6. Housing development (more than 300 lots identified) - roads in place but individual buildings not being built.
7. Great Pond Realty 1988 development proposal (condo/marina/ hotels/golfcourse) has been rejected so far might be re-submitted.
8. St. Croix Marksman's Association skeet shooting range.
9. Suggest moving APC boundary north to Route 624 north of Great Pond, recommend that a vegetation buffer be maintained between shore of road and edge of grazing field as a silt and nutrient trap.

Figure 10
Use Conflict/Resource Availability Map
Adapted from:
Island Resources Foundation, 1991

1,000'

Great Pond Bay APC/APR

Flood Insurance Rate Map



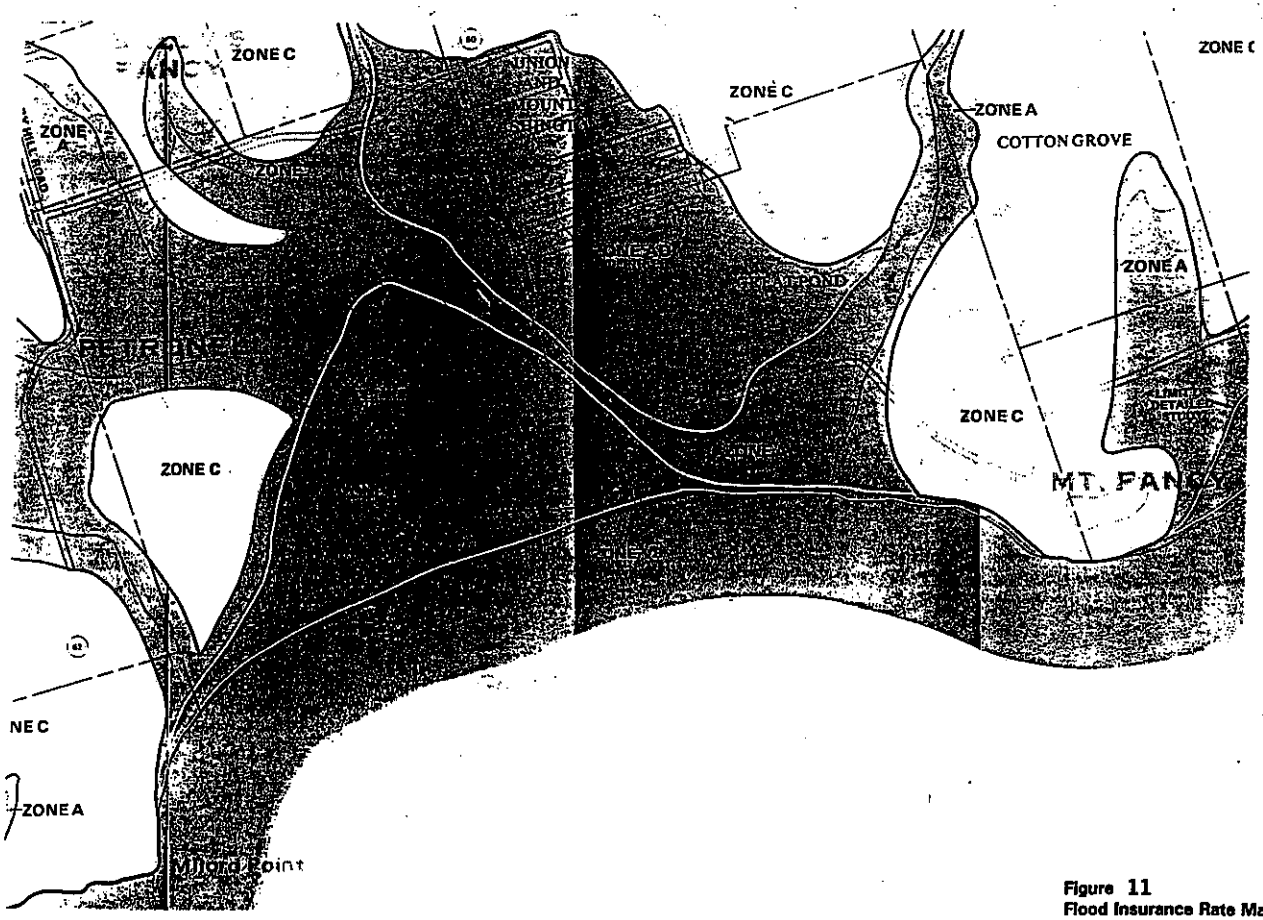
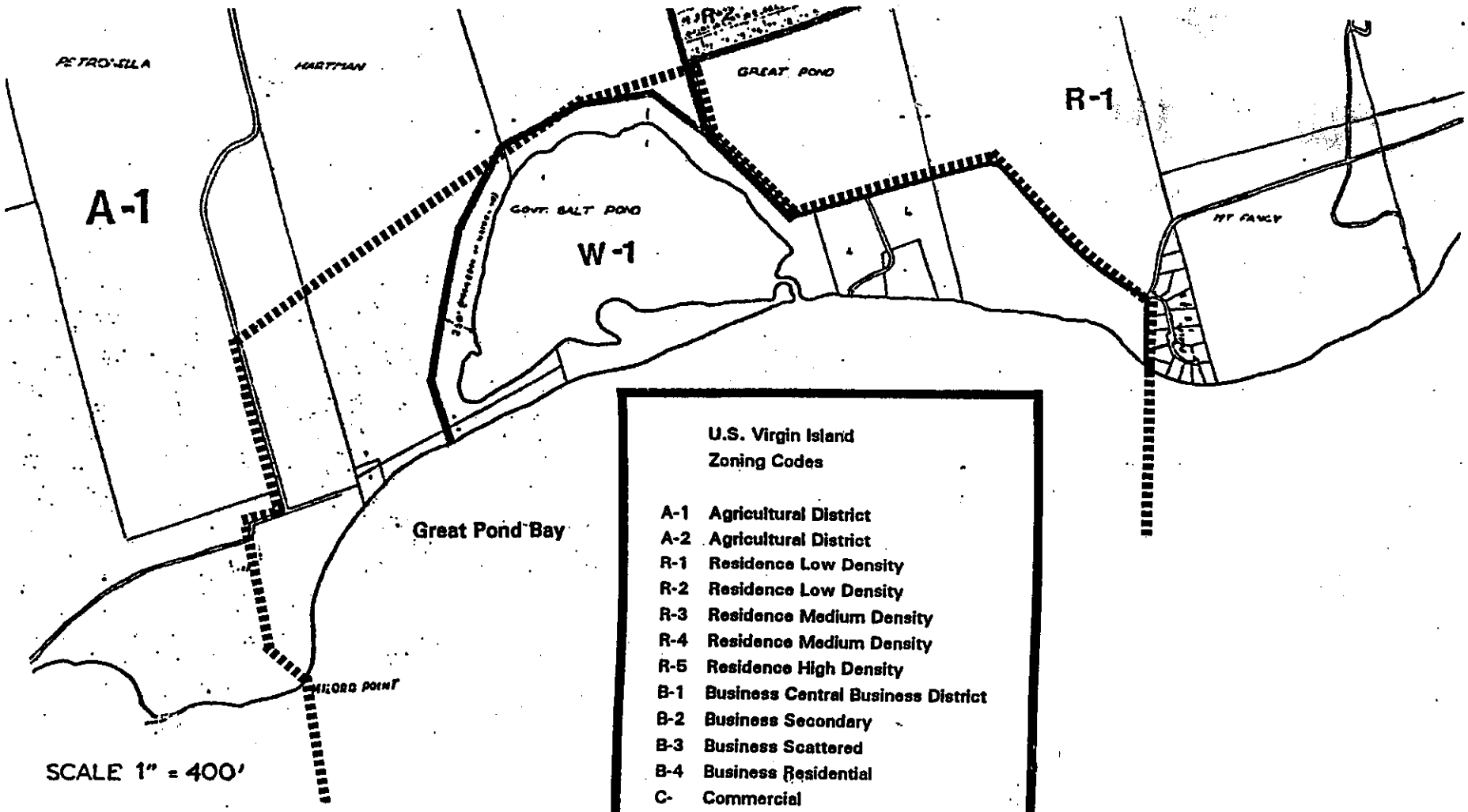


Figure 11
Flood Insurance Rate Map
Adapted from: Federal Emergency Management Agency National Flood Insurance Program, 1987
Island Resources Foundation, 1992

Great Pond Bay
Existing Zoning



U.S. Virgin Island
Zoning Codes

A-1	Agricultural District
A-2	Agricultural District
R-1	Residence Low Density
R-2	Residence Low Density
R-3	Residence Medium Density
R-4	Residence Medium Density
R-5	Residence High Density
B-1	Business Central Business District
B-2	Business Secondary
B-3	Business Scattered
B-4	Business Residential
C-	Commercial
I-1	Industry Heavy
I-2	Industry Light
W-1	Waterfront Pleasure
W-2	Waterfront Commercial-Industrial
P-	Public

Figure 12
Existing Zoning
Adapted from: Real Estate
Data Inc., 1987
Island Resources Foundation, 1993