

PHYSICAL DEVELOPMENT MASTER PLAN **for the** **COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS**



Volume II
SAIPAN

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Prepared for
**OFFICE OF
TRANSITION STUDIES AND PLANNING**

Prepared by
PACIFIC PLANNING AND DESIGN CONSULTANTS
Chalan Kanoa, Saipan Tamuning, Guam

January 1978

U. S. DEPARTMENT OF COMMERCE NOAA
COASTAL SERVICES CENTER
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PHYSICAL DEVELOPMENT MASTER PLAN
FOR THE
COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS

Volume II

SAIPAN

Prepared for
Office of Transition Studies and Planning
Government of the Northern Mariana Islands

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FOREWORD

The following paragraphs highlight the Physical Development Master Plan for Saipan. The format follows the outline of the text and will readily assist those readers interested in locating specific areas of interest. The Plan as developed herein focuses on the next seven years, 1978 to 1985. Within subsequent chapters planning for the period beyond 1985 is included within the text of the Plan Elements.

POPULATION: The present Saipan population, estimated at 19,000 BY 1985 14,000 in 1978, is projected to exceed 19,000 by 1985 - the end of the current plan period. The Micronesian segment is the largest component, comprising 83% of the present total, and estimated to comprise 79% of the 1985 total.

The non-Micronesian segment of the permanent population has increased from 8% to 15% since 1967, and is expected to reach 20% by 1985. The growth of this segment will be considerably volatile, due to its relationship to overall economic and political factors.

ECONOMY Tourism and agriculture will remain the significant economic sectors in the future development of the Commonwealth. Tourism, although volatile, is expected to increase such that by 1985 as many as 1800 persons will visit the Island on an average day. This number of visitors would constitute nine percent (9%) of the total population and comprises an important segment which must be planned for.

Subsistence farming will continue as a way of life; however, funds will be allocated to expand

commercial agricultural production. Development of beef cattle grazing lands, expansion of irrigated croplands at Kagman, and the construction of agriculture support facilities including a Plant Pathology and Entomology Laboratory, a Feed Mill, further irrigation improvements, and the purchase of additional heavy equipment to encourage greater agricultural production are proposed.

LAND USE PLAN

The existing inventory of urban development directly affects future growth. Continued expansion of the urbanized west coast at Garapan, Tanapag, and San Jose will permit incremental growth along the present infrastructure.

The land use plan allocates land for orderly growth and development during the present plan period 1978 to 1985 and beyond. In conjunction with capital improvement projects, the land use plan provides a framework for the management of change and future growth.

SAN ANTONIO

Growth is basically limited to areas to the east and southeast. A 315-unit village homestead site with an internal neighborhood commercial center is proposed for As Perdido (Kobler Field). Resort-related land uses include the White Sands Hotel and the possibility of a golf course to be developed at Agingan.

CHALAN KANO, SUSUPE, SAN JOSE

Little additional population growth is planned for this area. Emphasis is placed on correcting existing problems such as replacement of sub-standard housing. Changes to the road pattern

include upgrading and realignment of Texas Road. Redevelopment of Chalan Kanoa will include a commercial center in the central plaza. The present Civic Center complex in Susupe is anticipated to expand and take on added dimension with the completion of the Nauru Building and the renovation of the Joeten shopping center.

GARAPAN

The Garapan area is a desirable location for new residential growth. The plan proposes concentration of residential growth around the proposed junior high school. A commercial center is proposed just north of the junior high school site. The area surrounding this commercial center is proposed for multiple-family apartments. The American Memorial Park will be a central recreation area for all of Saipan. The resort-tourist area at Micro Beach will expand in size and importance. The new hospital will be located in Garapan, most likely along Navy Hill Road. The proposed upgrading of the port and dock facilities and the industrial park should result in an improved employment base for Garapan and all of Saipan.

TANAPAG

Significant growth is provided south of the existing village, for development under the Village Homestead Program. The area will contain a small commercial center and lands for public facilities. Agriculture use should continue on the public lands lying east of West Coast Highway to facilitate their conversion to industrial lands in the future.

SAN ROQUE

Expansion of San Roque will depend on the improvement of water and sewer lines and the establishment of a major resort development in the Marpi

area. Development of a new homestead site north of the existing village will occur; however, it is not anticipated during the present plan period.

MARPI

Public grazing lands are proposed at Banadera and I Madog. Hotel, recreation facilities, and a championship golf course are proposed adjacent to West Coast Highway in lower Marpi. Agricultural homesteads are proposed for Kalabera Plateau (east of East Coast Highway), along the Burma Road, and adjacent to Marpi Resort complex at Matansa.

KAGMAN

Proposed uses in the Kagman area include expansion of the Agricultural Station, expansion of the public croplands, location of a sanitary landfill, proposed correctional facilities, expansion of the existing housing area, and Kagman Wilderness Park.

LAND USE ZONES

In order to implement the land use plan, seven major land use zones have been designated. Each is discussed below.

Conservation

One-third of Saipan's total land area is in the Conservation Zone, which includes park and recreation areas, wilderness areas, unique vegetative areas, and historic and archaeological sites. Commonwealth Parks have been proposed at Mt. Tagpochau and Marpi. Other Commonwealth Parks outside the urban area include Tank Beach, Marine Beach, Paupau Beach, Wing Beach, and Ladder Beach. Kagman and Naftan Parks are identified as wilderness areas. Unique vegetative areas include Lake Susupe, a forest of indigenous

trees north of Wallace Highway between Beach Road and West Coast Highway, and the Mangrove stand adjacent to the industrial park. Historic and archaeological sites include the Japanese Hospital, the Japanese Jail, Sugar King Monument, and the 'Latte' Sites at Laulau and Obyan Beaches.

Agriculture

Two agricultural zones are proposed. Lands in the Agricultural 1 (Cultivation) Zone includes those in Kagman and east of the former Kobler Field runway, and should remain in public ownership to insure a future capability for crop production. Extensive portions of the island are in the Agricultural 2 (Grazing and Subsistence Farming) Zone.

Residential

Rural Residential zones are proposed between Sugar King Park in Garapan and Quarter-Master Road in Oleai, for lands west of Lake Susupe; and the entire eastern hillside from Wallace Highway to As Perdido.

The One- and Two-Family Residential Zone is proposed for existing village areas, future subdivision lands, and village homestead area.

Multiple Family Residential Zones are proposed for the Chalan Kanoa-Susupe-San Jose urban center and the Garapan area, where infrastructure and public facilities are adequate. Multi-family Residential Zones may also be developed as part of planned developments and urban renewal projects.

Commercial

The Light Commercial Zone is provided in all new subdivisions, government or private, which will eventually have more than 50 units. This zone

has also been designated in Chalan Kanoa at the existing location of the Post Office and Municipal Buildings, in San Antonio adjacent to Beach Road, and at the Susupe Civic Center complex. Two areas are also designated in Garapan: one east of Beach Road across from the resort area; and the second adjacent to West Coast Highway on government land below Navy Hill Housing. A commercial area is also proposed along the access road to the Airport.

Heavy Commercial Zones are proposed at the Industrial Park and an area in San Jose bordered by Wallace Highway, Beach Road, and West Coast Highway.

Resort The plan provides for Hotel-Resort Zones at Marpi, Micro Beach, Susupe, and San Antonio.

Industrial Industrial Zones have been designated for the Lower Base Industrial Park in Tanapag and the Saipan International Airport at Isley Field.

Public
Facilities Lands reserved for the development and delivery of essential public services are designated in the Public Facilities Zone. These activities include government operations, health care, education, recreation, public safety, and housing.

CIVIC CENTER It is proposed that the Civic Center and the lands adjacent to the existing facilities be reserved to ultimately accommodate all government offices, including those of the legislative and executive branches. As part of the Civic Center Complex, the Marianas High School will be expanded enhancing possibilities for joint use of facilities such as the library, auditorium, gymnasium, and recreational fields.

HEALTH

A new hospital is proposed in Garapan, to replace the present facility. Relocation of the Public Health Center from Chalan Kanoa to Susupe or Garapan is also anticipated.

EDUCATION

Aside from the expansion of the Marianas High School within the Civic Center, a new junior high school is proposed for Garapan. The new junior high school in Garapan will be complete with 25 to 30 classrooms, an auditorium-gymnasium, a library, recreational facilities, and an administration building. Construction of the facility will alleviate classroom shortages for junior and senior high school students and provide interim relief from overcrowding in the elementary schools, while expansion of these schools are being completed.

RECREATION

Wherever school recreation facilities can be jointly used for community needs, they will be planned for such uses. Other recreation facilities include the American Memorial Park, beach parks and historic sites, a Tennis Center in the Civic Center complex.

The American Memorial Park (between Micro Beach and Tanapag Harbor) will be the principal park for the Commonwealth and will have active recreational fields, passive park grounds, and a marina.

PUBLIC SAFETY

A new fire sub-station in Garapan and a correctional facility in the Kagman Area are proposed during the plan period. Renovations of the existing facilities within the Civic Center are accommodated in the expansion plans.

PUBLIC UTILITIES

The Public Utility Plan Elements include sections on Water, Power, Sewerage, Solid Waste, and Drainage.

WATER

Operational priorities require that resources be directed toward problems: of supply and water quality; excessive consumption and line losses; inadequate pressure; and finally expansion of storage. The plan provides for metering of all customers, development of additional wells and improvement of existing ones, location of high level and parbasal water in limestone including the expansion of the system into Chacha Kagman area, improving or reconstructing existing distribution systems and transmission lines.

SANITARY SEWER

Areas planned to accommodate high densities must have adequate public sewerage. Rural areas should not be developed beyond their ability to support private septic systems.

The plan recommends a decentralized system; separate treatment and disposal facilities for both the Southern area and the Central Highland (Northern) area. Southern Coast system improvements include the expansion of the treatment facility to 2.0 mgd capacity and possibly secondary treatment, a new high level interceptor sewer line and pump station along "Texas" Road, and an interceptor line for the proposed 'As Perdido' new town area.

Improvements to the Northern system include phasing out the existing treatment facility and outfall in Garapan and construction of a new 2.0 mgd secondary treatment facility and 20-inch outfall within Tanapag.

POWER

The plan recommends significant improvements to the power supply and distribution system. Construction of a new power generation plant of between 20 and 25 meg watts is proposed for the Industrial Park. Expansion of the primary distribution system, to include dual circuitry and hardening, is also recommended.

SOLID WASTE

Several actions are recommended to realize a safe and effective Solid Waste Management Program. They include: establishment of a weekly collection system; identification of a new landfill site and the phasing out of the existing landfill in Garapan; prohibiting of all uncontrolled burning of solid waste; and discontinued use of 55-gallon refuse containers.

DRAINAGE

Most drainage problems occur on the western coastal plain, where development has interfered with natural drainage patterns. Principal problem areas have been identified, analyzed, and corrective action specified at: San Roque Village; Cross-Island Road at Tanapag; Lower Base Industrial Park and flood susceptible areas in Garapan; Wallace Highway at Oleai; and Chalan Kanoa at Lake Susupe.

TRANSPORTATION

Plan Elements include Airports, Harbors, and the Existing Highway System.

AIRPORT

Airport improvements are recommended for navigation aids (lighting and instrumentation), ground operations (apron expansion, partial parallel taxiway, and runway exits), safety equipment (fire trucks and expansion to the crash/fire

rescue building), and support facilities (air cargo/maintenance buildings, general aviation fuel storage, and control tower).

HARBORS

Adequate harbors and dock facilities are vital to the overall economic growth of the Northern Mariana Islands, since most consumer goods and construction materials are transported via this mode.

At least 1,000 feet of deep water berths and 600 feet of medium depth berths are required for the commercial port. Charlie Dock is scheduled for minimal repairs initially, in order to preclude disruption of operations. A new facility at Baker Wharf is recommended.

The Fishing Base in Garapan is recommended for expansion into a fishing center for subsistence and small-scale commercial fishing operations. Improvements will include stabilization, improvement to the existing wharf, dredging, launching dock, building, boat anchorage area, and a secure boat storage area.

ROADS

Although the existing road network on Saipan is relatively well-developed, its physical condition can generally be considered as worn out with pavement and sub-base failures evident elsewhere. Furthermore, Beach Road and certain other major highways now experience heavy traffic congestion during peak travel hours. An ambitious, extensive highway development program will be required to keep pace with, as well as support, the needs of the evolving Saipan economy.

The program herein proposed will focus on the reconstruction of existing highways and the construction of new highways where only coral base roads now exist.

Improvements include the reconstruction of West Coast Highway and improvements to Texas Road southward to As Perdido Road. As Perdido Road will be upgraded, as will Wallace Highway, Micro Beach Road, and portions of Beach Road.

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BACKGROUND

GOALS AND OBJECTIVES

NATURAL SETTING FOR PLANNING

SOCIO-DEMOGRAPHIC SETTING

LAND MANAGEMENT FACTORS

ENVIRONMENTAL CONSTRAINTS

GOALS AND OBJECTIVES

Basic guidelines directing the development of the Saipan Physical Master Plan have been provided by the Office of Transition Studies and Planning. These guidelines are as follows:

- * Evolve a viable Physical Development Master Plan for Saipan to provide an adequate framework for accommodating the socioeconomic and political changes facing island residents.
- * Recognize natural environmental constraints such as slopes, soils, and water in the location and development of growth areas and preserve to the maximum extent possible the scenic and natural character of the island.
- * Provide for the orderly growth of the Saipan community by coordinating urban growth and economic development with the timely provision of roads, utilities, harbors and other Capital Improvement Projects.
- * Prepare a Capital Improvements Program for the next seven years based upon the physical development master plan for the island of Saipan.
- * To promote and provide for the increasing economic independence of the Northern Mariana Islands.

NATURAL SETTING FOR PLANNING

GEOGRAPHY

The Mariana Islands including Guam constitute a chain of 17 islands (three of which form the island of Maug) which extends about 440 miles along a north-south axis. Total land area of the Marianas chain is 399.11 square miles. Saipan, the second largest of the chain, is approximately 46.6 square miles (See Plate 1).

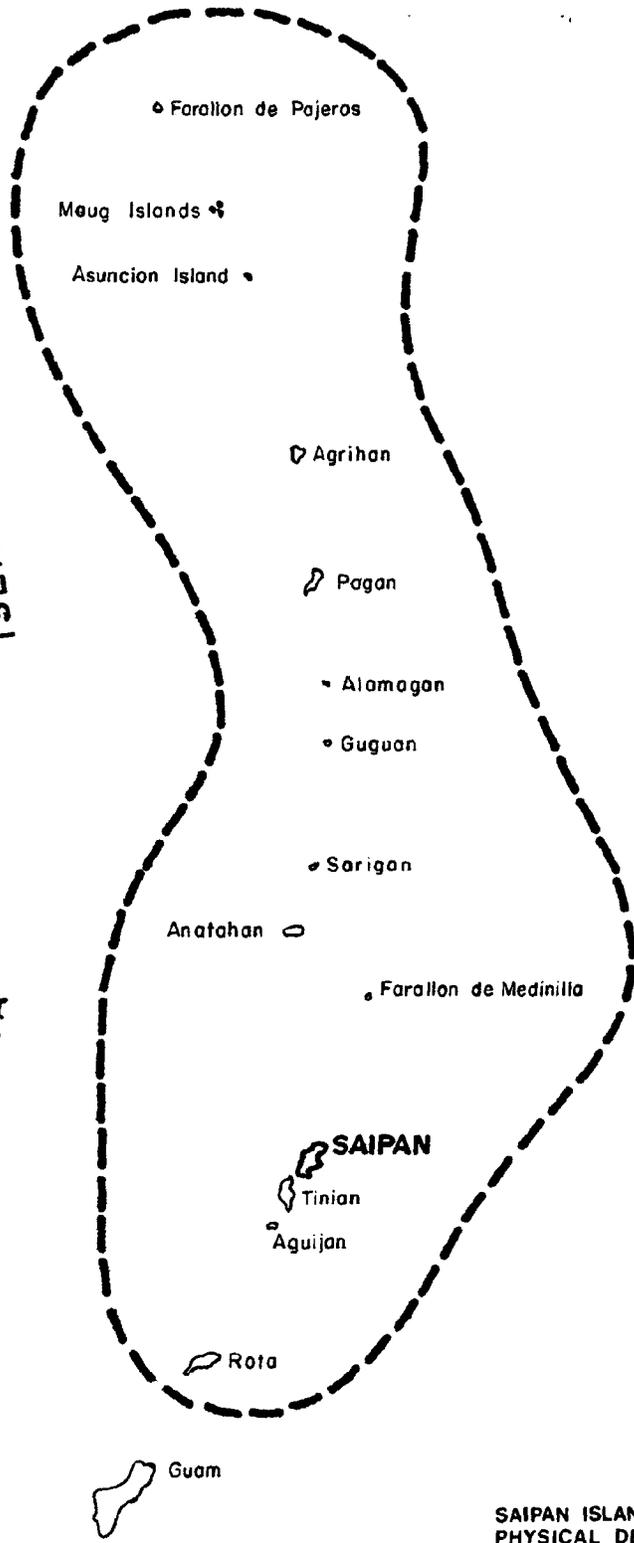
Saipan is located in the Western Pacific Ocean at about 150° 12' North Latitude and 145° 37' East Longitude. The nearest islands are Tinian and Agiguan, three (3) and twenty (20) miles to the south southwest, respectively. Guam, the largest island in the Marianas, lies about 120 miles south-southwest of Saipan. The larger continental groups of Japan, Ryukyus, Philippines and New Guinea, range north to south from 1,000 to 1,500 miles from Saipan in a western arc.

GEOLOGY

The Marianas are located along peaks of a submerged volcanic mountain range, lifted upward by tectonic forces resulting from the subsidence of the Pacific Basin. The slight curvature of the arc, as well as the geomorphology of the islands, indicate that geologically, the Mariana Islands are youthful, probably dating from the Eocene Period.

Geologically, the islands fall into two regions, a younger chain of small purely volcanic islands extending from Anatahan to the north, and an older, more complex group consisting of Saipan and the islands to the south. The northern islands retain their initial volcanic form. Guguan, Pagan Agrihan, Asuncion, and Farralon de Pajaros in this group are either

MARIANA ISLANDS



SAIPAN ISLAND
PHYSICAL DEVELOPMENT MASTER PLAN
VICINITY MAP

1

January 1978
Pacific Planning and Design Consultants
Saipan - Commonwealth of the Northern Mariana Islands

active volcanoes at present or have been so within the past 72 years. Saipan and the southern islands are volcanic in base, coral-capped, and evidence more prolonged evolution. Barrier reefs tend to develop on the more gentle western slopes, while reefs closely fringe the shores on the east. The eastern coastlines are generally rocky and cliffbound and are characterized by wave-cut notches, sea caves, abrasion benches, and detached segments of the former shore.

TOPOGRAPHY

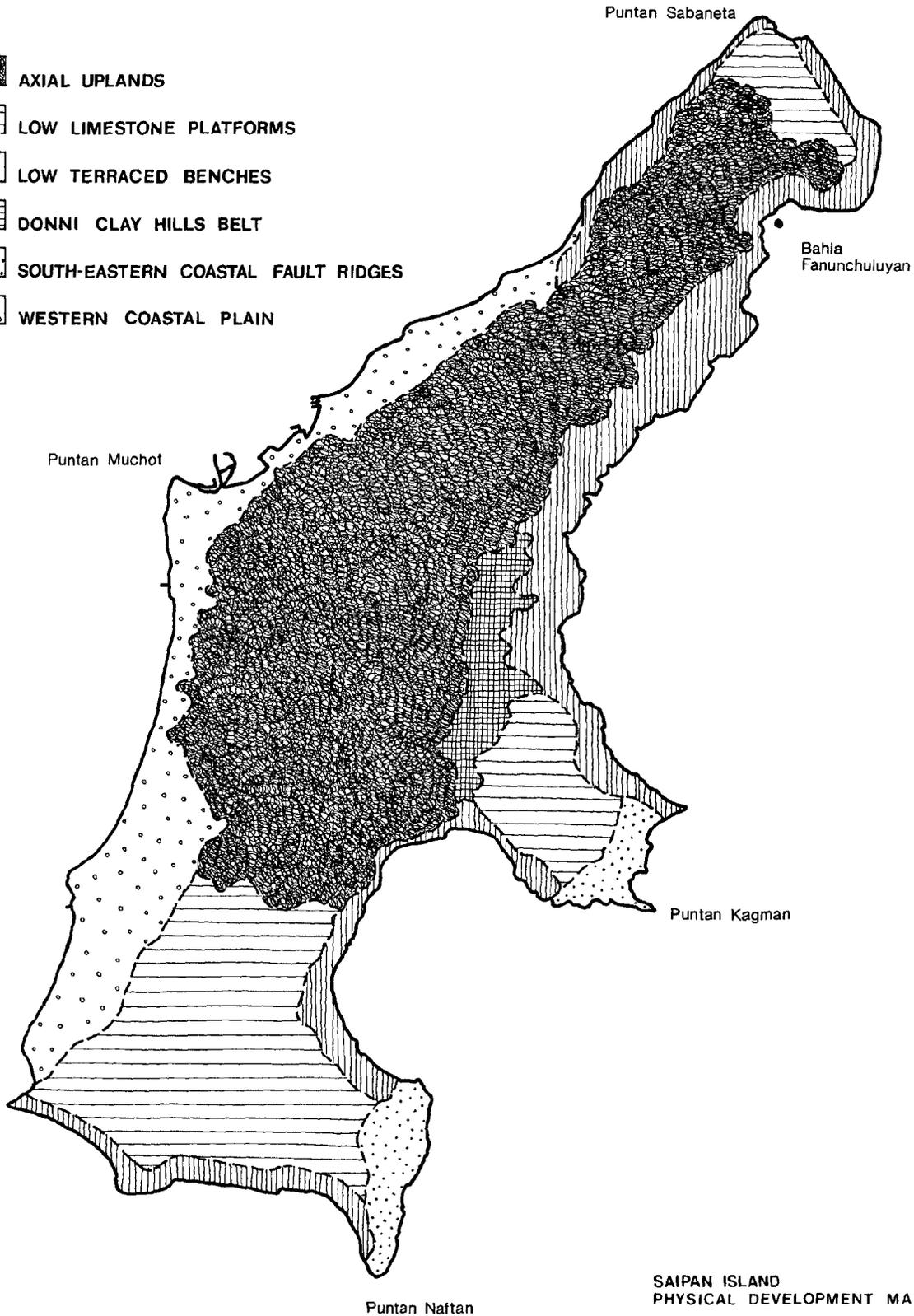
Saipan is about 13 miles long, averages about four (4) miles wide and has a total land area of 46.6 square miles (29,811 acres). Despite its relatively small size, it is considered to be more complex geomorphically than neighboring islands. Plate 2 indicates the principal geomorphic divisions.

The dominant topographic feature is an axial upland area extending through the northern three-fourths of Saipan. It consists of northern and southern terraced limestone uplands with a maximum elevation of 1,555 feet at Mount Tagpochau, a little south of center of the island and 835 feet in the Matus area at the north end. There are low saddles through the highlands providing access from one side of the island to the other.

The northern, eastern and southern coastlines of the island essentially exhibit moderate to steep cliffs and slopes, all with varying heights. Occasionally these features are interrupted by coral sand beaches.

The island has three distinct topographic regions generally delineated by terraced plateaus. These regions are found at the northern tip of the island (at Kagman Peninsula); and on the southern plateau (extending between Agingan Point and Naftan ridge). These terraces are bounded by high limestone cliffs locally interspersed with volcanic materials.

-  AXIAL UPLANDS
-  LOW LIMESTONE PLATFORMS
-  LOW TERRACED BENCHES
-  DONNI CLAY HILLS BELT
-  SOUTH-EASTERN COASTAL FAULT RIDGES
-  WESTERN COASTAL PLAIN



SAIPAN ISLAND
 PHYSICAL DEVELOPMENT MASTER PLAN
GEOMORPHIC DIVISIONS

The southern two-thirds of Saipan's western coast are lowlands adjacent to the lagoon. They form a narrow belt of sand from San Roque in the north to Agingan in the south. There is only one lake on Saipan. Lake Susupe is located inland from Susupe Village and contains brackish water surrounded by marshlands.

Saipan has either barrier or fringing reefs along most segments of its coast. Fringing reefs, as the name implies, fringe the coast and pass laterally in toward shore with little or no significant underwater relief, although micro-relief may vary considerably.

The serene beaches along Saipan's western coast are protected by the barrier reef. The barrier reef runs nearly parallel to the western shoreline for over 90% of Saipan's length. The barrier reef is elongate and continuous for most of its length, although there are holes, grooves, channels, and separations at various places. Some of the separations are large enough for smallcraft transit.

The largest gap in the reef occurs west of Tanapag Harbor and is used for ingress and egress by commercial ships. The width of the lagoon it creates varies from less than 100 meters to over 3,000 meters. Its widest point is opposite the commercial dock area in Tanapag Harbor. To the north and south the reef gradually moves shoreward.

The water depth in the lagoon is variable. In many areas it is possible to wade across the reef flat during a medium tide. In other regions, shallow coral heads present a hazard to small boat operation during extreme low tides. The Tanapag Harbor area ranges from 20 to 50 feet (6 to 15 meters) in depth and is able to accommodate small to medium sized tankers and freighters.

The small island of Managaha lies offshore from the commercial dock area and adjacent to the barrier reef. With its sandy beaches and lush vegetation, it is a popular spot for picnicking and skin diving.

SOILS

Three major soil groups exist on Saipan: soils on limestone; soils on volcanic rocks, and soils on elevated beach deposits. Limestone underlies approximately 83 percent of the island. Volcanic rocks and elevated beach deposits occupy about ten (10) and seven (7) percent respectively.

Eighty percent of the island is covered by soils generally less than 30 inches deep. It is generally felt that the shallow soils result from continuous erosion which appears to be occurring at about the same rate that the soils are being formed.

The four major soils developed on Limestone include Dandan, Saipan Chacha, Chinen and Rough Stoney Land. Each is discussed below.

The "Dandan" is a clay loam and is the most productive soil on Saipan. It is non-stony to stony in consistency. It is found on level to slightly sloping land in the northern and southern sectors of the island, as well as on the eastern peninsula (Kagman).

The "Saipan Chacha" is found throughout the island. This soil is a deep, fine-textured clay and difficult to work when wet.

The "Chinen" soils are usually found from the gently sloping to steeply sloping lands and are of a stony, shallow nature.

The "rough stony lands" occupy the steep mountain areas and the rocky coastal sections. These lands are not suited for any kind of cultivation.

Land classification as identified in the earlier soils reports indicates that less than 1300 acres of land are considered fair for overall agricultural use. Over half the land area of Saipan is considered unsuited for intensive agricultural use and consists of very steep, very shallow or rocky lands as well as construction areas and marshlands.

CLIMATE

The climate of the Marianas is tropical marine, reflecting the nearness of the equator and the influence of warm surrounding waters. Wind and rainfall are the most variable elements; humidity, temperature and pressure remain fairly constant throughout the years.

Climatically the year falls into two seasons with very little temperature variation but pronounced rainfall differences. Average temperature for Saipan is 27.5°C. (81.5°F). The annual range is about 2.2°C. (4°F) with a diurnal range between 5.0° and 5.6°C. (91.0°F). Extreme minimum temperatures of 20.0°C (68°F) have been recorded at Garapan; the extreme maximum, recorded at the same station, is 31.6°C. (89°F). These stations were located in lowland, west coast locations.

The period of heaviest rainfall occurs from July through October. The ratio between the driest and wettest months of the year is approximately 1 to 5. Annual rainfall extremes recorded at Garapan ranged from 115.1 inches to 59.8 inches over a nineteen year period averaging approximately 83 inches annually. Relative humidity averages 83%.

The outstanding characteristic of the wind regime on Saipan is the trade winds. Average annual wind velocity is 10.5 mph. Trade winds are pronounced and persistent during the period from January through May when the winds blow from north-east and east-northeast more than 90% of the time. Wind directions are far more variable during the period from July through October.

Two principal kinds of storms contribute markedly to the climatic character of Saipan: small-scale storms, consisting of thunderstorms and squalls, and large systems of tropical storms and typhoons. The small-scale disturbances may dominate an area of only a few square miles. Larger cyclonic storm systems may dominate an area as large as 300,000 square miles and may persist for a week or more.

Tropical storms are closed pressure systems about which the air moves counter-clockwise in the northern hemisphere with wind speeds of 33-65 knots (38-74.9 mph). Typhoons are similar to tropical storms but are accompanied by winds of 65 knots or greater. Major tropical cyclonic disturbances of these kinds occur on Saipan. Although they have occurred in all months of the year, they are far more frequent during the rainy season.

In the past 15 years, two major typhoons have passed close enough to Saipan to cause major destruction. In 1968, Typhoon Jean's 160+ knot winds caused major damage on Saipan, Tinian and Rota. On May 21, 1976, Supertyphoon Pamela passed directly over Guam with winds in excess of 200 knots. Saipan experienced estimated wind velocities in the range of 100-130 knots during Supertyphoon Pamela.

GROUNDWATER RESOURCES

Approximately 73 billion gallons of rain falls on Saipan in an average year. Were the rainfall uniformly distributed over time, which it is not, this would amount to about 200 million gallons per day. The groundwater is of critical importance to Saipan as it is the major supply of potable water for the island's residents. At present, the public water system on Saipan is served by 14 drilled wells, (five additional wells will be added in the near future); two infiltration galleries; and two flowing springs. Present water production on Saipan is between 1.6 and 2.5 million gallons daily.

Saipan is a high island made of the fossil remains of ancient reefs and lagoons that grew on an eroded volcanic terrain. Only about ten (10) percent of the island is mapped as volcanic substrate; the water infiltrates vertically to aquifers from which it slowly drains to the sea. The limestone terrain covering 90 percent of Saipan is so open to vertical infiltration of rain water that overland drainage is negligible. Only on the exposed volcanics in the Talofofu district has a surface drainage pattern evolved. Stream flow there is small, however, because of the limited drainage areas of the watersheds.

The fresh groundwater of Saipan commonly has been classified as either basal, which occurs in the form of a thin lens of fresh water floating on sea water in buoyant equilibrium near sea level, or high level, which saturates aquifers having relatively impermeable bottoms lying above sea level. A third type, transitional between the first two may occur, although it has not yet been discovered. It is called parabasal because it is hydraulically continuous with basal water but rests on an impermeable bottom that rises above sea level.

The principal basal water regions of Saipan that are currently being exploited are the Kobler-Isley Field portion of the island; Dandan, just to the north of the airfields; and the Rapugau district west of Capitol Hill. The salinity of pumped water ranges from about 200 mg/l chloride to more than 1000 mg/l, depending on source, pump rate, and time of year. The biggest producer is Maui Shaft 1, an infiltration gallery constructed by the U.S. Military at the end of the Second World War.

The Kobler Field - Isley Field - Dandan well fields are presently producing about 1.22 million gallons daily. There are eight producing wells and the Maui Shaft 1, which together are presently pumping 850 gallons per minute.

The other major source of basal water is the Rapugau well field which is presently producing about 0.40 million gallons daily from three wells and a second Maui Shaft. The potential of this region to supply additional water of low salinity is good and further exploration is justified.

The basal water of the Chacha district (Kagman) is barely exploited by one well supplying local domestic needs (Kagman Housing) and one well satisfying irrigation requirements. The region could yield a substantial quantity of low to moderate salinity basal, and perhaps parabasal water, but it is distant from the transmission lines of the distribution system and therefore its resources remain undeveloped.

In favorable situations where the volcanic basement lies above sea level, it behaves as an aquiclude above which groundwater accumulates in limestone aquifers. This is known as high level groundwater.

The most important high level groundwater resource on Saipan is found at Agag, located on the east flank of Ogso Tagpochau. The aquifer is composed of Tagpochau limestone that filled a pre-existing valley on the volcanic surface. The Agag wells produce approximately 400 gpm (.57 mgd) of low salinity water at a steady rate even during the dry season. This field is the keystone of the northern water distribution system. Without the substantial volume of its excellent water, the supply at Capitol Hill and the west coast would be far less palatable than it now is.

Donni Spring is high level water that flows from either a limestone or limestone-volcanic sediment lying on a less permeable layer of rock. Three 250 gpm pumps are installed at the spring but a yearly average flow of only about 210 gpm is available and withdrawn. The three pumps are used simultaneously only during peak flow periods in the wet season. Once the dry season sets in, spring flow decays quickly to about 350 gpm (0.5 mgd) and then drops slowly thereafter to about 35 gpm by the end of the dry season. As measured by the USGS, maximum flow has been 1.75 mgd, the minimum .01 mgd, and the average .35 mgd.

The water from Donni Spring has quality characteristics nearly identical to the Agag supply. Several other springs also drain from the east slope of Tagpochau but are too small to develop.

Additional sources of high level water in limestone aquifers could be expected to lie between Agag and San Vicente. Verification will require an exploratory drilling program, but the excellent water quality justifies the effort. Should new sources of exploitable water be discovered, a transmission main would be required to move the water south to Isley or north to the Agag booster.

Only one source of high level water from volcanic rock now contributes to the supply system. Tanapag Springs averages about 40 gpm, the dry season flow dropping to about 30 gpm and the wet season rising to about 100 gpm. Tanapag Springs drains a permeable artesian aquifer in volcanic rock, but throughout most of the volcanic area groundwater is unconfined and water tables lie high above sea level. Volcanic aquifers typically show extremely low permeability, though exceptions such as Tanapag are not infrequent. Groundwater in volcanic formations is an untapped resource, chiefly because expected yields of individual wells would be small and occasionally negligible.

FLORA

The vegetation of Saipan has been so disturbed by human occupation, encompassing aboriginal Chamorros, domination and alteration by four successive foreign cultures and destruction during World War II, that the vegetal pattern is neither simple nor stable and is now in a state of rapid change. In all probability the greater part of the island was originally forested, mostly with the typical mixed forest found on limestone in the Marianas. A little of the mixed forest remains near the top of Ogso Tagpochau, on and around the base of Laderan Banadero, and on cliffs along Kagman.

Relatively few plant species are unique to the Mariana Islands or Saipan proper. The basic flora of Saipan was probably originally introduced by overwater means, or, possibly by airborne transport during major tropical cyclonic disturbances (typhoons) which periodically ravage the Caroline and Mariana Islands. Hitch-hikers on, or in birds, bats and insects, or 'drifters' associated with floating logs or debris are also likely modes of introduction.

Introductions by aboriginal man were also significant. Present vegetation includes at least 30 species of crop plants which are in all probability of pre-European aboriginal introduction. Among the latter are the familiar bamboo (Bambusa vulgaris), banana (Musa sapientum), breadfruit (Artocarpus communis), mango (Mangifera indica) and sugarcane (Saccharum officinarum).

A large number of crop plants and ornamentals were also introduced from Mexico, central or South American by way of the early Spanish galleons. A major route was from Acapulco to Guam (Tinian, Saipan and Rota), and on to Manila. The long Spanish period ensured that many crops, ornamentals and weeds were introduced both from the New World and from the Philippines.

During Japanese tenure in the Mariana Islands, all of the level land on Saipan was put into sugarcane. There is no record of what original vegetation existed before, though some of it must have been mixed forest, either primary or secondary. Since the island at one time supported a large Chamorro population, probably most of the forest on level land was secondary growth on abandoned fields and dwelling sites.

Such growth was probably dominated by Hibiscus and Melochia, with blankets of Operculina ventricosa. Sugar growing was not resumed after the war, and the cane fields have been gradually invaded by different woody plants, forming uneven mixed thickets with the cane persisting in many places.

Much of the land previously in sugarcane has become infested with pure stands of Tangan-Tangan (Leucaena leucocephala). This species grows quickly, and is very difficult to eliminate.

Many areas of level sloping ground have been covered, either since the war or during Japanese times, by pure or mixed stands of Formosan Koa (Acacia confusa), and others by ironwood

(Casuarina equisetifolia). The first was said to have been planted by the Japanese for charcoal. Both of these species are similar to tangan-tangan in that they tend to exclude undergrowth.

Parts of the coastal plain are planted with various garden and field crops. Some of the marshy places are used to culture taro and related plants. Others, including the area east of Lake Susupe, are covered by brakes of marsh grass (Phragmites karka). Parts of the latter, at least, were previously in rice. Rice cultivation was practiced by the ancient Chamorros and carried on by the Japanese wherever the land was suitable.

The volcanic areas and part of the hills around Fanunchuluyan Bay, and the slopes east of Tagpochau, are mostly covered by sword-grass (Miscanthus floridulus) and associated species. On undisturbed areas of this type this coarse tall grass is dominant, but tends to be invaded by Casuarina.

On the west coast, Casuarina is conspicuous, but most of the strand forest has been destroyed. At Tanapag is a tiny mangrove swamp containing Bruguiera conjugata, Thespesia populnea, Hibiscus tiliaceus, Hernandia sonora, and Acrostichum aureum.

FAUNA

Terrestrial fauna is limited in the Mariana Islands. The only native mammals are two species of bats. One of these, the 'fanihi' or fruit bat (Pteropus mariannus) is a popular local delicacy. The fruit bat nests in trees during the day, and at dusk flies over well established routes to feed on papaya, guave, soursop and sweetsop. Unrestricted hunting and reduction in its habitat have almost eliminated the fruit bat on Saipan.

The second mammal, Emballonura semi-caudata, is a small insectivorous cave-dwelling bat found throughout the Marianas.

The Marianas Deer, Rusa marianna, is an introduced species originally brought to Saipan and Rota from the Philippines between 1771 and 1774. Heavy hunting pressure has brought it to near extinction on Saipan.

Rats and mice were inadvertently introduced by early ship visits. The common Norway rat (Rattus norvegicus) and mice (Mus musculus) have long been pests. Two other rats may also be present on Saipan; the Roof rat (Rattus rattus) and the Polynesian rat (Rattus exulans). The Oriental musk shrew (Suncus murimus), accidentally introduced to Guam in the early 1950's, has since spread to Saipan (Owen, 1974).

Feral (wild) dogs and cats are also found on most of the islands, the latter often constituting a problem by preying on chickens.

The monitor lizard, (Varanus indicus), is the largest terrestrial reptile in the Mariana Islands, occasionally reaching lengths of up to six feet. The blue-tailed skink (Emoia caruleocaude), the golden-brown ground skink, New World chameleons, and several species of geckos constitute the remainder of the known lizard fauna.

Typhlops braminus is the only terrestrial snake in the Marianas. It is a small, blind, non-poisonous burrowing snake which resembles an earthworm. The West-Indian or Marine toad, (Bufo marinus) was introduced by the Japanese to control slugs and insects and is found in large numbers on Saipan, Tinian and Rota.

Today, no fewer than 191 kinds of birds, belonging to 41 families and 103 genera are known to occur in Micronesia. The avian fauna of the Mariana Islands is influenced by the Japanese-Marianan flyway. From breeding grounds in Asia, the Aleutians and Alaska, certain migratory birds (especially waterfowl) follow the Asiatic coast or adjacent island chains to the Japanese Archipelago. From Japan, some birds fly through the Bonin and Volcano Islands to the Marianas and to points to the southeast.

The Golden Honey-eater (Cleptornis marchei) is a species endemic to the islands of Saipan and Agiguan. Four other species, including Rufous fronted fantail (Rhipidura rufifrons), Bridled White-eye (Zosterops conspicillata), Marianas Duck (Anas outaleti) and Rock Pigeon (Columba livia) are endemic to the islands of Saipan and Tinian.

The Marianas Duck is one of the very rare birds of the world and is declining in its range which once extended from Guam to Saipan. This nondescript patterned duck is and probably always has been rare in the Mariana Islands, since it is restricted to freshwater marshes and swamps, neither of which are extensive in the Marianas. Its last stronghold is believed to be Lake Susupe on Saipan and Lake Hagoi on Tinian. On July 10, 1977 the U.S. Fish and Wildlife Service, Department of the Interior, officially declared the Marianas Duck to be an endangered species under the U.S. Endangered Species Act. Continued hunting pressure and destruction of its marshland habitat by draining or filling could easily force the duck into extinction.

The Nightingale Reed Warbler (Acrocephalus luscini) is believed to be endangered throughout its range which includes the southern Mariana Islands. It is now extinct on Guam. This species is restricted to cane thickets and adjacent areas in and near fresh and brackish water marshes. The Lake Susupe area could therefore provide suitable habitat for this species as well.

SOCIO-DEMOGRAPHIC CONSIDERATIONS

HISTORIC

The Mariana Islands were first sighted by Magellan on March 6, 1521. There is some question as to the actual island he discovered first. Some sources say Guam, others say Tinian or Saipan.

The first missionaries named the islands Mariana in honor of Queen Maria Anna, widow of King Philip of Spain and patroness of the first missionaries. The Spanish soon established Guam as a provision port for treasure-laden galleons sailing between Mexico and Manila.

In 1565, Legazpi formally proclaimed the Mariana Islands a Spanish territory. But the islands had no gold or other treasure and Spain made no immediate attempt to colonize them. She did, however, bring Christianity to the Marianas. A mission led by Padre Luis de San Vitores landed on Guam in 1668. It housed the first Spaniards to live in the islands and administer Spanish rule.

The indigenous Chamorros did not see eye to eye with the Spanish nor did they easily become converts to Christianity. Likewise the missionaries opposed much of the local culture. The result was an armed revolt in which many Chamorros and priests were killed. The Spaniards then moved the Chamorros from the other islands of the Marianas to Guam. This left the islands north of Guam uninhabited except for a few people on Rota who survived by hiding in caves.

The most significant event during the Spanish conquest of the Marianas was the near obliteration of the Chamorro culture and Chamorro people. It is estimated that there were up to 100,000 Chamorros living in the Marianas in 1668. A Spanish census 42

years later listed only 3,500 Chamorros, three percent of the original population. The decline of the Chamorro race was checked to some degree by mixed marriages between Chamorro women and Spanish, Mexican and Filipino men.

From 1816 on, the Chamorros began migrating from Guam back to the other islands of the Mariana group. The history of the Saipan Chamorros, as relevant to our present study, may be said to have begun in 1818 when the first Chamorro settlement was reestablished on the island, more than a hundred years after their ancestors had been deported to Guam.

These settlers were a different people from the "unenlightened savages" of San Vitores' day. They were a mixed race with a culture and tradition that was more colonial-Spanish than aboriginal. They were devout Catholics, and their lives and training had been centered around the Church for over two hundred years. They had lost their skill as navigators and boat-builders during the period when they were confined on Guam, but on the other hand, they had advanced as agriculturalists.

The Chamorros, then, at the beginning of the nineteenth century were already an "acculturated" people. During the two hundred years of Spanish occupation the islands, being poor and unproductive, attracted little attention from the outside world. Customs and thought patterns, established in the early days, underwent little modification. Though the old matrilineal clan system was replaced, under Spanish influence, by a patrilineal one with strong father authority, the ties of the extended family still persisted. Very little trade had developed. Most Chamorros, including the town dwellers, owned land and grew their own food, supplementing the farm products by inshore fishing.

Carolinians came to the Marianas in several waves of migration between 1815 and 1869. The first to arrive were a group of about two hundred who established themselves on Saipan in 1815. Saipan was at this time uninhabited, and the Spanish authorities encouraged the settlement of Carolinians, who were skilled canoe-builders and navigators and could supply much-needed inter-island transportation. Another wave, about a thousand strong, came in 1865 and settled on Guam, Saipan and Pagan.

After their arrival in the Marianas, the Carolinians did not intermingle with the Chamorros, but lived in separate communities, preserving their own language and continuing in their own customs and ways of life. When the Chamorros began to re-settle Saipan, about two years after the establishment of the Carolinian colony, they founded different villages and the Carolinians had little contact with them. At the time of the United States occupation only Tanapag, a small northern community, had both Chamorro and Carolinian residents.

The culture that the Carolinians brought with them was apparently not dissimilar to that of the pre-Spanish Chamorros, but there were some differences. Their society was organized in matrilineal clans, but, unlike ancient Chamorros, women held a subservient position. Land was held by clans, not by individuals.

This culture was preserved in its essence by the Carolinians of Saipan until very recent times. Clan ownership of land was supplanted by individual ownership, since the Spanish issued land-grants to individuals. Spanish and later German census-takers attempted to impose a patrilineal pattern, at least as far as family names were concerned.

In 1898, after the Spanish-American War, Guam came under the control of the United States whereas the remaining Northern Islands of the Marianas became a colony of Imperial Germany.

This division of political administration for the Mariana Islands was to have far reaching consequences upon their economic development.

The Marianas were too distant and her resources were too limited to arouse much interest in Germany. But, the Germans did not neglect the islands totally, imposing health measures, establishing public schools, extending the road network and organizing an agricultural program, based chiefly on copra. However, the German period of occupancy was too short to leave much imprint on either the people or the landscape.

Japan dominated trade in the Northern Marianas even during the German tenure. By the end of the German period, Japanese trading incursions had resulted in their comprising the largest component of the foreign population on the islands.

With the advent of World War I the islands were taken by the Japanese without a struggle, and for the first time since their discovery, they became easily accessible to a ruling power.

The Japanese interest, though at first military and strategic, soon focussed on colonial expansion and on the use of the islands as permanent settlements for their surplus population. Within ten or fifteen years the natives found themselves transformed from the chief element in the population to a small and unimportant minority. By 1930, there were between twenty and twenty-one thousand Japanese on Saipan.

This tremendous increase in population was accompanied by a complete change in the island economy. The Japanese, early in their tenure, instituted the production of sugar on a large scale. The island was transformed into a vast sugar-cane plantation and large sugar refineries and factories for by-products were constructed. Native property rights were respected, but all land not owned by individuals at the time of

the Japanese occupation became inaccessible to them. The Saipanese labor force was too small to handle the development. So the Japanese brought in Korean, Okinawan and Japanese mechanics, engineers, and farmers.

The Japanese influence grew deeper with the establishment of schools where attendance was mandatory. Japanese language and philosophies were taught. The principal village, Garapan, became a boom town.

For nearly thirty years, the natives continued as a minority community in the midst of an alien civilization. Then on June 15, 1944, United States forces, after several days of aerial bombardment, invaded Saipan. The island and its inhabitants suffered extensive damages. Until early 1946, the local populace was kept isolated in temporary shelters centered in Chalan Kanoa. Then, after repatriation of the Japanese civilian prisoners, the local populace was allowed free circulation, and were gradually able to regain those parts of the island not occupied by U.S. forces. By 1947 the local populace was experiencing economic recovery. Every family had a house in Chalan Kanoa or in one of the nearby farm villages. All had access to farm lands. All had some means of livelihood and some were rapidly accumulating wealth.

However, their world was changed. Their pre-war homes were gone, and they were established in an unfamiliar part of the island. Although land had been allotted to them, it was in most cases on a temporary basis only, since the establishment of claims to pre-war holdings was a slow and complicated process. Long accustomed to submitting to authoritarian government, democratic practices and responsibilities were rapidly thrust upon them. Although inexperienced in financial matters, they were encouraged to undertake business enterprise. It was necessary for them to learn a new language in order to communicate with their conquerors, and for the third time within fifty years, to adapt as best they could to a new set of cultural values.

On July 1, 1962, the military administration was turned over to the Department of the Interior. The occasion saw the termination of nearly a decade of naval administration, the beginning of a civilian administration, and the establishment of the Mariana Islands District.

POPULATION

Saipan's population trends are indicated on Table 1 and detailed on Plate 3. Three components of the population have been selected for analysis: Micronesian residents, including the large dominant Chamorro population and the smaller, ethnically separate Carolinian minority; non-Micronesian including U.S. expatriates and alien labor; and tourists. These components were selected because their behavior can be reasonably associated with separable phenomena.

The present permanent population of 14,000 is projected to exceed 19,000 by the end of the current plan period. Data for 1976 was obtained from a study conducted by Peace Corps personnel. Data for 1973 was obtained from the 1973 population census of the Trust Territory. The data for 1978 and 1985 was derived from population studies conducted by Robert R. Nathan Associates during preparation of the Socioeconomic Development Plan.

Micronesian

The Micronesian segment is the largest component of population, comprising approximately 83% of the present total. It is also the most stable with respect to projections. The net rate of increase for this segment has declined from the 5% annually between 1967 and 1973, and is projected at 3% during the plan period. This trend is consistent with a declining birth rate accompanying rising living standards. Of particular interest is the declining proportion of this segment to total island

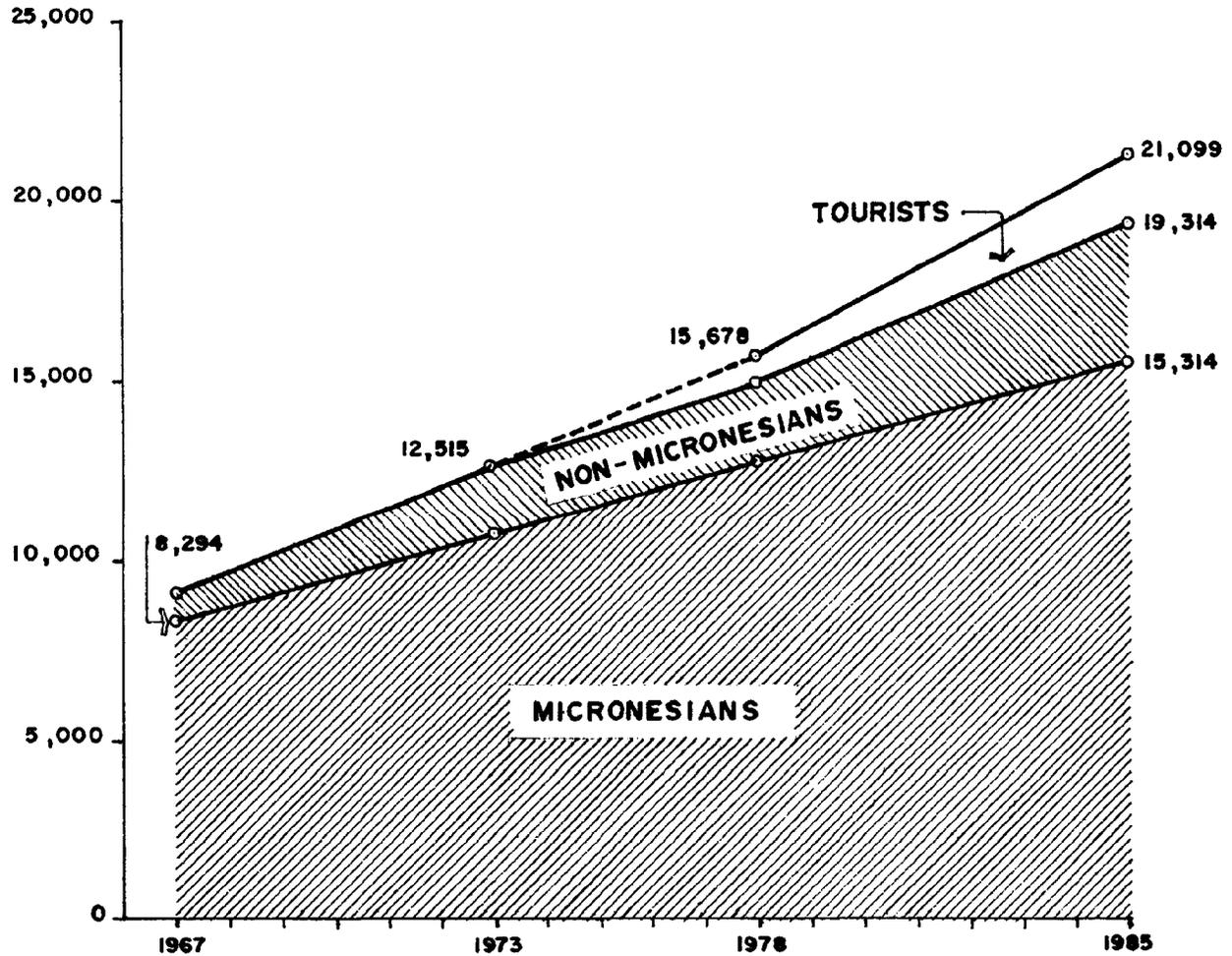
TABLE 1
MARIANA ISLANDS POPULATION 1967 - 1985

Population Segment	1967 Population (%)	1973 Population (%)	1978 Population (%)	1985 Population (%)
Micronesian:	8,294 (92%)	10,895 (87%)	12,651 (84%)	15,314 (79%)
Non-Micronesian:	741 (8%)	1,620 (13%)	2,323 (15%)	4,000 (20%)
Tourists:	N.A.* (-%)	N.A.* (-%)	704**	1,785**
TOTAL:	9,035 (100%)	12,515 (100%)	15,678 (100%)	21,099 (100%)
Source:	1968, Peace Corps Study	1973 TTPI Census	Robert R. Nathan & Associates' Socio-Economic Plan	Robert R. Nathan & Associates' Socio-Economic Plan

*N.A.: Not Available

**Denotes daily average of tourist population.

SAIPAN POPULATION PROJECTIONS 1967 - 1985



SAIPAN ISLAND
PHYSICAL DEVELOPMENT MASTER PLAN
POPULATION PROJECTIONS

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population. This proportion has declined from 92% in 1967 to 87% in 1973. The proportion is expected to be 84% in 1978, and is projected to drop to 78% by 1985.

Non-Micronesian

The non-Micronesian segment has shown a steady increase in its proportion of the total population, from 8% (1967), to 13% (1973). It is expected to increase to 15% by 1978, and to 20% by 1985.

The behavior of this population segment will be considerably more volatile than that of the Micronesian segment. Primarily due to its relationship with overall political and economic factors.

On the Political side, termination of the Trust Territory status will result in the removal of the headquarter from Saipan. For planning purposes, it has been assumed that this move will occur by the end of FY 1981, the target date for termination of the U.S. Trusteeship in Micronesia.

During the tenure of the Trust Territory Government, operation of the headquarters provided a steady and a high level of government expenditures. Local wage earners, both Micronesian and non-Micronesian, benefitted from operations as did business enterprises in Saipan's private sector. Termination of the trusteeship and its concomitant governmental operations will result in changes in the non-Micronesian segment of the population.

On the growth side, considerable construction activity is expected during the plan period. The shortage of managerial and craft skills will necessitate importing these skills, even though the Socioeconomic Plan recommends the establishment of a balanced labor program so that greater numbers of

local residents benefit from increased economic activities. Furthermore, the ability of Saipan to attract industries is still uncertain, so only modest growth in manufacturing activity (requiring some non-Micronesian skills) is anticipated.

There are several potentially significant factors, the ramifications of which cannot at this time be predicted, but which require constant surveillance. The proposals for military facilities on Tinian, a petroleum storage facility at Maug, and geothermal energy development on Pagan could each significantly alter the population projections for Saipan and the Northern Mariana Islands.

Tourists

Tourism represents an important source of outside revenue which generates employment in related economic sectors and generally stimulates the local economy as a whole. Most, if not all, of the employment in the visitor industry will be filled by local residents. Tourist-related enterprises, such as restaurants, travel agencies, sightseeing buses, sport fishing, car rentals, and souvenir shops are supported by tourist expenditures. Additionally, nearly all wholesale and retail enterprises are affected by the expenditures of workers employed in the tourist-related enterprises.

The tourist industry, however, is also volatile. Economic downturns, especially in Japan could cause tourism to fall far short of projections. Likewise, unanticipated economic booms would raise the number of visitors beyond the projected level.

The proportion of this segment to total population is expected to rise to 9% by 1985, which would be approximately 1,800 visitors on an average day. It should be noted that population data on the tourist segment was unavailable for 1967 and 1973.

EXISTING DEVELOPMENT PATTERNS

Under Japanese rule thirty-five years ago, Saipan had a populaion of over 45,000 persons, with less than 10 percent being natives. Most of the island was under cultivation and a narrow gauge railroad virtually encircled Saipan.

At that time Saipan was essentially an agricultural colony for Japan with over 18,000 acres of sugar cane fields. The population was centered along the west coast with Garapan as the principal city.

Saipan was heavily damaged in 1944 when allied forces seized the island from Japan. The Japanese agricultural fields were destroyed and replaced, within a year, by a huge American military complex of warehouses, airfields, military encampments, and ammunition storage areas. Today most of this is gone although many remnants of the war period are still prominent. Two major airfields, one having been converted to the Saipan International Airport, still dominate the landscape in the Kobler-Isley Area at the South end of the island. Various roads, concrete foundations, bunkers, and war ordinance are still present.

Today most of Saipan's 46 square miles is relatively unused. The landscape is dominated by tangan-tangan trees (seeded by the U.S. Military), flame trees and various other exotic vegetation. Old coconut plantations are still common on the sloping hillsides and urbanization dominates Saipan's west coast. An eleven mile area of development, with several identifiable villages, contains the bulk of the population.

The southern urbanized area, including the village of San Antonio, Chalan Kanoa, Susupe, and San Jose, contains two thirds of the native population and about 60 percent of the island's total population, or about 8,000 people. The housing in this area is some of the oldest on Saipan and is largely

substandard, thus not likely to withstand a typhoon. The southern area contains the Northern Mariana Islands government offices, the Saipan Municipal government office, all major shopping attractions, and the islands two high schools - one public and one private.

The central part of the west coast urbanized area includes the village of Garapan, the island's only port and dock facilities, and the only concentration of industrial related land uses. The Garapan area is presently experiencing more rapid growth than any other village on Saipan. Garapan Estates, and the two Sugar King developments will more than double the village's present population. The Garapan area should benefit greatly from proposed capital improvements since it is now the site of a dock in disrepair, an open dump that must soon be closed, a power plant in need of replacement and numbers of disjointed industrial uses.

Garapan is also the site of the islands' two largest and most modern hotels and some of the lagoon's nicest beaches. To some extent the populations at Navy Hill and Capital Hill rely on Garapan for provision of needed services.

The area north of Garapan contains two smaller villages, Tanapag and San Roque, with a combined population of about 1,500 or 12% of the islands population. Growth in this area is not occurring as rapidly as elsewhere perhaps due partly to the lack of urban services but more significantly due to the village culture. However, as pressures for land increase and as additional uses are permitted in the Marpi area, growth in Tanapag and San Roque can be expected.

Aside from the west coast developed area, the only other major population centers are located at Capital Hill consisting of about 600 persons, Navy Hill, with about 200 persons, and the Village of San Vicente a few miles north of the airport, with about 650 persons.

The present situation in Saipan regarding commercial development is what one might expect given a total lack of land use controls. That is, commercial development is randomly scattered along the island's major traffic route, Beach Road. Unfortunately, Beach Road also traverses along one of the island's most scenic features, the west coast lagoon. Without careful planning of land development along this route, it can be expected that most of the aesthetic value of Beach Road will soon be lost.

Existing conditions in Saipan's residential areas also present major challenges for future planning and development. Less than one thousand of over 2,500 houses in Saipan are of standard construction, i.e., able to withstand the force of typhoon level winds. Even in newly opened village homestead areas, substandard houses are now being constructed due to the lack of a building code and enforcement procedures.

Present industrial uses in Saipan are limited to scattered quarries, construction material manufacturing, and port area industrial uses. One feature of this plan is the proposed site plan for a viable industrial park at the existing Tanapag site.

Outside the urbanized centers just discussed are vast open space areas. The Marpi Area on the northern tip of Saipan is virtually 100 percent public land, and today is largely overgrown with tangen-tangan. Some of Saipan's most scenic sites including Suicide Cliff, Banzai Cliff, the Grotto and Bird Island are located in Marpi.

The Kagman Peninsula on the east side of Saipan is also public land. This region contains Saipan's most valuable agricultural lands. Two large tracts here are presently used as communication sites. A substantial portion of Kagman is presently under year to year leases for grazing purposes.

The Kobler-Isley Area, formerly a military retention area, forms the third major expanse of public land. Present and future uses of this area are somewhat limited by Saipan International Airport, which occupies a central site in this tract. Present uses include the lease of large areas for grazing. Potential future uses include airport related industry, recreation, grazing, and possibly residential uses on the periphery.

The south-central area of Saipan contains the island's only lake, Lake Susupe, and a surrounding wetland. Good agricultural land is also located in the Dandan-Fina Sisu valley stretching from Wallace Highway, southward to Kobler Airfield.

The central part of Saipan including the western and eastern flanks of Mt. Tagpochau and its related ridges are largely undeveloped. These areas are presently a mixture of public and private lands.

LAND MANAGEMENT FACTORS

CHANGING INSTITUTIONAL FRAMEWORK

Historical changes from Spanish, to German, to Japanese, and finally to American land law systems have created an extremely complex and often contradictory set of land records. Many conflicts and much confusion regarding property ownership remain to this day. Some title claims are still being made based on instruments dating back to Spanish rule. Land and land ownership occupy an important place in the culture and value systems of the people of NMI. Land ownership is closely tied with family solidarity and a sense of group responsibility and participation. It is often considered a solemn duty to retain land within the family, especially among those of Carolinian heritage. People are reluctant to sell land, and the desire to own land has resulted in a relatively high market valuation of land, probably much higher than any capitalization of future income.

On the other hand, some segments of the Chamorro populace are generally tending to view land as an economic commodity, to buy and sell in the market place for monetary gain. Private ownership facilitates rapid turnover of property.

PRIVATE HOLDINGS

Under German and Japanese regimes, the government took over all land not enclosed and cultivated. This practice prevented the accumulation of large private estates. Today, most of the 14,000 acres privately owned in the NMI are on Saipan. Plate 4 illustrates the location of public and private lands. The Marpi, Kagman, and Kobler-Isley areas are virtually 100% public lands. Of the remaining areas of the island, approximately 70-75% are in private ownership. Taking Saipan as a whole, approximately 40-45% is now in private ownership.

THE HOMESTEAD PROGRAM

Trust Territory law has permitted natives of the Northern Marianas to settle on undeveloped public land and obtain title to the land through development. The "Homesteading Program" as it is known has been very popular in the NMI, at least with the citizens receiving land. The popularity of this program will probably ensure its continuance under the new Commonwealth government.

The benefits of a homestead program are appealing. When citizens without land or homes are able to secure unimproved public land which becomes the basis of a home or subsistence farm, then both the citizens and the public benefit. The land owners then control a valuable asset that permits them to enter the credit market and have access to the monetary system and technology to improve their productivity. The owner can then build a better home and establish greater family security.

The Village Homestead program appears to be effectively achieving these goals. The requirement that the land be used and a house constructed within the three year period appears to have greatly aided the process, however, even this program has failed when government has been unable to provide infrastructure facilities necessary for development.

There seems to be serious question with the success of the Agricultural Homestead program. There has been a failure to enforce the requirement that the homestead be agriculturally developed in three year period. Too often the lack of strict development requirements and their enforcement has encouraged some homesteaders to hold the land for subdivision or speculation rather than for a permanent home and farm for a family.

As the Homestead Programs continue it will become increasingly important that government officials be aware of the many public costs of this program. The first and most obvious cost is the transfer of public land to private ownership.

As public land becomes scarce it becomes more valuable. Land on Saipan now has a great market value and the transfer of this land to the private sector represents the transfer of major public assets. Thus the transfer of too much land would create a public burden due to a shortage of natural resources, public parks, recreation areas, and possibly the loss of the intrinsic scenic value of the island. However, determining the cutoff point for the transfer of public land to private ownership will not be an easy matter.

Based on the relative successes of the Village and Agricultural Homestead programs, it would be in the best interests of the island resources to significantly curtail the latter program. Provision of housing areas should occur through adherence to a well-formulated land use plan, which would preclude residential subdivisions from springing forth in land intended for agricultural homesteading or prior to the provision of essential services such as water, power, sewer and roads.

PUBLIC LAND CORPORATION

The Commonwealth Constitution provides the potential to move the land management process in a positive direction. Although the Constitution is not specific in delineating the functions of the Public Land Corporation (PLC), it is clear that the homesteading program will continue in some form. One factor which should improve the program and discourage speculation is the Constitutional requirement that land be held for ten (10) years prior to resale.

The requirement that the PLC develop a Master Plan clearly defining proposed uses for public land constitutes a de facto land use control. Since the PLC also has the authority to purchase other lands as well as to lease and homestead its own, the influence of the PLC will extend beyond public land.

The PLC could use this authority to coordinate some development activity by releasing areas appropriate for private development while acquiring public control over other areas desirable for public purposes such as schools or medical facilities.

Deliberate coordination between the PLC and other governmental planning/development agencies would result in establishment of a viable land use control process.

ENVIRONMENTAL CONSTRAINTS

Planning for appropriate land uses on Saipan must reflect several constraints. Providing for areas to accommodate expected growth must be balanced against the need to protect, preserve, and enhance all existing resources. It is this unique balance between growth and constraints which will define the proposed Saipan Land Use Plan. Plate 5 summarizes the major environmental constraints upon future land development.

EXISTING DEVELOPMENT

The existing inventory of urban development directly affects future growth. The roads, water and sewerage infrastructure represent both a capital and social investment which should be utilized, especially for accommodating gradual, incremental growth. The distribution of existing development has already been discussed. Continued expansion of the urbanized west coast at Garapan, Tanapag, and San Jose will permit incremental growth compatible with present or proposed infrastructure, and reduce social turmoil inherent in growth of totally new areas.

Existing development can also create limits to further development. Development along the west coast has already used a considerable amount of developable land, which is now scarce. As discussed below, some west coast lands are environmentally sensitive and therefore inappropriate for development. Furthermore, land uses proposed for the Kobler-Isley areas must consider existing and future airport uses and the associated noise impacts.

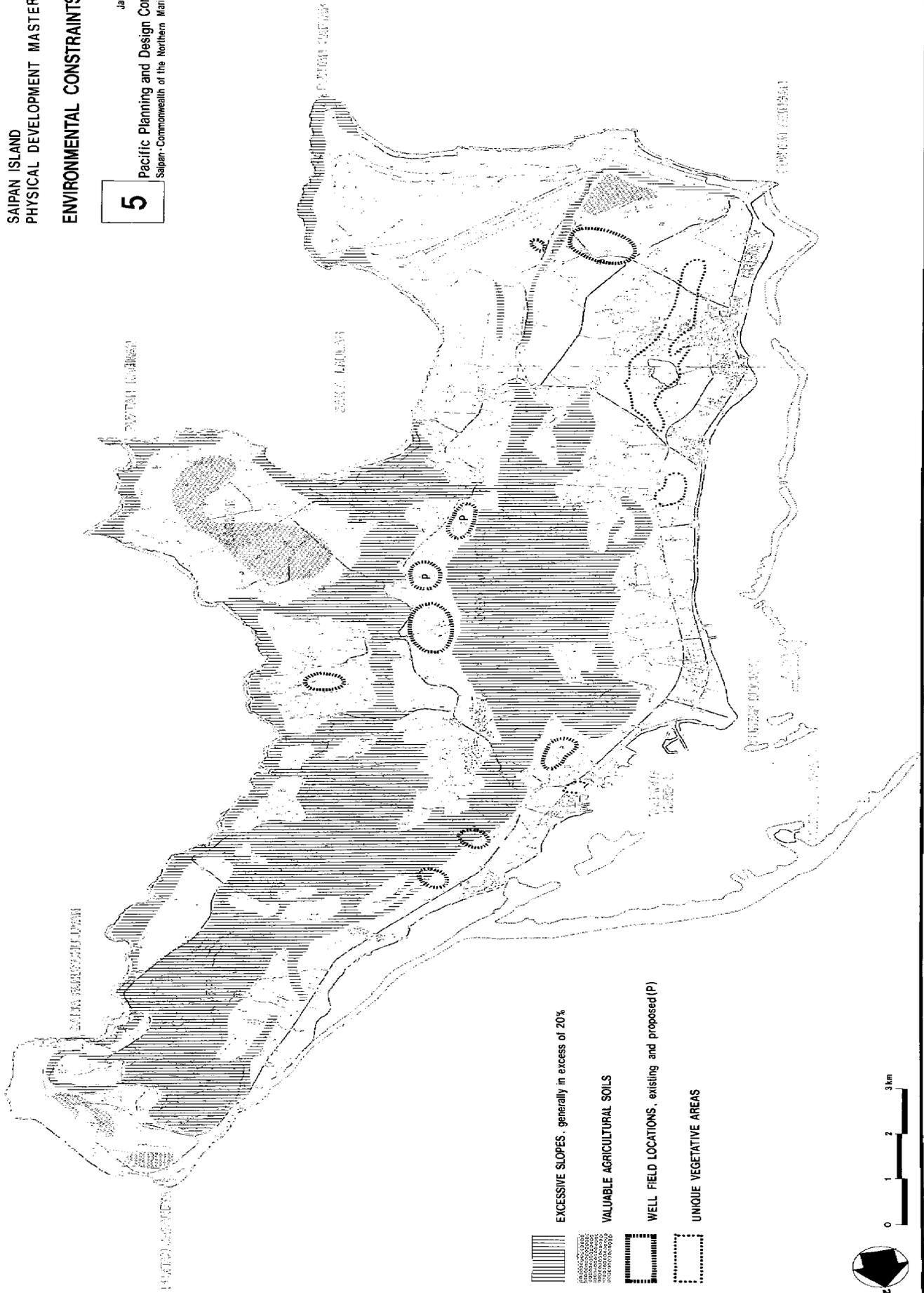
ENVIRONMENTAL PROTECTION

Natural constraints to development include land slopes, soil characteristics, water resources, wetlands, beaches, and scenic areas.

SAIPAN ISLAND
 PHYSICAL DEVELOPMENT MASTER PLAN
 ENVIRONMENTAL CONSTRAINTS

5

January 1978
 Pacific Planning and Design Consultants
 Saipan-Commonwealth of the Northern Mariana Islands



-  EXCESSIVE SLOPES, generally in excess of 20%
-  VALUABLE AGRICULTURAL SOILS
-  WELL FIELD LOCATIONS, existing and proposed (P)
-  UNIQUE VEGETATIVE AREAS



Large areas of Saipan have very rugged topography, whose slopes are too steep to support development of any type. Other areas of moderate slope are characterized by pockets of limestone sinkholes, which preclude economical development.

Saipan relies on groundwater resources for its domestic and irrigation needs. Replenishment of these resources - both high level aquifers and the basal lens resting on salt water - must be accomplished by percolation of rain water and storm flows back into the ground at areas which must be kept pollution free. Neither excess surface drainage nor contamination of the groundwater must be permitted.

Waste of the water taken from the ground must also be curtailed. Analysis found later in this study indicates that up to half of the domestic supply either escapes through leaking distribution lines or is wasted at the faucet.

Long-range planning forecasts indicate an eventual population of 35,000 to 45,000. At a population of 35,000, approximately 5.8 million gallons of water would be required daily. Ordinary and innovative techniques should be able to intercept the required flow. However, present waste of resources must be curtailed, and planning for additional facilities and appreciation for the eventual scarcity of finite water resource must be given high priority during this and subsequent planning horizons.

Lake Susupe and its surrounding wetland which is the habitat for the rare and endangered bird, the Marianas Duck is a valuable natural resource. It also acts as a unique stopping place along the flyway of Asian migratory birds. The lake and the surrounding wetland should be preserved in its present state, protected from encroachment.

Several scenic areas demand special consideration to insure their protection. These include the west coast lagoon and its reef which must be assured protection from urban related pollution, which can cause damage to water related recreation uses. Other scenic areas include beaches, coastal vistas, unique natural valleys, Ogso Tagpochau and some of its flanking ridges. These areas contribute significantly towards Saipan's identity as a beautiful tropical paradise. Both tourists and residents alike deserve to continue the enjoyment and benefits accruing from preservation of nature's beauty.

LAND USE

PURPOSE AND OBJECTIVES

PROPOSED LAND USES

PROPOSED ZONES

PURPOSE AND OBJECTIVES

The Land Use Plan for Saipan allocates land for the orderly growth and development of the island during the next seven years. The plan establishes residential densities, provides for needed commercial and industrial activities, hotels and resorts. Lands necessary for public facilities are also identified and included within the plan. The land use plan in conjunction with the provision of capital improvement projects provides a framework for the management of change and future growth.

The Land Use Plan is sensitive to environmental constraints and the availability of resources. Of necessity the plan respects the traditional lifestyle of the local citizens, their desire to own property, have decent housing and to actively shape the future of Saipan through individual choice of style and expression. Principal objectives which were pursued in the plan include:

- * To recognize and respect the traditional lifestyle of the Northern Marianas people, including the desire to own and occupy land.
- * To recognize natural environmental constraints such as water, topography, and soils in the dimensioning and location of future growth and to preserve and conserve land with valuable ecological characteristics, recreation uses, or scenic appeals.
- * To preserve community identities through the provision of neighborhood/community commercial centers near to existing residential areas.
- * To encourage redevelopment and new development patterns which enhance living conditions by clustering compatible uses (eg. schools, residential and neighborhood/community commercial) and separating conflicting uses (industry and residential).

- * To use public lands to encourage growth in desirable areas through the location of commercial nodes and urban homesteads near where additional development of private lands should take place.
- * To encourage agriculture as a viable economic use of suitable land.
- * To provide for or allocate suitable and sufficient sites for residential, business and industrial needs to meet anticipated growth.
- * To maximize public ownership and access to beaches and estuarine lands to insure their preservation, conservation or greatest public use and to provide adequate areas for public parks and recreation facilities.
- * To coordinate urban growth with the availability and growth of public services including water, power, transportation facilities and sewer.
- * To provide adequate areas for public facilities necessary for the orderly growth of Saipan.

PROPOSED LAND USES

The proposed land use pattern for Saipan is depicted in Plate 6 (See Plates in Pocket). A discussion of the various community development proposals follows, beginning with San Antonio in the South.

SAN ANTONIO

The village of San Antonio lies on the southwest corner of Saipan. The 1976 village population was about 1500, and the village boundaries can generally be described as being the Coast Guard Loran Station on the south, Hopwood Junior High School on the north, and the lagoon on the west. The eastern boundary is not as well defined, as scattered development extends to the boundary of former military retention lands at Kobler Field.

Potential growth of this village is basically limited to areas to the east or southeast. Minor growth could occur on the open space area adjacent to Hopwood Junior High School.

The major land use proposals for this area are illustrated on Plate 7 (See Plates in Pocket). These are based largely on the premise that public lands should be utilized in creating an urban homestead development with an internal neighborhood commercial center which should encourage private residential development in a desirable location. In this case, the objective is to initially develop a 100-acre site for approximately 315 village homesteads. Included within the site is a 5 to 10 acre commercial site and additional lands for an elementary school and other commercial activities.

With well fields located nearby and the sewage treatment plant at Agingan Point, the provision of urban services to both the village homestead site on Kobler Access Road and the privately-owned lands between Kobler and Beach Roads would be relatively

easy. Rigid control of subdivision and development on both public and private lands would be necessary to ensure that the provision of urban services and easements keeps pace with growth.

The triangular piece of privately owned property between Beach Road, As Perdido, and Kobler Access Road would be zoned for residential use. A gradual transition from the agricultural use now dominating the area to a residential density of up to six units per acre should be permitted as demand dictates. If the area is zoned for residential use the landowners who wish to maintain agricultural or open space areas should not be penalized by future tax policies which might force conversion to urban residential uses.

Although projected growth during the 1978-85 plan period certainly would not require it, ultimate growth might see the Kobler Village Homestead area extending from As Perdido Road to Beach Road along the east side of Kobler Road. The As Perdido Road should be upgraded and paved to provide better access to Chalan Kanoa, the western shoreline and the Isley Field airport.

A potentially important factor in the community development proposal for San Antonio is improved resort-related land uses in the area. It is assumed that the White Sands Hotel will soon open and provide some employment for local residents. It is also proposed that a new 18 hole golf course be constructed along the cliff eastward of Agingan Point. The site has beautiful vistas towards Tinian, suitable topography, and is sufficiently close to the sewage treatment plant to be irrigated with secondary treatment waste-water. This would represent an ideal use for this noise-impacted area. However, studies should be conducted to determine if any practices such as fertilization or irrigation would pose a threat to the reefs below.

Two sites should be considered for the provision of a neighborhood park in the existing village of San Antonio. One is the open space area between the village and the Junior High School, which could also accommodate some residential growth, perhaps up to 50 new homes. A second site which could accommodate a small park and has limited value for other use is the narrow strip of beachfront lands extending from the White Sands Hotel to Agingan Point west of Beach Road.

CHALAN KANOA - SUSUPE - SAN JOSE

For the purposes of this plan, these three villages will be treated as a single planning unit since their proximity to each other defies separation. By far the single largest concentration of Saipan's population is within this area where over 6,500 persons now reside. All of the island's major commercial activities are located here as well as the Northern Mariana Islands Civic Center and the island's two high schools.

The present development pattern here is such that little additional growth can be expected. As can be determined from the land use plan, the existing land use pattern is for the most part hemmed in on three sides. On the west side is the lagoon, and on the east side is Lake Susupe with its associated wetland. San Antonio borders this area on the south and Wallace Road provides the borders to the North.

Although one might expect intensive development north of San Jose between there and Garapan, there are several factors likely to prevent this, at least within the 1978-85 Plan period. First from a planning stand-point, it would be desirable to maintain, for as long as possible, the separate community identities of Garapan and San Jose - Susupe - Chalan Kanoa. In order to do this, much of the open space between Garapan and San Jose should be maintained for low-density rural residential use and by preventing strip commercial uses from further

blighting Beach Road. The second and perhaps more important factor is that the area lacks suitable infrastructure for intensive development.

The plan for the Chalan Kanoa-Susupe-San Jose area as discussed here is oriented towards correcting existing problems. For example, Saipan's most intensive effort in the replacement of substandard housing will take place in this area. Part of that process will be an effort to connect most of the existing houses to the sewer system for the first time.

Major transportation decisions must also be made in this area which will significantly affect land use. The upgrading of Texas Road is necessary to improve traffic conditions on Beach Road. The preferred alternative is to circumnavigate Oleai school so as to avoid the separation of the school from the neighborhood which it serves. The existing Texas Road would then be downgraded to a local collector road. One major advantage of this alignment is the preservation of the San Jose neighborhood. Continued residential growth could then be encouraged so that the village would ultimately surround the school on three sides.

South of Oleai school, the bypass road would rejoin Texas Road in the vicinity of the existing Marianas High School and the Civic Center. Eventually the road would be extended through Chalan Kanoa as far south as As Perdido Road.

Chalan Kanoa Urban Development

The history of a developed Chalan Kanoa dates back to the early 1930's when the Japanese built the town to house the sugar mill workers. Because the town escaped complete destruction during the war, Chalan Kanoa became the internment camp for natives in November, 1944. Barbed wire fences surrounded the village,

mainly to protect the residents, until the 1st of July 1946, when the fences came down.

During the Naval Administration, Chalan Kanoa developed into an attractive tropical town with its own movie theater, general merchandise shops, ice cream parlors, barber shops, a cobbler, and other commercial establishments. The older part of town had streets lined with poinciana and other shade trees. The houses, brightly-colored and well-maintained, stood in rows and had small gardens and flowering hedges in front. The movement of people to other parts of the island, as well as the absence of free construction material, available during the Naval Administration, were major causes of the deterioration of the town.

Chalan Kanoa is a town of great historical, cultural, and socio-economic significance. First of all, the existing municipal buildings and many of the original houses built by the Japanese, if not the original town, can be classified as historical sites. There are important cultural aspects such as the small gardens and the small cook houses. In addition, there are the social-economic aspects: Chalan Kanoa is still the largest town in Saipan and the Northern Mariana Islands and is the major organized community where Chamorros and Carolinians live together. It is with these factors in mind that we address the concept of the Chalan Kanoa Urban Renewal and Redevelopment Plan.

Specific plans for renewal are not presented here as they require a much more detailed study than was possible within the framework of the master plan study. However, as a minimum, the renewal effort should carefully address traffic circulation, infrastructure development, and flooding problems. Redevelopment of Chalan Kanoa must include a concerted effort to create a viable commercial center in the village's central plaza where the post office, bank, and municipal offices are presently located. Incompatible uses should be removed, walkways should

be provided, the old Japanese houses restored as shops if possible, trees planted, a fountain provided, landscaped open space maintained and parking provided. Lifestyles compatible with the culture and tropical environment should be encouraged and maintained. The urban and architectural scales should be compatible with existing structures.

A final major portion of the redevelopment proposal for the Chalan Kanoa, Susupe, San Jose area include proposed improvements to the Civic Center Complex. These are addressed later in the chapter on Public Facilities.

Resort-hotel uses within this area will be confined to the approximate present location of the Royal Taga Hotel and the recently opened Saipan Grand Hotel. Consideration should be given to the construction of resort type apartments or condominiums at the north end of the site now leased to the Royal Taga. The remaining beach area west of Beach Road between the Royal Taga Hotel and Garapan should be maintained as a public park with picnic facilities and possible tennis courts across from the Civic Center.

GARAPAN

The Village of Garapan located in the central part of Saipan's west coast urban strip presently has a population of about 1700 persons. Existing land uses include residential development along both sides of Beach Road, an elementary school, the islands's two newest and largest hotels, the dock and port facilities, and the industrial area just north of the village.

The Garapan Community Plan, illustrated on Plate 8, proposes a number of major uses which should vastly improve the livability of the village (See Plate 8 in Pocket).

It should first be recognized that Garapan is already experiencing more rapid residential growth than any other Saipan village. The development of Garapan Estates and the Sugar King Estates projects are the beginning of this process. Moreover it is a basic assumption of the overall Land Use Plan that the Garapan area is a desirable location for new residential growth. Many factors contribute to this choice. These include availability of easily developable land, the presence of water, sewer and power service, the resort-tourist industry, the proposed American Memorial Park, a proposed new Junior High School, the future improvements to the port facilities and adjacent industrial park, and finally the probable location for the new hospital.

As regards residential use, it is proposed here to concentrate residential growth around the proposed Junior High School at the intersection of Navy Hill Road and West Coast Highway.

To some extent this is already happening as Garapan Estates becomes developed on the site's west side and the two Sugar King Estates, are developed to the south. To the extent possible, residential growth should be encouraged on the east side of the school site also.

An important element in the growth of Garapan into an independent community is the development of a thriving community commercial center. It is proposed that the area just north of the Junior High School site be the location of a commercial center with permitted uses limited to personal service uses, such as a bank, grocery store, insurance office, laundry, barber shop, restaurant, bar, bakery, and other uses compatible with these.

The area surrounding this commercial center could be reserved for multiple family dwelling apartments. To the extent that the demand exists, residential growth should be encouraged eastward up the Navy Hill Road. A number of knolls offer the potential for valuable home sites with scenic vistas across

the lagoon. It is not anticipated that residential growth will be needed above Navy Hill during the short range period; however, in the ultimate plan, consideration should be given to the development of a road from Navy Hill to Capitol Hill along which residential development can occur where topography permits.

In support of the concept that Garapan should grow as a separate identifiable community, it is recommended that growth not be encouraged to the south. The proposed Garapan Fishing Marina and the park extending from the lagoon as far east as Sugar King monument should provide a buffer zone between the urban area to the north and the rural residential areas proposed to the south.

An important feature in the future of Garapan will be the American Memorial Park, which will act as a central recreation area for all of Saipan. This park will be developed as a result of the Technical Agreement in the Covenant to establish the Commonwealth of the Northern Mariana Islands. Therein, the U.S. Government has agreed to make 133 acres available for use as an American Memorial Park. The income from a \$2,000,000 trust fund will be available to develop the Park, as further described in the Parks and Recreation Element of the Master Plan.

An equally important area in Garapan which should increase in importance, is the resort-tourist area now situated along Micro Beach between the Continental and Hafa Adai Hotels. As the tourist market dictates, the construction of another hotel should be considered between the Inter-Continental and Hafa Adai Hotels. This would replace the existing Samoan housing. The presence of four hotels together should provide a viable resort community which would ultimately support the development of a tourist-oriented commercial center parallel-ling the existing hotels on the east side of Beach Road.

Another probable influence on Garapan's future is the proposed location of the new hospital in this area. A hospital site has tentatively been selected along Navy Hill Road. The site would overlook Garapan, the American Memorial Park, and the resort area.

The proposed upgrading of the port and dock facilities and the industrial park should result in an improved employment base for Garapan as well as the rest of Saipan. Perhaps as important would be the development of a more aesthetically appealing shoreline extending from the south tip of American Memorial park, north through the industrial park.

TANAPAG

The village of Tanapag has an estimated 1976 population of 725. The existing land uses include residential, a few small "mom and pop" stores, and lands for public facilities such as the baseball field, basketball court and the elementary school. Within the plan period 1978-85, extensive growth is not expected. However, relative to the village's existing population, a significant increase in population can be anticipated. There is a desire on the part of Tanapag residents to extend village in a southerly direction towards the Lower Base Industrial Park, and an area of approximately 30 acres has been set aside for village expansion. This parcel should be developed as part of the Village Homestead Program and should contain a small commercial center and lands for public facilities.

It is proposed that a linear park bordering one of the small streams meandering through the area act as a buffer zone between the residential development and the Lower Base Industrial Area. The large tract across west coast highway from the existing village should continue to be used primarily as agricultural land. Some additional agricultural lots of one hectare or larger should be permitted.

SAN ROQUE

San Roque Village with a 1976 population of about 700 is the northernmost village on Saipan. Presently the village borders both sides of Beach Road and is principally a residential community with an elementary school and a church. Expansion of the village through the Village Homestead Program is nearly impossible at present since all available land adjacent to the village is in private ownership.

The future expansion of San Roque will depend upon two major important factors. Firstly, there is the need to improve the village infrastructure, especially water and sewer lines. Secondly, the growth of San Roque will be dependent upon the location of a major resort development in the Marpi area. Should such a resort develop, the village of San Roque could become the principal major source of employees.

Ultimately, the population of San Roque could be 1,350 persons. A new homestead site has been designated north of the existing village, bordering probable resort lands (Marpi Village Homestead site). However, little development is either proposed or anticipated in this village during the short range plan. It should be noted that when development does occur, the subdivision should include provisions for a small commercial center and public facilities.

SAN VICENTE

The village of San Vicente is the only major community existing on the windward side of the island. Estimated population in 1976 was 635 persons living in approximately 102 family units. San Vicente is similar to San Roque in that most of the lands adjacent to the village homestead area are in private ownership.

The land tenure situation therefore limits the possibilities that public development might stimulate private development. Rural residential development is occurring on private lands west of Cross Island Road, and it is anticipated that this pattern will continue during the plan period.

MARPI AREA LAND USE

Plate 9 (in Pocket) depicts the proposed land uses within the Marpi area. Generally the uses proposed for this area are non-intensive uses in character with the desire to maintain much of this existing open space as public reserve and park land.

Major land uses include the Marpi Public Grazing lands, a Marpi Resort Area and a Residential Subdivision. Three Agricultural Homestead areas are also included.

Marpi Public Grazing Lands

One of the major objectives of the Socioeconomic Development Plan was the establishment of publicly developed grazing lands that would be leased out to interested persons thereby enabling proper management of the land resource. The Northern Marpi area, Banadero and I Madog, provides suitable lands for grazing on otherwise undeveloped lands. The establishment of farms should enhance the scenic character of the landscape as viewed from Suicide Cliff. The area offers security since access can easily be controlled along both the West Coast and East Coast Highways. Two small areas of fair to good agricultural land are suited for cultivated pasture. Water is not plentiful; however, sufficient quantities of water necessary for cattle should be available either through catchment basins or by exploitation of ground water resources.

Marpi Resort

A Marpi Resort Area with hotels, recreation facilities and a championship golf course are proposed for development on lands adjacent to both sides of West Coast Highway in lower Marpi.

The hotels, convention center, and most recreational facilities would be located on the beach side and the golf course would be developed on the As Matuis Plateau. Presently, the area lacks suitable infrastructure and it will be necessary for any proposed development to provide water, power, and sewerage facilities before development.

In planning this resort a number of important factors related to environmental protection must be considered. These include analyzing potential water pollution problems, and providing a design for handling runoff which would assure no damage to the off-shore reef. Also, the development of a design concept which would not create a visual blight on the landscape or block views of the shoreline and the provision of public access to the beaches and the maintenance of a 150 foot set-back from mean high tide must be considered.

A major concern is the provision of irrigation water necessary to keep the golf course green. Drilling of wells will be quite expensive and no other sources of water are available at the north end of the island.

Marpi Park

Marpi Park would include all the coastal lands as well as the cliffs and their associated plateaus. The park would encompass the Japanese Command Post, man made caves, Suicide and Banzai Cliffs, Bird Island, the Grotto and Kalabera cave.

Limited commercial forestry would be allowed. Also included are several areas that should be made available for cultivation and grazing leases.

Agricultural Homestead Areas

Three agricultural homestead areas are delineated on the Marpi land use plan. Total area is in excess of 269 hectares. The major homestead site is on Kalabera Plateau, east of East Coast Highway. A second, smaller site is located along the Burma Road. The third site borders the southern boundary of the golf course site at Matansa.

Marpi Village Homestead Site

The discussion of the Marpi Village Homestead site has been included in the previous section on proposed land uses for San Roque and will not be repeated here.

KAGMAN AREA LAND USE

Plate 10 depicts the proposed land uses for the Kagman area. The Kagman site has the advantage of an adequate water supply for irrigation, contains the island's most productive soils, and is generally flat land. Much of Kagman is in public ownership and considerable attention should be given to the establishment of a viable agricultural program as opposed to considering these lands for private homesteads. That is, it might be more productive to maintain the land in large communal tracts rather than subdividing the area into small homesteads which could ultimately be subdivided further by private landowners thereby removing these lands permanently from agricultural production (See Plate 10 in Pocket).

One major obstacle to the expansion of agricultural lands is the extensive area under lease by the Trust Territory Government for its communications station. As the demand for good agricultural land increases, serious thought should be given to either improving this system so as to reduce the land requirements or relocating the communication facilities to an alternate site.

Proposed uses in the Kagman area include: Expansion of the Agricultural Station, expansion of the public croplands; location of a sanitary landfill, the construction of proposed correctional facilities, the expansion of the existing housing area and the establishment of Kagman Wilderness park.

Agricultural Station

The present agricultural station in Kagman contains approximately 60 acres of land which are being utilized by farmers during the dry season for crop production. With the increasing emphasis placed on agriculture in the Socioeconomic Plan it is proposed that the existing agricultural station be expanded to several hundred acres to include all suitable cropland in Kagman. Some of the lands proposed for expansion presently lie within the TT Receiver Station boundaries and will not become available until that facility becomes obsolete or is relocated.

Kagman Residential Area

With the expansion of agriculture in the Kagman area, there will also be a need for the development of nearby housing. The plan calls for the expansion of the existing Kagman housing area. This area should eventually be developed as a village homestead; however, it is doubtful that the proposed expansion would occur during the initial plan period. Presently the lack of infrastructure precludes such development. The proposed area includes suitable privately owned lands existing north and west of the public lands.

Public Facilities

Two other major public facilities are proposed for Kagman and include a sanitary landfill site and the construction of correctional facilities. The proposed landfill site will be contained in an abandoned quarry north of East Field. A second potential landfill site lies immediately south of East Field.

The proposed correctional facilities are sited on lands north of East Field. Plans are to construct a medium security facility and later in the plan period to construct a minimum security or youth correction house. The plan concept is to locate the facilities upon lands suitable for cultivation so that inmates can engage in agricultural production.

Other Uses

It is proposed that lands in Kagman be retained in the public domain. Agricultural lease lands for grazing should be encouraged South and East of the abandoned runway.

Kagman Wilderness Park and related coastal conservation areas would complete the land use scheme for the Kagman area.

Tank and Marine beaches are areas which should be further developed into beach parks. Both will require the reconstruction of the existing access roads. The area which lies between Tank and Marine beaches has development potential for a golf course and related resort facilities. Presently, these lands are removed from the population centers; however, the continuation of this land in public ownership would facilitate such development in the future. It is therefore recommended that these lands be continued in the public domain. Their utilization as grazing lands under short-term lease agreements is suggested during the plan period.

PROPOSED ZONES

Delineated on the Land Use Plan (plate 6) and the more detailed land use plans for Kobler, Garapan, Marpi and Kagman, (plates seven (7) through ten (10)) are seven major land use zones three of which have been further subdivided.

Each of the following major land use categories are discussed below, with specific highlights as they relate to overall development.

Conservation

Agriculture

Agriculture 1 Cultivation

Agriculture 2 Subsistence farming and grazing

Residential

Rural Residential

Single Family Residential

Multiple Family Residential

Commercial

"Light" Commercial

"Heavy" Commercial

Hotel Resort

Industrial

Public Facilities

CONSERVATION

The Conservation Zone provides for the preservation and protection of natural resources such as, watersheds, unique animal habitats, historic and cultural resources, and scenic resources including prominent topographic forms and features, outstanding views and attractive wilderness areas. The zone

also includes areas of unique geologic or vegetative sites; steep slopes and ridges; inland and coastal wetlands; shorelines, offshore reefs, and lagoons; beaches; beach parks and general parks.

Approximately one-third of Saipan's total land area is in the Conservation Zone. Due to the various land claims made and received, and the rather haphazard manner in which homesteads have been granted, not all areas recommended for conservation are public lands. Areas such as the Susupe wetlands west of Lake Susupe and the limestone pinnacle rock forest near San Jose are now private lands which should be acquired through purchase or exchange.

Protection of conservation areas goes beyond merely preserving scenic spots. Many conservation areas are now used by the local populace and are integral to the Saipan lifestyle, e.g., the beach areas where picnic barbecues are common. The protection of many shoreline and adjacent areas as required by the Constitution is essential for the preservation of the shellfish and reef fish that now are an important food source for islanders. Saipan's scenic beauty -- already being degraded by litter, land scarification, and unrestricted erection of structures -- can be restored and maintained by proper identification of Conservation Zones and application of building and land use controls for these areas.

Parks and Recreation Areas

Two major Parks identified herein include Ogso Tagpochau Park and Marpi Park. Ogso Tagpochau Park would encompass the peak and the flanking steep ridges of the mountain. It would be a scenic park with limited picnic facilities, a few trails, and vista points. Agriculture would be encouraged to continue and those structures presently existing would be

allowed to remain. Lands which are now in private ownership that have access and slopes conducive to residential use should eventually be acquired or exchanged for other areas outside the proposed park.

The Marpi Commonwealth Park ties together the historic sites of Suicide Cliff, the Last Japanese Command Post, and Banzai Cliff with the natural features of the Grotto and Bird Island. This is accomplished with a Conservation Zone band stretching around the Marpi shoreline. This land is presently in public ownership. The Constitution prohibits transferring public land within 150 feet of mean high tide. Therefore, designation of such a park could be quickly accomplished by the Northern Marianas Public Land Corporation. Limited agricultural leases would be permissible as would limited forestry.

Other Commonwealth Parks outside the urban area include Tank Beach, Marine Beach, Paupau Beach, Wing Beach, the Talafofo River Valley and Beach, Laulau Beach, and Ladder Beach.

Wilderness Areas

Two wilderness areas included in the conservation zone are or can easily be made accessible to the public. These same areas, however, possess high scientific or environmental value due to their rare vegetation, geology, or wildlife. Their value is threatened by even moderate overuse. These include Kagman and Naftan parks which are proposed to be developed as wilderness parks.

Natural Preservation Areas

Three unique areas of vegetation are located within or border the largely urbanized west coast.

The first and largest of these is Lake Susupe and the surrounding wetland. Encompassing approximately 400+ acres of water and wetlands, these are the only wetlands in Saipan associated

with an inland water body, and is a valuable habitat for the rare and endangered Marianas Duck. A boardwalk nature trail through some of its parts would provide a useful education tool and foster greater understanding of wetland ecology. The uniqueness of Lake Susupe and the adjacent wetlands require their preservation and the provision of a buffer zone, to protect the area from urban encroachment.

A second unique natural site of approximately 20-25 acres is located north of Wallace Highway between Beach Road and the West Coast Highway and, bordered on the north by a low wetland dominated by grasses. Approximately 8-10 acres of this site is a forest of indigenous trees, including large ficus and palms on a limestone pinnacle rock base characterized by numerous sinkholes up to 6 feet deep. Bird life in this forest is extensive and varied.

The third unique natural site is located near Garapan where the Northern Mariana Islands' only stand of mangroves is located. The site is still in a youthful developing stage (probably less than 30 years old) and is approximately 3 to 5 acres in size. This mangrove area is located near Charlie Dock between the Public Works Department access road and Beach Road. Although not sufficiently large to play a major role in the marine ecology of Saipan, the uniqueness and potential for growth of this site justify its protection. Provision of a boardwalk through this small site or use of the old Japanese railroad berm as a nature trail would provide access to this unique botanical area for science students, birdwatchers, nature lovers, and people seeking a natural area for mental and spiritual refreshment.

Historic and Archeological Sites

Several historic and archaeologically significant sites, previously identified in prior studies (The Parks and Recreation Plan) have been incorporated within the conservation zone.

These sites include the Japanese Hospital, the Japanese Jail, Sugar King Monument, and the Latte Stone Sites at Laulau and Obyan Beaches.

AGRICULTURE

Two agricultural zones are proposed in the land use plan. The Agricultural 1 (cultivation) zone includes those lands to be used for intensive cultivation of field crops, orchards and forage. Lands included in this category contain the island's most productive soils and in many instances they overlay valuable ground water resources.

The Agricultural 2 zone provides land for grazing activity, subsistence croplands and uses related to animal husbandry, including the raising of cattle, swine, and poultry.

The present agricultural situation in Saipan is a stark contrast to the pre-WW II Japanese agricultural industry which placed over 18,000 acres in sugar cane production and over 2/3 of Saipan's 30,000 acres under some form of agricultural production. Today intensive agricultural use of land for row crops, staple items, or fruits occurs on less than a few hundred acres. In fact the only major plot which produces marketable agricultural products is the 50-60 acre site at the Kagman Agriculture Experimental Station. Other private land holdings utilize old banana/coconut plantations, or have small plots of pineapple and/or vegetables. However, most of these products are for personal or extended family consumption and have little effect on the market for fresh fruit or produce.

Animal production for market is limited. Approximately 1150 acres are now grazing about 700 head of cattle, about 15% of this total consisting of government experimentation. With most of the commercial beef sold in Saipan coming from the

large (7500 + acre) Micronesian Development Corporation ranch on Tinian, it is probable that most of the beef produced in Saipan is for personal consumption.

Based on pre-war production records, Saipan has the ability to produce fruit and produce for both domestic consumption and export. Approximately 1300 acres of Class B "fair" soils are well suited to row crop agricultural production.

Land proposed to be included in the Agricultural 1 (Cultivation) zone includes the best suited lands in Kagman and lands east of the abandoned Kobler field runway. It is proposed that these lands remain in public ownership to insure a future capability for crop production.

Extensive portions of the island have been included in the Agricultural 2 (Grazing + Subsistence farming) zone. Generally these lands are suited for grazing, orchards, and small subsistence lot farming. In many instances, land designated as agricultural 2 zone overlay ground-water resources. It will be necessary to monitor the utilization of pesticides and fertilizers within these areas.

Three major areas of continued public ownership of Agricultural lands have been discussed previously. They include: the Marpi Public Grazing Lands, Kagman Public Croplands and the Kobler - field grazing lands.

RESIDENTIAL

Two residential zones are delineated in the Land Use Master Plan. They include Rural Residential and One and Two family Residential. A third category Multiple-Family-Residential is not depicted on the land use plan but general thoughts concerning the location of multiple family residential areas will be included herein.

Rural Residential

This zone provides for low density residential development together with compatible agricultural uses generally characterized by "small farms" or "subsistence lots". This zone may lack basic essential services normally required for urban zones. Areas zoned Rural Residential may eventually be suitable for more intense urban uses. However, redesignation during this planning period would be premature with respect to other urban areas and/or provision of adequate infrastructure to support such development. Generally the lot size is 20,000 sq. feet or two units per acre.

A Rural Residential zone is proposed between Sugar King Park in Garapan as far south as Quarter-Master Road in Oleai.

Rural Residential zones are proposed for lands bordering the west side of the Lake Susupe Conservation area and the entire eastern hillside from Wallace Highway as far south as As Perdido.

One and Two Family Residential

The purpose of this zone is to provide areas for low density family living offering privacy and a reasonable amount of open space, and which are protected from noise, congestion and hazards that may result from incompatible land uses such as commercial or industrial. Uses will include one and two family dwelling units, incidental and subordinate commercial or personal services such as "Mom and Pop" stores, home occupations, schools, parks, playgrounds and recreational areas. This zone provides for up to 6 units per acre.

These areas have generally been discussed in the Community Plan proposals and will not be repeated here.

Multiple Family Residential

This zone provides for medium density (up to 16 units per acre) residential uses including low density apartments and condominiums. It may occupy transition areas such as between commercial and residential areas and between industrial and residential. Compatible land uses will include single and multiple family dwellings, home occupations, schools, parks, playgrounds and subordinate commercial or personal service uses.

Two major urban areas are identified for multiple family residential. They are the Chalan Kanoa - Susupe - San Jose urban area and the Garapan urban area. Proposed areas for multiple family residential generally correspond to those areas which have presently or that are anticipated to have adequate infrastructure development during the plan period. Multiple family residential may also be part of Planned Unit Developments (PUD's) or urban renewal projects such as envisioned for Chalan Kanoa or as part of new Village Homestead areas.

COMMERCIAL

Commercial activities beyond the intensity of occasional services, retail establishments, and professional offices appropriate to the residential zone should be located in designated commercial areas. "Mom and Pop" stores, restaurants, bars, etc. will be allowed to continue in those areas where they are presently located as long as they maintain a maximum size requirement of 500 square feet. In several areas they will be designated as non-conforming uses. Generally; however, "mom and pop" stores, and bars shall not be allowed in future residential subdivisions except in specified commercial areas.

The two proposed commercial zones are "light" commercial and "heavy" commercial. Light commercial includes those enterprises normally found in one-stop neighborhood shopping centers such as small grocery stores, office buildings, and

public and quasi-public facilities. "Heavy" commercial includes those activities that are generally not considered compatible with adjacent residential areas such as lumber sales, auto sales, etc. Each zone is discussed in greater detail below.

Commercial "Light"

This zone provides for a more intensive concentration of personal service-related enterprises than that which would be found in the residential zones. This zone may be in close proximity to, as well as, easily accessible from nearby residential neighborhoods. It will provide space for compact, one-stop shopping areas, office buildings, and public and quasi-public facilities which are architecturally and functionally related, and which fulfill regional market needs to varying degrees.

The creation of viable shopping areas near residential neighborhoods is a major concern of the plan. Generally shopping centers will be located on lands that can be provided with access from two major roads. The Master Plan proposals include:

- * The provision of small commercial areas in all new subdivisions, government or private, when the subdivision as proposed exceeds, or has the capacity to expand to more than 50 units.
- * The creation of a major commercial area in Chalan Kanoa at the existing location of the Post Office and Municipal Buildings. This should be a mall or plaza type concept and include the Japanese roll houses as small shopping centers or craft stores. Included within this plaza would be a farmers' market, grocery store, and neighborhood offices such as insurance and travel agents. Proposed layout and sizing of the center will be part of the Chalan Kanoa redevelopment project.

- * Some form of strip development will have to be accommodated along sections of Beach Road from Susupe to As Perdido Road where strip development is now occurring. Many of these shops and stores are modern or inappropriate to the surrounding neighborhood. Specific details must, however await the proposed urban renewal program of Chalan Kanoa.
- * Designation of a Beach Road commercial site in San Antonio would provide for the commercial needs that future expansion of San Antonio might require.
- * The Susupe Civic Center complex will continue to remain as one of the major "regional" shopping centers since Susupe has become the hub of daily activities. The Civic Center, high school, two first class hotels, and the new Nauru office building suggest that this area will remain a major commercial center long into the future. The discussion of the Civic Center Complex and proposed improvements is found in the Public Facilities chapter. See Plate 12 on Page 83.
- * Present trends in Garapan where strip development is beginning to occur along Beach Road, suggest the need to establish a viable commercial center East of Beach Road across from the resort area. Government assistance such as land exchange should be pursued to develop the center and avoid the strip development that has occurred in Chalan Kanoa.
- * A second commercial site is also proposed in Garapan along West Coast Highway. This would be located on Government land below Navy Hill housing and would probably include offices and small shopping areas catering to the surrounding multi-family housing area. It is proposed that the Garapan fire station be located on this parcel of property. Quick access to either Garapan or the Commercial Port Industrial Park area would be assured.

Commercial "Heavy"

This zone shall provide for the location of a major regional center where commercial uses not generally considered compatible with adjacent residential areas may be located. Such uses include lumber sales, construction material and equipment sales, warehousing, auto sales and repair.

It is most important that the location of heavy commercial areas be controlled. The plan recommends that the Government, through a program of land exchange, acquire the necessary property and lease it for heavy commercial developments. In this manner, proper location and greater control can be maintained through covenants negotiated with the lease of the properties.

Two areas are proposed for Heavy Commercial development. The first is within the Industrial Park. The second site in San Jose is bordered by Wallace Highway, Beach Road, and West Coast Highway.

HOTEL-RESORT

This zone provides for areas to accommodate the needs and desires of visitors, tourists, and transient guests. It provides for compatible and complementary development structures and uses in a unique resort setting. Permitted uses include hotels and accessory buildings customarily incident to hotel uses.

Generally an agglomeration of hotel and resort facilities provides for a more stimulating and varied environment for the tourist. A variety of shops, restaurants, and discotheques can make it much more enjoyable for the tourist. Single or remote hotels, unless they offer a unique experience or provide a full range of recreational activities (golf, sailing, tennis, etc.) will generally not be marketable.

The proposed zone does not suggest that no additional hotel-resort areas will be developed during the plan period. A number of sites including Fanunchuluyan Bay (Bird Isle), Obyan beach and Laulau bay, have exceptional potential for development as resort areas. Careful planning and design of the sites, however, is required. These sites are generally far removed from presently available water, power, and sewer facilities, and if these sites are to be eventually developed the provision of necessary services must be considered. Within the proposed Implementation and Legislation volume, provisions are made for consideration of such development.

The Land Use Plan proposes four major areas for hotel-resort development. These include: Marpi, Micro Beach, Susupe and San Antonio. This is not to preclude development in other areas, but suggests that the above-mentioned areas are either presently under development or are considered to be most suited for development at this point in time.

The Garapan-Micro-beach area presently contains three first-class hotels. A suitable location exists for a fourth which could be constructed between the existing Hafa Adai Hotel and the Saipan Intercontinental. The property is in the public domain, and the site presently has on it about a dozen Samoan-style houses constructed in the 1960's. It is proposed that this site be reserved for future hotel or resort-related development.

The Susupe Civic Center area presently has the Royal Taga Hotel and the recently opened Grand Hotel. The entire area is well-oriented to the lagoon and the nearby civic center. The expansion of the Royal Taga Hotel to the north with either a new wing of hotel rooms or condominium apartments is possible during the plan period. As discussed further in the Civic Center Complex section in the Public Facilities Chapter, this general area has the potential to become the island's true urban center.

Establishment of a third major resort complex in the lower Marpi area is likely to occur during the short range plan. Japanese interests have prepared several proposals for its eventual development. As noted in the Marpi Land Use Plan (See Plate 9 in Pocket) there are environmental concerns which must be addressed in any plan proposal. Presently water facilities extending northward from Garapan are inadequate to carry the flows necessary for a resort complex.

A single hotel presently exists in San Antonio south of the coast guard station. Nearby vacant land could be used for either expansion of the White Sands Hotel or for the construction of another resort hotel.

INDUSTRIAL

The industrial zone provides primarily for light industrial uses and processing plants including sufficient space to meet expected future needs. These reserved areas encourage orderly industrial development while avoiding nuisance or hazard potential to residential and commercial areas. Also included in this zone are concrete or asphalt batching plants, fuel and chemical storage, storage and warehousing. Furthermore, heavy commercial uses may be granted through special permit.

The Land Use Map (Plate 6 in Pocket) depicts two areas that have been specifically designated as industrial zones. They are the Lower Base Industrial Park in Tanapag and the Saipan International Airport lands in the south.

Lower Base Industrial Park

Light and heavy industrial uses, warehousing and supply buildings, an antenna field, and possibly the new power plant and sewage treatment plant will be located within the industrial park lands near Tanapag Harbor. As discussed in detail in

the Public Facilities Chapter, the industrial park is slated for infrastructure improvements within the plan period to encourage further development of industrial activities. The present uses are predominantly warehouse and supply oriented, principally accommodating the Northern Marianas Departments of Public Works and Education. Further development will support economic growth on Saipan.

Airport Industrial

Located in the southern part of Saipan, the airport industrial zone will provide for those activities directly supporting the Saipan International Airport. The zone includes the airport complex itself.

Principal uses for the airport zone will be bulk fuel storage for aircraft as well as maintenance facilities. Aircraft hangars and fuel tanks will be typical facilities that will be accommodated by the designation of the area as an industrial zone.

PUBLIC FACILITIES

The development and delivery of essential public services must be assured by the Master Plan. Lands must therefore be reserved for such uses and the Public Facilities Zone provides the mechanism to do so.

The necessary public services to be accommodated in the zone are governmental operations, health care, education, recreation, public safety and housing. In addition, two uses, an industrial park and a soon to be abandoned government complex, are appropriate to this zone by virtue of the public ownership of lands and buildings on them. These latter two zones are the Lower Base Industrial Park and the Capitol Hill Complex.

Summarily, a public facility for each of the services enumerated above are identified and discussed in the following paragraphs. More detailed discussions are presented in the Public Facilities chapter of the plan.

Civic Center

The Civic Center in Susupe will continue as a major seat of the Commonwealth Government. It is proposed that the Civic Center and the lands adjacent to the existing facilities be reserved to ultimately accommodate all government offices, including those of the legislative and executive branches. As part of the Civic Center Complex, the Marianas High School will be expanded enhancing possibilities for joint use of facilities such as the library, auditorium, gymnasium, and recreational fields.

Health Facilities

Dr. Torres Hospital and the Public Health Center are the two major health facilities which are to be included in the Public Facilities Zone. Four dispensaries located in various villages complete the catalogue of public health facilities.

The Public Health Center is proposed to be relocated as part of the Civic Center Complex in Susupe. Space has been provided for this relocation, a move desirable for the centralization of as many public services as can be accommodated within the center. There still remains a possibility that the Public Health Center will be combined with the proposed Garapan Hospital facilities, thereby achieving a centralization of health care services. This possibility is being investigated.

Education Facilities

Aside from the expansion of the Marianas High School within the Civic Center, a new junior high school in Garapan is proposed. Expansion of the existing elementary schools are also

anticipated in the plan. New elementary schools may be required beyond the immediate planning horizon; however, it is expected that these schools will be adequately accommodated by the present designation of Public Facilities Zone (see Education under the Public Facilities chapter).

The new junior high school in Garapan will be complete with 25-30 classrooms, an auditorium-gymnasium, a library, recreational facilities, and an administrative building. Construction of the facility will alleviate classroom shortages for junior and senior high students and provide interim relief from overcrowding in the elementary schools, while expansions of these schools are being completed.

Parks and Recreation Facilities

As noted, wherever school recreation facilities can be jointly used for community needs, they will be planned for such uses. Other recreation facilities include the American Memorial Park, beach parks and historical sites (discussed in detail in a subsequent section of the Plan), and a Tennis Center in the Civic Center Complex.

The American Memorial Park will be the principal park for the Commonwealth and is to be established between Micro-Beach and Tanapag Harbor. Active recreational fields, passive park grounds, and a marina are proposed for the Memorial Park.

Public Safety

A new fire sub-station in Garapan and a correctional facility in the Kagman Area are the only additional public safety facilities required in the plan period. These new facilities will require the designation of public lands for their use. Renovations of the existing facilities within the Civic Center have been anticipated and accommodated in the center's expansion plans.

Other Public Facilities

Specific facilities not identified in any of the previous sections, but which are reserved as public facilities, include the new Baker Wharf dock, a fishing center, and an agricultural station in Kagman.

The new Baker Wharf dock is proposed as the first construction project in the expansion of Saipan's Commercial Port. Completion of the new dock will provide more berthing areas and will allow continued trans-shipment capability while Charlie Dock, in present use, is renovated.

The fishing center in Garapan is to accommodate the needs of sport fishermen as well as other small boat operators. Additionally, a fishing area will be provided for fishermen who presently utilize Charlie Dock and interfere with cargo movement functions at the Port.

The Kagman Agricultural Station will provide a plant protection lab and an extension office for the benefit of increased agricultural production in the Northern Marianas.

PUBLIC FACILITIES

CIVIC CENTER

HEALTH

EDUCATION

PARKS AND RECREATION

PUBLIC SAFETY

HOUSING PROGRAMS

LOWER BASE INDUSTRIAL PARK

CAPITOL HILL COMPLEX

AGRICULTURAL IMPROVEMENTS

INTRODUCTION

The following sections present details on the major public facility projects recommended for Saipan during the plan period. Many of the facilities are proposed to stimulate economic growth; others are to replace or improve inadequate facilities or to provide for nonexistent facilities. Each major facility is mentioned briefly below, and its location is depicted on Plate 11. Also depicted are some of the major utility improvements proposed during the plan period.

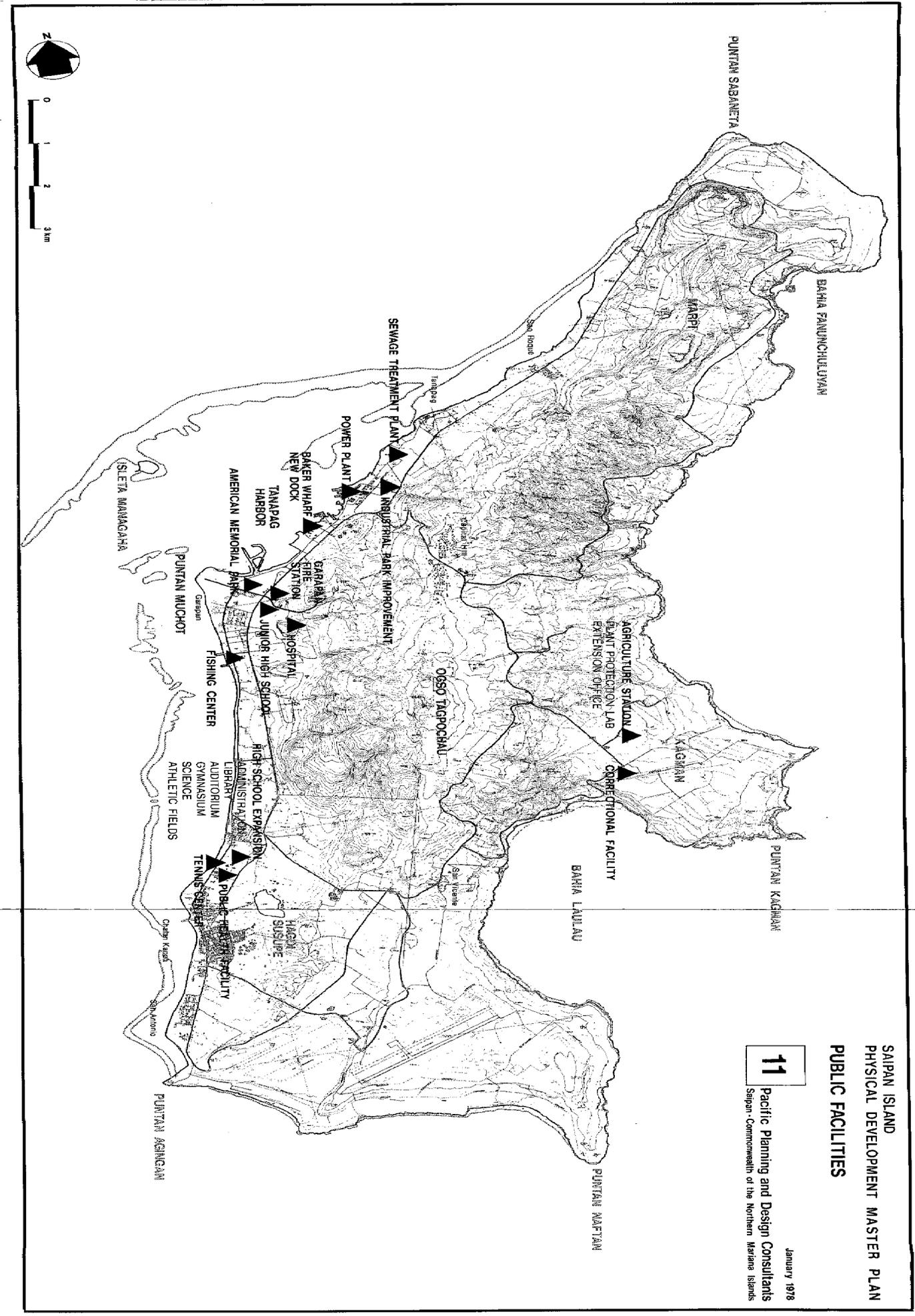
- * Expansion and improvements to the Civic Center Complex, including the construction of a public health center (dental clinic) and a new civic auditorium to be used jointly by the High School and the Saipan community.
- * The construction of a new acute care hospital most probably to be located on Navy Hill in Garapan.
- * Relocation of the Chalan Kanoa Public Health Center to either the Civic Center or the new hospital site.
- * Marianas High School will be improved with the addition of a gymnasium, science building, administrative building, and a library.
- * A new Junior High School for 600 students will be constructed in Garapan.
- * The development of the American Memorial Park, including a war memorial and active and passive recreational facilities.
- * Improvements to and development of island recreational facilities, including upgrading of athletic fields at the high school and the development of a tennis center in Susupe at Civic Center Beach.
- * The construction of a fire station in Garapan.
- * Construction of a medium security corrections facility in Kagman.

- * The development of infrastructure improvements for Sugar King I and II subdivisions.
- * The development of the As Perdido subdivision.
- * Expansion and infrastructure improvements at Lower Base Industrial Park, including the location therein of a new Power Plant and a Wastewater Treatment Plant.
- * Reconstruction of Garapan Boat Basin and development into a small boat fisheries harbor.
- * Construction of new commercial port facilities at Baker Wharf and eventual reconstruction of Charlie Dock.
- * Improvements to the existing Agriculture Experiment Station, including the expansion of existing croplands and improvements to the Plant Pathology and Entomology Laboratories.
- * Development of Beef Cattle Grazing Lands at Marpi.

SAIPAN ISLAND
 PHYSICAL DEVELOPMENT MASTER PLAN
PUBLIC FACILITIES

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CIVIC CENTER COMPLEX

One of the major development schemes includes the continued improvements to the existing Civic Center whose construction began in 1968 following the devastation wrought by Typhoon Jean. This concept differs somewhat from the original plan designed and developed by consultants in 1968. It is cognizant of the need to expand the existing educational facilities and further recognizes the need for development of an urban center. Included as part of the scheme are incentives and include the removal of parking and hazardous access along Beach Road. The proposal is also tied in with the planned relocation and upgrading of Texas Road as discussed later in the section on Highway Transportation.

The proposed upgrading and realignment of Texas Road will allow traffic to feed into the Civic Center from both Beach and Texas Roads. After by-passing Oleai School, Texas Road would rejoin the existing alignment at the rear of the existing high school site. Improved access would allow for more intensive land uses between the paralleling roads. The eventual continuation of Texas Road as a limited access highway into Chalan Kanoa should ease or alleviate many of the traffic problems along Beach Road.

The central commercial site within the area will remain in the vicinity of the existing Joeten Shopping Center. It is proposed that the Joeten Center develop its parking to the north and east of the existing building, relocate the main entrance to the rear, and landscape the present parking area fronting Beach Road. With the warehouses removed at the rear of the existing lot, a new extension, parking, and an open plaza could be developed. Access to the center would be provided from Texas Road, as well as Beach Road. With the new

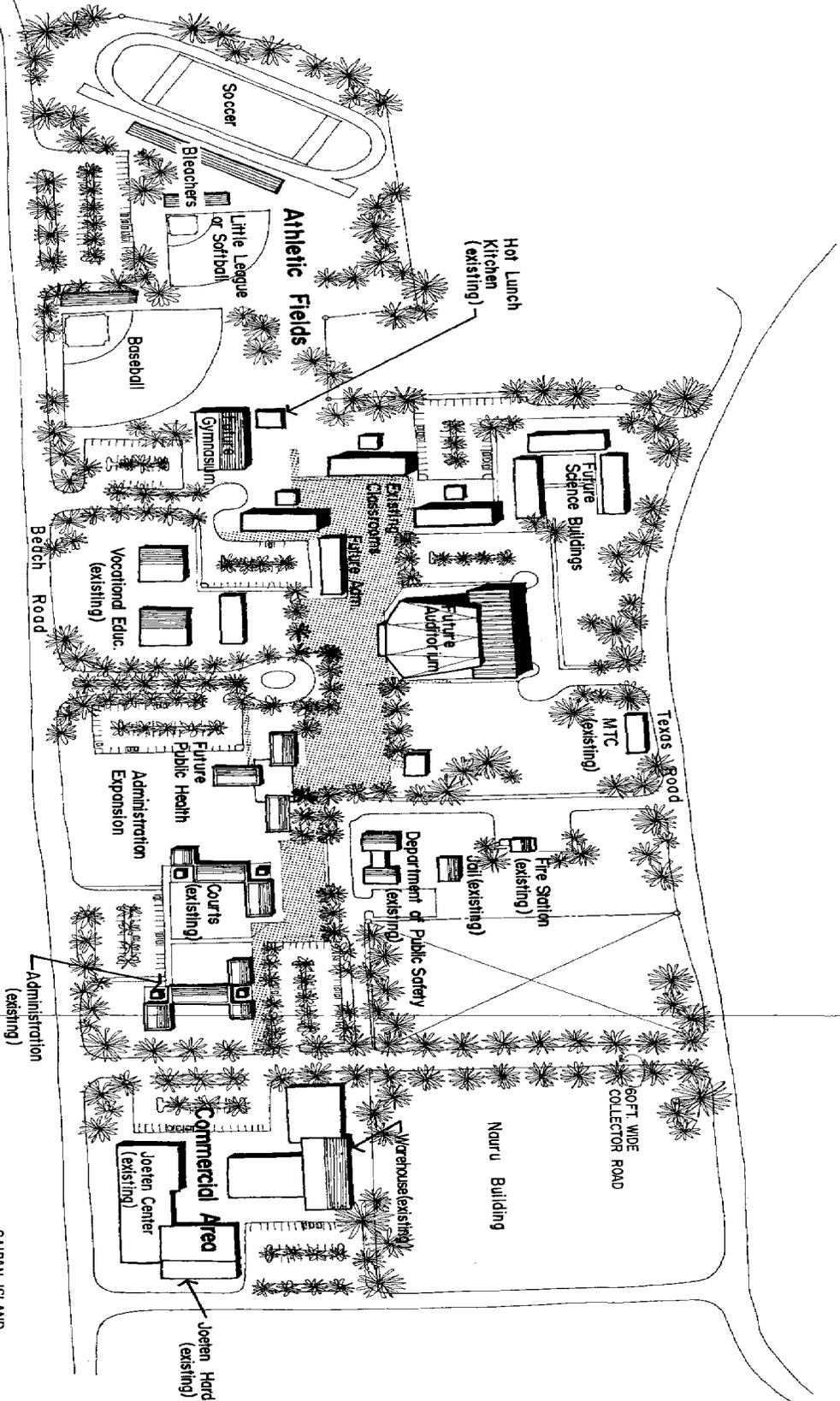
Nauru Office Building, the Joeten Center and the existing vacant lot east of Joeten's developed into either commercial or apartments, Saipan would have a modern commercial and civic center (See Plate 12).

There should be no through traffic bisecting the government complex, nor should there be an east-west traffic link between the high school and the Civic Center. The entire complex should be designed like a campus linking all public buildings with shaded pedestrian walkways. The focal point will be a new auditorium which is anticipated to be built in 1983 or 1984, placed centrally between the high school and administrative offices, so that it may serve multiple purposes. The central pedestrian plaza and walkway which parallels Beach Road should be flanked by the more important government offices (functions). Shade trees, fountains, sculptures, war relics, benches and space for outdoor meetings, leisure or passive recreation should be incorporated into this space.

The scheme illustrated is a long range plan. Implementation will be gradual, but the initial phases should be built along the central walkway (or plaza) and spread toward the outer fringes (Texas Road and Beach Road) in later phases. Adequate room for expansion of the Civic Center to ultimately accommodate all government offices including legislative offices and the governor's offices is provided. It is possible that the office cluster on Texas Road may never be needed. It is also possible that a multi-story structure (such as the Nauru building) will include leased space to the government.

High School Improvements

The final major redevelopment includes the proposed improvements to the high school where a science building, library, gymnasium and administrative buildings are proposed for construction.



SAIPAN ISLAND
 PHYSICAL DEVELOPMENT MASTER PLAN
 CIVIC CENTER
 master plan

The two athletic fields, the multipurpose athletic field located adjacent to Texas Road, and the baseball/softball diamond located between the administrative center and the Joeten Supermarket should be phased out and located to the north and northeast on high school and government grounds. Central to these sports areas should be the proposed gymnasium which will be located at the north end of the public place, so as to form a visual anchor point for the Civic Center and high school combined. The present track would be reoriented and new baseball and softball diamonds would be constructed.

The construction of the science buildings should take place near Texas Road as envisioned in the earlier plan. If and when the vocational buildings require expansion it may be possible to build a new addition onto the wing in front of the unsightly prefabricated buildings. This addition should match or be sympathetic to the architectural expression of present buildings in order to evoke a feeling of unity and cohesiveness of the entire complex.

HEALTH FACILITIES

EXISTING CONDITIONS

The physical facilities available for health services can be characterized as inadequate and inefficient. Their appearance indicates neglect, and their shabbiness detracts from the beneficial psychological effects which are usually required for effective medical care. These inadequacies have helped create the negative image that the delivery of health services has developed in the Northern Mariana Islands.

Dr. Torres Hospital

This facility (84 beds, 12 bassinets) was built in 1962 and, while some efforts to rehabilitate and maintain it have been made, they have been inadequately funded and too modest in their conception. The hospital is of the U.S. Army field type, consisting of seven separate buildings connected by covered walkways, and designed to be as cool as wind and weather permit. Air-conditioning has been installed in some parts of the hospital; however, patchwork carpentry has been required to close openings that were originally designed for breezes. Hospital laboratories are dark and poorly designed; nursing care is difficult to provide in the widely dispersed wards; and the flow of outpatients and the traffic patterns between wards are both inefficient and potentially dangerous. There has been serious deterioration in the electrical wiring and water pipes, and the roofing, though typhoon-resistant, does not protect building interiors from getting wet.

Funds have been made available to rehabilitate Dr. Torres Hospital, but the U.S. Department of HEW has advised that the hospital cannot be renovated to meet minimum U.S. standards, and hence would be ineligible for participative federal funding.

Dispensaries

Four dispensaries have been built in Saipan. These are located in the villages of Garapan, Tanapag, San Roque, and San Antonio. They are small wooden buildings used for offices by nurses and as clinics. They do not have any diagnostic facilities or pharmacies.

Public Health Center

The Saipan Public Health Center in Chalan Kanoa is housed in two buildings at the Municipal Center. Both of these buildings were built prior to 1944 by the Japanese, and are in need of major renovation. There is a small pharmacy and limited diagnostic capability at the Public Health Center. The dental clinic consists of four antiquated chairs and a laboratory with insufficient space for storage.

PLANNING FACTORS

Hospital Occupancy and Outpatient Usage

Hospital occupancy rates have been slowly increasing: 61 percent in FY 1973; 63 percent in FY 1974 and FY 1975; and 65 percent in FY 1976. The patient data shown in Table 2 reveals a heavy use of facilities and services. The annual number of outpatient visits has increased by 52 percent since 1972.

These figures indicate the high frequency with which medical facilities are used. But they also indicate the heavy outpatient demand at the hospital versus that at the dispensaries. Several reasons may contribute to this situation.

* The dispensary concept was developed when residents in various communities were constrained in mobility. This situation has changed considerably on Saipan during the last several years, due to the increasingly widespread ownership and use of the automobile.

TABLE 2
OUTPATIENT USAGE

	1974	1975	1976
SAIPAN HOSPITAL	39,061	43,789	44,303
SAIPAN PUBLIC HEALTH CLINIC - CHALAN KANOA	4,003	3,116	5,774
SAIPAN DISPENSARIES	3,552	4,557	4,375
ROTA SUBHOSPITAL	9,445	12,940	7,255
TINIAN SUBHOSPITAL	<u>3,464</u>	<u>3,923</u>	<u>3,648</u>
	59,525	68,325	65,355
1976 ALL PATIENT VISITS			67,669
OUTPATIENT	97%		
INPATIENT	3%		

- * The dispensaries were never properly supported and lacked good diagnostic equipment.
- * Today and in the foreseeable future there is little chance of securing sufficient qualified personnel to provide good clinic care. The patients prefer to go where they have access to a doctor.

RECOMMENDATIONS

The Socioeconomic plan has identified several guidelines for health service. Among these, three particularly affect the provision of capital facilities.

- * Meet the medical facility and health manpower accreditation standards required by the U.S. Department of Health, Education and Welfare to participate in all relevant Federal programs by 1981.
- * Substantially improve the utilization of all health care facilities and related services.
- * Establish a "feeder system" for the acute care hospital to prevent unnecessary duplication of health services, health personnel, and diagnostic and treatment equipment.

Hospital Size and Location

There is virtually unanimous agreement that Saipan needs a new hospital facility. The size of the facility, however, is subject to some dispute. A study is presently being undertaken by health planners to determine the ultimate size and necessary facilities required to provide adequate health care. It is essential that a facility needs and program plan be developed. Should the facility be overbuilt, the extremely high cost of the hospital facility would unnecessarily escalate the cost of the health care. Most probably a facility between 70 and 100 beds will be recommended for construction.

The proposed hospital will require a site of between ten and twenty acres although ultimate land requirements will depend upon the terrain of the site selected, type and style of structure, and most importantly determination of what health services will be provided on the site. Should the decision be made to include Public Health and out-patient services, the continuation of nursing school and medical staff housing a larger site would be required.

Demographic patterns suggest a location on West Coast Highway between Wallace Road and Garapan. Four sites have been tentatively identified as possible locations. Two (2) are on public lands and two are on private. A fifth alternative would be reconstruction at the present site. The new sites include:

- * Navy Hill location
- * Sugar King
- * Gualo Rai
- * Golf Course Site (Chalan Kiya)

Navy Hill

The principal site is ideally located off the West Coast Highway in Garapan. A 20 acre site is proposed on Navy Hill Road which would allow for the location of the hospital, public health facilities and provide additional open area for the eventual construction of a nursing school. The Navy Hill Housing area, anticipated to become available by 1981 or 1982, could also be utilized to house medical staff. Utilization of this site may require that the Sugar King II subdivision design be modified to provide sufficient room for the hospital.

Public Health Facilities

Relocation of the Public Health Center from Chalan Kanoa is also envisioned during the plan period. Health planners are not yet decided as to whether the future Public Health facilities should be located at the Civic Center or the same site

as the new hospital. Most probably health facilities at the Civic Center would require the construction of additional buildings and an area has been reserved in the Civic Center Master-plan to accommodate these facilities (See plate 12 on Page 83). In any event it is believed that the Civic Center is the ideal location for a Public Health Dental Clinic as it would be close to the existing population center and adjacent to the high school.

Dispensaries

The existing dispensaries in Garapan, San Antonio, Tanapag and San Roque are proposed to continue in service during the short range plan. It is proposed that the dispensaries serve as first call facilities and be utilized for dissemination of health information. Public Health nurses would screen patients in all dispensaries and send them to either the Public Health Clinic, or to the hospital out-patient ward. Some degree of underutilizing dispensaries will exist, however, and the natural inclination of patients to go directly to a doctor must be addressed in an aggressive public education program.

Capital Improvements Program

The timing of new or improved physical facilities has been guided by the need to improve the facilities as rapidly as possible. Not only is this need created by the high priority given to improving the quality of health care, but also by the fact that the earlier that standards of HEW are met, the earlier the people of the Northern Marianas can receive the benefits of the funds which will be made available under Medicaid and Medicare programs. Tables 3 and 4 indicate the proposed scheduling of facility improvements and the proposed funding scheme.

TABLE 3

Schedule for Health Facility Improvements

<u>FACILITY</u>	PROPOSED YEAR
Acute Care Hospital	1978-81
In-patient - 70 beds	
Out-patient facilities	
Emergency facilities	
Public Health Offices and Dispensary	1980
Renovation at Civic Center or	
new construction at Navy Hill Site	
Dental Offices and Treatment Facilities	1981
Renovated or new building at	
the Civic Center	
Village Dispensary Improvements	1979
Garapan, Tanapag, San Roque	
and San Antonio	

TABLE 4

HEALTH SERVICES: PROJECTED CAPITAL IMPROVEMENTS
PROGRAM EXPENDITURES, FY 1978-85

(Thousands of dollars)

Facility and location	FY 1978	FY 1979	FY 1980	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	Total FY 1978-85
<u>Saipan</u>									
Acute care hospital....	500	2,850	1,550	1,100	--	--	--	--	6,000
Public health building...	--	50	100	--	--	--	--	--	150
Village dispensaries..	--	100	--	--	--	--	--	--	100
Dental facilities...	--	50	--	100	--	--	--	--	150
Hospital renovations (Dr. Torres)...	140	--	--	--	--	--	--	--	140
TOTAL.....	640	3,050	1,650	1,200	--	--	--	--	6,540

Source: Projections prepared by RRNA.

In Fiscal Year 1978 it is assumed that the \$500,000 would be programmed for the Design and Engineering of the new facilities.

Improvements to Dr. Torres Hospital should be minimized and only those improvements which are absolutely necessary should be completed. One hundred and forty thousand dollars are presently earmarked for that purpose.

EDUCATION FACILITIES

EXISTING CONDITIONS

The Saipan school system consists of kindergarten through the twelfth grade. Mount Carmel, a private school having grades one thru twelve has some of the enrollment, but the majority of pupils attend the public school system. The following analysis is limited to the public system.

Physical Plant-Size

The physical facilities consist of nine schools - seven elementary schools, Hopwood Junior High, and the Marianas High School. These facilities contain approximately 165 classrooms (See Table 5). Data on the average number of students per classroom - available in Volume II of the Socioeconomic Development Plan - indicate that the total number of classrooms is reasonably adequate. However, several classrooms have been diverted to non-classroom uses such as offices and libraries. Moreover, several classrooms are unsatisfactory for school use and must be programmed for either replacement or upgrading.

Based on mainland standards, most of the school sites are sufficiently large to support current enrollments. The standards for high school sites suggest that the campus for Marianas High School should be between 35 and 40 acres. Only 22 acres are in use today, however, the present site can be expanded to the north.

Moreover, the joint use auditorium proposed to the south of the high school site will also compensate for the small site size.

TABLE 5

SAIPAN SCHOOLS & FAC.

SCHOOL	AREA (AC)	NUMBER OF CLASSROOMS				RECREATION FACILITIES
		MASTER PLAN		EXISTING		
		EXIST'G	PROP.	STAND.	SUBSTA	
SAN ANTONIO	5.13*	7	5	7	5	Basketball, Baseball Field, Multi-purpose Field, Picnic & Beach Area
CHALAN KANOA	10.63	20	-	13	17	BASKETBALL CT.
SAN JOSE	10.41	12	1	12	3	NONE - OPEN FIELD
SAN VICENTE	7.38	6	14	6	3	MULTI-PURPOSE FIELD
GARAPAN	7.36	8	12	8	16	NONE - OPEN FIELD
TANAPAG	6.04	-	-	-	6	MULTI-PURPOSE FIELD
SAN ROQUE	5.32	5	-	5	3	BASKETBALL CT., SMALL PLAYGROUND
HOPWOOD	18.40	-	-	33	-	BASEBALL FIELD, PICNIC & BEACH AREA
MARIANA HI.	31.97	25	25	-	-	BASEBALL, SOCCER FIELD, 2-VOLLEYBALL 2- BASKETBALL CT.

* THERE'S A 4.8 AC GOV'T LAND ADJ. TO SCH. - VACANT

Classroom Conditions

A recent physical study showed that of the 218 classrooms in the NMI, none could be rated as excellent; 142 were good, 60 were fair, and 17 were poor. It should be noted that the standards used in this evaluation were significantly lower than those that would be used in an average American school system. A general impression of currently used classrooms is one of severe inadequacy, both in terms of maintenance and equipment.

Within the nine schools comprising the Saipan Public School System 53 rooms, located in 15 buildings, ranging in size from two to seven rooms are considered substandard structures. That is, these buildings are not likely to withstand typhoon level winds, and most do not have adequate protection from wind and driving rains.

There is little evidence that in the planning of schools, the special needs of the school administrators, counselors, and teachers were even considered. In the past, pressure to build classrooms has evidently been so great that practically all other space requirements were neglected. The space used for administration, counseling, and auxiliary teaching services (laboratory, supplies, etc.) is also clearly inadequate. In many cases, regular classrooms or hallways are used for these important functions. Office quarters are usually crowded, ill-furnished, and lack privacy. Teacher restrooms and office facilities are virtually non-existent.

The sanitary facilities in many schools are inadequate and ill-maintained. Many plumbing fixtures are in need of replacement, and waste disposal is a frequent problem.

There are four school libraries in Saipan and, in general, the school library facilities are inadequate and ineffectively operated.

Schools have limited space for recreation facilities and activities. Some classrooms are used for storage and recreational equipment and some indoor forms of recreation activity, but there are no buildings reserved specifically for these purposes. School grounds usually have open space for outdoor games, but have very little equipment. Teachers lead elementary classes in group games but physical education teachers have only been recruited for the junior high and high school. Only the private school in Saipan has a roofed-open-wall facility for games.

PLANNING FACTORS

Policies Affecting Physical Plant

Policies affecting the capital improvement program have been developed in the 1978 to 1985 Socioeconomic Development Plan for the Northern Mariana Islands. The following summary of policies affecting the education physical plant have set directions for the present planning horizon.

- * Existing Village schools will be retained in their present locations.
- * A new Junior High School is to be constructed in Garapan.
- * All schools will have adequate numbers of good classrooms.
- * Administrative offices, counseling rooms, storage space and library facilities will be improved at all schools. A science building is to be added to the High School.
- * Audio-visual rooms will be constructed to all schools with large schools having auditoriums.
- * Recreational facilities will be improved at all schools including the construction of a semi-enclosed gymnasium at the high school.

Population Growth and School Population

Present School population estimates were obtained directly from school principals. Projections of school populations are based on the proportion of each grade-group (elementary, junior high, and high school) to the total resident population at the end of the planning horizon (1985) and for ultimate development. Table 6 summarizes this data.

Classroom Requirements

The enrollment figures contained in Table 6 have been translated into classroom requirements in Table 7. The requirements for the year 1985 and at ultimate development will be significantly affected by the desired student size per room. Table 7 indicates classroom requirements based on overall average class sizes of 20 and 25 students. Because of several administrative and scheduling considerations, individual class sizes are often greater than the desired standards. However, it should also be noted that contemporary standards among education administrators require that average class size be reduced for the junior high school and high school groups, especially for the latter.

Table 7 shows the total number of classrooms required, all of which should be of adequate physical standard. These requirements do not include special classroom requirements which may be desired by education administration officials.

The most urgent requirements are for junior high school classrooms. However, high school classroom space will also be urgently needed, as will kindergarten space, and replacement of substandard elementary classrooms. Currently no provision has been made for kindergarten space. A minimum of 10 classrooms, assuming double sessions will be required by the end of the plan period.

TABLE 6

SAIPAN SCHOOL ENROLLMENT BY GRADE GROUP

GRADE	1977	1985	ULTIMATE
KINDERGARTEN	360 (ESTIMATED)	477	1267
GRADES 1-6	2159	2860	7600
JUNIOR HIGH SCHOOL			
GRADES 7-8 (PRORATA)	(672)	(917)	(2448)
GRADE 9 (PRO-RATE)	(369)	(458)	(1224)
HIGH SCHOOL			
GRADES (10-12)	616	985	3024

TABLE 7

CLASSROOM REQUIREMENTS

	1985		ULTIMATE	
	Low (20)	High (25)	Low (20)	High (25)
KINDERGARTEN	24	19	63	51
ELEM. SCHOOL (1-6)	143	114	380	304
JUNIOR H. S. (7,8)	46	37	122	98
JUNIOR H. S. (9)	23	18	61	49
HIGH SCHOOL (10,11,12)	49	39	151	121

CAPITAL FACILITY RECOMMENDATIONS

Elementary Schools

This grade group consists of kindergarten through the sixth grade. Based on school enrollment projections it is estimated that a minimum of 114 classrooms will be required by 1985. Furthermore, of the existing 107 classrooms, 53 are considered substandard and should be replaced.

As many as 70 new classrooms could be required during the plan period - 53 to replace substandard rooms, and 17 rooms for additional space. Funding guidance provided in the RRN/A Socioeconomic Plan would enable the construction of thirty-one (31) new classrooms. Assuming that 10 or 20 special purpose rooms would also be available, some 29 substandard classrooms would remain in use at the end of the plan period.

In general, it is recommended that new classroom space should be provided at existing school locations and that the elementary campus size be limited to 26 to 28 classrooms. This would allow for four sets of kindergarten through sixth grades at a particular site. The San Antonio site should be expanded by annexation of the adjacent 4-acre parcel. The individual school master plans presently existing for San Antonio, San Jose, Chalan Kanoa and Garapan require reevaluation, to make certain that these sites can be expanded to meet future classroom requirements and to determine the specific nature and timing of the expansion.

Several additional elementary sites will be required beyond the present planning horizon. Eventually, as many as 225-250 elementary school classrooms will be necessary. Timely site acquisition is essential to insure an orderly expansion of the school system and to preclude the need to pay exorbitant acquisition costs. The proposed new subdivisions at Kobler field and the Marpi homestead site should both include sites reserved for educational facilities. The Sugar

King I site should be redesignated as an elementary school if it does not become the location for the new hospital.

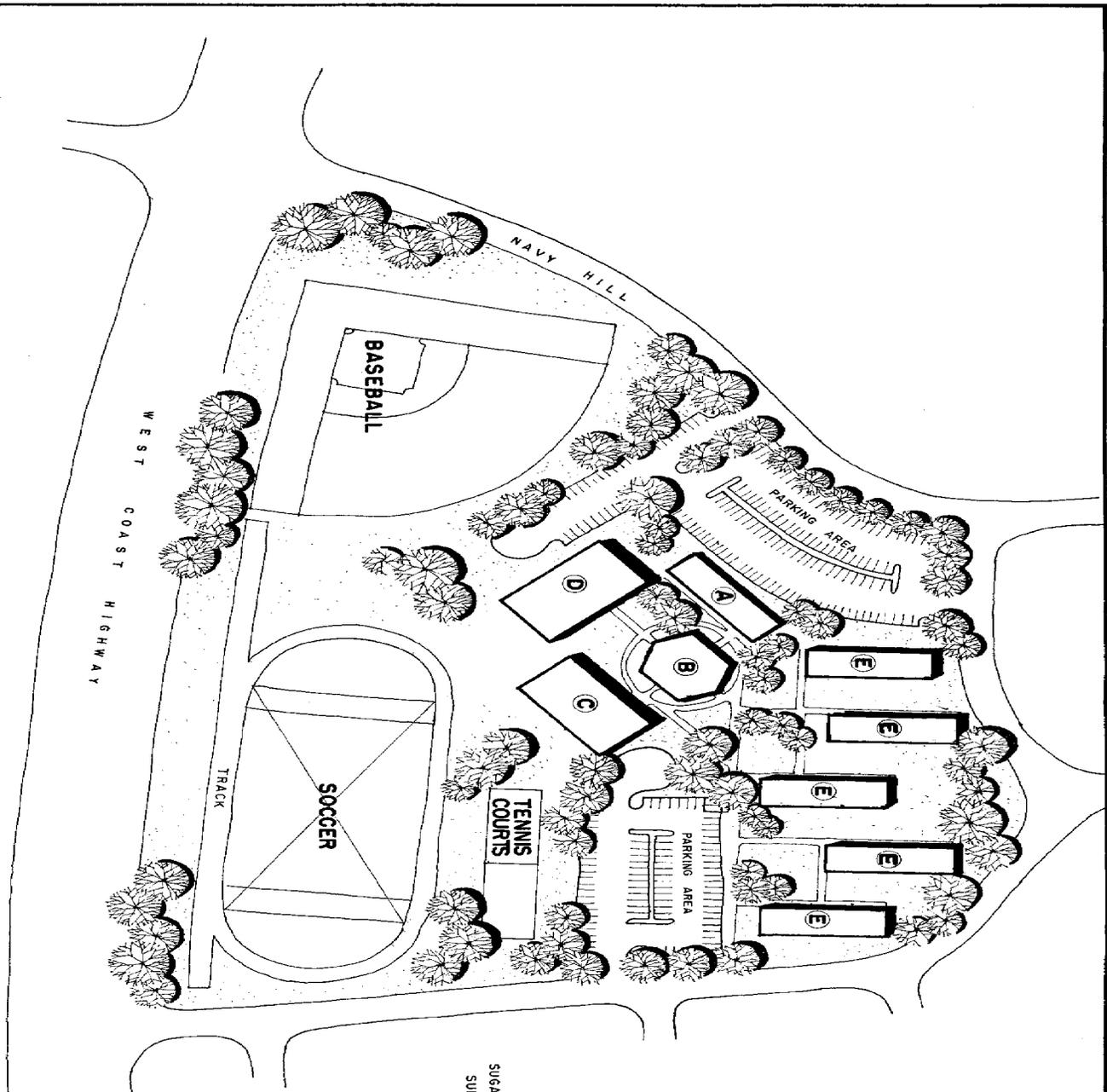
Junior High School

Immediate action is required to design and construct the new Garapan Junior High School. Construction should not only relieve the critical space shortage, but will also provide interim relief at the elementary school level. A complete educational complex including 25 to 30 classrooms, an auditorium gymnasium, library and administrative buildings, and recreational facilities are proposed for the site (See Plate 13).

At least one additional junior high school facility will be required beyond the present planning horizon. It is recommended that either the present high school be converted to a junior high school (with concurrent construction of another high school) or that a new site be acquired, preferably along Wallace Highway at the site of the present golf course.

High School

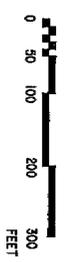
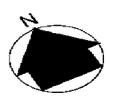
By the end of the present planning horizon (1985), the present High School will be experiencing slightly overcrowded facilities. A number of capital improvements are proposed at the high school during the 1977-1985 Plan period. These include a new gymnasium, a science building, an administrative building and a library which will release several classrooms presently utilized for those purposes. Additional facilities are proposed to be added to the vocational education department. Plans are also proposed to upgrade the existing recreational facilities. A new auditorium, for joint use as a school assembly facility and a community civic center, on lands immediately south of the school site are also proposed (See Plate 12 on page 81). Based on Saipan's ultimate population, there could be over 3000 students requiring high school space for grades 10, 11 and 12, and still more if a four-year high



SUGAR KING II
SUBDIVISION

LEGEND:

- A ADMINISTRATION
- B LEARNING CENTER
- C CAFETERIUM / AUDITORIUM
- D GYMNASIUM
- E CLASSROOMS



SAIPAN ISLAND
PHYSICAL DEVELOPMENT MASTER PLAN
GARAPAN JR. HIGH SCHOOL
schematic plan

school system is adopted. It is essential that the School Board and the Department of Education re-examine needs for either a three-year or four-year high school. Although two separate high schools of identical curriculum is not recommended, it may be possible to eventually support a vocational-technical high school. Plate 14 illustrates the proposed gymnasium.

A second high school site should be coterminus with the proposed junior high school site at the golf course. If the option is chosen to consolidate all high school facilities at the golf course site the existing high school could then be available as a third junior high school.

Community College

Recent discussion has centered upon the need for a Community College. It is suggested that the present hospital site be utilized for this purpose. Several of the existing buildings could be renovated thereby saving the costs of new construction. Joint use of existing high school and vocational educational facilities should also be considered as an alternative.

Land Use Planning Implications

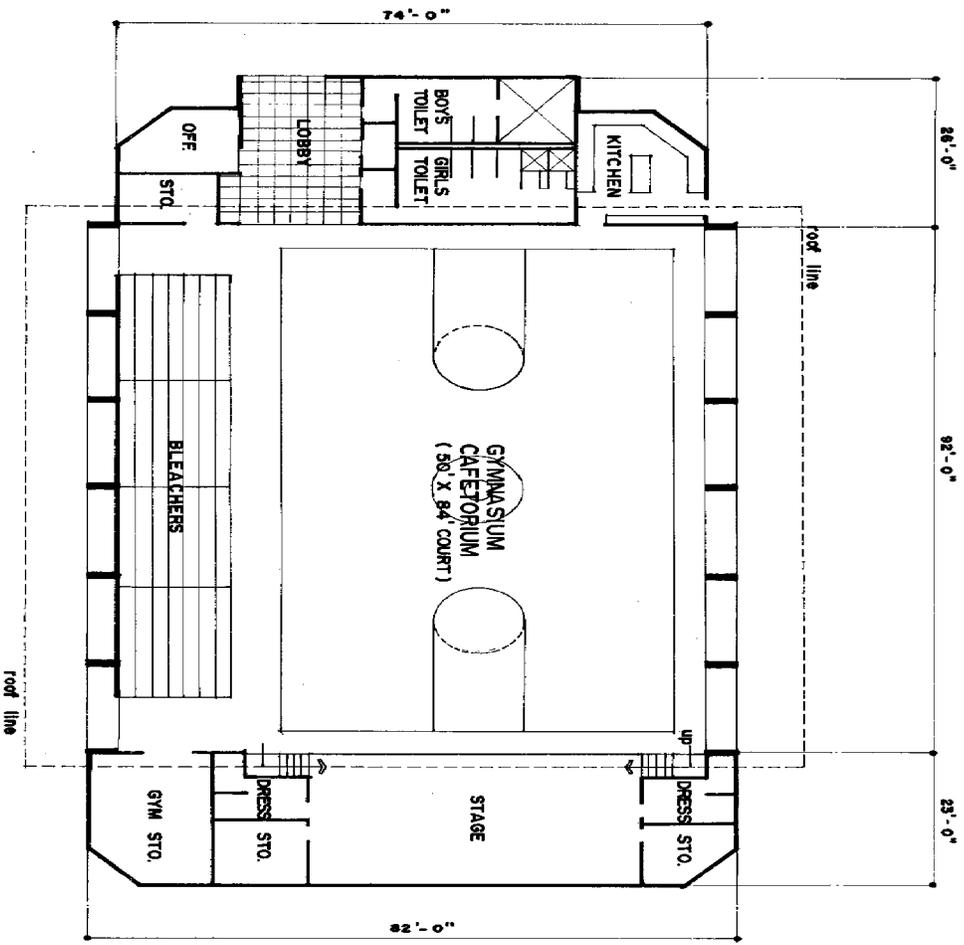
The primary factor in the education program related to growth and land use is the location of the new Junior High School. Its proposed location at the southeast corner of the West Coast Highway and the extension of Micro Road should be a desirable location. Further development of Garapan Estates and Sugar King I and the proposed development of Sugar King II, bordering the school site on the south, would surround the school on three sides with residential use. Student access would be facilitated and the only major problem would be West Coast Highway. Proper buffering and provisions for pedestrian access from the west could, however, solve this problem.

Location of the Junior High in the Garapan area may also affect growth trends elsewhere to some extent. It will mean reduced pressure on the northern elementary schools and perhaps induce more growth in the Garapan and San Roque-Tanapag areas. Also, many of the proposed new elementary classrooms could be constructed in the Chalan Kanoa and Oleai areas thus relieving the increasingly crowded conditions at those sites.

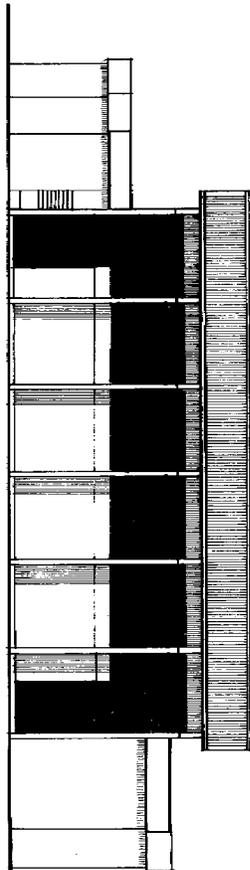
Consideration must also be given to the eventual location of a new campus for a high school facility in the long range or ultimate plan. Such a facility would require 35 to 40 acres of land and should be centrally located with respect to the population. A possible site which should be explored is a portion of the existing nine hole golf course in Chalan Kiya. This assumes of course that a new golf course facility is built during the plan period and that the land can be acquired.

Conclusion

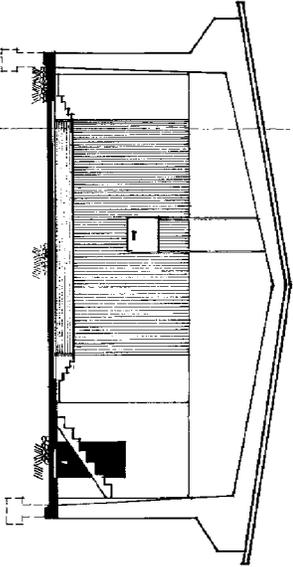
Observation of the proposed budget for the 1977-85 plan period encompassing the above facilities indicates probable substantial improvement over existing conditions. However, it is not presently the intent of the program to eliminate the use of all substandard facilities within the plan period. The extent to which these facilities are phased out will depend on future trends in school attendance and population growth. Continuation of 3% annual increases in school population, coupled with the various new facilities including the new Junior High and thirty new elementary classrooms, should reduce the use of substandard classrooms from the 53, in use today, to a maximum of 30 by 1985.



FLOOR PLAN



ELEVATION



CROSS-SECTION

SAIPAN ISLAND
 PHYSICAL DEVELOPMENT MASTER PLAN
GYMNASIUM / CAFETORIUM
 schematic plan

PARKS AND RECREATION

Recreation is an important part of life on Saipan as the traditional lifestyle includes frequent family and group picnics at beaches and other recreational sites. Future planning and funding for recreational facilities must carefully balance the needs of the local community with the recreational needs to meet an expanded tourism industry.

The proposed short and long range park and outdoor recreation system for Saipan has been established in close conformity with the Northern Mariana Islands Park and Outdoor Recreation Resource Study prepared in April, 1977.

EXISTING CONDITIONS

The existing park and recreation system for Saipan includes the numerous beach parks, and historic sites such as the Last Command Post, the Japanese Hospital and Jail, and the German Light House.

Also included are the active recreational baseball, basketball, and tennis courts, etc., facilities. Plate 15 depicts the location of these facilities.

The active recreational facilities that have been developed on Saipan consist generally of open space or multipurpose fields and multipurpose courts constructed so as to accommodate basketball, tennis, or volleyball.

Generally, the fields that have been constructed are for baseball; however, several such as at the high school can also accommodate softball and soccer. Many of the fields at the elementary schools are open space multipurpose play areas which were constructed with no specific use in mind.

Table 8 indicates the existing public and semi-public outdoor recreational activities exclusive of beach parks.

There are thirteen basketball courts or multipurpose courts which are distributed about the island. Only the Mt. Carmel High School facility is semi-enclosed and allows play during inclement weather. All are in pretty good shape; however, they could be improved with fences and backboard replacement. Several lack bleachers and lighting.

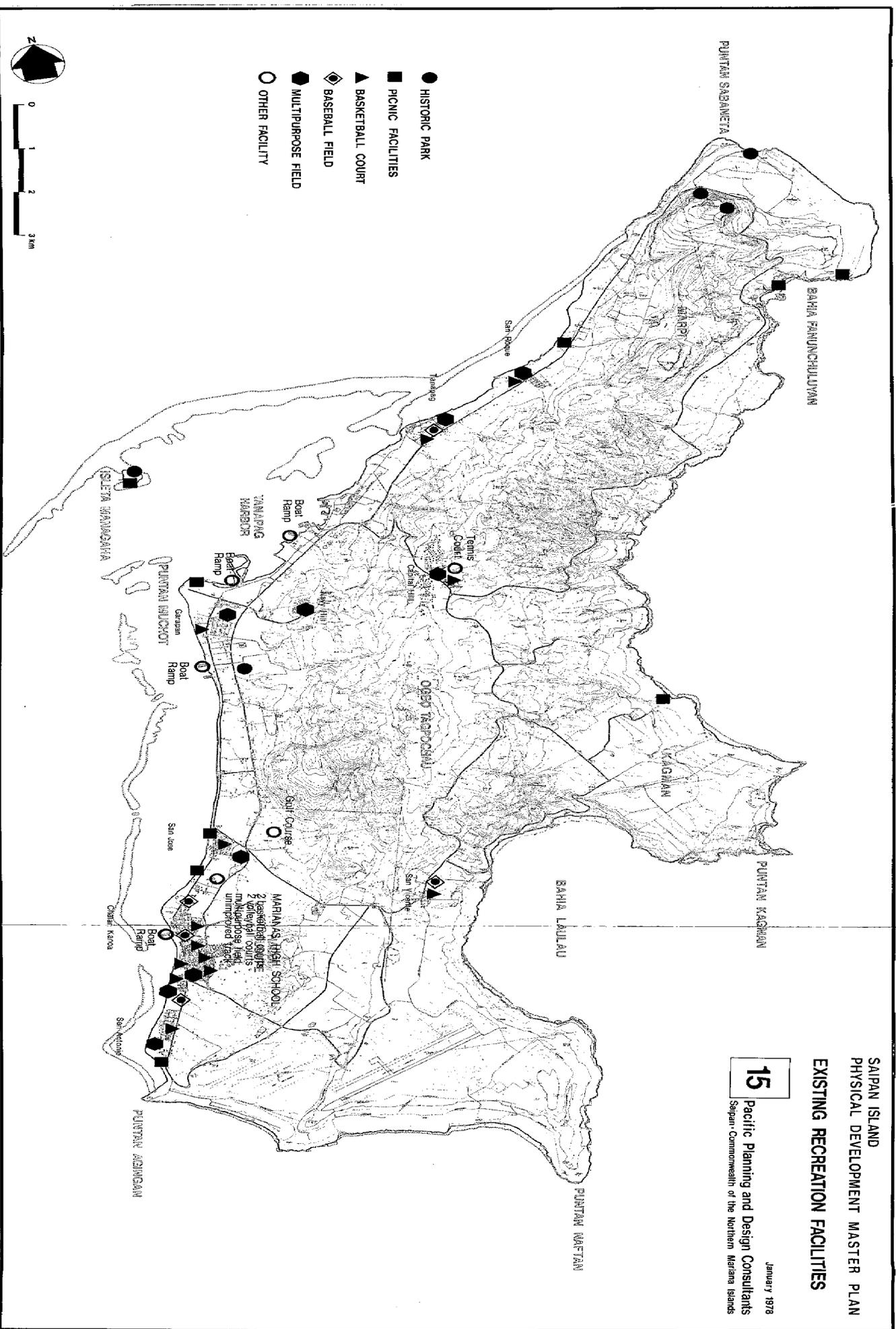
Presently there are two public tennis courts, one at Capitol Hill and the second at Civic Center beach. Quasi-public courts include the Intercontinental, Hotel Courts and those at the Coast Guard station. Many of the basketball courts have been constructed as multi-purpose courts; however, most are constantly in demand for basketball.

Presently, there are five public little league baseball/softball fields (excluding the Mt. Carmel facility). These could be improved with minimal expenditures to provide for or improve backstops and screened dugout areas.

Saipan is fortunate in having extensive beachfront areas which remain in public ownership along its western shoreline. Most villages have informally claimed beach areas which are considered to be their village beach and park areas. Many have wooden tables and several have tables and barbecue pits constructed of cinder blocks or concrete.

SAIPAN ISLAND
 PHYSICAL DEVELOPMENT MASTER PLAN
EXISTING RECREATION FACILITIES

15
 Pacific Planning and Design Consultants
 Saipan, Commonwealth of the Northern Mariana Islands
 January 1978



- HISTORIC PARK
- PICNIC FACILITIES
- ▲ BASKETBALL COURT
- ◆ BASEBALL FIELD
- MULTIPURPOSE FIELD
- OTHER FACILITY



TABLE 8

VILLAGE RECREATIONAL FACILITIES

<u>San Antonio</u>	<u>Location</u>	<u>Garapan</u>	<u>Location</u>
Basketball Court (multi-purpose court)	Village Center	Basketball (multi-purpose court)	Village Center
Baseball Field	Associated with Hopwood Junior High School	Open Field	Elementary School
Basketball Court (multi-purpose court)		Tennis Court	Intercontinental
Soccer Field			
Multi-purpose Field	Elementary School		
Tennis Court (semi-public)	Coast Guard Station		
		<u>Navy Hill</u>	
		Multi-purpose Field	Navy Hill Housing
<u>Chalan Kanoa</u>			
4 Basketball Courts	Each District		
Multi-purpose Field	Elementary School	Basketball (multi-purpose court)	
Basketball Court (partially closed)	Mt. Carmel School	Baseball Field	
Baseball Field	Mt. Carmel School	Open Field	Elementary School
<u>Susupe</u>			
Basketball (multi-purpose court)	District Meeting Hall	Baseball Field (Playground)	Elementary School
Baseball Field	Civic Center	Basketball (multi-purpose court)	Community Center
Tennis Court (multi-purpose court)	Civic Center Beach		
2 Basketball courts (parking lot)	Associated with Marianas High School	Tennis Court	Associated with Trust Territory Headquarters
2 Volleyball Courts		Basketball Court (needs resurfacing)	
Unimproved track		Multi-purpose Field	
Multi-purpose Field			
		<u>Capitol Hill</u>	
<u>San Jose</u>			
Basketball Court	Church Grounds	Basketball (multi-purpose court)	Elementary School
Open Field	Elementary School	Baseball (multi-purpose field)	Elementary School
Golf Course (nine holes)			

Saipan is blessed with a wealth of historic sites dating from early Chamorro settlements up through the various governmental administrations which have held control over the Marianas. The incorporation of this resource into the recreational plan is especially important for tourism.

A partial inventory of sites taken by the Historic Preservation Office is included as Table 9. It is anticipated that this list will be updated as part of the ongoing Historic Preservation Program. It should be noted that programs are presently underway to restore several of the Japanese period structures. Another thrust is a study which will initially survey areas of early Chamorro settlements and develop a methodology for assessing the value of each site.

TABLE 9
HISTORIC SITES

PRE-CONTACT (CHAMORRO)	Laulau Beach Latte Obyan Beach Latte Bird Island Latte	
SPANISH ADMINISTRATION	Kalabera Cave Church Tower	Marpi Area Garapan
GERMAN ADMINISTRATION	Lighthouse Governor's House (steps)	Navy Hill Garapan
JAPANESE ADMINISTRATION	Japanese Hospital Sugar Factory Housing Municipal Complex Japanese Jail	Garapan Chalan Kanoa Chalan Kanoa Garapan
WORLD WAR II	Last Command Post Banzai Cliff Suicide Cliff Coastal Gun Bunkers	Marpi Area Marpi Area Marpi Area Obyan, Laulau, Agingan
OTHER SITES	Bird Isle Managaha Underground Stream Cave The Grotto	Marpi Area

RECOMMENDATIONS

Overall objectives of the Parks and Recreation plan should be to:

- * Provide suitable and adequate active and passive recreational places for the local community and island visitors.
- * Maintain those areas of local significance that are of importance either as food gathering or food procurement, or which are significant culturally.
- * Develop recreational facilities that support and encourage expanded tourism.
- * Provide adequate recreational facilities in conjunction with the school system and community centers.

Specific recommendations which will help to attain these goals include the following:

- * Renovate and improve the active recreational facilities scattered about the island. Fencing of tennis courts, reconstruction of backboards, leveling and improving of all-purpose fields.
- * Improve the central sports complex at the Susupe High School location. The track field should be reorientated. A soccer, football field, regulation major league baseball field, and minor league/softball fields should be constructed.
- * A semi-enclosed gymnasium should be constructed at the Susupe site. Initial design and construction should allow for expansion of facilities to add stage and locker rooms.
- * The American Memorial Park should be phased so as to minimize the duplication of essential facilities. Initial construction of active recreational facilities should include the swimming pool and tennis court areas.

- * Improve access roads to the beach parks, provide for litter pick-up and increase the number of picnic tables and barbecue pits. Necessary road improvements are discussed in the section on transportation.
- * Promote or encourage the private development of at least one 18 hole golf course, either in the Marpi Resort Area or at Agingan Point.
- * Develop through the Historic Preservation Office the means by which historic sites are inventoried, surveyed, renovated and included into the parks and recreation plan.
- * Establish and develop the Marpi Commonwealth Park and the Kagman, Naftan, and Ogso Tagpochau wilderness parks.

More detailed explanation of each of the above recommendations follow:

Recreational Facility Standards

Future active recreational facilities must include "tot lots", play lots for children of pre-school age, neighborhood playgrounds or village parks, area centers of community facilities and, finally, island centers.

Playlots (Mini Parks)

Playlots are small recreational areas designed for pre-school children to play in complete safety. Space devoted to the playlot should be between 2,500 to 10,000 square feet. Generally, they are part of more densely populated urban areas. Presently, only Chalan Kanoa has densities of development and numbers of pre-school children which warrant their development. Future subdivisions or multi-family residential areas should consider their development.

Neighborhood Playgrounds

Neighborhood playgrounds serving between 500 and 1,000 persons should be developed at each elementary school or within major subdivisions. The playground of each elementary school should be of sufficient size and design, and properly maintained, to serve both the elementary educational program and the recreational needs of all age groups in the neighborhood. Since education and recreation programs complement each other in many ways, unnecessary duplication of essential outdoor recreation facilities should be avoided. The cost to duplicate facilities and lack of suitable public lands near the existing residential areas makes it even more important that the duplication of facilities is avoided on Saipan. Present plans suggest that each facility should contain a multi-purpose court, childrens' playground and multi-purpose field. The minimum area requirement that will accommodate essential activities is about 3 acres.

Area Centers - Community Playgrounds

The Community area would normally be associated with either the Junior High School or High School facilities. This is a most economical approach to the development of community recreational facilities when the school sites are properly located. Facilities should initially include two multi-purpose courts, a baseball field, and a soccer or football field enclosed by a track. A minimum of twelve (12) acres are required for development of such facilities. The ultimate school plan would also include an enclosed basketball court gymnasium. Such sites are presently envisioned at the Hopwood Junior High School, the Marianas High School in Susupe and the New Garapan Junior High School.

Island Center

This facility would serve the entire island and provide the recreational facilities normally included in the area centers,

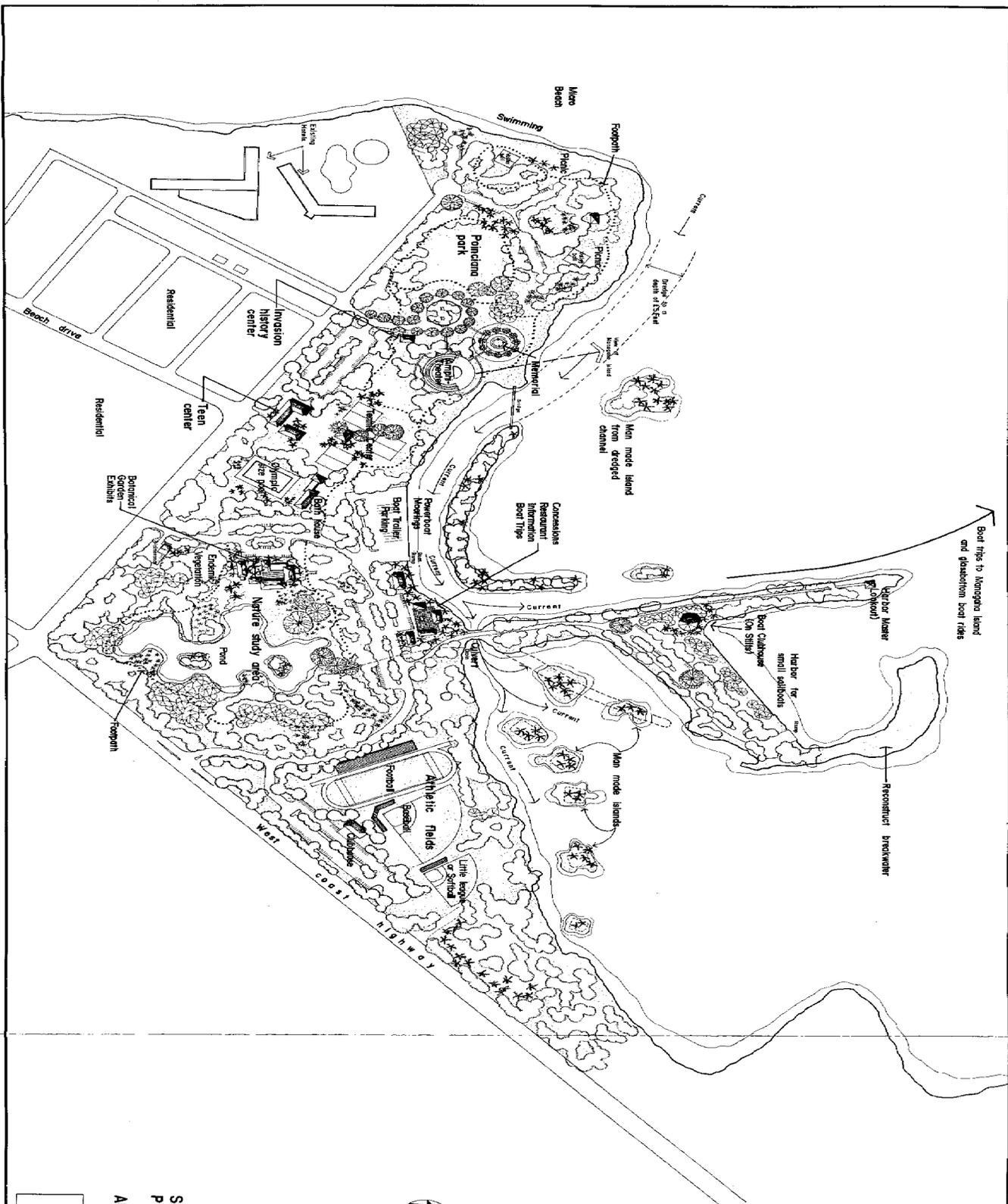
as well as provide for facilities such as a swimming pool, recreation building, nature trails and picnic areas. Fields would be equipped with lights for night play. The American Memorial Park facility as discussed later in this section will contain the above mentioned functions and should fulfill the island's needs.

American Memorial Park

The principal Commonwealth park will be established between Micro beach and Tanapag harbor area.

The Covenant states in Section 803 (e) that the Government of the United States will set aside an area of 133 acres at Tanapag Harbor for public use as a memorial to American and Marianas people who were killed or wounded in the Marianas Campaign during World War II. The \$2 Million received from the Government of the United States for the lease of this property will be placed into a trust fund and used for the development and maintenance of the park.

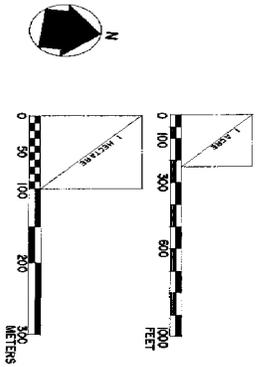
Plate 16 illustrates the conceptual design of this American Memorial park. It is proposed that the park have various mixtures of active and passive recreational facilities providing facilities for both the visitor and the local citizen. Proposed active recreational facilities include tennis courts, a swimming pool, a teen center and island-wide athletic fields including soccer/football, baseball and softball diamonds. Initially a powerboat marina should be constructed to provide facilities for sport fisheries and commercial boat activities geared towards the tourist. As need or demand increases a second marina for sailboats should be developed. Passive recreational areas in the war memorial site will include the Amphitheater, Monument and Poinciana park. A natural area with a botanical garden is proposed to be developed in the natural ponding basin including buildings to house an information center and a natural historic museum. This area might also include a Micronesian cultural center.



Boat slips to Morogata Island and glider/trim boat rides

Reconstruct breakwater

- LEGEND:**
- Beaches
 - Footpath
 - Olympic site pool
 - Tennis courts
 - Roadway
 - Parking



**SAIPAN ISLAND
PHYSICAL DEVELOPMENT MASTER PLAN
AMERICAN MEMORIAL PARK**

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Pacific Planning and Design Consultants
Saipan - Commonwealth of the Northern Mariana Islands

January 1978

Marpi Park

The Marpi area should also be developed into a major commonwealth park. Marpi area represents the largest contiguous area in public ownership on Saipan. Much of the land area is recommended to be preserved as a wilderness area or to be developed into public grazing lands. The area includes the outstanding natural features of Suicide Cliff, the Grotto, Bird Island, Fanunchuluyan Bay, Laderan and Jeffries Beach (Unai Fahang). It includes, furthermore, the important historic sites of Banzai Cliff and the Last Japanese Command Post.

Within this area, some overgrown existing Japanese road alignments should be reestablished as trails, to be part of a hiking trail system connecting historic and scenic interests. This park will offer the following recreational opportunities: historic education, scenic driving, snorkeling, scuba diving, picnicking, hiking, camping, nature observance and contemplation.

Wilderness Parks

Three large wilderness parks are proposed which take advantage of lands marginal for development. They are illustrated on Plate 17 and include Kagman, Naftan, and Mt. Tagpochau. Each includes highly scenic features and in the case of Kagman and Naftan, the lands are presently in public ownership. Parts of the proposed Tagpochau park are in private ownership.

Municipal Parks and General Parks

Along with the municipal beach parks, three general parks are proposed for development. The first, to be called Sugar King Park, includes lands and historic sites including the sugar train, sugar king monument, the hospital and jail and extends down to the proposed fishing marina. This park was proposed in the 1967 Master Plan and is considered to be worthy of mention again.

A second park, to be called Tanapag Beach park, would extend from the Tanapag ridge down to the beach front. This park would provide a buffer between the industrial park and proposed southward expansion of Tanapag. It was in this vicinity that the Japanese made their last attack against the American forces during World War II.

The third proposed park would be the Lake Susupe - Civic Center park area which would provide for a strip of land from the shoreline through the civic center and eventually extending into the conservation lands bordering Lake Susupe.

Golf Course Development

The present golf course in Chalan Kiya is a small nine hole course of medium difficulty. The 1967 Master Plan had suggested that this site be expanded to a full 18 hole course with ancillary recreational facilities. Recent residential development adjacent to the course, hindering further expansion and land acquisition problems, make it nearly impossible to construct an 18 hole course on the site. In recognition of the above factors we recommend that possible sites be proposed for golf course locations and that the Government invite private interests to develop the site. Two potential golf course sites are proposed. The first is at Agingan Point where approximately 150 acres have been set aside in public reserve for the development of the course. The site offers exceptional views to Tinian, and should be designed to have maximum interplay with the coastline. A particular problem of golf courses in the Western Pacific is to keep them lush during the dry season. The Agingan Sewage Treatment Plant with proposed expansion could provide up to 1.5 million gallons of water daily for golf course irrigation. It is a potential irrigation source which should not be overlooked.

The second golf course site is located in the Marpi Resort area. Presently developers have a proposal for the construction and operation of a resort hotel, convention complex, including a golf course. The golf course would be made available to Northern Marianas citizens as part of the development package. Timetable for completion of the project is under negotiation as is the final lease agreement. The golf course site is upwards of 200 acres on a high plateau overlooking the western coastline.

Financial Allocations

Table 10 indicates the proposed financial allocations for recreation and community event projects as identified in the Socioeconomic Development Plan. Additional funds are also being allocated for recreational facilities to be developed in conjunction with educational facilities (See Table 11). Where necessary, trail and access roads to beaches on public lands will be constructed and maintained by the Public Land Corporation. Where the beaches are heavily used, their access will be part of the road pattern developed and maintained by the Department of Public Works. It is anticipated that well kept paths to such major tourist points as the tip of Tagpochau, Bird Island, Banzai Cliff, etc. will be constructed and maintained by the Public Land Corporation. Funds for these operations are included in the operating funds budgeted for agencies. Additional funds may be available from the Bureau of Outdoor Recreation of the U.S. Department of the Interior. The Marianas Visitors Bureau should assume responsibility for the maintenance of public beaches and points of tourist interest with funds from the beverage tax and a grant from the NMI government. Government funds totalling \$188,000 are provided as a subsidy to MVB for this purpose.

Table 10

Northern Mariana Islands Projects for
Recreation and Community Events

(Thousands of dollars)

Type of Activity	FY 1978	FY 1979	FY 1980	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	Total 1978-85
Managaha renovation.	35	35	--	--	--	--	--	--	70
Historical preservation (matching funds) a/	50	50	--	--	50	--	--	150	150
Village picnic and recreational facilities	10	10	10	25	25	25	25	25	155
Public sports center tennis courts.	--	--	--	--	--	--	--	100	100
Public sports center playing field improvement.	--	--	--	--	--	--	--	100	100
Memorial park.	50	50	50	--	--	--	--	--	150
Total.	145	145	60	25	75	25	25	225	725

a/ Japanese Hospital, Light House, Banzai Cliff, Suicide Cliff, Rota Quarry, Taga House, Matching funds required to meet available grants from U.S. Department of Interior.

TABLE 11

EDUCATION AND RECREATIONAL FACILITIES

<u>Facility</u>	<u>Funds</u>	<u>FY Budgeted</u>
Recreational Equipment	\$ 49,000	Operations
School Ground Recreational Facilities (playground, ballfield, etc.), Saipan, Rota, Tinian	200,000	1979 - 83
Marianas High School; covered recreational building (basketball court, stage, office, etc.)	487,000	1981 - 83
Maintenance of school recreational facilities	Included in school maintenance	Operations

PUBLIC SAFETY

EXISTING CONDITIONS

Physical facilities for public safety services on Saipan presently consist of a police headquarters, a set of detention cells, a communal jail, and a fire station, all located within the Civic Center. The headquarters and criminal detention cells are housed in one building with the communal jail located in a separate building to the rear of the headquarters.

Public safety equipment include: 15 police vehicles, half being late model; a police radio system consisting of a base unit and portable units in each vehicle; a pumper and a tanker truck assigned to the Civic Center fire station; and two fire trucks permanently stationed at the International Airport. The two airport trucks, one being a crash/fire/rescue truck and the other a back-up tanker, provide water and foam concentrate extinguishing capability in the event of an aircraft mishap.

The existing facilities and equipment for police services are basically adequate, requiring only additions to and timed replacements of the vehicle stock as well as expansion of the communications capability to provide full coverage of Saipan. Despite the establishment of a booster facility on Navy Hill, several areas cannot be reached by the communication network due to the constraints imposed by topography.

The corrections facilities are sorely inadequate for several reasons: No separation of adult male and juvenile offenders is possible during the day in the communal jail; no separate area is available for females other than detention cells; and the detention cells are not provided with basic sanitation facilities.

The fire fighting capability on Saipan is weak. Existing fire trucks and other fire apparatus, with the exception of the airport trucks, are in poor operating condition and need early repair or replacement. Of crucial concern is the lack of radio communication units in any of the vehicles.

PLANNING FACTORS

The mission of police and fire fighting forces is to protect the safety of the public. At the least, adequate response to the threats of criminal activity and the devastation of a fire must be provided. Thus, the planning of any capital improvements should be based on the need to respond quickly and effectively to these elements that threaten the public's safety.

Crime is believed to be increasing in the Northern Marianas, particularly on Saipan. Increase in crime is a function of many variables which are difficult to analyze for relative importance. It is likely, though, that limited police capabilities in crime prevention and law enforcement, as well as marginally effective corrections programs, have been strong contributing factors.

Fire fighting response to the immediate Susupe/Chalan kanoa area is estimated to be from five to eight minutes. Response times to other areas are even longer, which certainly do not reduce the threats to life and complete property losses that might result from fires in remote areas.

In determining necessary improvements, the provision of effective corrections facilities that separate female from male offenders and repeat from first time criminals has been considered a desirable objective.

Additionally, fire response times of three to six minutes for the downtown area and no more than ten minutes to other areas have guided the determination of fire fighting capital improvements.

Improvements to police vehicle stock as well as the expansion of the police and fire communications capability are necessary. However, these will be undertaken as part of operational improvements. Thus, these are not addressed further in this section.

RECOMMENDATIONS

The recommended capital improvements are enumerated as follows:

- * Construct a female cell block within the Civic Center jail and provide sanitation for each cell in the present facility.
- * Construct a new NMI corrections facility for adults to provide effective, but minimum security detention.
- * Construct a youth correction facility which would provide the needed separation between repeat adult, and youthful, first time offenders.
- * Purchase an attack pumper to increase fire response capability for the Civic Center Fire Station.
- * Construct a fire substation in Garapan to reduce response times to population centers in this area.

During the Short Range Plan, a total of \$1,270,000 has been allocated for these improvements. Each recommended improvement, along with its costs, is briefly outlined below.

Civic Center Jail

The detention cells in the existing jail should primarily be utilized as a lock-up facility for detention of those persons apprehended and awaiting arraignment. Female prisoners would also be incarcerated in this facility. Thus a new cell block, sight and sound-proof with respect to the other blocks, is required. Each cell must also be provided with sanitation facilities, a basic requirement for improvement of prison conditions. Costs for these renovations are estimated to be approximately \$25,000.

NMI Medium Security Corrections Facility

A medium security facility is proposed primarily for the incarceration of non-felony, male offenders. (Felony prisoners require maximum security facilities which would be prohibitively costly to construct. Thus, they are to be incarcerated at off-island facilities through a contract arrangement). The initial facility should accommodate 25 inmates, provide vocational rehabilitation facilities, include agricultural lands suitable for cultivation, and provide recreation facilities, both indoor and outdoor.

Costs for the new facility will amount to \$625,000, including design, construction, and equipment. The facility is expected to be designed in FY 1978 with construction and equipment purchase budgeted for in 1979. Initial plans are to locate the facility in the Kagman area.

Youth Corrections Facility

Late in the plan period, a separate Youth Correction Farm should be developed for juvenile, male offenders. The NMI corrections facility may thus be reserved for adults. The youth facility would be similar to the adult facility, however, it would be minimum security and costs are expected to amount to \$325,000. This facility is also recommended to be constructed in Kagman.

Saipan Fire Equipment

A 250 gallon "attack pumper" is needed to immediately strengthen the service efficiency and response capability of the Civic Center Fire Station. The pumper is small, but highly mobile and should suit the requirements of Saipan's population. Estimated cost of the pumper is \$25,000.

Garapan Fire Sub-Station

Tentatively, Garapan has been chosen as the location for a new sub-station. The facility will enable quick response to fires in the area which will be especially critical as the population of the island expands over the next five to ten years. Design, construction and equipment costs will be approximately \$230,000. Design and construction are expected to occur in FY 1983 with equipment purchases to be made in 1984.

HOUSING PROGRAM

The goals and objectives of the Housing Program as identified in this Plan are:

- * To provide decent, safe, and sanitary houses for the people of Saipan and the Northern Mariana Islands;
- * To develop inexpensive houses through various homestead assistance programs;
- * To develop house plans that incorporate conservative features, allow for future expansion, and still meet the criteria of decent, safe, sanitary and inexpensive houses;
- * To provide as many amenities and infrastructure improvements to the homestead housing sites without significantly increasing costs to the prospective residents; and
- * To encourage the development of total housing packages by private developers through provision of incentives such as release of available public lands at nominal costs.

In addition to the above goals and objectives, a policy to provide various subsidies, those mentioned in the Socioeconomic Plan or otherwise stated herein, should be pursued by the government.

EXISTING CONDITIONS

There are approximately 2500 housing units on Saipan of which only 1000 are capable of meeting minimum housing code standards for decent, safe, and sanitary homes. More than half of the present housing stock must therefore be upgraded during the plan period. In addition, socioeconomic planners have identified a need for 100 new units each year to meet increasing population growth. It is thus projected that some 2300 units will be needed during the plan period to properly house the residents of Saipan.

In Table 12, projections of housing construction under the aegis of the Mariana Islands Housing Authority or by private developers are shown. These projections indicate that at the most approximately 1210 units could be constructed.

Another 400 units, assuming 80% of all housing construction occurs on Saipan, are anticipated under the Homestead Housing Assistance Program as identified in the Socioeconomic Plan. A total of 1610 units could therefore be constructed during the initial seven-year plan period.

Unfortunately, the above figures indicate that replacement of substandard homes can barely be accomplished and that housing needs due to population increases will not be met. Perhaps a more vigorous construction program should be pursued by the government.

Homestead Housing Program

The major focus of the government housing program is the Housing and Village Homestead Program. The Socioeconomic Plan has set aside a total of \$5.555 million for the construction of 500 housing units, together with bare essential infrastructure (power, water, roads). Currently, it is felt that homestead areas should be subdivided into one-quarter acre lots (approximately 10,000 square feet) serviced by paved roads, water and power. These lots are adequately sized for septic tank disposal of wastewater. It should be noted that the cost for septic tank installation was inadvertently left out of the housing costs as estimated in the Socioeconomic Plan.

TABLE 12

PROJECTED HOUSING CONSTRUCTION FOR SAIPAN

<u>PROGRAM</u>	<u>HOUSING UNITS (YEARLY)</u>	<u>TOTAL # UNITS (PLAN PERIOD)</u>
MIHA Federal (150 Yearly)	130*	910
Private	<u>45</u>	<u>300</u>
Totals	<u><u>175</u></u>	<u><u>1210</u></u>

* Based on the assumption that 80% of total projection would be constructed on Saipan. The Socioeconomic Plan proposes the construction of another 500 units under the Homestead Housing Assistance Program.

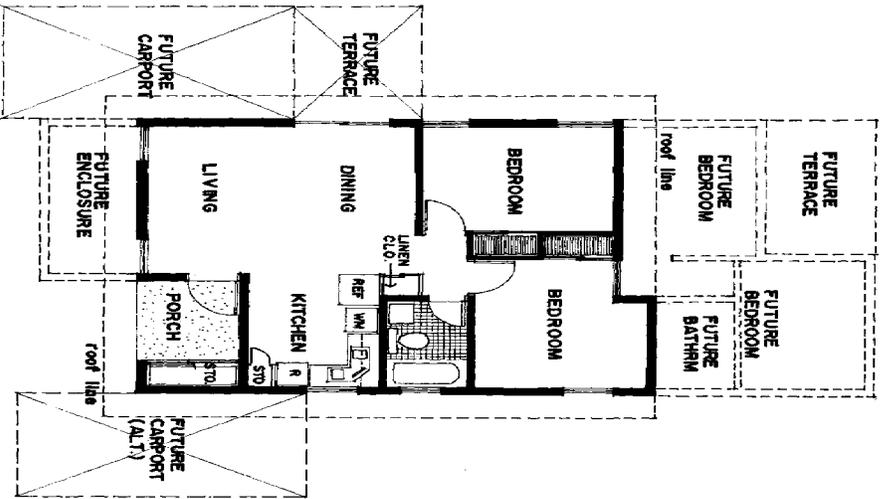
Planning and survey work is currently underway for the As Perdido Subdivision located in the old Kobler Field area. The project, which was funded by the previous Legislature, involves the creation of a village homestead complete with 300 + lots, commercial and government facilities. The first phase calls for the planning, surveying, and mapping of the basic lot and the subdivision. The second phase calls for engineering design of the infrastructures.

Because sewerage facilities are available nearby, the lots will eventually be sewerred. However, the use of septic tanks for disposal of sewage is initially required, hence the lots are being minimally sized as quarter-acre lots.

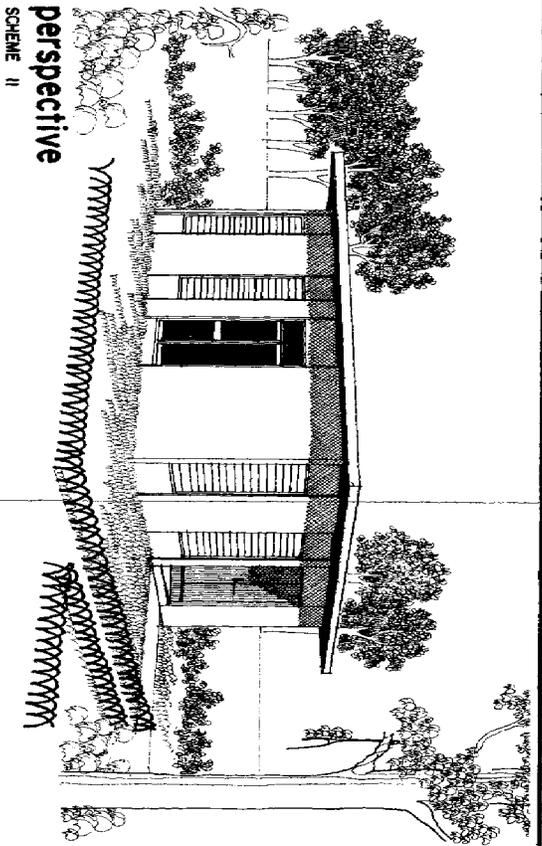
HOUSE PLANS

One of the objectives of the housing program is to develop typical houses plans for use by local residents in the development of their homesteads. Accordingly, two schemes have been developed and are graphically represented in Plates 19 and 20. The major features of the plans are summarily outlined as follows:

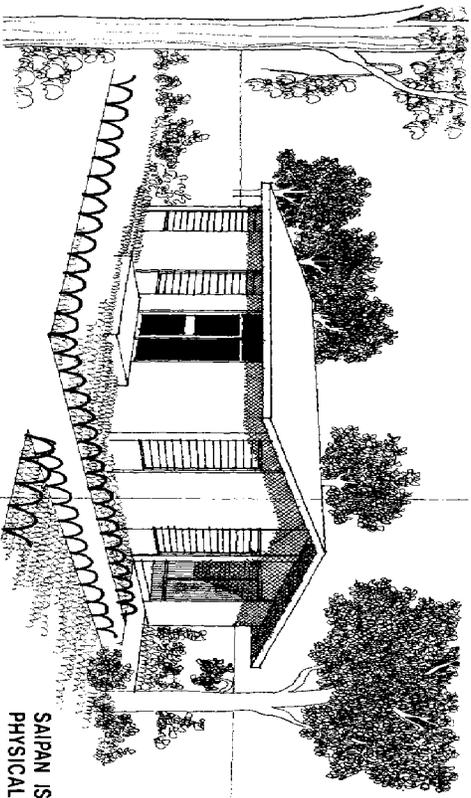
- * Minimum floor area should be 704 square feet (This differs from the 550 square foot floor area as recommended in the Socioeconomic Plan).
- * Each house should include two bedrooms and a bathroom arranged to facilitate future expansion.
- * The living, dining and kitchen areas should be contiguous open spaces to provide maximum flexibility for the large families that typify the average family unit in the NMI.
- * Laundering appliances should be protected from the elements to prevent rapid deterioration. Space can be allocated in the kitchen area or, as indicated in Plan B, Scheme II, by provision of a utility room between the kitchen and bathroom.
- * All fixtures requiring plumbing connections should be placed back to back along one plumbing wall to achieve maximum economy.
- * A poured-in-place concrete slab on grade is the most economical and practical floor material and should be standard flooring for the homes. Termite infestation of wooden floors and dry or wet rot problems make wooden floors undesirable.
- * The bearing walls should be constructed of reinforced concrete masonry units with a bond beam at the top and a cement plaster finish on the outside wall. These walls are most economical unless large tract developments are contemplated which make tilt-up pre-cast concrete panels competitive.
- * The climatic conditions, especially given the character and intensity of typhoons make it desirable that concrete slabs be used for the roofing of the standard home. Greater peace of mind and security during a typhoon are assured by concrete roofs. Moreover, given the substantial investment in a home that a person makes, protection from the



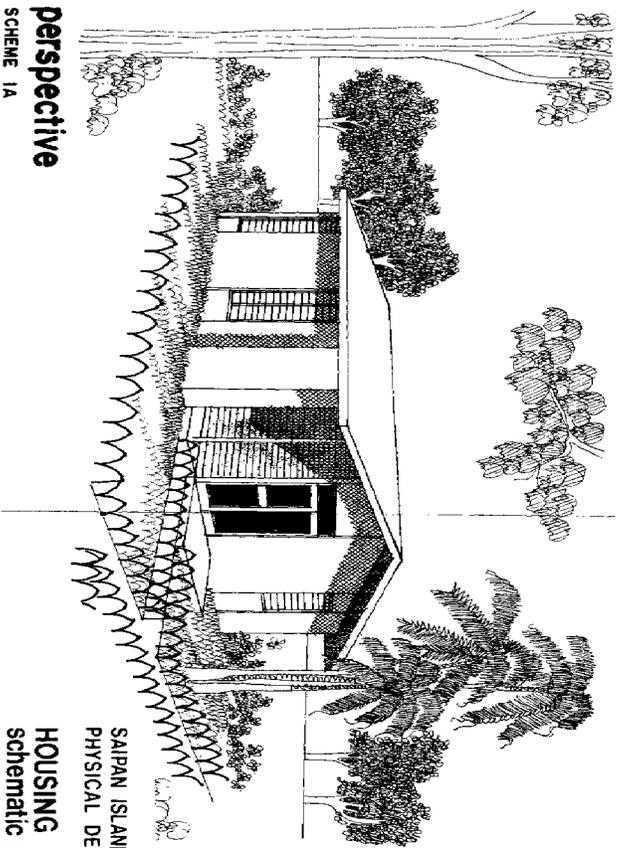
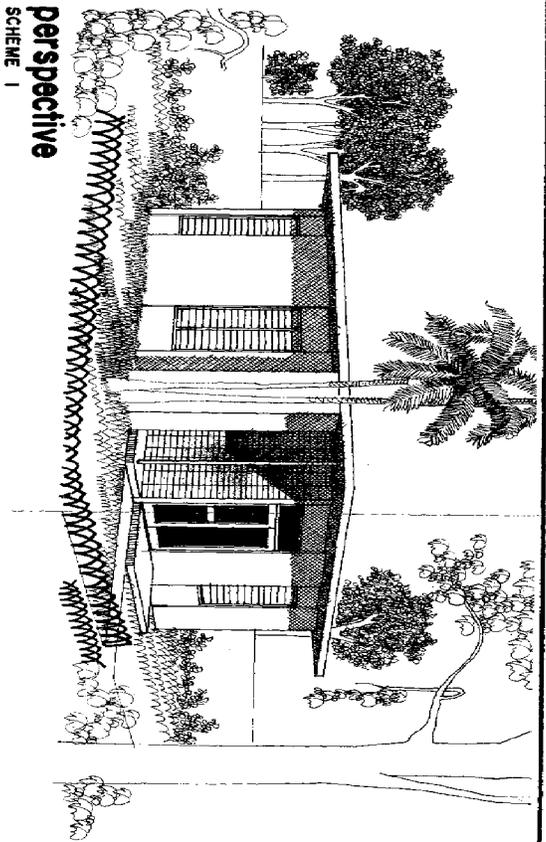
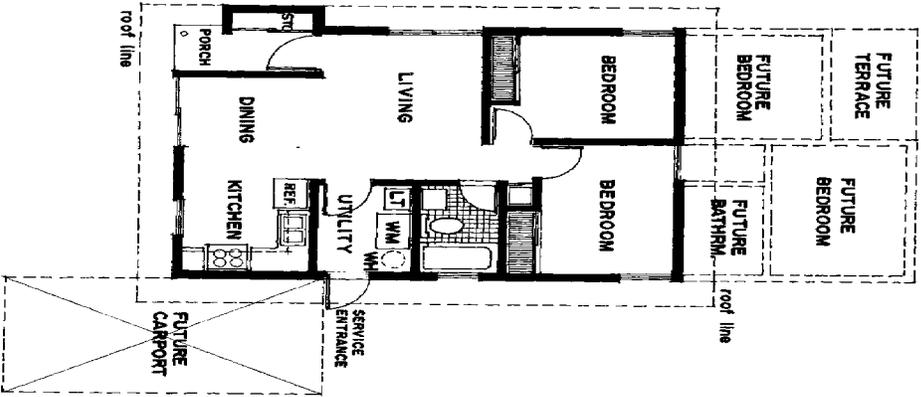
FLOOR PLAN
 AREA (FLOOR) = 738.00 SQ. FT.



perspective
 SCHEME 11



perspective
 SCHEME 11A



devastation of typhoons is most desirable. Low-income families are not in a position to constantly rebuild or repair homes and if a substantially typhoon-proof home can be provided to these people then a major burden on future expenses can be removed.

- * The interior side of the concrete masonry unit walls can be exposed with struck joints and left unpainted without seriously affecting the livability of the home. The homeowner also has the flexibility to paint the walls at a later date.
- * Gypsum plaster drywall panels on metal studs are inexpensive yet effective materials for interior partition walls.
- * Hanging closets in the bedrooms should be left doorless to realize economy in the cost of the standard home.

Replacement of unsafe homes for low income families with standard homes such as detailed above appears to be a reasonable approach for the government to pursue. These standard homes are fireproof and reasonably comfortable to live in yet they can be constructed at minimum costs. Large savings for the low-income person are realized through the omission of "extra" cost items such as tile finishes over concrete floors, paint finishes over the masonry walls, doors on the closets and ceiling light fixtures (equally effective lighting is achieved by simply providing outlets for plug-in fixtures). Of course, the homeowner does have the option to provide these "extras" but the initial cost of the home can be reduced without affecting the safety, or health of the family and the habitability of the home.

House Plan Cost Estimates

Table 13 outlines preliminary cost estimates for each scheme based on the minimum finishes and features enumerated above.

TABLE 13

HOUSING COST ESTIMATES

	Scheme 1	Scheme 2
Concrete and Masonry		
Roof Slab (2500 psi)	\$1,365.00	\$1,540.00
Footings (2000 psi)	408.00	420.00
C.M.U. Walls	2,780.00	2,920.00
Carpentry		
Closet, cabinets	2,388.00	2,628.00
Louvres	562.80	651.00
Doors	1,197.00	912.00
Electrical Outlets	770.00	840.00
Plumbing		
Outlets	375.00	375.00
Water Heater	120.00	120.00
Forms	990.00	990.00
Hardware	100.00	100.00
Sub-Total	<u>\$11,055.80</u>	<u>\$11,496.00</u>
30% Labor	<u>3,316.74</u>	<u>3,448.80</u>
	<u>\$14,372.54</u>	<u>\$14,944.80</u>

These cost estimates appear to be very disproportionate to estimates identified in the Socioeconomic Plan and also seem to indicate that the minimally standard home may be beyond the reach of low income families. However, these discrepancies are justified and elaborated upon as follows:

Perhaps the greatest differences between the standard homes recommended in the Socioeconomic Plan and in this plan is the size of the floor area - 550 square feet as recommended in the Socioeconomic Plan versus 704 square feet recommended in this plan. It is the contention in this Physical Development Plan that 550 square feet will inadequately accommodate the average family in the NMI.

Another difference lies in the bare conveniences to be provided for the home. The Socioeconomic Plan provides no more than a concrete structural shell, lacking such necessities as cabinets and closets. Such "amenities", as they are treated in the Socioeconomic Plan, can be provided without adversely affecting monthly mortgages albeit a change in financing strategies becomes necessary. This change is detailed as follows.

The costs as outlined in Table 13, would amount to a monthly mortgage (assuming 5% interest for 20 years and the application of the various cost reductions for materials and labor identified in the Socioeconomic Plan) of between \$63 to \$65. However, should the duration of the loan be extended, i. e., from 20 years to 30 years, costs for standard homes recommended in this plan can be reduced to approximately \$51 or \$53 per month.

Thus the standard home recommended in this Plan complete with a concrete roof, closet (without doors), and cabinets is well within the reach of low-income families yet is a substantial improvement over the Socioeconomic Plan's standard home. The GNMI should seriously consider adopting a policy

to extend 30 year loans to the low-income homesteaders if the objectives of the housing program are to be realized.

Should such a policy be undesirable, the schemes presented in this plan can be modified to reduce costs even further without reducing comfort. Aluminum roofing which may reduce costs about \$1500 to \$2000 is an option many may find more comfortable especially when designed so as to reflect heat off the roofs. The roofing can also be designed to withstand strong winds and provide protection from typhoons.

It must be understood, though, that the margin of safety is much smaller and thus homesteaders may suffer from feelings of insecurity and anxiety during storms.

The construction of septic tanks that meet Public Health standards is a major item that has not been included in Table 13. Septic tanks together with the leaching fields are estimated to add an additional \$1,500 to the construction cost. The two major cost items in the installation of septic tanks are the digging of the hole and construction materials. As indicated in the Socioeconomic Plan, these costs can be reduced through government subsidies. Providing concrete blocks for the walls and pipes for the leaching fields on a discount basis, as well as possibly doing the actual digging are forms of subsidies which the government would find reasonable to pursue.

The house schemes, whether constructed with concrete or aluminum roofs, should be developed into complete house plans with electrical and plumbing design. The complete plans should be reviewed by the Building Permit Section and given a blanket seal of approval for all schemes.

The plans should then be made available to the indigenous and welfare case families with the permit fees waived, provided that a homestead lot has been made available to them.

SITE DEVELOPMENT AND SUBDIVISION PLAN

A site development and subdivision plan for homestead areas is not made part of this Physical Master Plan. A meaningful site plan can only be generated once accurate topographic maps and geological investigations are conducted. Since the sites themselves have not been selected (other than the As Perdido Subdivision) or have not been surveyed, recommendations for a typical subdivision layout would be invalid at this time.

To illustrate the point, different criteria govern the design of subdivisions on hillside properties from those on flat terrain. Beyond an approximation that lots would be laid out roughly 100 by 100 feet, substantive expressions cannot be made with any certainty. Street sections and geometric configurations for example would differ from one site to the other.

In the selection of a homestead site serious consideration must be given to the manner in which sewage disposal is to be accomplished. The use of septic tanks and leaching fields require larger parcels than sewer house lots. Consequently the costs of the other infrastructure (roads, water and power) increase on a per lot basis. On the other hand, sewer collection systems are expensive, especially if an interceptor line is required. (See costs comparison herein). In the process of making a trade-off evaluation, it should be noted that a sewer subdivision allows for more units per acre than in unsewered developments. Furthermore, in any decision process regarding locations for homestead subdivisions, consideration should also be given to novel and innovative methods such as package treatment plants, lagoons, etc.

Construction Costs for Site Development

In spite of the lack of a typical subdivision layout, construction costs can be generalized. Careful note should be made however that only a magnitude of costs is inferred and that actual costs will be subject to conditions at each site. The concerns previously raised especially with regards to differences between hilly and flat terrain also apply to the costs outlined below:

Roads, Residential and Rural 20-foot travel surface with 4' to 5' stabilized shoulders at \$31.50 per ft. x 100'.....	\$ 3,150
Water lines 6" diameter with hydrants and appurtenances \$25 per ft x 100'	2,500
Power lines at \$50,000 per mile of unhardened lines or \$9.50 per 100'	<u>950</u>
TOTAL FOR 100 LINEAL FEET	<u>\$ 6,600</u>

Assume lots on both sides - $\$6,600/2 = \$3,300$ per lot.

If the costs of septic tanks and leaching fields are added to the above figure, the costs of development will be \$4,860 per lot exclusive of the house pad.

For sewerred lots, assuming a 75-foot frontage (for a 75' x 100' lot), and assuming that a sewerage system is available nearby, the following tabulation is made:

Roads, water and power .75 x \$3,300	\$ 2,475
Sewer lines, 8" diameter with appurtenances \$35 x 75'	<u>2,625</u>
TOTAL	<u>\$ 5,100</u>

As can be seen from the above calculations, the difference between sewered and unsewered homestead lots is not excessive. The advantages of sewered lots, however, are significant - better utilization of homestead sites, better sanitation, reduced incidences of pollution, etc.

Other costs associated with mass housing developments are the costs of the pads for the housing unit itself. Again, depending on topographic and soil conditions this may vary considerably from site to site. The minimum pad required should consist of at least 6" thick compacted coral base and extended 6 feet from the exterior walls of the house. A 24' x 30' house (Scheme II), would therefore need a pad of 36' x 42' or 1,512 square feet. If coral costs \$10 a cubic yard, this item adds another \$300 per lot.

From the above discussion it is also apparent that the Socioeconomic Plan understated the cost of developing housing within the homestead program. Instead of constructing 500 units within the Plan period, a more accurate estimate based on the CIP money being set aside for this program, is 350 units.

HOUSING PROJECTS BY PRIVATE ENTERPRISES

One of the objectives for housing in the Socioeconomic Plan is to "make the maximum possible use of private enterprise in attaining NMI housing goals". The government would do well to encourage private developers as the use of public funds can be minimized.

Several innovative low-cost housing projects were initiated and successfully completed in the Territory of Guam. Two such projects involved the use of government-owned properties. The properties were turned over to private developers at

very nominal fees (amounting to \$350 per lot), which were then developed as low-cost housing areas. The developments included complete infrastructure facilities -- streets with sidewalks, utilities, park sites, and 3 and 4 bedroom houses. The developer was required under contractual agreement to develop the total package and sell the house and lot at certain pre-arranged prices.

We envision a similar situation taking place on Saipan. Once a site and the developer are selected, and the development concept approved, the developer proceeds on a 'turnkey' basis to perform all the necessary tasks from survey to construction to sales without the further encumbering of public funds. If handled properly, this program can add 500 units to the housing market within the plan period. These homes would most likely sell in the price range of \$20,000 to \$25,000. Granted, these prices may be out of the reach of 85% of the people of the Northern Marianas now, but it is conceivable that about midway through the plan period, certain people would be in a position to afford these houses.

Certain government lands have been identified as suitable for this purpose. The Capitol Hill site and a homestead area in Marpi are potential development sites. Infrastructure development costs at each site will be minimal since water and power are available nearby.

There are large parcels of private properties that are also suitable for this type of development. A more practical program alternative may thus be arranged for exchange of government-owned land for private properties.

It is recommended that the housing agency initiate preliminary work to identify the most favorable site for such a development early in the plan period. The methods of financing should be studied, approved, and the listing of priorities

by income and need established. After financing and program policies and procedures have been established, construction may be implemented by conventional contracting methods or on a 'turnkey' basis.

LOWER BASE INDUSTRIAL PARK

EXISTING CONDITIONS

Lower Base Industrial Park is located on Puntan Flores in the vicinity of Tanapag Harbor. Presently, an area of approximately 45 acres accommodates warehouses, supply buildings, two central repair shops and offices of the Northern Mariana Departments of Public Works and Education. A privately-owned office and batch plant as well as a 2.7 acre parcel for a cemetery are also located within the park area.

Although the industrial park is served by road, power, sewer, water and drainage facilities, the present infrastructure is inadequate and will require improvements if expansion and development of the park is to be achieved. The existing conditions of the infrastructure are summarized as follows.

Roads

The main access road into the park area is paved. However, the present entrance point, immediately north of Charlie Dock, requires improvements to the existing box culvert and realignment of the existing road section. Realignment and reconstruction of the roadway is necessary to improve circulation between the Harbor and the industrial area.

With the exception of several narrow surface roads and the main access, there are no other paved roads through the park area. Service and maintenance roads, in particular the roads leading to the Education Office, are only coral-surfaced. These roads should be paved to provide convenient access for industrial park tenants and patrons.

Problems with certain intersections have also been identified within the park area. In anticipation of the increases in

industrial-related traffic, specifically trucks and other cargo carriers, these intersections will require improvements especially with respect to turning radii.

Water and Power

The water and power facilities into the park area appear to be inadequate by virtue of both their size and their service area. The existing water line is a four-inch pipe connected to a six-inch transmission line running adjacent to the east side of the park (West Coast Highway). Replacement of the existing pipe as well as extensions into other areas of the park are anticipated. The existing power lines should be relocated to follow the major rights of ways. Extension of power lines to provide service to presently vacant lands is also necessary.

Wastewater

Wastewater collection lines within the park area are virtually non-existent. The present sewer line extends only about 390 feet into the park and presently serves only the NMI Public Works complex. Since industrial activities, possibly including a cannery, are expected to develop within the area, adequately sized sewers will be necessary.

Drainage

The inadequacy of the existing drainage canal to convey storm runoff from adjacent areas through and away from the industrial park area is perhaps the most severe constraint affecting industrial park expansion.

The existing canal has been poorly maintained resulting in heavy siltation and overgrowth in the inland portions of the canal. Storm runoffs from a 1400 acre watershed, upland of the industrial complex, flow into these flatlands. The blockage in the canal causes the waters to overflow and flood land that can be utilized for industrial development. Estimates

of the flows during a 50 year storm indicate that as much as 5800 cfs can be expected, a magnitude of flow that cannot be entirely dissipated by percolation and must therefore be conveyed away by other means.

To further complicate matters, poor construction practices have resulted in the impoundment of surface runoff from the existing development. Further development can only be expected to aggravate the situation and invite more serious flood conditions if proper drainage facilities are not provided.

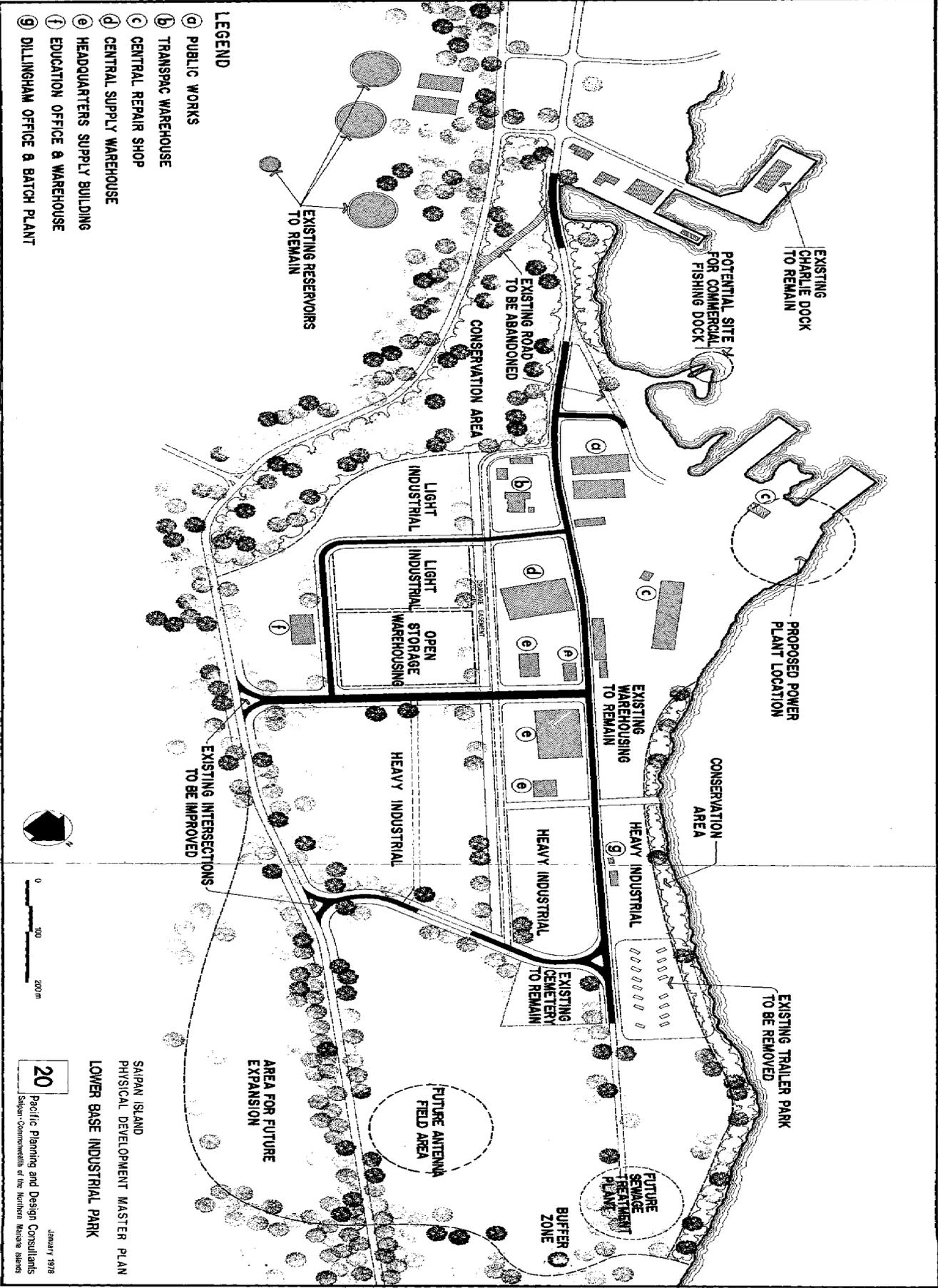
PLANNING FACTORS

The extent of industrial development that will be realized is a function of the economic stimulation from outside investment and will be affected by whatever provisions may be imposed on the lease of lands in the industrial complex. It is anticipated that policies involving low rents, long term leases, construction of buildings to suit manufacturing interests, as well as the provision of infrastructure at the cost of the GNMI, will be developed to encourage foreign investment in the NMI. Such policies, if successful, may result in the complete utilization of all the areas designated for industrial activities.

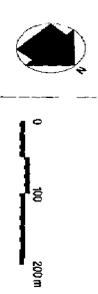
Land Use

The overriding determinants of infrastructure requirements are the proposed land uses for the area and the extent of development that is anticipated. Plate 18 depicts the particular zones that have been designated for the expansion of industrial activities.

A 13.2 acre light industrial zone has been designated for accommodating activities of a light manufacturing nature such as lumber yards and research. This zone will be located to the east of the existing Transpac warehouse and Central Supply warehouse.



- LEGEND**
- ⓐ PUBLIC WORKS
 - ⓑ TRANSPAC WAREHOUSE
 - ⓒ CENTRAL REPAIR SHOP
 - ⓓ CENTRAL SUPPLY WAREHOUSE
 - ⓔ HEADQUARTERS SUPPLY WAREHOUSE
 - ⓕ EDUCATION OFFICE & WAREHOUSE
 - ⓖ DILLINGHAM OFFICE & BATCH PLANT



SAIPAN ISLAND
 PHYSICAL DEVELOPMENT MASTER PLAN
 LOWER BASE INDUSTRIAL PARK

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 Pacific Planning and Design Consultants
 Saipan, Commonwealth of the Northern Mariana Islands

January 1978

Adjacent and north of the light industrial zone, open storage warehousing and perhaps wood processing industries are anticipated and a 6.4 acre parcel has been reserved for such uses.

A proposed heavy industrial zone encompassing three parcels totaling 38.9 acres will be located north of the light industrial and open storage zones. Manufacturing plants, fuel processing, construction material batch plants, are typical activities to be accommodated in this zone.

Finally, the land use pattern in the industrial park will also allow for the proposed location of several public facilities including a new power plant and a new sewage treatment plant. The power plant is to be sited west of the Public Works complex near the existing seaplane ramp. Present plans for the location and sizing of the sewage treatment plant are to provide approximately four acres of land north of the existing trailer park.

RECOMMENDED IMPROVEMENTS

The improvements necessary for developing the industrial park require an expansion of the present facilities. These are enumerated as follows:

- * Perhaps most importantly, the drainage system must be improved so that land, the essential resource in this area, is made available for development.
- * The existing coral roads must be paved to provide convenient access to the buildings and other areas of the park.
- * Water lines of an adequate size and quantities to meet industrial demands, especially those of food packaging and processing plants, must be constructed. The water distribution system must be adequate for fire fighting capability.

- * The wastewater collection system must be extended into the park, particularly as the industrial wastes must be conveyed to treatment facilities before disposal.
- * The power system must be extended and the system hardened so that service is improved as well as protected (to the extent possible) from the devastating effects of tropical storms or typhoons.
- * Fencing of certain areas must be provided for the security of buildings and/or equipment.

Drainage

A drainage study for the Garapan area including the Industrial Park should be conducted to refine estimates of design storm flows that must be handled by the drainage facilities. The study is estimated to cost approximately \$100,000 to be jointly funded from CIP funds for the Industrial Park development and the American Memorial Park. It is anticipated that \$50,000 from the Industrial Park funds will be expended for the drainage study.

Actual drainage improvements must await the results of the study. Preliminary investigations have identified, however, the need for three drainage culverts, estimated to cost approximately \$140,000.

Construction costs totaling \$300,000, including the \$140,000 for culverts, have been anticipated and should be funded out of the CIP funds for the Industrial Park development.

Roads

To provide adequate access to the park approximately 8,800 feet of roads are to be paved. Two twelve-foot wide travel lanes and stabilized eight-foot shoulders are minimally recommended. The travel surfaces are to be paved with three inches of asphaltic concrete -- a feature designed in anticipation of

industrial truck traffic -- and the costs will approximate \$55 per linear foot, or \$490,000. These funds are to be derived from the local CIP funds as Federal Highway Act aid cannot be extended to access roads.

Water

The water lines in the park area consist of four-inch and six-inch lines which presently serve only a portion of the lands. It is anticipated that the lines, especially the four-inch lines, will be replaced with at least six-inch lines and that the network will be expanded to serve other portions. Fire fighting capability will be an integral aspect of the water improvements.

The costs of improvements are approximately \$205,000. This would include roughly 6,600 feet of eight-inch lines and 2,000 feet of six-inch lines. The existing six-inch lines may be retained provided that actual field investigations indicate the lines are in good condition.

Sewer

A main sewer line as well as service lines totaling 8,000 feet, are required within the park area. The 8,000 feet of line (size has not been exactly determined) will cost approximately \$340,000 to construct. The extension of the sewer line is anticipated to be part of the overall sewerage system improvements for Saipan. A sewage treatment plant is to be located within the Industrial Park and the main line leading to the plant is anticipated to be routed through the park. Thus the only sewer lines that need to be funded from the Industrial Park funds are the service lines to the different parcels within the park area. These are expected to cost approximately \$87,400. However, a new pump station will be required, the cost of which will be dependent on the size of

the station. It should also be noted that EPA funding for the improvements remains a possibility and such funds should be pursued.

Power

There are plans to construct a new power plant within the Industrial Park. Construction of the plant will require the relocation of the main transmission lines within the park.

Aside from this relocation, the power distribution system is to be extended and hardened. The extension is required so that power utilities may be provided to areas presently without service. It is anticipated that service lines to individual lots and/or businesses will be provided with underground power connections. The underground connection will provide protection from typhoon winds. The improvements to the power system will also include the installation of street lights. The lighting is necessary for security and nighttime visibility within the park area.

Total costs of the power improvements have been estimated at \$100,000. Funds for these improvements will be derived from the CIP monies for the industrial park development. It is doubtful that federal funding will be available for any of the power improvements.

Security Fencing

It is proposed that security fences be provided for certain zones within the Industrial Park. Initially, the light industrial areas will be fenced with a chain link or equivalent fence. An area of approximately 13.2 acres will be fenced in requiring roughly 3,600 feet of fencing. Estimated cost of the project is \$53,900. The monies are to be derived solely from the Industrial Park development funds.

Improvements Beyond the Short Range Plan

Further expansion of infrastructure is anticipated for the period beyond the immediate 1978-1985 planning horizon. Expansion and extension of service roads, water, power and sewer lines totaling approximately \$425,000 will enable the development of additional lands especially for heavy industrial activities.

CIP funds have not been allocated beyond the year 1985, consequently these improvements have not been scheduled for any particular year. Although federal aid may be available for certain improvements, especially the wastewater system improvements, it is anticipated that the extent of federal involvement will be minimal. Consequently, local funds must be assured if these improvements are to be completed.

Funding Scheme

The Industrial Park development is to be phased over the seven-year plan period, dictated by funding constraints. The Socioeconomic Plan has identified and earmarked \$950,000 in CIP monies for proposed improvements. The specific yearly allocations of CIP funds identified in that plan are shown in Table 14 as local funding.

It is anticipated that construction costs for improvements will exceed the budgeted amounts primarily due to the need for more extensive infrastructure requirements than were originally anticipated.

Since the Industrial Park is essential to the economic development of Saipan, it may be possible to solicit funding aid from the Economic Development Administration (EDA). Such aid is granted on a 50% cost-sharing basis, but is subject to the non-availability of other federal funds. For certain improvements, specifically roads, water, and drainage, EDA

Table 14

SCHEDULE OF INDUSTRIAL PARK INFRASTRUCTURE IMPROVEMENTS

<u>Fiscal Year</u>	<u>Action</u>	<u>Estimated Cost</u>	<u>Local* Funding</u>	<u>Other** Funding</u>
1978	Drainage study, and Master Plan and De- sign.***	\$ 150,000	\$ 150,000	---
1979	Construction	246,900	175,00	\$ 71,900
1980	Construction	246,000	175,000	71,900
1981	Construction	311,000	200,000	11,000
1982	Construction	<u>371,600</u>	<u>250,000</u>	<u>121,600</u>
		\$1,326,400	\$ 950,000	\$ 376,400

* As allocated in Socio-Economic Plan.

** Includes EPA, EDA, EDLF, and lease repayment fund sources.

***To include detailed site and facilities planning as well as design of the infrastructure.

funds will be required and can be justified as the appropriate federal agencies cannot participate in the development of an Industrial Park. Another potential source is the funding of initial capital investments from the Economic Development Loan Fund (EDLF) granted to GNMI by the Covenant. The loan can then be repayed out of the lease of lands within the Industrial Park.

Finally, the joint development of the Harbor and the Industrial Park can be a potential source of additional funding. Again, EDA could be solicited to fund the joint development, especially since both the Harbor and the Industrial Park are integrally related to the economic development of Saipan.

CAPITOL HILL COMPLEX

An important resource of the NMI is the Capitol Hill complex consisting of 100 single family residences, 15 apartment units, and 12 administrative buildings. The complex contains over 88,000 square feet of office space.

The complex was built by the Naval Technical Training Unit (NTTU) in the 1950's. The buildings were constructed of pre-cast concrete panels and, in spite of some serious leakage problems due to the method of construction utilized, they are in relatively good condition. Structurally, both the residential units and the office buildings remain sound. Consequently, the useful life of the complex is expected to last beyond the present plan period (1978 to 1985).

The disposition of the Capitol Hill facilities will be a major consideration of the new Commonwealth government. Currently these facilities are being used by the TTPI government as headquarters and residences for expatriot workers and their families. By 1982, the executive branch of TTPI should be relocated, and the Capitol Hill complex vacated. By then a mechanism for disposing of the facilities should be implemented. It is highly recommended that the TTPI departure and the disposition plan be coordinated effectively to ensure that the units are not left vacant for long.

PLAN ALTERNATIVES

As mentioned above the Capitol Hill complex consists primarily of residential units and office buildings. Several alternatives are proposed for disposing of the housing units, and these are enumerated below:

- * Property Exchange Program
- * Government Assisted Housing for Low Income People
- * Privately Managed Housing development
- * Development of High-Quality Resort

Each of these options will now be examined and suggestions for implementation will be discussed below.

Property Exchange Program

The housing units and the properties to which they are affixed can be used as property exchanges for such programs as highway relocation, urban renewal relocation, etc. This would require the completion of a subdivision survey and a plot-map of the housing area. Because of the low density, each parcelled lot will be relatively large (perhaps 1/2 acre in size) thereby making the exchange program attractive.

Government Assisted Housing For Low Income People

A certain number of housing units can be set aside and used as relocation housing for families that are temporarily displaced due to community redevelopment projects or other government-directed programs. In addition, a certain number of units can be used for low-rent and Section 8 housing subsidies. Relocation, low-income, low-rent and Section 8 housing subsidies should be under the purview of the Mariana Islands Housing Authority.

Privately Managed Housing Development

One alternative to a Government assisted housing program is a housing program managed by private enterprise. As a beginning, the dwelling units at Capitol Hill can be turned over to a developer chosen on the basis of some specified performance criteria. The developer will make units available either for direct rental or for government subsidized housing for low income people (under Section 8), or for housing expatriot government employees. Two major benefits are readily apparent from this alternative:

- * The private developer will assume all financial responsibilities. Thus the government will be free of the responsibility for providing initial operating capital.

- * The private developer will have the flexibility to mix the neighborhood tenancy to assure that neither a ghetto of low-income families nor a cluster of high-paid professionals and expatriots is created.

Development of a High-Quality Resort

Recommendations and a proposal have already been received by the NMI government to convert the Capitol Hill complex into a high-quality resort area. The dwelling units would possibly be sub-leased to large corporations in Japan and elsewhere. Incumbent with this alternative is the lease of additional vacant properties in order to develop a self-contained recreational and sports facility.

Disposition of Office Buildings

Each of the above-mentioned alternatives deals primarily with the disposition of housing units -- the office buildings are not included in any of the options. It is recommended that the office structures in the Capitol Hill Complex be programmed for use by the NMI government administrative agencies that have little contact with the general public. Such departments and agencies might include the Civil Service Commission, Public Services Commission, Public Auditor, Financial Administration, Development Bank and others. These could be located in the current facilities with ease and comfort. Likewise, as an interim measure, the legislature could use the former facilities of the Congress of Micronesia (COM) for all their needs, until such time as the government decides on a permanent location for the legislature. Although the capacity of a structure depends largely upon its intended use, the configuration of the building and the permanent portions therein, as a general guideline, 100 square feet of office space should be allotted to each office worker. Thus the TTPI executive offices can provide space for up to 700 employees, while the COM facilities can accommodate 100 workers.

Outright Sale of the Property

A final possible alternative for disposing of Capitol Hill is the outright sale of the entire complex, including land, residential units, and office buildings. The major advantage of this option is, obviously, the revenue that would be generated from the sale. The accompanying disadvantage is the permanent loss of a valuable asset.

Constitutional requirements would have to be satisfied before the execution of this option. Also as a hedge against an economic downturn which might depress property values, the sales contract should stipulate that the property can be resold only to the government.

RECOMMENDATIONS

It would be premature to make a decision on the ultimate disposition for Capitol Hill. All of the above mentioned alternatives are viable and should be considered during the next several years. Further analysis of the advantages and disadvantages of each should be made in the ensuing years.

AGRICULTURAL FACILITIES

Agriculture will continue to be the principle occupation for a significant number of persons and will continue to supplement the incomes and daily diets of many Saipanese families.

Increased output and greater productivity are the goals of development in the agricultural sector during the course of the plan. To accelerate progress toward these goals, a broad program of actions in plant and animal industry has been recommended in the Socioeconomic Development Plan. Similarly, principles and recommendations have been suggested for a number of overall agricultural sector problem areas including Agricultural Homesteading and future agriculture education and experimentation.

RECOMMENDED IMPROVEMENTS

Major capital projects proposed for Saipan include the Development of Plant Pathology and Entomology Laboratory, Development of Beef Cattle Grazing Lands, Completion of an Irrigation Reservoir Project, Improvement of Slaughterhouse and Refrigeration Facilities.

Plant Pathology and Entomology Laboratory

The Socioeconomic Development Plan recommends the construction of a Plant Pathology and Entomology Laboratory. Seventy-five thousand dollars is programmed for its immediate construction. Approximately 10% should be set aside for Architectural and Engineering Design. A facility of between 2000 and 2500 square feet should be able to be built with the proposed funds, assuming that infrastructure facilities are available. Location at the existing Kagman Experiment Station is envisioned.

Irrigation Reservoir Project

Thirty-five thousand dollars has been proposed to complete construction on the irrigation reservoir at Kagman. Funds are to

line the pond and provide for additional pumping capacity. It is doubtful that a new well can be developed at the present funding level as well development costs in the Marianas are presently thirty to forty thousand dollars per well.

In subsequent years 1984 and 1985, a total of \$20,000 has been provided for pilot activities to determine the feasibility of small, on-farm irrigation reservoirs.

Beef Cattle Grazing Lots

One of the major animal industry development projects recommended in the Socioeconomic Development Plan is increasing Beef Cattle production.

The development of a number of improved pastures on public lands is proposed which would be subsequently leased to interested cattlemen. The pastures would be fenced in and arranged around chutes constructed for vaccination, spraying, and other management tasks.

On Saipan the most promising area for such usage is the Northern Marpi area at Bandero and I Madog. Lands suitable for grazing exist adjacent to the old Japanese Fighter Strip. The previous area disturbed by runways, taxiways, and aprons can be used to locate corrals, spraying facilities, farm buildings, and other equipment.

Presently there is no potable water system serving the Marpi area; however, sufficient quantities of water necessary for cattle should be available either through the development of catchment basins or by further exploitation of ground water resources. During World War II the U.S. military forces developed several wells with chloride content between 800 and 1000 ppm. These wells have since been abandoned, and a new well would have to be developed. This water would be marginally suitable for cattle drinking water; however, with mixing

of catchment water should be quite satisfactory.

The proposed Marpi Cattle Grazing Lands are indicated on Plate 9 (See Plate in Pocket). Actual design of the pasture blocks, location of corrals and other facilities would require more detailed site examination than was possible during the plan effort. Some survey work and minimal design would be required and should be completed prior to 1982 when funds for construction become available.

Other Improvements

During the plan period other capital improvement funds are proposed for further development of the Kagman Station Facilities (115 thousand dollars during the plan period). The renovation of an existing building to be utilized as an Extension Office is programmed for 35 thousand dollars in 1979. Purchase of additional agricultural equipment and machinery is funded for 195 thousand dollars during the plan period. The purchase of a hammer mill to further encourage the production of feed for small livestock development is funded for 42 thousand dollars. Renovation and expansion of the existing slaughterhouse including expanded refrigeration facilities are funded for 50 thousand dollars in 1983. A goat development experimentation project is funded for 22 thousand dollars during the plan period. To encourage export crop production, packaging and refrigeration equipment is funded for 60 thousand dollars in 1980. Fifteen thousand dollars is also proposed for the purchase of canning and refrigeration facilities for demonstrations and public use to expand the Home Economics Program.

Each of the above mentioned projects is discussed in much greater detail in the Socioeconomic Development Plan, and they will not be repeated herein. Table 15 summarizes and indicates by year the proposed Agricultural Facility improvements proposed for Saipan during the plan period.

TABLE 15

SAIPAN AGRICULTURAL DEVELOPMENT: PROJECTED CAPITAL IMPROVEMENT FUNDING
1978-1985

(Amounts in 000's)

	1978	1979	1980	1981	1982	1983	1984	1985	Total
Development of Kagman Station Facilities	35	20	-0-	20	-0-	20	-0-	20	115
Extension Office	-0-	35	-0-	-0-	-0-	-0-	-0-	-0-	35
Agricultural Machinery	45	-0-	50	-0-	50	-0-	50	-0-	195
Plant Protection and Entomology Laboratory	75	-0-	-0-	-0-	-0-	-0-	-0-	-0-	75
Export Crop Development	-0-	-0-	60	-0-	-0-	-0-	-0-	-0-	60
Beef Cattle Grazing Infrastructure	-0-	-0-	-0-	-0-	35	-0-	-0-	30	65
Small Livestock Development (As Lito Station)	-0-	42	-0-	10	-0-	-0-	-0-	-0-	52
Slaughterhouse Refrigeration	-0-	-0-	-0-	-0-	-0-	50	-0-	-0-	50
Goat Development	-0-	5	-0-	-0-	-0-	17	-0-	-0-	22
Irrigation Expansion	35	-0-	-0-	-0-	-0-	-0-	10	10	55
Home Economics	-0-	-0-	15	-0-	-0-	-0-	-0-	-0-	15
TOTAL	190	102	125	30	85	87	60	60	739

Source: Robert R. Nathan Associates, Inc., October 1977

AGRICULTURAL HOMESTEADING AREAS

The Constitution of the Northern Mariana Islands mandates the continuation of the Agricultural Homestead Program. It specifies that three (3) years must elapse between a homestead grant and receipt of freehold interest, and that this freehold interest may not be transferred for ten years after receipt. It is hoped with the stipulation of the ten-year transfer requirement that agricultural lands will not be subdivided, parcelled, or held for speculation and that the intended purpose--that of providing land for subsistence agriculture to needy persons--be realized.

The Socioeconomic Development Plan recommends that, should the Agricultural Homesteading Program be continued, then a number of principles should be observed. Those specific principles which bear on future land use include:

- * Agricultural homesteading areas should be redefined according to the physical land use plan.
- * Agricultural homesteading should give priority to crop and small livestock production. Thus, no parcel should be larger than 5 acres (about 2 hectares) nor smaller than 2.5 acres (about 1 hectare).
- * Homestead areas should be surveyed and land capability or fertility be assessed so that proper sizing of the homesteads can be made prior to permitting.

Public Lands available for Agricultural Homesteads are generally restricted to the Kobler-Isley, Kagman, and Marpi regions. Because of the value that the Kagman region holds for possible future commercial farming activities, it is suggested that lands lying therein be zoned agriculture and be leased rather than homesteaded. This would assure the continued utilization

of these lands for agriculture and allow for the possibility of medium size commercial farming operations to occur. It will also facilitate management practices and provide assurance that the resource is not destroyed by poor agricultural practices.

During the initial plan period 1978 to 1985, lands in Marpi and lands in Kobler-Isley are proposed for Agricultural Homesteading. Total land area is estimated at 530 hectares, of which approximately 270 hectares are located in the Marpi area and 260 hectares are positioned east of the Saipan International Airport at Isley Field. These lands are depicted on Plates 7 and 9 (See Plates in Pocket). Other Publicly Owned Lands in the Kobler-Isley and Marpi regions should be held in reserve for future public use, either through a provision of leasing agreements or by initially being placed in a conservation zone.

It should be mentioned that insufficient land area is available to meet the existing number of applicants presently awaiting Homestead Lands. Reassessment of need and qualifications of applicants will be necessary to make certain that those persons most deserving of lands are given first consideration.

PUBLIC UTILITIES

WATER

SANITARY SEWERAGE

POWER

SOLID WASTE

DRAINAGE

WATER

EXISTING CONDITIONS

The fresh ground water of Saipan is classified as either basal, a thin lens of fresh water floating on sea water, or high level, which saturates aquifers having relatively impermeable bottoms lying above sea level.

The principal basal water regions of Saipan that are presently being exploited include the Isley-Kobler field area, Dandan immediately north of the airfield and the Rapugau district lying west of Navy Hill.

The most important high level ground water resources is found at Agag, lying on the east flank of Ogso Tagpochau. Other high level sources include Donni Springs and Tanapag Spring.

Generally the daily production of water on Saipan is between 2.0 and 2.4 million gallons though it varies considerably during the dry season when yields from the wellfields and springs in the north decrease. Five new wells are presently being constructed.

The existing resources, treatment plants, reservoirs, and transmission mains for the island of Saipan depicted on Plate 21 can be divided into five sub-systems as described below. Table 16 provides a tabular summary of the quantity of water pumped from each source.

South Sub System

This major system supplies water to the villages along the west coast from Puntan Agingan to Oleai, via 18-, 16-, 12-inch and other smaller distribution mains. Also included in this system are the hospital, San Vicente Village, and Saipan International Airport. Water for the system is obtained from the Maui I shaft, wells No. 9, 10, 11 in the

TABLE 16
SAIPAN ISLAND WATER SYSTEM

	<u>Water Source</u>	<u>Well Pump Capacity (gpm)</u>	<u>Reservoir</u>	<u>Reservoir Volumes (MG)</u>	<u>Spillway Elevation (ft)</u>
<u>South System</u>					
Isley (basal)	Maui I	190	Isley	1.0	196
	Maui I	270	Isley	1.5	
	Well No. 9	70			
	Well No. 10	70			
	Well No. 11	70			
	Well No. 1*	55**			
	Well No. 2	55**			
	Well No. 15*	60**			
	Well No. 16*	60**			
	Well No. 17*	60**			
Dandan (basal)	Well No. 7	28	San Vicente	0.5	352
	Well No. 20*	55**			
	Well No. 22*	-			
Hospital (basal)	Well No. 3	47	Hospital	1.0	182
			Hospital Tower	0.05	
				4.05	
<u>Capitol Hill System</u>					
Agag (high level)	Well No. 31	Dry	Capitol Hill	1.0	890
	Well No. 45	Dry			
	Well No. 50	200			
	Well No. 75	80			
	Well No. 70*	-			
	Well No. 71*	-			
	Well No. 72*	-			
Donni Spring		210			
				1.0	
<u>Navy Hill System</u>					
Rapugau (basal)	Maui IV	55	Calhoun	0.5	561
	Maui IV	45			
	Well No. 2	40			
	Well No. 3	50			
	Well No. 4	50			
Donni Spring (high level)		210			
Tanapag (high level)		40			
				0.5	
<u>Central Coastal System</u>					
(Same sources as for Navy Hill System above)			Tanapag	1.0	190
			As Mahetog	0.2	225
			Achugau	0.02	233
			Emergency	3.0	60
			Emergency	9.0	60
				13.22	
<u>Kagman Station</u>					
Kagman (basal)	Well No. 76	35	Kagman	0.05	370
				0.05	
				18.82	

* Recently constructed wells

** Approximate well pump capacity

Isley area, Dandan well No. 7, Hospital well No. 3 and mixed water from the other systems. Several new wells have recently been constructed in the Maui I, Isley Field, and Dandan areas. These are wells 1, 2, 15, 16, 17, 20, and 22. Water is stored for distribution in Isley reservoirs 1 and 2, San Vicente, the hospital water tower, and the hospital reservoir, and is distributed via the transmission mains shown on Plate 21.

Capitol Hill Sub-System

The Trust Territory facilities at Capitol Hill are supplied with water from Agag Field (wells 45, 50 and 75) and from Donni Spring. Wells 70, 71 and 72 have recently been constructed in the Agag area. Water is pumped to the 1 MG Capitol Hill Reservoir, the highest reservoir at elevation 890 feet, and transmitted by gravity via 6- and 10-inch lines to the living quarters and facilities in the headquarters area. A portion of the water from these sources feeds the central coastal system.

Navy Hill Sub-System

The residents of Navy Hill and the upper Garapan Heights are supplied with water from the Maui IV well, and Rapugau well numbers 2, 3, and 4. They also receive overflow from the Capitol Hill System. Water from Donni and Tanapag springs can also be blended into the main source. The water is chlorinated at the Maui IV treatment plant and pumped to the Calhoon Reservoir, which has a capacity of 500,000 gallons, situated at elevation 561 feet.

Central Coastal Sub-System

The Central Coastal system supplies water to the villages of Oleai in the south and San Roque in the north. Water for these villages is obtained from the same sources as those listed under the Navy Hill system. Water is stored for distribution, however, in the reservoir located at Tanapag, which

basically feeds the area along the west coast from Puerto Rico to Oleai. The water stored in the As Mahetog and Achugau reservoirs generally serves the areas of Tanapag and San Roque.

Kagman Sub-System

This system is a separate system serving the Kagman area lying on the eastern shoreline. The Kagman Reservoir, located at elevation 370 feet, has a storage capacity of 50,000 gallons and is supplied by good quality water from well No. 76.

PLANNING FACTORS

Aside from the basic objective of being able to provide adequate water pressure and water quality, the proposed Saipan water improvements must also address the elimination of wastes due to line losses and domestic waste.

Line Losses and Excessive Consumption

Average daily water supply data for the 1970-1976 period were statistically tabulated from Public Works production records. Based on the present (14,000) population and a total daily production of 2.4 million gallons, the per capita water consumption is an alarmingly high 171 gallons per day.

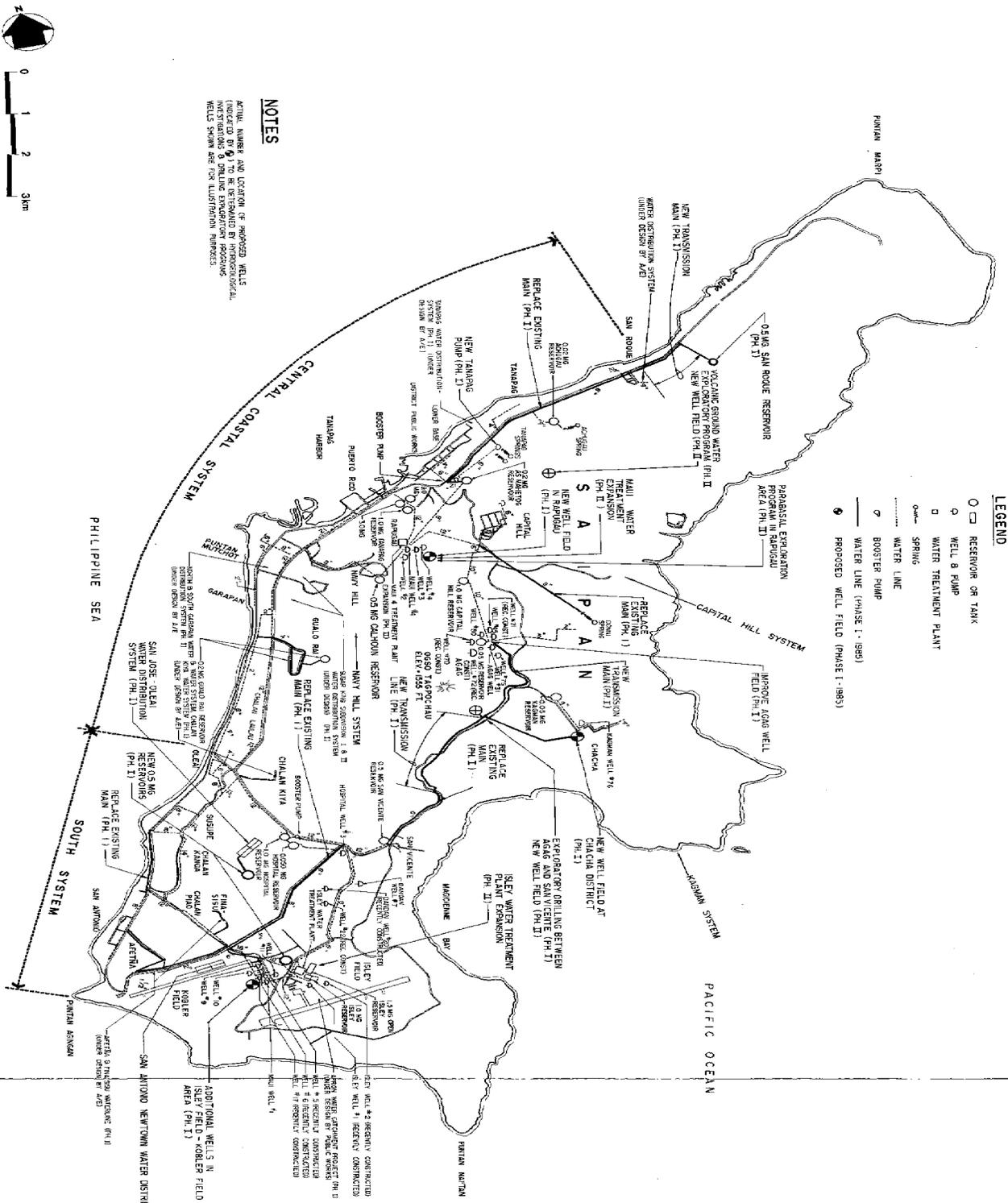
Further statistical analysis of metered residences indicated that, on the average, each metered home used 480 gallons of water per day. For an average family size of 5 persons per home, the rate of consumption is 95 gallons per person per day.

Although conclusive consumption figures can be obtained only when all customers are metered, it is probable that the difference between 171 gallons per capita per day (gcd) and 95 gcd, or 75 gcd, is being lost through a combination of leaks and waste. This excessive loss contributes directly to the interruption of water service and low water pressures.

SAIPAN ISLAND
 PHYSICAL DEVELOPMENT MASTER PLAN
 WATER SYSTEM

January 1978

21 Pacific Planning and Design Consultants
 Saipan, Commonwealth of the Northern Mariana Islands



NOTES

ACTUAL NUMBER AND LOCATION OF PROPOSED WELLS (INDICATED BY 9) TO BE DETERMINED BY GEOPHYSICAL INVESTIGATIONS & OTHER FIELD STUDIES FOR DISTRIBUTION PURPOSES.

Provision of Adequate Pressure

Although present average consumption is 171 gcd, a successful water management program should significantly reduce this figure. Saipan's standard of living will rise and eventually approach that of other middle class areas. Consequently, an average water consumption rate of 110 gcd was used to determine the water requirements for Saipan. The 110 gcd is below that of established middle class communities on Oahu, which in FY 1976 was about 160 gcd. This difference is attributed to the use of domestic water for lawn irrigation. Maximum daily consumption is taken as 1.5 times average daily consumption, and peak hour consumption is taken as 2.0 times maximum daily consumption, or 3.0 times average daily consumption. Based on these per capita consumption figures, water requirements have been established for the present planning horizon and beyond. They are given in Table 17. Table 18 details expected 1985 consumption by general village areas.

Although some areas suffer from chronic low pressure, analysis indicates that reservoir location is generally adequate to provide acceptable minimum line pressures. These isolated problem areas will be corrected as leaks are discovered and repaired, and waste is reduced.

Reservoir capacity should meet the following conditions:

- * Equalize fluctuations in demand rate during the day.
- * Provide for highest fire flow plus maximum day consumption rate for the duration of fire flow.
- * Provide for one day's maximum consumption.

In Saipan the governing criterion is that to provide storage for one day at maximum consumption. Required 1985 storage capacities for various parts of the system are shown on Table 19. Additional reservoir capacity is also needed to provide the capability to transfer water between regions.

TABLE 17

SAIPAN WATER REQUIREMENT, 1985 AND ULTIMATE

<u>Plan Horizon</u>	<u>Population</u>	<u>Ave. Day Supply (mgd)</u>	<u>Max. Day Supply (mgd)</u>	<u>Peak Flow (mgd)</u>
1985	24,000	2.64	3.96	7.92
	Industrial, Commer- cial, Resort, Others	<u>0.78</u>	<u>1.17</u>	<u>2.34</u>
		3.42	5.13	10.26
Ultimate	50,000	5.50	8.15	16.50

TABLE 18

1985 WATER REQUIREMENTS BY GENERAL VILLAGE AREAS

<u>Village Area</u>	<u>1985 Population</u>	<u>Ave. Day (mgd)</u>	<u>Max. Day (mgd)</u>	<u>Peak Flow (mgd)</u>
<u>Central Coastal and Navy Hill System</u>				
San Roque	885	0.097	0.146	0.292
Tanapag	1,621	0.178	0.268	0.534
Garapan	4,000	0.440	0.660	1.320
Chalan Laulau	960	0.106	0.158	0.317
Industrial, Commercial, Hospital, Resort, Other	--	<u>0.540</u>	<u>0.810</u>	<u>1.620</u>
	7,466	1.361	2.042	4.083
<u>South System</u>				
San Jose-Oleai	2,775	0.305	0.458	0.916
Susupe	2,260	0.249	0.373	0.746
Chalan Kanoa	5,270	0.580	0.870	1.739
San Antonio	3,100	0.341	0.511	1.023
Hospital Area	150	0.017	0.025	0.050
Industrial, Commercial, Resort, Other	--	<u>0.240</u>	<u>0.360</u>	<u>0.720</u>
	13,555	1.731	2.597	5.194
<u>Capitol Hill System</u>				
Capitol Hill	<u>600</u>	<u>0.066</u>	<u>0.099</u>	<u>0.198</u>
	600	0.066	0.099	0.198
<u>Other Systems</u>				
San Vicente	902	0.099	0.149	0.298
Other Agricultural Areas	<u>1,477</u>	<u>0.162</u>	<u>0.243</u>	<u>0.487</u>
	2,379	0.261	0.392	0.785
	24,000	3.42	5.13	10.26

TABLE 19

Estimated Reservoir Requirements

<u>Water System</u>	<u>1985 Max. Day (mgd)</u>	<u>Existing Capacities</u>	<u>Additional Capacity to be Provided</u>
Central Coastal and Navy Hill system	2.04	1.72 mg. (excl. emergency re- servoires)	0.5 mg for San Roque Area
South System	2.60	2.05 mg (excl. Isley open reservoires)	1.0 for San Antonio Area
Capitol Hill	0.10	1.00 mg	None
San Vicente	0.15	0.50 mg	None

TABLE 20

Fire Requirements

	<u>Flow</u>	<u>Duration</u>	<u>Fire Hydrant Spacing</u>
1. Farm Lots	1,000 gpm	1/2 hour	700 feet
2. Single Family and duplex buildings	1,000 gpm	1 hour	350 feet
3. PUD town houses and low rise apartments	1,500 gpm	1 hour	250 feet
4. Schools, neighborhood businesses, small shopping centers, hotels, and high rise apartments	2,000 gpm	2 hours	250 feet
5. Light industry, downtown business, and large shop- ping centers	4,000 gpm	3 hours	250 feet

Provision of Adequate Fire Flow Protection

National fire protection standards affect water system design because system adequacy affects fire insurability and associated insurance rates. The National Board of Fire Underwriters Guide, "Grading Cities and Towns of the United States with Reference to Their Fire Defenses and Physical Conditions", is the standard of comparison. Although adoption of the standards in this reference would result in a system favorable for insurance purposes, the costs of required improvements would be prohibitively high. The cost effectiveness of protective measures must be considered. A more realistic set of standards, similar to those used in Honolulu, is given in Table 20 (See preceding page) for residential, business, and commercial establishments.

Improve Water Quality

The majority of the domestic water on Saipan is presently obtained from deepwells in the Isley and Rapugau regions that exhibit high chloride, hardness, and total solids concentration. To treat the raw water, the Isley and Maui IV water softening treatment plants have mixing and settling tanks and two gravity filters to reduce the high hardness and total solids concentration.

The two 10.5-foot diameter gravity filters are Lo Prest Type N units with a capacity to treat 260 gpm of water per filter. The clarifier is a 20-foot diameter, circular (Lo Prest Type C) unit with a center lime feed compartment. The mixing and settling tanks are not being used because of the high cost of chemicals, and the filters are not being used since they frequently overflow. It has been reported that backwashing has to be done every two days. The only treatment performed at this time is the chlorination of the water. The saltiness of the water cannot be controlled by using the treatment

facilities; only reduced pumping of the existing wells will decrease salinity. To compensate for high salinity, most households in the southern areas have resorted to the use of cisterns to privately collect rainwater for drinking and cooking.

In order to replenish water storage reservoirs, the Public Works personnel several months per year, close valves supplying water to villages from 1 pm to 4 pm, and 8 pm to 5 am. Although this practice tends to conserve water, it allows air to enter the distribution system, resulting in increased internal rusting of metal pipes. When valves are opened the water scours the pipe interior picking up some of the rust, causing the brownish-red color reported in the South System. Further system improvements are needed to increase reservoir replenishment rates, eliminate the inconvenient service interruptions, and prevent water discoloration.

RECOMMENDED IMPROVEMENTS

The present program of water improvements remains basically sound and will improve the quantity and quality of the water supply. Although the program will require continuous updating, the following are recommendations for the 1978-1985 plan period. Presently, consultants are preparing a Water Facilities Fact Plan which will prioritize and schedule improvements through the year 1997.

The improvements that are planned for the entire water system will attempt to strike a balance between resource development projects, improvements to the distribution network as have been recommended in previous studies, and other improvements as determined necessary in the Water Facilities Fact Plan.

Major physical facility improvements are being recommended in the following areas:

- * Completing the upgrading of the village distribution systems.
- * Continuation of resource exploration and development.
- * Completing the metering system.
- * Other improvements include upgrading and extending transmission lines, improving reservoirs, installing new booster pumps, and conducting hydraulic analyses.

The recommended improvements are further discussed below and are detailed with estimated costs in Table 21. Two non-facility oriented improvements but of equal importance are the need for an education program concerning the need for water conservation and a study of the overall manpower requirements of the Water Supply Division.

Distribution System

Patch-up improvements have been initiated in Chalan Kanoa, Oleai, Susupe, and San Antonio. However, major improvements are yet to be implemented. Areas identified for improvements include:

- * North and South Garapan
- * San Roque
- * Tanapag
- * Sugar King Subdivisions I & II
- * Gualo Rai Reservoir and distribution system
- * Chalan Kiya
- * Afetna
- * Fina Sisu
- * Chalan Kanoa

Metering

Individual metering of water service to all consumers appears to be effective, and the program should be completed rapidly so that a reasonable estimate of line leakage can be made.

Unless leaks are repaired and excessive water use curtailed, the quantity of water produced will be insufficient and water quality will not improve, even with new water sources. A leakage surveillance program of the existing distribution and individual lateral systems should be initiated. Also, a source output metering program should be instituted to obtain direct data on volume of water produced from all available sources.

Resource Development

The following specific improvements are recommended for resource development:

- * Improve the Tanapag Springs and Agag well fields.
- * Develop more basal water resources further inland and explore for parabasal water at Rapugau fields.
- * Start a drilling exploration program for high level and parabasal water in limestone. The program should not be tied to immediate plans for production. However, advanced design of the water well fields together with the distribution system improvements and land acquisition must be made early in the plan period to take advantage of Economic Development Administration Public Works funds.
- * Extend a transmission line to Chacha Kagman from San Vicente and develop additional well fields therein.

Education Program

An education program should be implemented immediately to emphasize the scarcity of water and the cause of poor water quality now and in the future. Much water is lost through leaking faucets, hose and pipe connections, and indiscriminate consumption practices. Public education should emphasize the importance of water conservation, the metering programs, and citizen's responsibility for proper maintenance of his home

Water Treatment

Water treatment plants at Isley and Maui IV have not been operated in the past or fully utilized by Public Works because of a lack of trained personnel and the cost of chemicals necessary for plant operation. This has not been a serious concern in the past since most potable water is derived from individual home catchment basins. As the water quality improves an adequate supply realized, and less reliance is based on catchment basins, it may be necessary to re-evaluate the present policy of non-treatment.

Hydraulic Analyses

Since fire protection is poor in many areas, hydraulic analyses and field pressure tests should be conducted. Additional mains and/or increased storage by construction of new reservoirs and installation of more fire hydrants as required should be implemented to provide adequate fire flow to all villages.

Manpower

The Public Works Department should review and upgrade the manpower and operating budget as soon as possible because it is understaffed and unable to keep up with the present demands for water. The present Public Works staff will not be able to handle any future expansion and acceleration of its activities due to population growth and expansion of urban areas.

Summary of Costs

The total estimated cost of Phase I improvements exceeds the \$4.4 million programmed in the socioeconomic study guidelines. However, some of these improvements may be eligible for funding from additional Federal programs. Furthermore, some improvements are presently being completed with prior year funds. Other improvements may be found unnecessary after further system experience is gained. Because the program cannot be stabilized at this time, the unbalanced funding situation indicated on Table 21 has been left unadjusted.

TABLE 21

SAIPAN WATER SYSTEM PROPOSED IMPROVEMENTS 1978-1985*

1.	Complete water metering program of all homes and commercial businesses	Lump Sum	\$ 50,000	9.	Eight-inch transmission main between Chacha well field, Agag wells, and San Vicente area	22,500 @ \$30/lf	\$ 675,000
2.	Complete planned improvements to the water distribution system as recommended in previous studies and/or under design			10.	Transmission main, reservoir, and distribution system for San Antonio Newtown	Lump Sum	\$1,500,000
	a. North and South Garapan distribution system	Lump Sum	\$800,000	11.	Transmission main and distribution system for new areas in Garapan	Lump Sum	\$ 300,000
	b. San Roque distribution system	Lump Sum	\$200,000	12.	Transmission main, booster pumps and reservoir for San Roque	Lump Sum	\$ 700,000
	c. Tanapag distribution system	Lump Sum	\$400,000	13.	Transmission main and distribution system for new areas in San Jose-Oleal-Susupe areas	Lump Sum	\$ 400,000
	d. Sugar King Subdivision I & II distribution system	Lump Sum	\$200,000	14.	Additional distribution system, improvements and replacement of existing pipes for existing villages (San Antonio, Chalan Kanoa, Susupe, Oleal, Garapan, Tanapag, San Roque, and San Vicente)	Lump Sum	\$1,500,000
	e. Gualo Rai Reservoir and distribution system	Lump Sum	\$500,000	15.	Transmission main and distribution system for new areas in Tanapag	Lump Sum	\$ 500,000
	f. Chalan Kiya distribution system	Lump Sum	\$100,000	16.	Replace and upgrade existing transmission mains that are old or in deteriorated condition.		
	g. Aetna distribution system	Lump Sum	\$300,000	a.	Transmission main along primary road in vicinity of San Vicente	Lump Sum	\$ 150,000
	h. Fina-Sisu and Chalan Kanoa distribution system	Lump Sum	\$100,000	b.	Transmission main from hospital well #3 to Isley field-Kobler field area	Lump Sum	\$ 400,000
	i. Tanapag pump	Lump Sum	\$ 40,000	c.	Transmission main in Chalan Kanoa	Lump Sum	\$ 150,000
	j. Airport Apron Water Catchment system	Lump Sum	\$100,000				
3.	Initiate inventory and data base program that will allow systematic analysis of behavior of the water sources over time						
4.	Additional wells at Isley Field Kobler Field area	2 wells @ \$40,000	\$ 80,000				
5.	New well field at Rapugau	3 wells @ \$40,000	\$120,000				
6.	Conduct exploratory drilling program between Agag and San Vicente	Lump Sum	\$200,000				
7.	Improve Agag well field	Lump Sum	\$100,000				
8.	New well field in Chacha district	4 wells @ \$40,000	\$160,000				

* Proposed improvements are not yet prioritized.

SANITARY SEWERAGE

Planning for sewerage facilities plays a very dominant role during this development cycle. Notwithstanding the dearth of precise, comprehensive, and historic data, there is ample evidence of the urgency surrounding investment in these facilities.

Areas presently operating on cesspools and septic tanks are experiencing some indicators of impending failure. Pumping and cleaning of private cesspools in San Vicente must be accomplished every two to three months. The leaching field at the Tanapag Elementary Schools operates improperly, requiring periodic pumping of the septic tank. Private systems cannot for long be located in impermeable clay soil nor in low lying, poorly drained areas. Areas in San Vicente and in the low areas surrounding Lake Susupe and the swamp have already or will develop serious problems.

Density of dwelling units also affect the suitability of private systems. Saipan will experience a growth rate of up to 15 percent annually over this planning period, and as housing densities increase so too will the incidence of system failures. Generally, those areas planned to accommodate high densities must have adequate public sewerage. Other areas cannot be developed beyond their ability to support private septic systems.

EXISTING CONDITIONS

Parts of the Saipan sewerage systems still in use today were constructed during the early stages of occupation by U.S. military forces. It is not uncommon to find asbestos cement, concrete, cast iron or steel sewers; materials that were available at that time. In the early 1970's, major improve-

ments were made to the system with the addition of the Agingan and Garapan wastewater treatment plants which included related transmission and collection systems.

The public sewerage system for Saipan can be generally separated into two distinct systems: 1) the southern coastal system and 2) the central highlands and coastal system. Although seventy to eighty percent of the population could be serviced by the existing system it is estimated that only ten (10) percent of the population presently utilize the system.

Southern Coastal System

The Southern system extends from Puntan Agingan on the south to Oleai on the north, as illustrated on Plate 22. This system services the villages of San Antonio, Chalan Kanoa, Susupe, and Oleai. Public and private facilities also served include the hospital, Royal Taga Hotel, the various schools, government offices and business organizations along the highway. The waste flows generated by these facilities are conveyed by a series of gravity interceptor sewers and sewage lift stations to the Agingan treatment plant. Following "primary" treatment, the effluent is discharged into the ocean through a 12 inch surface outfall sewer.

The Agingan wastewater treatment plant has a capacity of 1.0 mgd. A Dorr Clarigester treatment unit provides both primary sedimentation of raw sewage and anaerobic digestion of settled solids.

The effluent from the clarigester is then chlorinated prior to final disposal through the ocean outfall. Chlorination is accomplished by an automatic V-notch 400 ppd module unit. The anaerobically digested sludge from the clarigester is dewatered by gravity filtration utilizing a trailer-mounted mobile "DCG"

unit (Dual Cell Gravity sludge dewatering unit, Permutit Co. Model 100). Dewatered solids are disposed of at a sanitary landfill.

Central Highlands and Coastal System (Northern System)

This system extends from North Garapan to South Tanapag, including the tributary areas of Navy and Capitol Hill (See Plate 22). This system services the hotels, Garapan Elementary School, a portion of the homes and businesses in Northern Garapan, the facilities and residences at Navy and Capitol Hill, and the facilities at the Public Works area. The sewage collected by this system is conveyed by a system of interceptor sewers and sewage pump stations to the Garapan wastewater treatment plant, treated and discharged into the ocean.

The Garapan wastewater treatment provides primary treatment for flows generated in the central highland and coastal system. Its present design capacity is 0.3 mgd with provisions to expand to 0.6 mgd, if the present site can accommodate the increase. The Garapan plant employs a Dorr Clarigester treatment unit for both primary sedimentation of raw sewage and for digestion of settled solids, similar to the Agingan plant. The primary effluent from the clarigester is chlorinated and discharged via an 850 foot long 12" diameter outfall at a depth of 53 feet. The trailer mounted mobile "DCG" unit assigned to the Agingan plant is available for dewatering of digested sludge at the Garapan plant.

Individual Septic Tanks/Cesspools

These types of individual disposal units are universally used and are adequate for sparsely developed areas if soil conditions are favorable. As population densities increase, however, the failure rates of septic tanks and cesspools invariably increase. Health hazards to the community increase, as does the threat of damage to receiving waters.

More specifically, the villages of Chalan Kanoa and Susupe are located in the low area surrounding Lake Susupe and the swamp. Heavy rains cause cesspools and privies to flood giving rise to potential health problems. There are also several problem areas which require frequent pumping of cesspools and septic tanks.

The existing leaching field at the Tanapag Elementary School does not operate properly. The septic tank leading to the field requires pumping nearly every other day by Public Works personnel. Cesspools at San Vicente require pumping once every two to three months due to the impermeable clay soil. Extension of the sewerage system to these areas should remedy these problems and relieve Public Works personnel for more productive work.

PLANNING FACTORS

Population projections for Saipan indicate an increase of between 22,000 to 25,000 persons within the next seven years. Moreover, the projected growth of the tourist industry will place further stresses on the island's sewerage facilities. It is essential to continue improvement of the sewerage system to accommodate this growth.

Land Use Pattern

The proposed land use pattern provides input on future land use and the growth of existing urban areas. Generally, those areas having a dwelling unit density of less than two per acre are not scheduled for public sewerage facilities. It is essential to the success of the planned system that positive action be taken to insure these density limits are not exceeded.

Planning Objectives

The plan for sewer improvements should be directed to meet the following objectives:

- * Eliminate or minimize health risks and nuisance problems.
- * Eliminate or prevent adverse effects of sewage discharges on the quality of receiving waters.
- * Implement the best practicable control technology mandated by Public Law.
- * Support the continuation, expansion, and creation of urban land uses compatible with the existing urban pattern.

Projected Flows

The following criteria were used to develop flows:

Unit Flow Coefficients:

Flow per residence	=	80 gpdc
Flow per hotel unit	=	160 gal/hotel unit/day
Commercial, industrial area	=	3000 gpad
Infiltration	=	1000 gpad

Maximum Design Sewage Flow Rate: Ave. design sewage flow rate x max. factor; where max. factor is based on Babbitt's formula.

Wet Weather Infiltration: 1500 gpad

Peak Flow Rate: max. design sewage flows + wet weather infiltrates.

Regional versus Sub-Regional System

In the development of the plan, consideration was given both a regional system consisting of one treatment and disposal facility serving both the Southern and Central Highland areas, and a sub-regional system, retaining separate treatment and disposal facilities for each area. The following are highlights in the evaluation of these two alternatives.

- * The existing facilities were constructed independently. To convert to a regional system would require rerouting of portions of the existing interceptor sewer system and enlargement of mains to accommodate larger flows. Both existing outfalls would have to be abandoned and replaced with a larger one adjacent to the new treatment facility.

- * Greater initial capital costs are required to establish a single large treatment and disposal facility.
- * Construction and/or modifications to each sub-regional system can proceed independently, minimizing down time, public inconvenience, and time for implementation.
- * The Southern Garapan and Chalan Laulau areas are planned for "rural residential". Development of this intensity is sufficiently sparse for adequate septic system operation. Consequently, there is no immediate requirement within the 1985 planning horizon to extend either the northern or southern systems into this area.

RECOMMENDED IMPROVEMENTS

The plan recommends a decentralized system. There should be a separate treatment and disposal facility for both the Southern area and the Central Highland (Northern) area for the reasons mentioned above.

Southern Coastal System

The design sewage flow projection is 2.0 mgd, based on application of the preceding flow parameters to the proposed development pattern.

The proposed sewerage master plan, shown on Plate 22, recommends the following major improvements:

1. Expand the existing 1.0 primary treatment facility to 2.0 mgd, with possible upgrading to secondary treatment.
2. A high level interceptor sewer line, and a sewage pump station constructed along the "Texas" road or Texas road bypass is required. The existing system of pump stations and transmission mains along Beach Road does not have the capacity to handle the projected flows. While peak flows of approximately 6.0 mgd is anticipated, the present system can handle only 1.2 mgd.
3. An interceptor sewer system to convey waste flows generated from San Antonio/New town area.

Central Highlands - Coastal (Northern) System

The anticipated flow generated in this area is 2.0 mgd, approximately one-half being attributable to the 250 acre industrial area in Tanapag.

Approximately 9000 residents will be serviced by this system. Other users will include the resorts in the San Roque and lower Garapan area, and the commercial area in Garapan.

Besides expansion of service mains and collectors, the plan recommends eventual abandonment of the existing treatment facility and outfall located in the Rapugau area. The land available at the existing plant site cannot accommodate a facility for treatment of 2.0 mgd, the projected sewage load for the northern area. Moreover, the existing site is located near an area where complaints of odors emanating from the plant are constantly reported.

Finally, the outfall discharges within the barrier reef into Tanapag Harbor. Because of long detention time within the embankment the discharge may eventually cause drastic changes to the ecosystem, a phenomenon reported in several instances worldwide. These changes will eventually reduce the recreational and aesthetic value of the nearshore water in Tanapag Harbor to a serious degree.

The plan recommends construction of a new 2.0 mgd secondary treatment facility at one of two alternate locations. The Tanapag industrial area location would require a new 20 inch outfall extending 3500 feet offshore to a discharge depth of 30-40 feet. This site shown in Plate 22, is on government-owned land and is reasonably close to the center of wastewater generation.

An alternate site for the proposed treatment facility has been identified in the North Tanapag/South San Roque area (See Plate 22). This land is privately owned, however, and must either be purchased or exchanged for government land.

This site has advantages of lower cost for the land portion of the outfall due to shorter length, and is located on the "fringe" areas of development, which would minimize the potential odor problems.

The general location for the outfall site is based on two factors. This location requires a minimum length for the ocean portion of the outfall and furthermore, the predominant current and winds which are generally parallel to the shoreline in this area, minimize the risk of transporting effluent into the reef area.

Besides the new treatment plant and outfall, the plan provides for the following elements:

1. Construct a system of interceptor sewers and pump stations to convey sewage from San Roque to Tanapag.
2. Construct a system of interceptor sewers and pump stations to serve the southern portion of Garapan and the unsewered areas, and pump to new station.
3. Construct a system of interceptor sewers and pump station from Rapugau to the proposed treatment plant.

Capital Costs

Table 22 presents the distribution of the \$14 million required for complete implementation of the sewerage plan. Sixty percent of the cost is for the northern area; the remaining forty percent is for the southern area.

Detailed costs are indicated in Table 23 and a recommended prioritized capital improvements schedule has been developed. Recommendations are based on quantitative cost benefit evaluations, the relationship of each item to the operation of the entire system, and the expected rate of growth in affected areas.

Table 22
 COST SUMMARY OF PROPOSED TREATMENT
 FACILITIES FOR SAIPAN BY AREAS

	<u>Cost in \$1000</u>	
<u>Northern Area</u>		
San Roque	870	
Tanapag (North)	4,780	
Tanapag (South)	1,800	
Garapan	<u>1,000</u>	
		\$ 8,450
 <u>South Area</u>		
San Jose - Oleai	430	
Susupe	420	
Chalan-Kanoa	1,270	
San Antonio, including new town	<u>3,590</u>	
		<u>5,710</u>
Total		\$14,160

Table 23

Cost of Saipan Sewage System* (\$1000)

Area	Transmission Main	Pump Station	Collection System	Treatment Facility	Outfall	Total
1. San Roque	440	270	160	---	---	870
2. Tanapag (Northern)	410	210	210	2,250	1,700	4,780
3. Tanapag (Southern)	1,300	500	---	---	---	1,800
4. Garapan	500	---	500	---	---	1,000
5. San Jose-Oleai	240	140	50	---	---	430
6. Susupe	210	140	170	---	---	420
7. Chalan Kanoa	690	200	380	---	---	1,270
8. San Antonio	1,300	620	170	1,500	---	<u>3,590</u>
						14,160

*NOTE: Lateral are not included in the cost summary.

POWER

EXISTING CONDITIONS

Saipan's power system presently suffers many shortcomings which have to be corrected. The primary power source, "Impedance" suffers frequent and prolonged outages and is scheduled to be dry-docked by 1979. The distribution system suffers from poor maintenance. Frequent outages are caused by lightning, failing transformers, and storms. Wires are corroded, hardware is old and difficult to replace, and poles are rotting.

Electrical energy conservation practices are not in effect. The present metering and billing procedures run contrary to reasonable conservation efforts.

Growth of electrical demand is anticipated to be significant. The annual growth rate will probably approach 9-1/2 percent, but due to the relatively small size of Saipan's system, growth will occur in quantum jumps. At best, therefore, growth will be dramatic and must be analyzed with respect to development project.

Management/Operation

The Public Works Division of the Northern Mariana Islands (NMI) government now operates the entire electric power system. The Saipan Utilities Agency has been established with this division to operate the electric power, water and sanitation systems in Saipan. Current peak usage is about 11.2 MW (11,200,000 watts or 11,200 KW). During FY 1976, about 50 million KWH were generated by the system.

Power Generation

Table 24 summarizes the present generation capability of the power system. Plate 23 shows the location of these facilities. The army power barge "Impedance" is the primary power plant.

TABLE 24

SAIPAN POWER GENERATION CAPABILITY

CENTRAL POWER PLANT

Power barge "Impedance" = 30 MW
 (Commissioned in 1943)

STAND-BY POWER PLANT

a) 2-Nordberb units, 2.2MW ea. = 4.4 MW*
 b) 2-White Superior units, 1.5MW ea = 3.0 MW*
 c) 1-White Superior unit, 1.5MW (1971) = 1.5 MW* ++

MISCELLANEOUS POWER EQUIPMENT

a) 1-Caterpillar = 0.6 MW
 b) 2-GE units, 0.6 MW ea. = 1.2 MW
 c) 11 Caterpillar, 0.8 MW
 (being overhauled) = .8 MW
 d) 3-GE units, 0.6 MW ea.
 (being overhauled) = 1.8 MW

NOTE: * Indicates units considered suitable for retention as stand-by power, capacity of 8.9 MW. Units to be phased-out by 1990.

++ Unit is to be relocated to the stand-by power plant.

Commissioned in 1943, she has 2 boilers capable of delivering 30 MW. The barge is on loan at no cost to the NMI, but must be kept in good repair and is examined yearly by a team of army engineers.

At best, the "Impedance" is inefficient. Since its installation in November, 1975, the "Impedance" has had unscheduled outages for repair approximately once per month. Its age and present condition indicate a high maintenance cost in the near future, and it is due for drydocking in 1979.

A standby power plant consisting of 2 Nordberg and 2 White Superior generators is capable of supplying 7.4 MW. The plant in which these diesel units are located was designed so that it could be expanded by 2 more small diesels, adding up to a total capacity of 10.0 MW. A third White Superior 1.5 MW unit is scheduled to be relocated to the plant. Miscellaneous equipment include five (5) GE .6 MW units and two Caterpillar units totalling 4.4 MW.

Only the Nordberg and White Superior Units should be considered for operation as stand-by units. After about 1990 the Standby Plant and the miscellaneous equipment should be retired as they are too inefficient to operate.

Power Distribution

The distribution system on Saipan consists of about 72 miles of primary line (13.8KV) and approximately 96 miles of secondary lines. Plate 23 shows the location of the 13.8 KV circuits. These circuits consist of various size conductors. Circuits 3 and 4 which serve the area south of the power plant carry 80% of the system load.

The condition of the lines ranges from fair to poor, with numerous unscheduled outages caused by lightning, burned out

transformers and storms. Maintenance is less than optimal, with repair and replacement of corroded wires, hardware, and rotten poles occurring less frequently than reasonable maintenance schedules call for.

PLANNING FACTORS

Load Growth

The seven percent annual load growth projection given in the basic power consultant report was re-examined with respect to Saipan's unique growth prospects. The constant percentage basis of projection can be applied to relatively large systems having a historical data base. Saipan, in contrast, is a relatively small area facing dramatic quantum growth from international interests such as the economy of Japan and U. S. military plans. It should be noted that load increases on a system the size of Saipan's 500 KW capacity, requires special consideration. Therefore, projections of anticipated load growth based on anticipated socioeconomic factors were developed. These are summarized in Table 25.

The new Nauru office building is projected to add a minimum of 500 KW to the system peak load. Design calls for two 500 KVA transformers. This alone represents a system load increase of 4.5 percent. The Grand Hotel will add a similar load. These two projects alone will increase peak load by about 9% in 1978.

Table 26 synthesizes the gains and losses through the planning period. These data indicate an average annual growth of 9.5% in Saipan's power requirements. In 1985 the peak demand is expected to reach 22.98 MW. If the 9.5% growth is projected, the system will peak at 30 MW in 1989 and 40 MW in 1992. Moreover, major social and economic changes would affect these projections.

TABLE 25

SAIPAN POWER DEMAND 1977 - 1985

FOR PROBABLE MAJOR CONSTRUCTION

		EST LOAD	KVA
1978	Nauru Building (under construction)	500	
	White Sands Hotel (60 rooms completed)	120	
	Grand Hotel (under construction)	400	
	150 New Single Family Homes	300	
	Hook Up of Sugar King I (Approximately 160 homes)	320	
	10 New Elementary Classrooms	<u>10</u>	
	TOTAL		1650
1979	New Junior High School (25 Classrooms)	100	
	Public Health Center - 10,000 sq.ft.	50	
	160 New Single-Family Homes	<u>320</u>	
	TOTAL		470
1980	New Hospital 90 to 100 bed (Phase out of old)	500	
	1st 15 room correctional facility (max. security)	25	
	5 New Classrooms Elementary	5	
	170 New Single Family Homes	340	
	Far East Broadcasting	<u>750</u>	
	TOTAL		1620
1981	New Commercial Center - Garapan size, of Town House	750	
	180 New Single Family Homes	<u>360</u>	
	TOTAL		1110
1982	Two hundred (200) room hotel	400	
	190 New Single Family Homes	380	
	New Fire Station (Garapan)	<u>50</u>	
	TOTAL		830
1983	Canning Processing Plant (Maximum 8,000,000)		
	Lime Plant - (size unknown) Estimate	1500	
	200 New Homes (20% Apts and/or Condominiums)	<u>400</u>	
	TOTAL		1900
1984	New Harbor Facilities - Lighting		
	600 ft, berth - breakbulk warehouse	600	
	210 New Homes	<u>420</u>	
	TOTAL		1020
1985	220 New Homes (20% Apts & Condominiums)	440	
	Misc. a) Probably more commercial area		
	b) Potential for another 100 room hotel		
	c) Increase in light industrial Estimate	<u>700</u>	
	TOTAL		1140

Alternate Generator Configuration

The load projections indicate that the initial plant requires a basic delivery capacity of at least 20 MW (Megawatts).

Table 26 shows a 1985 demand of nearly 23 MW, which if projected at the 9.5 percent growth rate would necessitate a delivery capacity of 30 MW in 1989, and 40 MW in 1992. The statistical risks of projecting linear increases for small areas still remains, however, and it is emphasized that deviations from these projections can be dramatic. System flexibility is therefore an important consideration.

In developing alternate plant configurations, back-up power and stand-by power must be considered. Besides generating the required projected load, the plant should have back-up generators which permit periodic maintenance to be performed on individual units. In other words, an additional unit is needed to allow "rotation" for maintenance and inspection. Stand-by capability is also required for unscheduled failures of on-line units. As a minimum, another unit is required for stand-by. The existing two Nordberg units and three White Superior units can provide the stand-by requirements until about 1989/1990. At this time they will have to be replaced.

Table 27 details alternate plant configurations based on 7.5 megawatt (MW) and 10.0 MW units. Each configuration uses multiples of an identical unit, which is considered necessary for operation and maintenance efficiency.

Both alternative configurations are currently under study by Office of Transition Studies and Planning and Public Works personnel. During the initial years of the planning cycle, there appears to be a relative advantage in using multiples of 7.5 MW units. However, towards the end of the Short Range planning horizon (1985) and beyond, the relative advantage

TABLE 26

SAIPAN SYSTEM GROWTH THROUGH 1985

<u>YEAR</u>	<u>EXIST'G GROSS PLANT GEN. MW</u>	<u>EST. NEW CONST. MW</u>	<u>OTHER INCR. (1%) MW</u>	<u>STA. LOSS (NEW) 8% MW</u>	<u>TOTAL INCR. MW</u>	<u>NEW DEMAND MW</u>	<u>% INCR.</u>
1977	11.2						
1978	11.2	1.65	0.11	0.13	1.89	13.09	16.88
1979	13.09	0.47	0.13	0.04	0.64	13.73	4.89
1980	13.73	1.62	0.14	0.13	1.88	15.61	13.69
1981	15.61	1.12	0.15	0.09	1.36	16.97	8.71
1982	16.97	0.83	0.17	0.07	1.07	18.04	6.31
1983	18.04	1.90	0.18	0.15	2.23	20.27	12.36
1984	20.27	1.00	0.20	0.08	1.28	21.55	6.32
1985	21.55	1.14	0.21	0.08	1.43	22.98	6.64

AVERAGE INCREASE 9.48

TABLE 27
ALTERNATE PLANT REQUIREMENTS

	<u>7.5 MW UNITS</u>			
	1979	1985	1989	1992
Demand	14MW	23MW	30MW	40MW
Basic Units	2 (15MW)	3 (23MW)	4	6
Back Up	1 (7.5MW)	1 (7.5MW)	1	1
Total	3 22,5MW	4 30MW	5 37.5MW	7 52.5MW
Standby	8.9MW Plus Misc. standby equipment	8.9MW Plus Misc. standby equipment	1 @ 7.5MW	1 @ 7.5MW

	<u>10.0 MW UNITS</u>			
	1979	1985	1989	1992
Demand	14MW	23MW	30MW	40MW
Basic Units	2 (20MW)	3 (30MW)	3 (30MW)	4 (40MW)
Back Up	Standby plant 8.9MW	Standby plant 8.9 MW	1 (10MW)	1 (10MW)
Total	3 28.9MW	4 38.9MW	4 40MW	5 50MW
Standby	Misc. standby equipment	Misc. standby equipment		

tends to support multiples of 10.0 MW units. Adoption of one of the alternatives will depend on further analyses of relative costs, system performance, and possibly on fuel type.

Fuel Type

Presently two types of fuel are being considered for utilization in the proposed power plant, diesel fuel no. 2 and no. 6 residual fuel. In essence either fuel can be utilized; however, no. 6 residual fuel does have problems which should be considered. The use of residual (black oil) fuel will result in higher maintenance costs, a more complicated plant to operate even with experienced operators, a need for duplicate (DF-2 and residual) fuel systems and the necessity to start-up, shut down and operate at lower loads on DF-2.

In conclusion, despite lower cost the utilization of No. 6 residual fuel should be carefully weighed prior to commitment to its usage.

The current U. S. effort to curtail the use of oil and gas as fuel sources and substitute coal, nuclear power, sun, wind or thermal power will, in practice, have little effect in the Northern Mariana Islands. While the costs of power will undoubtedly increase, there presently is no practical alternative to the use of oil in the generation of power in the Northern Mariana Islands. For the small population involved, coal/steam plants are uneconomical and other sources such as wind, sun, nuclear and thermal power are still in the development stage and will lack practical application during the plan period (1985). However, they should not be discounted as potential future sources of Northern Mariana Islands energy needs.

Power Plant Location

Three alternate locations are being considered in the vicinity of the Industrial Park (Lower Base). The preferred location appears to be the Outer Seaplane Ramp area and sufficient lands should be set aside for the plant location at that site. Impact assessments of the potential sites are presently being made and will be available shortly.

Hardening

Recent experience has emphasized the need to "harden" the power system against tropical storms and typhoons. Both on Saipan and neighboring Guam, the distribution system is the first to fail. Therefore, as lines are extended or replaced, an evaluation of the cost effectiveness of various hardening techniques will be made. The eventual burial of the line on Beach Road from Micro Beach to Wallace Road, for example, has already been identified. This action will markedly reduce the recovery time of restorative operations to customers throughout the entire area.

Conservation

Forced dependence on oil fuel will mean drastic increases in Saipan's energy bill throughout the planning horizon and beyond. Although technological breakthroughs may come any time, it is almost certain that energy will remain an ever precious commodity. Therefore, an electrical energy conservation plan similar to the type in the planning stage in the U. S. must be implemented on Saipan. The plan would establish a power budget for various types of clients with a heavy penalty for any power consumed beyond the established budget. As stated, there are no existing conservation programs in use today although some states and territories have completed initial studies with federal grants. Guam has completed the first phase of its study and will proceed into the second phase, implementation of the plan, shortly.

CAPITAL IMPROVEMENT RECOMMENDATIONS

The short-range recommendations for the development of the Saipan Power Generation and Power Distribution Systems include:

- * Construct a diesel power generation plant from alternate plant configurations consisting of units between 7.5 MW and 10.0 MW. Initial plant should be at least 20 MW.
- * Develop a program for the systematic replacement of primary and secondary lines. Redundancy and hardening of essential primary lines should be considered.
- * The "Impedance" and all standby units should be phased out by 1979 and 1990, respectively.

The proposed system shown in Plate 23 will serve island growth to the 40 MW level, matching the proposed power plant's ultimate capacity. All four circuits will have a 10 MW capacity. Circuits are expected to run along major roads. Major developed areas and facilities such as the airport, new hospital, industrial area, resort area, and commercial area will have a back-up circuit. One circuit from the new power plant paralleling West Coast Highway should be hardened immediately to provide assurance of rapid renewal of power service and long-lived capital investments in the generation and distribution subsystems.

The estimated cost for the system is \$15,580,000, which includes \$12,000,000 for power generation and \$3,580,000 for power distribution. Detailed costs are depicted in Table 28.

Beyond the Planning Horizon

About 5 years before the 40 MW system peak is reached, a study should be made to determine new requirements for a power plant and the distribution subsystems.

When the system's load exceeds 40 MW, a major change must be made to the distribution systems. If the southern half of the island exceeds 20 MW, then a higher voltage transmission line must be built and a substation located as near as possible to the load center.

TABLE 28

POWER GENERATION AND DISTRIBUTION
Estimated Costs 1978-1985

POWER GENERATION

<u>OPTION 1</u>	<u>OPTION 2</u>
1978: Three (3) 7.5 MW units Installed cost \$400 per KW Total \$9,000,000	1978: Two (2) 10 MW units Installed cost \$400 per KW Total \$8,000,000
1985: One (1) 7.5 MW unit Installed cost \$400 per KW Total \$3,000,000	1985: One (1) 10 MW unit Installed cost \$400 per KW Total \$4,000,000
TOTAL COST \$12,000,000	\$12,000,000

POWER DISTRIBUTION

NEW LINE CONSTRUCTION

Primary line 10 miles @ \$50,000/mile	10 x 50,000	\$500,000	
Secondary line 20 miles @ \$25,000/mile	20 x 25,000	500,000	
Commercial & Residential Hook Ups Estimated 1400 during plan period @ \$200	1400 x 200	<u>280,000</u>	\$1,280,000

REPLACEMENT OF EXISTING LINE

Estimated replacement needs in short term are 33% of existing Primary and Secondary lines			
Primary line 22 miles @ \$50,000/mile	22 x 50,000	\$1,100,000	
Secondary line 30 miles @ \$25,000/mile	30 x 25,000	750,000	
Primary line - Hardening Approx. 7.5 miles @ \$60,000/mile	7.5 x 60,000	<u>450,000</u>	<u>\$2,300,000</u>
	POWER DISTRIBUTION COST		\$3,580,000

SOLID WASTE

Planning for solid waste management must be cognizant of the unique problems of the Mariana Islands in general, and of course the unique characteristics of Saipan's size and population, transportation concerns, and types and quantities of waste which are anticipated.

Proper storage, collection and disposal of solid waste and refuse will have a tremendous impact on a developing economy, especially an economy that has close ties to America, and one that hopes to capitalize on the Japanese tourism potential.

EXISTING CONDITIONS

The present solid waste collection and disposal system is inadequate. Although the reasons for this situation are complex, improper collection and disposal practices basically stem from failure to realize that health hazards and blight to the scenic qualities of the island are consequences of improper waste disposal.

The official disposal sites are inadequate and operated improperly. Unofficial dumpsites randomly located along roadways are havens for vermin, and make the spread of diseases a threat to everyone. They scar the beautiful face of Saipan and present an undesirable image to visitors. The practice of burning solid waste is rampant. This practice creates air pollution in addition to being an outright nuisance.

Composition of Waste

Extensive data on solid waste generation in the Northern Mariana Islands - Saipan included - are not available. However, data from Guam is available. The proximity to Guam, the

similarities of weather conditions, customs, and habits of the people and the applicability of such biological factors as the fly cycle, allow for assumptions of waste composition and generation in the Northern Marianas and particularly Saipan, based on data from the neighboring U. S. territory.

Table 29 outlines the probable composition of residential waste in Saipan. Average residential waste contains about 7% food waste, 10% garden waste, and 16% paper products, or a total of 33% decomposable materials. Saipan may generate a slightly lower percentage of food waste than that indicated, due to the more prevalent practice of using this waste for chicken and pig feed. This discrepancy may be expected to decrease as Saipan continues development.

With respect to commercial and industrial wastes, it is necessary to identify waste components of a hazardous nature which may require special handling, storage, and disposal procedures. Presently, the types of hazardous waste found and generated in the islands include:

- * PCB Compound (or transformer fluid)
- * Chlorine
- * Ordnance left over from World War II (these "wastes" are hazardous because of their explosive nature and/or their chemical poisoning potential)
- * Pathological wastes
- * Crank case oil from service stations
- * Petro-chemical wastes from asphalt plants

A study presently undertaken by the Hawaii Department of Health for EPA Region 9 may provide additional information on hazardous waste problems of the Marianas.

TABLE 29

COMPOSITION OF RESIDENTIAL SOLID WASTE IN SAIPAN
(Based on Guam-generated data)

Component	Average % of Component by Weight	Estimated lbs. of Component per Capita per Day
Food Waste	7.7	.30
Garden Waste	10.7	.62
Paper Products	16.0	.62
Plastic, rubber, leather	2.2	.07
Textiles	5.1	.20
Wood	1.9	.08
Metals	35.3	1.37
Glass and ceramics	13.6	.53
Rocks, Dirt, Ashes, etc.	7.5	.25
TOTAL	100.0%	3.9 lbs.

Source: Saipan Solid Waste Disposal
Office of the District
Planner, Gerald Maier and
Scott Russell, June, 1975.

Storage and Collection Practices

There is no organized refuse collection service for the majority of residences. The Department of Public Works presently collects trash at government housing areas and for public institutions such as schools, the hospital, and government offices.

Wastes for the majority of residences are stored in assorted containers, generally in 55 gallon containers which are used for both storage and burning of trash. Trash is generally loaded into the back of pick-up trucks and is carried uncovered to the dump site in Puerto Rico or to numerous unofficial open dumps scattered about the island.

Due to this practice, streets are littered with beverage bottles and cans, paper wastes, and offending leftover foods and other perishable material. It is a foregone conclusion that the major islands should have regularly scheduled collection. Whether this effort should be handled by the government or by private enterprise is another matter that requires a policy decision. The ideal system would provide twice a week residence-by-residence collection.

Disposal Practices

The existing official dump site at Puerto Rico has been identified as environmentally unsuitable by the U. S. Army Corps of Engineers and may eventually be condemned by the U. S. Environmental Protection Agency. Moreover, the numerous unofficial dumpsites along less traveled roads present equal, if not greater, causes for alarm. Virtually no manageable pest control program can be established if random littering and dumping continues. This practice conveys to all an attitude of disregard for Saipan's beauty and her people, and is quickly picked up by visitors.

PLANNING FACTORS

The intent and purposes of the Solid Waste Management element of the Saipan Master Plan is to make recommendations on operations, storage practices, collection and disposal methods and procedures.

The contract under which the plan is being prepared does not allow for an in-depth study of Solid Waste Management. Consequently, such aspects as environmental assessment, volume and composition, organization of the Solid Waste Management Division at the Department of Public Works and alternate waste processing and disposal methods cannot be addressed in this report. A separate study to be funded through an EPA Technical Study Grant would allow for greater in-depth analysis of the overall solid waste management practices.

However, several factors essential for more comprehensive analysis have been identified. These factors have led to the development of several immediate considerations which will have to carry Saipan through the study period.

Waste Generation

In 1970 national per capita refuse production was 4.2 pounds per day. For Guam this figure is 3.9 lbs/day. On an annual basis this amounts to 1480 pounds per capita. Based on Guam's figures, Table 30 was derived reflecting 10-year waste generation figures for Saipan. Commercial waste is estimated at 3300 tons for 1978. This total includes the tourist oriented and support industries and is based on Guam's ratio for the year 1970. The table also incorporates an increase of 0.05 lbs per person per day. The commercially generated waste is increased at the rate of 5% per year.

TABLE 30

PROJECTED QUANTITY OF REFUSE GENERATED

Saipan, Northern Marianas

YEAR	POPULATION	QUANTITY PER YEAR		TOTAL GENERATION
		RESIDENTIAL	COMMERCIAL	
1978	14,041	9,990 Tons 119,880 C.Y.	2,260 Tons 26,400 C.Y.	12,190 Tons 146,280 C.Y.
1979	14,939	10,771 Tons 129,252 C.Y.	2,310 Tons 27,720 C.Y.	13,081 Tons 156,972 C.Y.
1980	15,904	11,610 Tons 139,320 C.Y.	2,426 Tons 29,106 C.Y.	14,036 Tons 168,426 C.Y.
1981	16,666	12,316 Tons 147,792 C.Y.	2,547 Tons 30,561 C.Y.	14,863 Tons 178,353 C.Y.
1982	17,524	13,108 Tons 157,296 C.Y.	2,674 Tons 32,089 C.Y.	15,782 Tons 189,385 C.Y.
1983	18,360	13,908 Tons 166,896 C.Y.	2,808 Tons 33,696 C.Y.	16,716 Tons 200,592 C.Y.
1984	19,341	14,825 Tons 177,900 C.Y.	2,948 Tons 35,376 C.Y.	17,773 Tons 213,276 C.Y.
1985	20,306	15,757 Tons 188,964 C.Y.	3,096 Tons 37,152 C.Y.	18,843 Tons 226,116 C.Y.
1986	21,374	16,778 Tons 201,336 C.Y.	3,250 Tons 39,000 C.Y.	20,028 Tons 240,336 C.Y.
1987	22,225	17,647 Tons 211,764 C.Y.	3,413 Tons 40,956 C.Y.	21,060 Tons 252,720 C.Y.
TOTALS		136,700 Tons 1,640,400 C.Y.	27,672 Tons 332,056 C.Y.	164,372 Tons 1,972,456 C.Y.

1. Based on 3.9 lbs/day/capita with an increase of .05 lbs/day/capita every year

Collection Alternatives

Two methods of collection have been proposed: house-to-house pick-up, and central pick-up from a limited number of transfer stations in each village. Both alternatives must be carefully considered before a permanent program can be selected. However, today's sanitation and nuisance problems are so acute as to require immediate remedial action. In anticipation of this requirement an immediate scheme for weekly house-to-house pick-up has been developed.

Table 31 reflects the 1978 population projection and dwelling unit count for each village. Seventy to eighty per cent of Saipan's residences are located in villages and other urban areas such as Gualo Rai. The population and the amount of waste they generate is of minor importance in the formulation of the equipment list and schedule of pick-ups. The number of residential units is the governing factor.

Disposal Alternatives

Previous solid waste studies for Saipan have reviewed waste disposal alternatives, and the exercise will not be repeated here. Based on previous findings it is assumed that the sanitary landfill approach with possible future reduction of waste volume through reprocessing waste and using returnable cans and/or bottles is the most viable approach for Saipan.

The first matter to be addressed is the identification of a proper landfill site for many environmental reasons, but chiefly due to scenic blight, water pollution, and health hazards. The present Garapan site should be closed, covered up and landscaped as soon as possible. Uncontrolled dumping at unofficial sites must also be restricted. Furthermore, the practice of locating dumps in swamps or lowlands because

TABLE 31

POPULATION AND DWELLING UNIT DISTRIBUTION

COMMUNITIES	1978*	
	POPULATION	DWELLING UNITS
San Roque	729	118
Tanapag	839	137
North Garapan	1,900	348
South Garapan	1,442	310
Capitol Hill	568	115
Navy Hill	200	33
San Vicente	846	187
San Jose	1,510	287
Susupe	923	186
Chalan Kanoa	3,582	667
San Antonio	1,402	312
TOTALS	14,041	2,700

* Population Projection assumes an average density of 5.2 persons/DU overall.

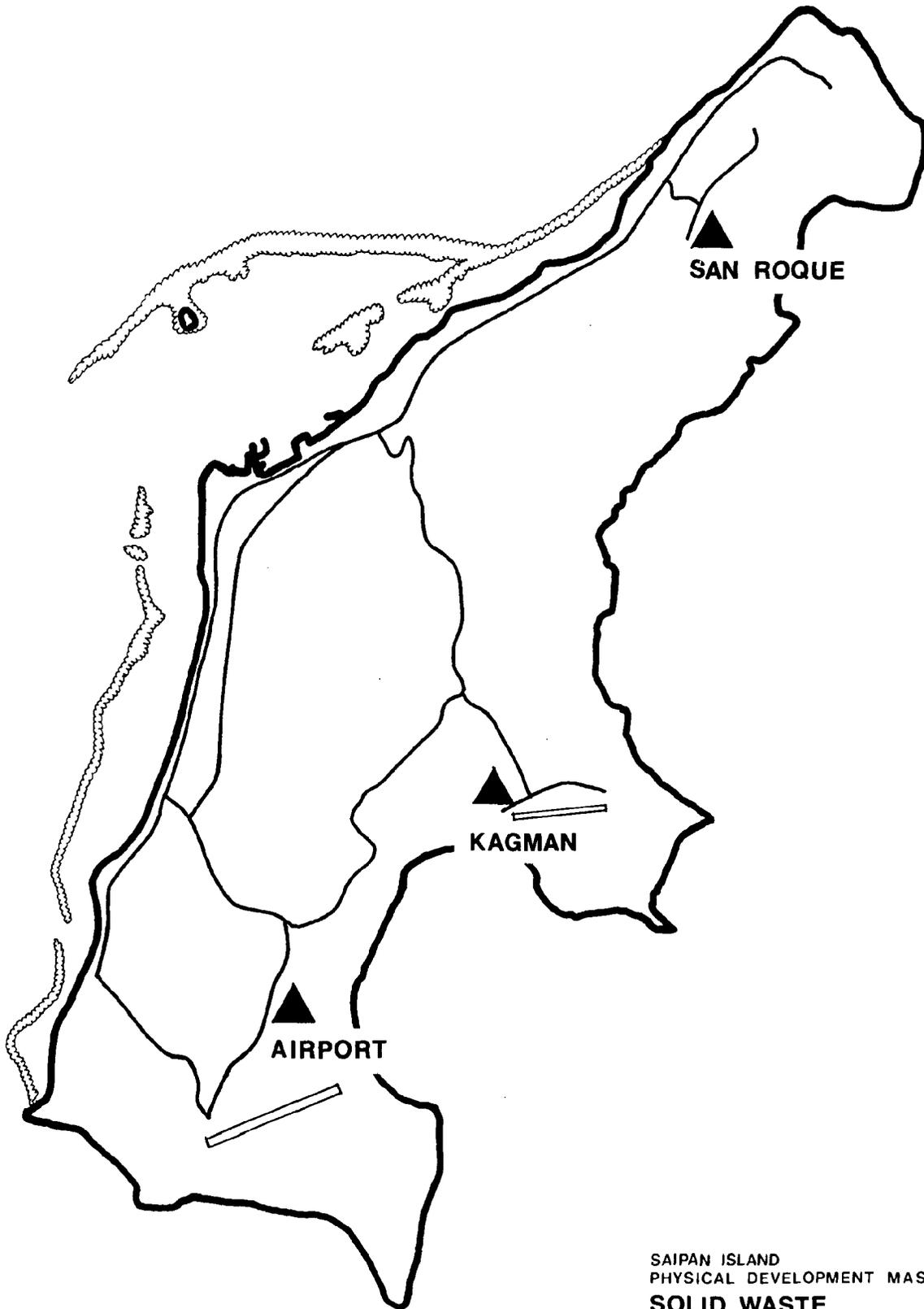
the practice was believed to reclaim "unuseable" land should be stopped immediately. Scientific evidence has clearly demonstrated that swamps and marshes act as water purification areas. Swamp plants remove pollutants from water and convert them to useable plant food substances. One such area in Saipan, Lake Susupe, is also the habitat of the Marianas Mallard, a rare duck found only in the Marianas and listed worldwide as an endangered species.

Plate 24 shows three possible landfill sites. The first site in As Lito is an abandoned quarry just north of Saipan International Airport. This site offers the advantage of good accessibility (4.6 miles from Central Chalan Kanoa and 6.0 miles from Central Garapan), adequate space and soils, and non-conflicting nearby uses.

However, a serious potential problem with a sanitary landfill at this site is the possible pollution of nearby wellfields. Conclusive evidence that the leachate would not flow southwesterly toward the Dandan and Kobler wellfields must be established before this site could be selected for landfill use.

A second site, which may be marginal in size, is located in the Kagman area on the road to Laulau Beach. The advantages of this site are adequate soil cover, and a lesser threat to the groundwater since there are no wellfields nearby. However, further investigations of groundwater activity should also be carried out here. The disadvantage of this site is accessibility. The site is about 8 miles from central Chalan Kanoa and 7 miles from central Garapan.

The third site is an old quarry about two miles northeast of San Roque Village. This site is larger than the Kagman site but probably smaller than the As Lito site. It should pose



SAIPAN ISLAND
 PHYSICAL DEVELOPMENT MASTER PLAN
SOLID WASTE
 potential land fill sites

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no groundwater pollution problem (again this must be verified by a qualified hydrologist) and adequate cover material should be available. It could be kept from conflicting with nearby uses by providing buffer zones. A major accessibility problem exists here, however. The distance from the bulk of Saipan's population may be excessive since the site is 11.5 miles from Chalan Kanoa.

Storage Practices

Wastes are stored in assorted types of containers. The use of anything bigger or heavier than a 32-gallon container, such as the commonly used 55-gallon drums, creates serious problems for the implementation of an efficient refuse collection system.

Use of the 55-gallon drums promotes the burning of wastes. Burning, in addition to creating pollution and general nuisance, makes the container weigh heavier because of the accumulation of ashes. To complicate matters, these drums are usually not covered, allowing rain water to collect along with the ashes. Rusting of the container is thus accelerated. The excessive weight, bulkiness, and deterioration make these drum containers impractical for use in a sound, efficient and sanitary refuse storage and collection program.

Resource Recovery

Although conservation techniques may not seem important now, as the volume of waste increases the ability to properly dispose of it will decrease. A complete waste reprocessing center which separates out glass and metal for recycling and converts combustible material to compost or energy is probably not feasible at this time. However, careful observation of the feasibility study of a waste reprocessing plant in Guam should be made to determine its potential application

in the Northern Marianas. The time frame necessary to study and start a reprocessing plant is such that a new landfill site will be needed anyway.

Since a significant portion of the litter on Saipan and the solid waste at the dumps are cans and bottles, the possibility of a law banning throw-away cans and bottles for drinking beverages should be considered. Successful implementation would reduce littering, reduce projected costs of maintaining public historic and scenic sites, beaches, and road rights-of-ways. Also, it would have a long term effect of increasing the life expectancy of the landfill site.

PLAN RECOMMENDATIONS

It has been recommended to the Office of Transition Studies and Planning that, pending final designation by the Commonwealth Government of the Northern Marianas, Saipan should constitute a separate management district for handling normal residential waste and bulky wastes. Furthermore, a regional boundary including all the islands of the Northern Marianas should be established for the disposal of hazardous wastes, with Saipan as the central processing and disposal point.

The collection and disposal of hazardous wastes which can become quite a delicate matter, should be centralized as much as possible and be managed at the regional district level. The fewer the number of sites for disposing of these wastes that exist, the lesser the hazard to the general public. Further, the collection and handling of these wastes will require specialized training and/or equipment, thereby eliminating the possibilities that normal solid waste collection crews can handle them safely.

Although additional study is required to address adequately a comprehensive solid waste management program, the urgency of today's problems demand immediate remedial action. Therefore, the plan makes several recommendations regarding storage, collection and disposal which will directly alleviate the most glaring health and nuisance problems for the immediate future. These actions will permit time for thorough analysis of Saipan's needs for the balance of the 1985 planning horizon and beyond. Specific recommendations for collection, storage, and disposal are listed below.

Collection and Storage

1. Immediately initiate a once-a-week collection system for all residential areas with implementation of twice-a-week service by the end of the planning period.
2. Collection of commercial waste should be handled by private haulers or by government pick-up at an established fee.
3. Weekly collection should be scheduled on a four day week with the fifth day reserved for pick-up of oversized materials or for the completion of uncollected areas.
4. Legislation prohibiting burning in private containers should be passed and rigidly enforced.
5. Regulations prohibiting the use of 55-gallons drums as refuse containers should be established. Only 32-gallon galvanized iron steel containers with tight covers, or plastic bags should be used.
6. All commercial accounts, institutional accounts, and apartment buildings of more than 4 units shall be required to furnish containers of a design and capacity designated by the Division of Solid Waste Management.
7. Trash containers should be placed at all parks, picnic areas, beaches, public buildings, and other public areas.

8. Residents should be encouraged to place their refuse containers in readily accessible locations so as to facilitate collection.
9. Oversized objects such as tree cuttings and yard trimming should be bundled up and tied.

Disposal

1. Close any and all open-burning dumps.
2. Initiate immediately the development of a sanitary landfill at either the As Lito site or Kagman site.
3. A D-7 tractor equipped with a special blade can be used for spreading and compacting waste and the cover material.
4. Establish regulations requiring contractors to use the site for disposal of construction waste and excess excavated materials, as well as demolition debris.
5. Start a water quality monitoring program in the nearby well-fields.
6. A fence may be necessary to set the boundary limits of the landfill site, and also to control the use of the area by private haulers.

The use of packer trucks should be required, whether the collection is conducted by the government or through the private sector. In urban areas, the accepted standard is 2 minutes per pick-up. Twenty-yard packer trucks are the optimal units for the islands as they are reasonably sized and can negotiate the local streets and roads. They should be equipped with the mechanism for loading two and three yard containers. An analysis of equipment requirements for collection are identified in Table 32.

If collection is to be done by government personnel, it should be standard practice to dismiss the collectors when the day's

TABLE 32

EQUIPMENT REQUIREMENT

Total number of dwelling units (DU's) in 1978	= 2,700
Number of DU's to be picked up weekly on a four-day week basis = 2,700 divide by 4	= 675 DU's
Assume 6 hours of actual pick up time, total number of minutes available for pick up, 6 x 60	= 360 min.
Using 2 minutes per residence for pick up number pick-ups available for each equipment, 360 x 2	= 180 DU's
Number of equipment needed 685 divide by 180	= 3.7 say 4 Packers with 2 in reserve for standby and periodic maintenance
With four crews and equipment working the number of possible pick-ups = 4 x 180	= 720/day

work schedule is accomplished. This provides incentives to work faster and more efficiently. This interim service would require six-packer trucks and four crews.

Costs of Improvements

Estimated capital costs for the implementation of an effective solid waste management program is \$605,000 during the seven-year plan period and includes:

- * Feasibility study of Solid Waste Disposal System and development of a Solid Waste Management Program Strategy for the Northern Mariana Islands.
Estimated cost \$60,000

- * Preliminary feasibility studies on alternate landfill sites and development costs for the selected landfill.
Estimated cost \$80,000

- * Purchase of six (6) Packer trucks to supplement existing equipment. Two (2) to be purchased in FY 1978 and the remainder to be purchased between 1980 and 1983.
Estimated cost, at \$55,000 or \$220,000

- * Purchase of a D-7 Bulldozer or comparable equipment with sanitary landfill blade.
Estimated cost \$135,000

Operational and maintenance costs have not been identified herein; however, they will be identified as part of the Solid Waste Management strategy to be conducted in 1978.

DRAINAGE

EXISTING CONDITIONS & PLANNING FACTORS

Saipan's drainage problems predominantly occur on the western half of the island where rugged, steep limestone formations abruptly give way to flatlands, typically near sea level.

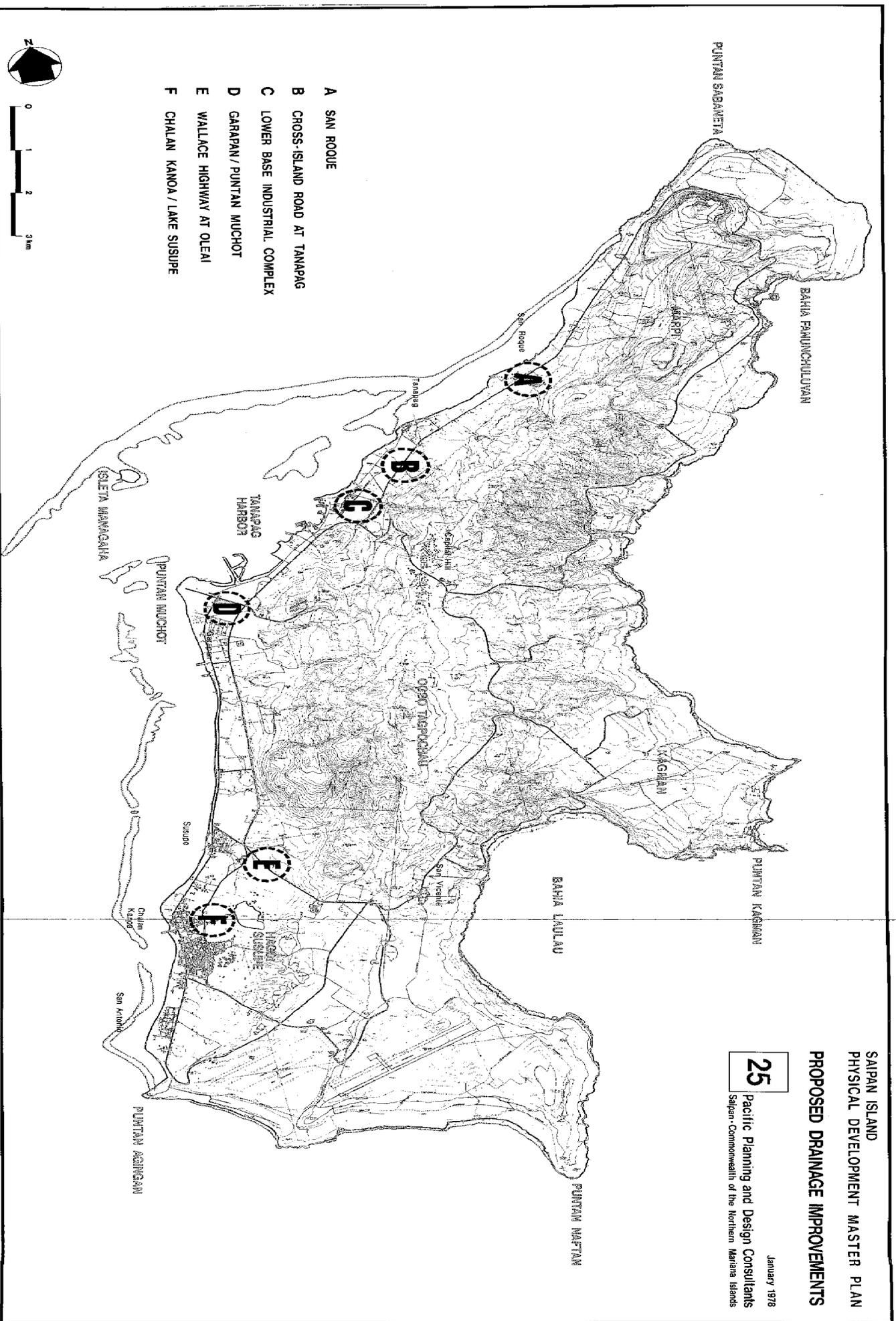
Natural drainage ways which carry storm runoff from the slopes are well-defined. However, on the coastal plain where substantial development has taken place, drainage channels have been systematically obliterated, filled, dammed or otherwise altered giving rise to serious ponding and flooding problems. The post-World War II construction of the island's highway network was accomplished without adequate drainage crossings. Residential and commercial areas were carelessly developed, often without storm water collection and disposal facilities. Existing culverts are predominantly 55-gallon drums welded end to end or corrugated metal pipes - the majority of which are grossly undersized and badly deteriorated.

The areas which have been identified as having acute, chronic drainage problems are depicted on Plate 25. The following paragraphs briefly describe and define the drainage conditions and problems which prevail in each specific area. It should be noted that GNMI has not established storm drainage planning design criteria and that runoff estimates presented in this report are based on Guam Drainage Standards. Because of the Island's similarity of geology and hydrology, it is felt that use of Guam Drainage Standards will give a reasonable picture of the magnitude and extent of Saipan's drainage problems.

SAIPAN ISLAND
 PHYSICAL DEVELOPMENT MASTER PLAN
PROPOSED DRAINAGE IMPROVEMENTS

25
 Pacific Planning and Design Consultants
 Saipan, Commonwealth of the Northern Mariana Islands

January 1978



- A SAN ROQUE
- B CROSS ISLAND ROAD AT TANAPAG
- C LOWER BASE INDUSTRIAL COMPLEX
- D GARAPAN / PUNTAN MUCHOT
- E WALLACE HIGHWAY AT OLEAI
- F CHALAN KANOA / LAKE SUSUPE

San Roque Village

San Roque Village, Saipan's northernmost community, is situated directly in the path of a major natural drainage way. The tributary watershed is 150 acres. Twenty-year design storms are predicted to generate runoff volumes of approximately 720 cubic feet per second (cfs) from this extensive watershed area. During storms, runoff is collected and discharged at the southeastern corner of the village into a masonry-lined rectangular open channel about four feet wide and six feet deep. The channel constructed by the San Roque Municipal Public Works Department, extends a distance of 1000 feet to Cross Island Road. There, flows are intercepted and conveyed northward along the highway by a series of shallow earth-lined ditches and small culverts which, for the most part, are not functional. The existing drainage facilities are not only hazardous, but are also hopelessly inadequate to cope with runoff from storms of even light to moderate intensity. Consequently, San Roque has compiled a depressing history of acute flooding problems. The situation will gradually worsen with further expansion of the village.

Cross-Island Road at Tanapag

The construction of Cross-Island road at Tanapag was accomplished without adequately sized drainage crossings. This condition has reached flood hazard proportions at an area approximately 3000 linear feet north of the GNMI Public Works Complex where flow from a rugged 77-acre watershed overwhelm a series of greatly undersized pipe culverts. The existing crossing is made up of one 12-inch and two 18-inch diameter concrete pipe culverts with only one of those currently operative. Flows across the roadway during intense storms often reach depths of two feet and are characterized by strong velocities and heavy sediment and debris loading. The twenty-year design storm runoff volume is estimated to be about 375 cfs.

Lower Base Industrial Complex at Tanapag

Runoff from a 1400-acre watershed flows into the government owned industrial complex located at the base of Sabanan As Kina. The existing developed area, containing an assortment of both public and private industrial facilities, makes up only a fourth of the 240-acre government property reserved for industrial uses and designated for intensive development in the plan period. The area is characterized by extremely flat terrain and is underlain by sandy soils of good permeability. Runoff from upland areas, including Capitol Hill, Sabanan As Kina and As Rapugau, predicted to reach a volume of 5800 cfs during 50-year storms, converge on the flatlands, causing extensive ponding and severe flooding. Flood waters are partially dissipated through percolation and evaporation. However, runoff is primarily disposed of by direct outflow to the sea via a major drainage way known locally as Sadog Tase which loops through the complex, emerging at the bay at two separate points. The interfaces between this drainage canal and the sea appear to be well developed tidal estuaries with abundant mangrove vegetation. The inland portion of the canal is heavily silted and overgrown with swampgrass and tangan-tangan and does not function effectively in disposing of storm water. This poor drainage predicament has been aggravated by a long history of improper grading practices which have created large ponding areas. Without the construction of an adequate infrastructure, expansion and further development of the industrial complex will surely invite disastrous flood conditions.

Garapan/Puntan Muchot

Garapan and the Puntan Muchot peninsula lie at the base of As Rapugau and As Falipe hills, between West Coast highway and the shoreline. Tributary areas total over 400 acres and are of limestone formation with average slopes between 10% and 20%. The watershed is largely undeveloped terrain and well-forested, with the exception of the Navy Hill area that has been developed over the years for residential and commercial uses.

Runoff from upland areas, predicted to reach 1500 cfs during a 30-year design storm, is conveyed under West Coast Highway at several points and discharged into Garapan. Prior to World War II, shallow open drainage channels extending to the sea provided a means for collection and disposal of storm water from both Garapan and Puntan Muchot. However, post World War II residential and commercial developments have obliterated most of these channels, causing storm flows to flood the flatlands. Eventually and over a considerable period of time, flood waters dissipate through percolation and evaporation. However, because Garapan and Puntan Muchot are practically at sea level, effective percolation is severely constrained by the water table and tidal fluctuation.

Garapan appears to be headed for intense residential and commercial development. Expansion of residential and commercial facilities in Garapan, as well as further resort development at Puntan Muchot can be expected to aggravate present flooding conditions. An integrated flood control program to be implemented concurrent with further development is necessary if more serious flooding problems are to be avoided.

Wallace Highway at Oleai

Wallace Highway, a primary road with a long history of drainage problems, bisects an extensive alluvial coastal terrace extending south from the base of Sabanan Gallego to Lake Susupe. The highway, constructed on only two feet of fill, receives runoff from an extensive 1782 acre watershed that includes portions of Sabanan Gallego, Laderan Tagpochau, and Fina Sisu to the north and east of Oleai. It is estimated that runoff volumes for a 50-year design storm will exceed 4000 cfs. It is no wonder then that Wallace Highway floods during light to moderate rainfall. Stormwater, however, does not pond on Wallace Highway, but flows towards Lake Susupe, a natural drainage basin which serves as the ultimate disposal point for a vast 2800 acre tributary area.

Chalan Kanoa/Lake Susupe

Chalan Kanoa, the most densely populated community in Saipan, sits at the periphery of an extensive wetlands area extending south from Chalan Kiya to the northern boundary of San Antonio municipality. At the drainage centroid to these wetlands lies an eight-acre freshwater lake known as Lake Susupe. The areas which contribute runoff to Lake Susupe reach far north to Laderan Tagpochau, east to Fina Sisú and south to As Perdido, embracing over 2800 acres. The 50-year design storm flow into Susupe is estimated at over 7000 cfs. During intense storms of long-duration, the water level of Lake Susupe rises dramatically and floodwaters spill into Chalan Kanoa and Susupe Village inundating extensive residential and commercial areas. The drainage problem at Chalan Kanoa and Susupe is clearly one of flood control.

The Chalan Kanoa area is slated for a Community Redevelopment Program under the auspices of the Mariana Islands Housing Authority (MIHA). It is anticipated that the program will provide drainage infrastructure facilities which should alleviate current flood problems in the villages of Chalan Kanoa and Susupe.

CAPITAL IMPROVEMENT RECOMMENDATIONS

General

Before proceeding with the design and construction of drainage improvements, it is imperative that the GNMI develop and establish storm drainage planning and design criteria based on a thorough statistical analysis of Saipan's rainfall data and unique watershed conditions. This project will involve, as a minimum, the following tasks:

- A. Analysis and synthesis of these hydro-geological relationships and factors:
 1. Rainfall intensity and duration
 2. Rainfall - runoff relationship
 3. Storm recurrence interval

4. Times of concentration
 5. Percolation rates for various sub-surface conditions.
 6. Runoff coefficients for differing watershed topography and conditions
- B. Adopt storm drainage methodology and procedures
 - C. Develop construction standards and "guide" specifications to prescribe and regulate materials and methods involved in the construction of drainage facilities.
 - D. Prepare and publish a Saipan "Manual of Storm Drainage Planning, Design and Construction Standards" which incorporates the results of tasks A through C.

This project is estimated to cost \$50,000 and should be undertaken as soon as possible.

In order to provide immediate, temporary relief of present drainage problems, it is recommended that the GNMI initiate a program for maintaining existing drainage facilities. All existing drainage channels and culverts should be located, cleaned out and maintained regularly. Fifty-five gallon drum culverts should be systematically replaced by adequately sized reinforced concrete pipe culverts.

This maintenance program can be undertaken using present GNMI Public Works personnel and equipment. Additional labor, equipment and material requirements should be programmed as line items in the GNMI Public Works Operation budget.

San Roque

To alleviate flooding conditions at San Roque, upland storm flows must be intercepted before they enter the village, then conveyed safely to ultimate disposal. It is recommended that an underground concrete box culvert system, of sufficient size

to accommodate storm runoff from a 20-year design storm, be constructed beginning at the southeast corner of the village extending generally along the southernmost village street to Cross Island road. The box culvert should continue along the highway for a distance of at least 1100 feet then turn westward, crossing the roadway and extending to the sea.

The lower box culvert section should be increased in capacity as necessary to accommodate additional runoff from the village proper plus provide for future runoff from a 60-acre area just north of the existing village. This area is likely to develop as part of the inevitable expansion of San Roque.

The total cost of improvements is estimated to be \$900,000 including \$55,000 for engineering and design. Since the drainage problem is one of flood control, funding may be provided through the Army Corps of Engineers Civil Works program when it becomes applicable in the Northern Mariana Islands or through the Economic Development Administration's Public Works program.

It is recommended that engineering and design funds be made available early in the plan period to catalyze an EDA grant for construction.

Cross Island Road at Tanapag

A box culvert of sufficient capacity to accommodate 20-year design storm flows should be constructed at the existing highway crossing. Energy dissipators should be provided along with transition channels at both upstream and downstream sections of the proposed culvert. A 200 foot section of roadway must be reconstructed as part of the scheme of improvements.

The cost of improvements, including engineering and design, is estimated at \$100,000. Design may be financed from Highway Program funds and construction through an EDA grant. Again, it is recommended that design be undertaken early in the plan period to take advantage of EDA funding.

Lower Base Industrial Complex at Tanapag/Garapan and Puntan Muchot

The drainage problems at Lower Base, Garapan, and Puntan Muchot are not only contiguous, but also exhibit similar hydro-geological features. The solution to the drainage problems will involve intercepting and diverting upland storm flows away from existing and proposed residential, commercial and industrial areas and either ponding in conservation areas or channelling to the sea - or through a combination of both methods.

It is recommended that a detailed drainage study be conducted and a Facilities Plan prepared for the combined regions of Lower Base, Garapan and Puntan Muchot, including Puerto Rico, the coastal area between Lower Base and Garapan. The study and drainage facilities plan should address the following items:

- * Investigate and analyze the hydrology of the combined areas.
- * Identify and evaluate existing drainage facilities in the combined areas and their respective watersheds.
- * Compute storm flows based on accurate existing and predicted hydrological statistics and appropriate storm drainage design criteria.
- * Develop storm drainage disposal alternatives including ocean disposal, ponding or a combination of both methods.
- * Assess the impact of each alternative on the environment in general and on marine and groundwater resources in particular.
- * Develop a plan for the construction of drainage facilities which should provide the following as a minimum.
 - a) Basis for planning and design of facilities
 - b) Schematic design of improvements establishing sizes and alignments as required to accommodate the anticipated future industrial, commercial, residential and recreational development.

- c) Land and easement acquisition requirements
- d) Guide construction specifications and procedures
- e) Construction phasing and implementation schedules
- f) Environmental Impact Statements (if necessary)
- g) Funding requirements and recommended financing schemes
- h) Land use and Development controls to assure proper plan implementation

The cost of the Drainage Study and Facilities Plan is estimated at \$100,000 and will be financed through joint funding from the GNMI American Memorial Park and Lower Base Industrial Park Development funds.

Construction of improvements should be incrementally programmed and may be financed through a combination of Industrial Park development, Highway Program, EDA and Subdivision development funds. It is recommended that private developers be required to finance or construct portions of the improvements as part of residential subdivision, commercial or resort development.

Wallace Highway at Oleai

A detailed drainage study for the Wallace Highway area is being conducted under the administration and supervision of the GNMI Department of Public Works to provide a basis for the design of highway improvements. Preliminary drainage and highway design analyses recommend that the portion of Wallace Highway through the swamp be raised about 2.5 feet above its existing elevation and equalization culverts be installed at several points along the highway.

Construction of highway improvements, scheduled to begin early in the plan period and to be financed by Highway Program funds, will improve drainage conditions. However, it should be noted that the design of drainage improvements - to be constructed

as an integral part of the highway project - is based upon the implementation of the Land Use Plan. Deviations from this plan will significantly influence the purpose and performance of the proposed drainage facilities.

Chalan Kanoa/Lake Susupe

The drainage problem in the Chalan Kanoa and Lake Susupe areas is one of flood control. In fact, substantial parts of Chalan Kanoa and Susupe Village lie in the Lake Susupe flood plain.

The lake and surrounding wetlands comprise a fragile, sensitive ecological system which can be easily disrupted and destroyed by indiscriminately altering its character. Lake Susupe must be continuously recharged by a sufficient quantity of good quality runoff from its tributaries. On the other hand, intense storm discharges will surely cause floodwaters to inundate Chalan Kanoa and Susupe. The present drainage problem is a dilemma of sorts and the solution will be complex. It will involve a detailed flood control study, followed by construction of flood control facilities and the implementation of a sound flood plain management program which should impose land use and development controls on not only Lake Susupe but its flood plain and watershed as well.

It is therefore recommended that:

- A. A detailed flood control study be conducted of Lake Susupe, to entail the following scope:
 1. Investigate and analyze the hydrology and flood problems of Lake Susupe and its tributaries.
 2. Identify and evaluate existing drainage facilities in and around Lake Susupe and its watershed.
 3. Compute storm flows based on accurate existing and predicted hydrological statistics and appropriate storm drainage design criteria.

4. Develop flood control alternatives including ocean disposal of overflows, ponding or a combination of both methods.
5. Assess the impact of each alternative on the environment in general and on Lake Susupe and marine resources in particular.
6. Develop a plan for the construction of flood control facilities which should provide the following as a minimum.
 - a) Basis for planning and design of facilities.
 - b) Schematic design of improvements establishing sizes and alignments as required to accommodate the anticipated future industrial, commercial, residential and recreational development.
 - c) Land and easement acquisition requirements for facilities and the flood plain.
 - d) Guide construction specifications and procedures.
 - e) Construction phasing and implementation schedules.
 - f) Environmental Impact Statement.
 - g) Funding requirements and recommended financing schemes.
 - h) Develop a Flood Plain Management and Zoning Program which will set forth recommendations with respect to authority, organization, administration, policies, procedures, land use and development controls, etc.

The study is estimated to cost about \$150,000 and may be undertaken by the Army Corps of Engineers, or financed jointly through the MIHA Redevelopment and Coastal Zone Management Programs. It is also possible that the Federal Insurance Administration (FIA) could lend assistance in mapping flood hazards areas - assuming the National Flood Insurance Program becomes applicable to the Northern Mariana Islands.

-
- B. The construction of flood control facilities should be undertaken in phases with immediate, limited village drainage improvements being incorporated into the Mariana Islands Housing Authority (MIHA) Chalan Kanoa Redevelopment Program. Major flood control structures could subsequently be financed by the Army Corps of Engineers Civil Works Program or EDA.
- C. A Watershed and Flood Plain Management and Zoning Program be implemented for Lake Susupe, its flood plain as well as its tributaries. The program must include the establishment and enforcement of land use and physical development controls which will ensure not only that the Susupe ecosystem is preserved, but that fringing residential and commercial areas are adequately protected from flooding as well. The program should be a regulatory function of the Commonwealth Government and could be funded by the GNMI Executive budget or through special appropriations or taxation.

TRANSPORTATION

AIRPORTS

HARBORS

HIGHWAYS

AIR TRANSPORTATION

EXISTING CONDITIONS

Air transportation is the principal mode of travel connecting the Northern Mariana Islands and therefore plays a vital role in the social and economic development of these islands. Island residents are highly dependent upon air transport for resupplying perishable foodstuff, medical supplies, merchandise, and personal travel, which places high priority and importance on safe and reliable air transportation and efficient airport facilities. This report identifies current and projected airport development requirements for Saipan and proposes a development program through 1983 together with estimated project costs for planning purposes.

Trust Territory Airport System Plan

Data from the current Trust Territory Air System Plan have been analyzed and in some instances incorporated into this report. These include: airport standards, forecasts of air traffic, and capacity analysis of existing airport system and airspace which have been analyzed and summarized in subsequent sections of this report. A detailed summary of existing conditions is also provided here.

Airport Layout Plans

The approved airport layout plan (ALP) for Saipan International Airports was utilized as the basis for developing the system costs and the proposed schedule for improvements.

PLANNING FACTORS

Saipan is served by limited commercial air carrier traffic, and is also the home base for a small number of chartered general aviation aircraft. However, important changes in air service

requirements for this area are expected and in fact are already emerging. It is therefore necessary to begin by examining the planning factors most likely to impact heaviest on this sector of public transportation.

Changing Route Structure

The air route structure within Micronesia presently centers around Guam, the point of interchange between airlines flying across the Pacific and Micronesia. The major routing is eastward from Guam, connecting Truk, Ponape, Kwajelein, Majuro, Johnson Island and Honolulu. Other routes are southwestward between Guam, Yap and Palau and north-south between Guam, Rota, Tinian, and Saipan. These are the routes over which scheduled air carrier service via Continental-Air Micronesia has been available.

On October 1, 1977, Continental-Air Micronesia and Japan Airlines inaugurated direct flights between Tokyo and Saipan. Continental-Air Micronesia has revised its overall route scheduling to include the Tokyo-Saipan leg with the remainder of their route structure. This change will eliminate the need for connecting flights at Guam for their passengers. Their revised schedule is as follows:

1. Tokyo-Saipan-Guam-Truk-Ponape-Kwajelein-Majuro-Johnson Island-Honolulu--3 flights a week each way.
2. Tokyo-Saipan-Guam-Yap-Palau--2 flights a week each way.
3. Tokyo-Saipan-Guam--2 flights a week each way.

Japan Air Lines has four flights a week each way between Tokyo and Saipan, with passenger connections provided by Continental-Air Micronesia for points beyond.

Larger Aircraft

The largest aircraft presently in service are the Boeing 727-100's used by Continental-Air Micronesia and the Douglas DC-8's used by Japan Air Lines. However, as projected traffic materializes, it may eventually require the introduction of larger capacity aircraft such as the Boeing 747 and Douglas DC-10.

Air Taxi Service

Most of the air passenger service between islands is provided by small air-taxi operators (Island Air, Aviation Services and Tinian Air), which provide two- to four-times a day service between Saipan and Guam. Special charter and sightseeing flights are also available to all islands, including Pagan. These air-taxi operations utilize small single or twin engine aircraft. Air-taxi service will remain a significant factor in the movement of air passengers in the future.

A wide range of aircraft are available which can serve practically any type of service requirements or airport size and conditions. Many of these aircraft are highly specialized, while others are more flexible. Costs can vary widely for each available cargo pound mile or available passenger mile produced. Generally, the more highly specialized and smaller the aircraft, the more expensive it is to operate on an available passenger mile basis. To illustrate this fact a broad comparison of various aircraft, compiled from other reports, is shown below:

<u>Aircraft</u>	<u>Cost per Available Passenger Mile</u>
Helicopter (4 passengers)	70¢
Seaplanes (9 passengers)	19¢ (1975 cost)*
Cessna 402 (8 passengers)	8¢ (1977 cost)*
Britain Norman Islander (9 passengers)	6.93¢ (1975 cost)*
Norman Tri-islander (17 passengers)	5.39¢ (1975 cost)*

De Havilland Twin Otter
(20 passengers)

5.25¢ (1977 cost)*

*Based on high utilization rate

It can be readily seen that costs per available seat mile decrease as the size and efficiency of the aircraft increase. However, these figures must be matched with demand to determine load factors conducive to economical air service. For if there are no passengers to fill the aircraft, costs quickly soar. A good air service with a frequent schedule to each island can be provided only if there is sufficient demand.

With the wide range of aircraft available to the air-taxi industry and the unique transportation requirements of this area, the air-taxi industry will become stronger and larger, and be an important user of airport facilities.

Air Traffic Forecasts

The air traffic forecasts used in this report are those developed in the Trust Territory Airport System Plan report. Projections of air passenger traffic and cargo/mail volumes were used to derive aircraft operations needed to handle these forecasts. Aircraft operations are broken down into air carrier-passenger, air carrier-all cargo, air taxi, general aviation, and military operations. Peak hour forecasts and sensitivity analyses are also included. The forecasting methodology considers historical visitor arrival statistics, the economic profile, and the political aspects of the whole of Micronesia.

Table 33 summarizes the air traffic forecasts for the 1980, 1985 and 1995 planning horizons.

These forecasts may be questionable for some uses, but their overall usefulness as a planning tool remains. It is significant that the forecasts indicate a need for only minimum

TABLE 33

SUMMARY OF AIR TRAFFICE FORECASTS
SAIPAN INTERNATIONAL AIRPORT
 1980-1995

<u>Year</u>	<u>Air Passenger Movements (ENP & DEP)</u>	<u>Total Arriving Cargo/Mail Volume (000 pounds)</u>	<u>ANNUAL AIRCRAFT OPERATIONS</u>					
			<u>Air Carrier Passenger Aircraft</u>	<u>Air Carrier All Cargo Aircraft</u>	<u>Air Taxi</u>	<u>General Aviation</u>	<u>Military</u>	<u>Total</u>
1980	248,948	12,579	5,314	728	5,144	1,000	104	12,290
1985	464,645	26,072	6,608	1,456	8,374	2,000	104	18,542
1995	896,824	46,042	11,134	1,976	13,266	4,000	104	30,480

Peak Hour Operations:

1980	5	4	2	1	12
1985	6	6	3	1	16
1995	11	7	4	1	23

facility construction. Once accomplished much higher usage than that projected could be accommodated without significant facility addition.

AIRPORT DEVELOPMENT NEEDS

The immediate objective of the Mariana Islands Airport Authority is to attain and retain air carrier certification for its existing air carrier airports by January 1978, when the Northern Mariana Islands enters into commonwealth status, in accordance with the FAA safety and operational standards, Federal Aviation Regulation, Part 139.

The needs of the Northern Mariana Islands for airport improvements are limited because of funding restraints to items essential to provide safety and operational efficiency. These include minimum paved runway lengths, adequate runway safety areas, cleared approach and transitional surfaces, runway lighting, navigational aids, safety and security equipment, taxiways, and apron areas. Terminal buildings, vehicle parking lots, access roads, and similar items are included to improve operational efficiency.

Saipan International Airport is a complete facility capable of handling large jet aircraft. Additional navigation aids, safety equipment, and ground operations facilities will be required to handle the forecasted traffic over the next 20 years. To meet these requirements, the following projects have been funded or earmarked for funding:

- * Runway End Indicator Lights (REIL lights) are required on runways 7 and 25. This requirement is included in ADAP Project No. 6-75-0003-04, funded in fiscal year 1977.
- * The ground operations area requires expansion. A partial parallel taxiway with runway exits and apron expansion is a firm requirement, identified for funding in Fiscal Year 1979.

- * Additional safety equipment is needed. A firm requirement for funding in fiscal year 1979 is the addition of a fire truck and expansion of the CFR building.
- * Other requirements to provide for substantial airport activity include construction of air cargo/maintenance buildings, general aviation/fuel storage facilities, and control tower. Installation of navigation aids for instrument landing capability are also required.

These requirements are listed in Table 34, in order of recommended accomplishment. Being a rapidly changing sector, frequent changes in the nature and phasing of the capital improvements can be expected. Frequent examination of the program by MIAA will insure a current program, and should be understood and welcomed by the public.

Airport Development Costs

Table 34 also indicates the estimated cost of the airport improvements, along with the suggested source of funding. The cost for the Fiscal Year 1977 improvements are exact since the project has already been initiated. The other costs are not as precise, and should be considered accurate only to the order of magnitude. The estimates provide for engineering, administration and contingency costs.

Fund sources include the Federal Aviation Administration (FAA), Economic Development Administration (EDA), and Marianas Islands Airport Authority (MIAA). It is assumed that MIAA will actively seek maximum federal funding of eligible projects. Two points should be remembered, however, when seeking federal assistance. First, only certain types of projects are eligible for federal assistance. Second, federal-aid programs are highly competitive and subject to fund availability. This competition could result in extended waiting periods for funding of projects, even if approved. However, the high cost of improvements greatly

TABLE 34

SAIPAN AIRPORT DEVELOPMENT COSTS
(Costs in 000's)

<u>FISCAL YEAR</u>	<u>ACTUAL PROJECTS</u>	<u>FAA</u>	<u>MIAA</u>	<u>OTHERS⁴</u>	<u>TOTAL</u>
1977	Reil lighting, security fence ¹	92.0	10.2	-	102.2
1979	Partial parallel taxiway, apron expansion, CFR building expansion, and additional fire truck	<u>2,984.0</u>	<u>746.0</u>	-	<u>3,730.0</u>
	Sub Totals	3,076.0	756.2	-	3,832.2
	<u>Potential Projects</u>				
1980	Air Cargo/Maintenance building	-	-	5,500.0 ²	5,500.0 ²
1981	General aviation/fuel storage facilities	-	-	400.0 ³	400.0 ³
1982	Nav aids for ILS System	588.0	147.0	-	735.0
1983	Control Tower	<u>1,300.00</u>	-	-	<u>1,300.0</u>
	Sub Totals	1,888.0	147.0	5,900.0	7,935.0
	Totals	4,964.0	903.2	5,900.0	11,767.2

1. Project which had been recently bid; figures indicate grant amounts
2. No taxiway costs included
3. No costs for fuel storage facilities and taxiway included
4. Potential source of funds assumed to be EDA

prevents the local residents from bearing the entire cost of the program. It is recommended that whenever possible, projects be designed in advance in preparation of the possibility that funds become available on short notice.

HARBORS

Although the airports are a key to the Northern Marianas for passenger movement, the harbor and dock facilities are more important to overall economic growth in the islands. The movement of most consumer goods to the Marianas and the reliance upon local subsistence fisheries by many of the people require adequate docks and harbor facilities.

Establishment of regular and reliable sea cargo services between other countries and the Northern Marianas will be a critical factor in the growth and development of the economy. The problem of promoting shipping services for the Northern Marianas is and has been that the whole Trust Territory area, including the NMI, generates a relatively small volume of cargo. In addition, physical facilities in NMI ports have been rather poor, creating inefficiencies in cargo handling and lengthening vessel turn-around times.

During the plan period it is anticipated that the volume of sea cargo transported to the NMI will increase, with the increased capital improvements program, as well as rising personal incomes and population growth. Increased capital improvements resources will also make substantial port development possible within a few years. In sum, the efficiencies achieved through port improvements, coupled with general growth in economic activity throughout the NMI, will increase the appeal of the Northern Marianas as a port of call for vessels and ships.

Planning for Harbors and Dock facilities in the Northern Mariana Islands and more specifically for Saipan must consider the following issues:

- * Saipan is favorably located and with its exclusion from provisions of the Jones Act could become a major transshipment point for cargo vessels in the western Pacific.
- * Inter-island sea transport between Saipan and neighboring islands is important for the overall economic development of the Northern Mariana Islands.
- * Commercial fisheries could become an important industry in the economy of the Northern Mariana Islands.
- * Recreational boating, sport fishing and subsistence fishing require improved docks, pier spaces and ancillary shore facilities in order to grow and contribute to the overall economic development of the Northern Marianas.

EXISTING CONDITIONS

Management of docks and harbors in the NMI is presently the responsibility of the Department of Public Works. On Saipan, a Port Control Officer with a staff of five has administrative charge over entry and departure of vessels and responsibility for generally overseeing dockside operations.

Sea Transport

As of the beginning of 1977, eight private shipping companies have been granted rights to enter ports in the NMI, of which six have established scheduled services. The companies provide service between Saipan and ports in the Far East, Australia and on the U.S. West Coast, including Hawaii. Routes often include ports in the Trust Territory as well. Frequency of service varies between roughly 40 and 60 days, depending upon route structure. In addition, barge service on a weekly basis has been established between Saipan and Guam by two private companies which provides intermediate or transshipment service to Rota and Tinian.

For calendar year 1976, a reported 68,803 revenue tons (R/T) moved through NMI ports. Inbound cargo accounted for 59,485 R/T and outbound cargo 9.318 R/T, or about 86.5 percent and 13.5 percent, respectively, of total cargo volume. The 1976 figure represents an increase of about 44 percent over 1975's reported 47,756 total revenue tons. The Port of Saipan handled 64,503 R/T, or nearly 93.8 percent of all NMI cargo in 1976, while Tinian handled 2,359 R/T (3.4 percent) and Rota 1,941 R/T (2.8 percent). Earlier records of cargo movement are fragmentary; however, it does appear that increases or declines in the amount of cargo moving through the Port of Saipan have been closely tied to the size of public and private construction activities.

Physical Facilities - Saipan Harbor and Charlie Dock

Saipan Harbor, which consists of the outer anchorage, Garapan Anchorage, and Puetton Tanapag, is the port of entry and is the administrative center for GNMI. The harbor is formed by the waters within a radius of 2/½ miles of the root of the landing at Garapan. The entrance channel of Puetton Tanapag is about 300 feet wide and has a shallow depth of 8.8 m (29 feet). The harbor is sheltered by the barrier reef and is partially protected from winds.

Anchorage. The outer anchorage affords shelter during prevailing easterly winds, but none during infrequent westerly storms. This anchorage, which lies from 3 to 5 miles offshore, is suitable as only temporary anchorage for large vessels.

The inner anchorage, which includes Garapan Anchorage, contains numerous berths in depths ranging from 14.6 m (50 ft.) to over 54.9 m (180 ft.), holding ground fair to good, with coarse coral sand. This anchorage lies from 1 mile to 2 miles offshore.

The anchorage area in Puetton Tanapag has been dredged to a projected depth of 9.1 m (30 ft.). A seaplane landing area is located northward of the anchorage area.

Navigation Aids. Tanapag Harbor is equipped with range lights and some lighted buoys. There is also a U.S. Coast Guard Loran Station located on Saipan.

Charlie Dock (Pier C). Saipan's harbor complex consists of a commercial port plus a small boat quay and a pier at which the power barge "Impedence" is currently docked.

As-built drawings or plans for Charlie Dock are not available. The dock was originally constructed by the Japanese prior to World War II and was subsequently improved or expanded. Inspection of the dock in 1972 indicated that the face of dock is a masonry wall consisting of 4' x 4' x 5' concrete blocks.

Charlie Dock C, is L shaped, and has 530 feet of berthing space along its north side. Berths, with depths of 7.6 m (25 ft.) to 6.1 m (20 ft.) are available along the north and west sides of the pier. Depths of 2.4 m (8 ft) are found alongside the south side of the pier.

The channel to the dock, running more or less on a south-westerly line, is 457.2 m (1,500 ft.) long, 91.4 m (300 ft.) wide and 8.8 m (29 ft.) deep. It is marked with lighted and non-lighted buoys set by the U.S. Coast Guard.

Dockside facilities include a 1,115 m² (12,000 ft²) warehouse (Prefab type) constructed by the Trust Territory and presently used as a break-bulk warehouse. For cargo handling, the port has some heavy forklift equipment and trucks available, and has access to heavy cranes (50 ton mobile and 30 ton crawler) owned by NMI Public Works.

A second prefab type warehouse owned by the NMI Government is also located at the port and is presently occupied by port operations and maintenance.

Small Boat Facilities

Facilities for small boat harbors are also woefully inadequate. Only the "Smiling Beach" small boat area provides adequate protection during storms.

In Garapan a pier, 155 meters in length (485 feet) originally constructed by the Japanese and later reconstructed by the U.S. military forces, is in a bad state of disrepair. Erosion of the shoreline, filling in of the formerly-dredged docking area, wooden pilings, and several wrecks make this harbor area inadequate. Garapan Channel is also shallow and narrow and has inadequate navigational facilities further limiting the harbor's usefulness. Shore facilities are inadequate as no docking or tie up space is available. Only recently were concrete boat launching ramps constructed.

Sugar Dock, another Japanese remnant in Susupe consists of a concrete pier 84.1 m (276 ft) in length. Presently the Tinian Co-op vessel utilizes this facility on Tuesdays and Fridays. However, the channel is so shallow that entry and exit can not be made during low tide. A concrete launching ramp is available and daily usage is generally between seven (7) and ten boats. Navigational aids are also inadequate. Adjacent land is all in private ownership further limiting the usefulness of this pier (See Plate 26).

PLANNING FACTORS

A substantial increase in cargo volumes to be handled in NMI Ports is projected between FY 1978 and FY 1985. Factors underlying this growth will be the quantum increase in construction activity which the new political status of the Northern Marianas will bring, rising real incomes of NMI citizens, and a continuing increase in population.

ISLETA MANAGANA

COMMERCIAL PORT

PHASE 1

- CONSTRUCT BAKER DOCK
- FIVE ACRE CONTAINER YARD
- SECURITY FENCING
- WAREHOUSE

PHASE 2

- RECONSTRUCT CHARLIE DOCK

HARBOR BASIN

CHARLIE DOCK

AMERICAN MEMORIAL PARK

- CONSTRUCT POWER BOAT MARINA
- CONSTRUCT SAIL BOAT MARINA

EAST QUAY

- MODIFY FOR FISHING FACILITY

PUNTAN MUCHOT

GARAPAN 'Wharf' SUBSISTENCE FISHING

- 200FT. PIER
- LAUNCHING RAMP
- LOADING DOCK
- NAVIGATIONAL AIDS
- SHORE FACILITIES
- PARKING AREA (lighted)

SUGAR DOCK

- WIDEN & DEEPEN CHANNEL
- NAVIGATIONAL AIDS INCLUDING LIGHTED FIXED CHANNEL MARKERS
- PARKING AREA (lighted)

GARAPAN CHANNEL

- DEEPEN TO 15FT. ENTRANCE 10FT. INSIDE
- INSTALL NAVIGATIONAL AIDS INCLUDE LIGHTED FIXED CHANNEL MARKERS

GARAPAN DESIGNATED ANCHORAGE

- MOORINGS
- NAVIGATIONAL AIDS



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SAIPAN ISLAND
PHYSICAL DEVELOPMENT MASTER PLAN
HARBOR AND DOCK FACILITIES

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Pacific Planning and Design Consultants
Saipan · Commonwealth of the Northern Mariana Islands

January 1978

With the recent indications to increase tariffs at the port of Guam, there is an excellent chance for Saipan to pick up significant quantities of transshipment cargo should adequate facilities be available.

Port Calls and Wharf Requirements

The records of the Mariana's District Public Works Department show that about 250 port calls to the Saipan commercial harbor were made by more than 70 different vessels during 1976. An analysis of the information in Table 35 indicates that at least 304.8 m (1,000 ft.) of deep water berths and 182.9 m (600 ft.) of medium depth (6.1 m + or 20 ft +) berths are required for the commercial port.

Growth in cargo volumes in the Port of Saipan will be most significant. With the increase in capital improvement projects, durable and non-durable consumer goods, and with a general increase in inter-island trading, total cargo passing through the Port of Saipan is projected to rise to about 138,700 R/T by FY 1985. This represents an increase of about 115 percent over the present base level volume of approximately 64,000 R/T.

Transshipment

Many private businessmen and public officials concerned with shipping in the Northern Marianas have expressed interest in developing Saipan as a transshipment point for cargo passing through the Western Pacific. The Northern Marianas' exclusion (under the Covenant) from provisions of the Jones Act, which governs U.S. coastwise shipping, may in fact permit Saipan to attract foreign vessels carrying cargo from the continental U.S. to Pacific or Far Eastern destinations. The recent proposal to increase tariffs at Guam's Commercial Port, presently the major transshipment point for the Western Pacific, provides an additional incentive for Saipan to attempt to capture some of the transshipment market.

Table 35

Analysis of the District Public Works Department
 Log on Port Calls at Saipan Harbor During 1976
 Number of Days Ships Were in Port

	Ships								Tug & Barge	LCM
	0	1	2	3	4	5	6	7		
January	6	4	5	6	3				7	3
February	1	6	11	4	5				4	2
March	5	9	8						7	1
April	7	7	12	3					5	5
May	11	8	7	1					5	
June	3	13	6	3	2					
July	4	5	6	5	3	2	2	2	7	1
August	-	5	17	3	6				4	3
September	3	13	12						6	2
October	2	6	16	6	2				6	4
November	5	5	11	4	1	1	1	1	7	
December	8	11	8	1					5	
Totals	55	92	119	36	22	3	3	2	69	21

The basic data was furnished by the Trust Territory of the Pacific Islands District Public Works Department.

The average vessel turn around time, excluding the barge, is 36.9 hours.

The average vessel turn around time, including the barge, is 26.7 hours.

Significant upgrading of the physical facilities at Saipan's port, including warehousing, and ship and cargo handling capabilities would be necessary.

Inter-island Sea Transport

Efforts should be made during the course of the plan period to accommodate the expansion of inter-island sea transportation, commensurate with increasing requirements. Sea transport service for both cargo and passengers to the sparsely inhabited northern islands will be an important component of inter-island transport. This shipping service, presently known as "field trip" service, is organized and funded by the Government of the Northern Marianas as a public service to northern islands residents.

The government itself does not possess a vessel for field trip operations, but leases a ship from a local private operator. The option of obtaining a vessel on a permanent basis to use for field trip shipping, as well as for other services, is currently under consideration. Possibilities include renovation and taking possession of a YFU class landing craft from the U.S. Navy, or obtaining a vessel from the Trust Territory Government under the agreement dividing Trust Territory capital assets with the Northern Marianas.

Inter-island sea transport needs between Saipan and its neighbor islands of Rota and Tinian appear at present to be adequately covered by private shipping companies, principally barge service, plus boats operated by the Tinian Municipality.

Once military base construction on Tinian is initiated, however, it will be important to establish a regular daily ferry service between Tinian and Saipan in order to promote a steady flow of goods and labor which will support both the base construction and later, the base operations.

Fisheries and Recreational Boating

Physical facilities for subsistence fisheries, large scale commercial activities and recreational boating are inadequate and should be improved during the plan period. Improved docks, pier spaces and ancillary shore facilities are needed in order for the subsistence fisheries industry to grow and to contribute to the overall economic development of the Northern Marianas.

An estimate of the number of small fishing craft was made with the help of the Northern Marianas Fishing Cooperatives. Currently, there are fewer than 100 co-op members and only 37 co-op boats. (See Table 36).

Table 36

ESTIMATE OF SMALL FISHING CRAFT - NMI

<u>Island</u>	<u>Number of Members</u>	<u>Number of Small Fishing Boats (Outboards)</u>		
		<u>Co-op Members</u>	<u>Non-Members</u>	<u>Total</u>
Saipan	58	25	53	78
Rota	24	6	2	8
Tinian	<u>16</u>	<u>6</u>	<u>5</u>	<u>11</u>
Total	98	37	60	97

The primary need is to improve launching ramps at convenient locations. The old Japanese seaplane ramps are good for launching boats except that they become very slippery at times tending to launch both the vehicle as well as the boat.

There are also several concrete boat ramps such as at Fishing Base in Garapan and Sugar Dock and one gravel launching ramp at the memorial park site, "Smiling Beach".

The deep lagoon around the commercial port provides a super abundance of moorings. There is also a shallow lagoon, about 10 feet deep, inside the reef near Garapan. Channels through the reef are shallow (6 feet deep) except for the 29 foot ship channel.

Commercial Fishing Port

Commercial fishing could become an important industry in the NMI economy, and policies relating to marine resources are of extreme importance to economic development. The new international agreements on the 200 mile coastal fishing zones will involve the NMI in many ways and must be followed carefully.

The existing berths for commercial fishing vessels at the end of Charlie Dock interfere with traffic, disrupt security, and inadequately serve the fishing industry. Although it is likely that the East Quay will continue as the fishing dock during the Short Range Plan, future possible locations include the rehabilitation of portions of Able Dock or construction of a new facility behind the present Northern Marianas Public Works facilities, south of the existing seaplane ramps. If large scale commercial fisheries prove to be viable, a medium depth dock and shore facilities should be constructed.

Present Maritime Fleet

A list of vessels in service in the Trust Territory of the Pacific Islands (TTPI) during 1976 was provided by the TTPI District Public Works Department (DPWD). The characteristics of these vessels were compiled from the American Bureau of Shipping Record Book, 1977, and are shown on Table 37. The deepest draft vessel, the ENNA G. draws 28.29 feet when fully loaded. All others draw less than 26 feet, and about seven of them draw less than 12 feet. Generally, it is anticipated that the type of vessel serving Saipan and the Mariana

TABLE 37

VESSELS CALLING AT SAIPAN PORT
GOVERNMENT OF THE NORTHERN MARIANA ISLANDS
Marianas Public Works Department
Saipan, Mariana Islands

Data revised in accordance with the American Bureau of Shipping Record Book, 1977.

<u>Name of Vessel</u>	<u>VESSEL DATA SHEET</u>			
	<u>Length</u> (feet)	<u>Breadth</u> (feet)	<u>Depth</u> (feet)	<u>Draft</u> (feet)
Muskingum	338.75	50.00	29.00	1/
Herkimer	321.33	50.00	29.00	23.42
Fentress	321.33	50.00	29.00	23.42
Micronesia Princess	242.75	40.00	21.50	13.83
Ponape Maru	479.00	73.49	1/	25.82
Enna G	456.08	61.04	1/	28.29
Seven Seas	231.30	37.10	17.00	1/
Tjirebon Maru	433.00	60.33	27.60	1/
Coral Princess	477.75	61.00	1/	18.54
Marshall Islands	185.00	33.00	11.00	1/
Kaselehlia	131.23	27.90	11.48	10.10
James Cook	225.67	1/	1/	1/
Truk Islander	111.02	22.31	9.84	8.88
Yap Islander	111.02	22.31	9.84	8.88
Ran Annim	165.00	32.00	14.29	10.04
Militobi	156.00	30.00	13.00	11.05
Tinian II	40.00	12.00	6.00	1/
Olwol	72.36	15.60	7.55	1/
Normar II	122.00	23.00	10.40	9.20
New Field Trip Vessels	185.00	33.00	15.00	11.00

1/ Information not published.

Islands will continue to be of similar class although it is probable that significantly more cargo will be shipped via containers.

Future Maritime Fleet

At least three types of vessels may be involved in the future of the Northern Mariana Islands. The selection of future vessels will be affected by cargo type, passenger markets, cargo tonnage, passenger volume, fuel costs, and the development of new types of vessels. Modernized tugs and barges and self-loading monohull container ships with bow thrusters for maneuvering will continue to be competitive during the short term.

Hovercraft and the high speed hydrofoil, such as the Boeing Jetfoil, have an exotic appeal. These 50 mph vessels stimulate the imagination and provoke thoughts for their use on short runs. A ferry system, such as from Tinian to Saipan is one possible use provided future passenger volumes of 200-300 persons per trip become a reality. These passenger carriers draft only 5 feet with foils up. Sugar Dock pier with minor channel improvements could therefore be used as a terminal. A shorter run and direct delivery of passengers to the population center on Saipan are possible advantages.

However, it is discouraging that experience with these vessels in Hawaii has not proven competitive with regular air service. Hydrofoil fares are actually less for given routes but operations have been conducted at a loss. Sea Flite, as the hydrofoil service is known in Hawaii, has therefore been terminated and the GNMI would do well to seriously evaluate the feasibility of such services before embarking on any commitments.

The stable, semi-submersible platform (SSP) appears to be the most promising of future vessels. A pilot model is presently being tested in Hawaii. A report on the use of the SSP entitled "Hawaii Marine Highway System Study, Review of a Stable Semisubmerged Platform (SSP) Marine Highway System," was made by the State of Hawaii Department of Transportation in 1976. Vessels proposed for use include 500-ton and 3,000-ton displacement SSP's. The 500-ton SSP would have a full load draft of 16.5 feet and a capacity of 150 long tons with an operating range of 600 miles at about 25 mph. Such vessels may prove economical for future inter-island transport in the Marianas.

PORT AND HARBOR DEVELOPMENT PROGRAM

To accommodate projected growth in cargo, and in general to support and stimulate economic activity in the Northern Mariana Islands, a program of port and harbor developments will be implemented during the Plan period. The program should feature major improvements to the commercial port and the development of shore facilities for Saipan. Funding for subsistence and commercial fishing program needs will be provided in large part by government CIP allocations. It is anticipated, however, that U.S. Federal program assistance for port development will also be available, especially for harbor and channel dredging, and breakwater construction. Recreational and tourist oriented boating facilities are proposed to be included in the American Memorial Park.

Future Harbor Development, Federal Cooperation

It is assumed that future harbor planning will be in cooperation with the U.S. Government; therefore, the normal division of responsibilities would conform with proposed legislation and U.S. statutes. Accordingly, the Corps of Engineers would be authorized to plan harbor development, construct and maintain the main channels, basins, and breakwaters for commercial

harbors, for fishing harbors including those of subsistence fishing, and recreational harbors. On such projects, the GNMI would be required to contribute about half the construction cost.

The Corps of Engineers' maintenance would include periodic hydrographic surveys to check the harbor depth, etc. (Hydrographic surveys of the harbors in the NMI, except for Rota Harbor were last conducted in 1944. Rota Harbor was surveyed in conjunction with the design of various repairs and improvements necessitated by the devastation of typhoon Pamela.) The U.S. Coast Guard would also be authorized to provide navigational aids on Federal projects. The Defense Mapping Agency, Washington D.C., will update navigation charts as new data becomes available from hydrographic surveys by the Corps of Engineers or others.

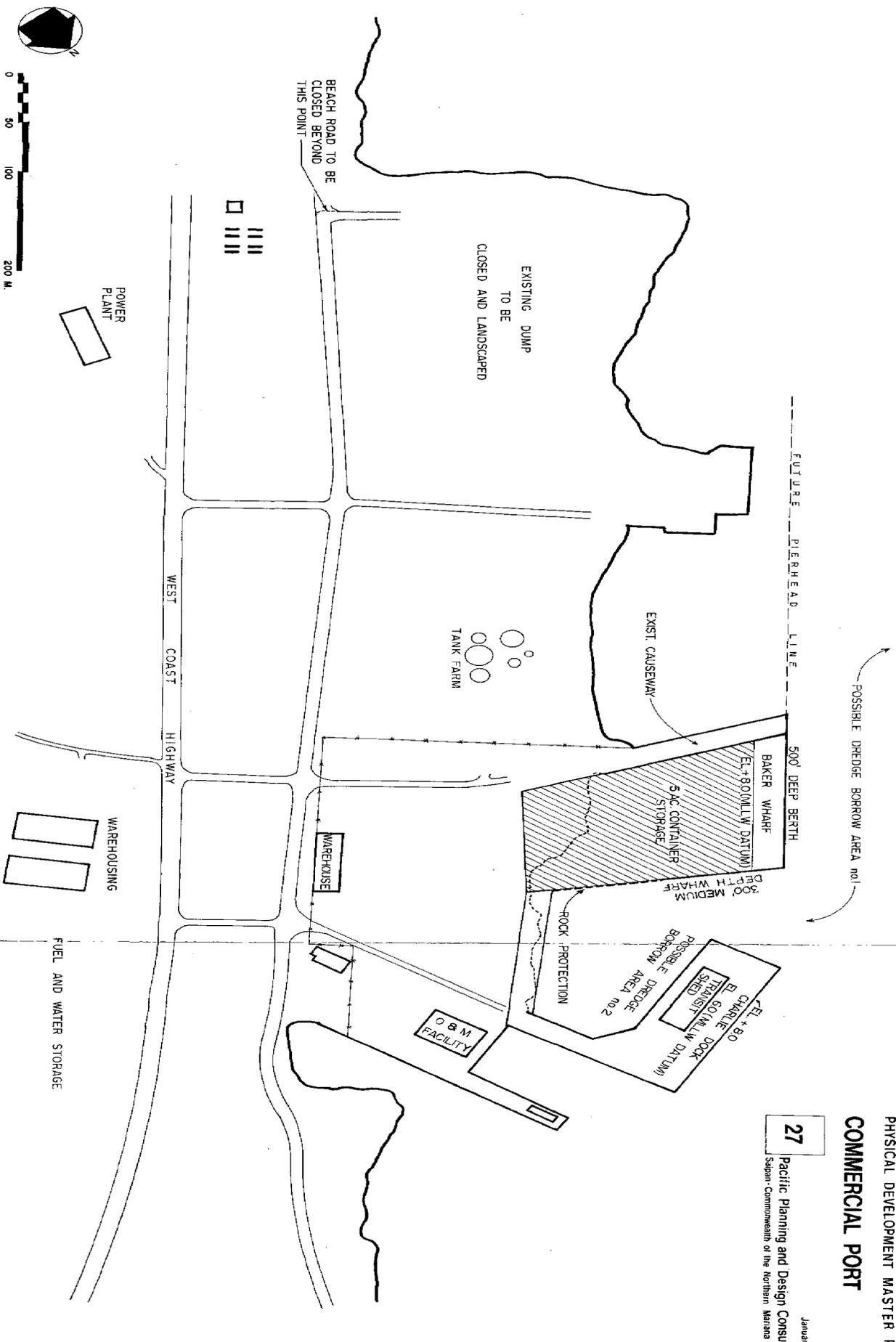
Commercial Port

Early in the plan period, it is suggested that funds be made available to do emergency repairs (bullrail and temporary fenders) to Charlie Dock. An engineering analysis of Charlie Dock should also be undertaken to determine its structural integrity.

Although the present planning effort did not provide funds for an extensive analysis of Charlie Dock, preliminary surveys seem to indicate that major reconstruction of Charlie Dock will be necessary. The final configuration of the new port complex would depend upon the findings of the Charlie Dock analysis and subsequent master plan, but in any event would include substantial expansion of dockside storage and working areas. Other features of the port development would probably involve construction or reconstruction of a bulkhead; doubling, reinforcing, and paving of dock surface areas; creation of additional ship berthing space; construction of a break-bulk warehouse; provision of security fencing for the dockside itself (See Plate 27). Adequate shoreside facilities for loading and unloading of cargo will also be required.

SAIPAN ISLAND
 PHYSICAL DEVELOPMENT MASTER PLAN
COMMERCIAL PORT

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 Pacific Planning and Design Consultants
 Saipan, Commonwealth of the Northern Mariana Islands
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The long term commercial port facility would then have approximately 304.8 meters (100 feet) of deep berthing, 182.9 meters (600 feet) of medium berthing, 10 acres of container storage, a transit shed to be rebuilt on Charlie Dock for break-bulk cargo, a warehouse, scales, etc. Factors that inhibit the immediate reconstruction of Charlie Dock include:

- a. The cost of upgrading Charlie Dock to modern standards approaches costs for construction of a new pier.
- b. The construction work to upgrade Charlie Dock would seriously interfere with stevedoring operations.
- c. It appears that in the near future two docks will be needed anyway.

It is therefore recommended that only interim repairs to Charlie Dock be made. For example, it is necessary to install a 12' x 12' timber curb for safety purposes. Presently, equipment operators do not use the outer 5 to 10 feet of the pier because of the danger of rolling off the pier.

Baker Wharf

Rather than reconstruct Charlie Dock it is recommended that a new Baker Wharf be the first phase of construction.

Construction of Baker Wharf would add 500 feet of deep water berth (30-35 feet deep) and 300 feet of medium depth berth (15-20 feet deep). Construction activities would include dredging to a 35-foot depth alongside the new wharf. The dredge material could be used as compacted backfill behind Baker Wharf for a container yard and other purposes.

Ultimate development to provide for efficient mechanization of the commercial port, would include an extended pier head line established on a straight line from the northwest corner of Charlie Dock to the south end of the old Army pier. If major transshipment activity is thus developed, container crane tracks and other mechanized equipment and facilities could be installed to serve more than 2000 feet of deep water wharf.

Container Yard

The container yard would require about 5 acres to handle an average of 40 containers per day and 10 day demurrage. The container yard should also be raised on a good foundation and paved with a minimum 4 inches of A.C. on a 12 inch base.

Other requirements include:

- a) break-bulk shed
- b) security fence
- c) control tower
- d) flood lights
- e) electric outlets for refrigerated containers and
- f) truck scales, etc.

Subsequent to the completion of Baker Wharf, Charlie Dock can be renovated, thereby avoiding the discontinuance of service during construction. Estimated cost for the construction of Baker Wharf is given in Table 38.

Charlie Dock Reconstruction

The eventual reconstruction of Charlie Dock would include an envelope of a new concrete-capped, steel sheet pile wall with tie backs and a new fender system. The new wall should be 2 or 3 feet outside the existing block wall. The deck level should be raised to an elevation of 8 feet to minimize overtopping by waves and to provide a suitable backing for the fender system. A new transit shed would have to be constructed.

Reconstruction of Charlie Dock would provide an additional 400 feet of medium depth dock and 550 feet of deep dock, 30 to 35 feet deep. (See estimates Table 39).

TABLE 38

ESTIMATED COST FOR CONSTRUCTION OF BAKER WHARF

New 500' Baker Wharf (35' depth, 60 returns):	
Sheet Piles & Tie Backs 620' @ \$1600 =	\$ 992,000
Fenders 500' @ \$500 =	250,000
Cleats & Misc. Metal 500' @ \$50 =	25,000
Pave Wharf 500' x 60' = 30,000 SF @ \$1.35 =	<u>40,000</u>
	SUBTOTAL: \$ 1,307,500
New Medium Depth Wharf (East Side):	
Sheets 240' @ \$1200 =	280,000
Fenders 300 @ \$350 =	<u>105,000</u>
	SUBTOTAL: \$ 393,000
Fill for New Wharf & 5 Ac. Container Storage:	
Dredge Fill (-10 to +8)	
165,300 c.y. @ \$5.00 =	826,500**
Dike on east side 500' @ \$200 =	100,000
Dike on north face 450' @ \$200 =	<u>90,000</u>
	SUBTOTAL: \$ 1,016,500
5 Acre Container Storage:	
Paving & Base 218,000 SF @ \$1.35 =	294,300
Fencing 1600 LF @ \$15.00 =	24,000
Rock Protection east side 300 LF @ \$100 =	30,000
Flood Light	80,000
Electric Underground	25,000
Warehouse	<u>150,000</u>
	SUBTOTAL: \$ 603,300
TOTAL SHORT TERM: \$ 3,320,300	
ENGINEERING INSPECTION 10%:	<u>332,000</u>
	TOTAL: \$ 3,652,300**

* Utilities, unless specified, are not included

** Assumes dredge fill from Harbor and Channel. Cost for dredging harbor and channel may be borne by the federal government. Should a Corps project not be simultaneous with Dock construction estimated cost for land fill material is approximate 3.000/cubic yard or 500,000.

TABLE 39

ESTIMATED COSTS FOR RENOVATION OF CHARLIE DOCK

Short Term Improvements Emergency Repairs for Charlie Dock	
Bull Rail and Fenders	\$ 50,000
Structural Analysis of Charlie Dock	<u>70,000</u>
SUBTOTAL:	\$ 120,000
Long Term Improvements Reconstruction of Charlie Dock*:	
Sheet Pile & Tie Back 900' @ \$1600 =	1,440,000
Fenders 500' @ \$500 =	250,000
400' @ \$350 =	140,000
Fill - 4' Deep - 100,000 SF - 14,800CY @ \$6.00 =	88,800
130,000 SF @ \$1.00	130,000
Cleats & Misc. 500LF @ \$50 =	25,000
Lights & Power Service	<u>50,000</u>
SUBTOTAL:	\$ 2,123,800
Transit Shed on Dock	<u>160,000</u>
SUBTOTAL:	\$ 2,283,800
Engineering & Inspection 10%	<u>288,200</u>
TOTAL:	\$ 2,512,000*

* Utilities on Dock not included. Does not include cost of any breakwater or significant harbor dredging.

In addition, dredging of portions of the Saipan harbor and channel will be required to complement development of the dock and its related facilities. An application requesting Federal Assistance should be filed with the U.S. Corps of Engineers to accomplish this work.

Garapan Wharf

Small-boat fishing facilities are planned for Garapan Wharf. Work would involve dredging to improve the passages in the lagoon and permit better access to the dock, and construction of a launching dock, a building, boat slips, and a secure boat storage area. It is hoped that breakwaters and navigational aids will be constructed with Federal funds.

The buildings at the small-boat center will include:

- * A service building for refrigerated storage of fish for ice making and to house equipment for weighing, cleaning and selling fish.
- * A second building will contain offices for the government agencies involved in developing the fishing industry, and offices for fishing cooperatives. A classroom/meeting room will be available for training purposes, as well as for co-op meetings.
- * Land should also be made available for a secure one or two acre boat repair yard.

Estimated costs of the fishing wharf are indicated on Table 40.

Recreational Facilities

Marinas for power boats and sail boats will be constructed as part of the development plans for the American Memorial Park. Capital Improvement costs for the park including the two Marinas will come from the \$2,000,000 trust fund. In addition, marine fuel taxes and boat berthing fees should be set aside

TABLE 40

ESTIMATED COST FOR GARAPAN FISHING WHARF*

Design Engineering:	\$ 52,000
Stabilization, renovation and resurfacing of 200 feet of the existing pier \$800/ft.:	160,000
Boat Ramp facility including parking lot, water line for boat washdown, loading dock, lighting, landscaping, minor dredging, clearing and grading:	125,000
Buildings:	
Service buildings for weighing , cleaning and selling fish including small reefer.	
Gov't offices and classroom/meeting room	113,000
Designated Anchorage for 25 boats	
3 anchor 2 point mooring 25 @ \$3,000 =	<u>75,000</u>
SUBTOTAL:	\$ 525,000

* Does not include cost of any breakwaters or significant harbor dredging.

to amortize pier and mooring costs originally financed by CIP funds. Power and sail boat piers would be provided in the inner basin until the outer basin is developed for sail boats.

Summary Costs

Table 41 is a summary of Harbor and Dock facilities costs as projected during the short range plan and for anticipated costs beyond the seven (7) year plan. Marine facility costs for Saipan are estimated to be 4.8 million dollars during the present plan period.

TABLE 41

Cost Estimates of Marine Facilities for Saipan
Short and Long Term
(In Thousands, 1977 Prices)

	Wharf Deep, 30-35'	Wharf Medium 15-20'	Container Yard Complete	Wharf Subsistence Fishing Boat	Boat Ramps Complete	Designated Anchorage	TOTAL
Short Term 7 years	(Baker Wharf) \$3,652	300 ft. Included w/ Wharf	Five Acre Included w/ Wharf	Garapan 200 ft. pier and Ancilli- ary facili- ties \$525		Designated Anchorage Garapan Area for 25 boats Included in cost of Sub- sistence Fishing Wharf	\$ 4,803
		Commercial fishing 200 ft. Dock \$414			One complete Boat Ramp fa- cility (\$212)		
Long Term (Charlie Dock)	\$2,512		Additional Five Acre Container yard \$300	Continue Re- construction Garapan Pier "280 ft."	A second complete Boat ramp facility	A second Designated Anchorage Area	\$ 3,323
	\$6,164	\$414	\$300	\$224	\$212	\$75	\$ 8,126
				\$749	\$424	\$75	

HIGHWAY TRANSPORTATION

Highway transportation improvements will play a vital role in the development of Saipan. A well-integrated, dependable, improved highway system will ensure safe, efficient, and convenient intra-island transportation services responsive to the mobility requirements of people and goods.

Although the existing road network on Saipan is relatively well-developed, its physical condition can generally be considered as worn out. Furthermore, Beach Road and certain other major highways now experience heavy traffic congestion during peak travel hours. An ambitious, extensive highway development program will be required to keep pace with, as well as support, the needs of the evolving Saipan economy.

EXISTING CONDITIONS

The existing road system on Saipan originates from two sources: The network of unimproved primary roads constructed by the Japanese prior to World War II, and the improved roads constructed by the American Armed Forces shortly after occupation in 1944. Most of the paved roads are over 30 years old and have deteriorated due to the absence of a regular maintenance program. Cracks indicating pavement failure, and pot holes and slumps indicating subgrade failure are evident everywhere. More importantly, it should be realized that the useable life of portions of the road system could be extended with the implementation of an asphalt overlay program; however, unless such a program is undertaken relatively soon roads which are salvagable in their present condition will require major reconstruction due to further deterioration.

Previous Authority for Administering Improvements

The Government of the Northern Mariana Islands has been responsible for construction and maintenance of primary

and secondary roads in the Northern Marianas, while the municipalities were tasked with the construction and maintenance of their respective municipal roads.

At the Government of the Northern Mariana Islands level, road improvements have been performed by the Roads/Airports/Grounds/Heavy Equipment Branch of the Operations and Maintenance Division of GNMI Department of Public Works. However, since the Branch has many and varied responsibilities, road work was never been actually funded as a specific budget item.

At the municipal level, road programs have been funded by grants-in-aid from the Northern Mariana Islands Legislature, based on the share of fuel excise taxes collected in each municipality. The Saipan Municipal Government includes a Public Works section consisting of about 19 personnel with an annual budget of nearly \$108,000. In Rota and Tinian, road work is handled by the GNMI Public Works Offices on those islands, with funding on a direct, a non-reimbursable basis.

Previous Planning and Road Improvement Efforts

In 1974 the District Planner prepared a Road Development Plan which recommended that some 90 miles be improved or reconstructed on Saipan. The estimated cost for the program was \$19.5 million. Other than the resurfacing of airport road, no construction or road work other than maintenance has been initiated.

The highway plan was re-evaluated in 1976 with recommendations that about 203 miles of roads in the Northern Mariana Islands be constructed or reconstructed. The revised Plan was synthesized into a Five-Year Road Development Program with an estimated cost of \$43,000,000. The program indicated that approximately 91 miles of Saipan's roadway system required reconstruction.

Over the years, no large scale road maintenance or construction has taken place in the Northern Marianas, reportedly due to inadequate program funding and to a lack of proper road equipment. With a few exceptions, which will be addressed later, road work has been limited to temporary or emergency road repairs such as patching, culvert cleaning, and occasional drainage improvements. To be sure, the glaring lack of proper drainage facilities appears to be one of the major factors which have contributed to the general deterioration of the Northern Mariana Islands road system.

In addition to the limited maintenance that has been performed to date, there have been several Capital Improvement Projects (CIP) appropriations for road development over the years. Specifically, various CIP grants received by the Trust Territory Government from the U. S. Congress, plus CIP appropriations by the Congress of Micronesia for the Marianas, have provided sources of funds for road improvements and road equipment purchases. Since FY 1969, total CIP appropriations from both sources available to the Northern Marianas have amounted to \$239,500. Individual projects included in this sum are presented in Table 42.

PLANNING FACTORS

Road classification

In theory, roads in the Northern Mariana Islands are categorized as "primary" roads, those serving the major points of activity for the resident population; "secondary" roads, those of lesser use which tend to connect village or communities; and "local" roads, those which function as either residential or intra-village streets. It should be noted that a functional classification of the road network does not yet exist. In many instances the roadway functions are not well defined as certain roads serve not only as primary, but also as collectors and even residential or local streets. An approximate

TABLE 42

PAST CIP APPROPRIATIONS FOR NMI ROAD SUBSECTOR

<u>Source</u>	<u>Appropriation</u>	<u>Purpose</u>	<u>FY</u>
Trust Territory	\$ 55,000	Hot Asphalt paving of road to Saipan International Airport	75
Trust Territory	\$ 50,000	Surfacing of Kagman Road	72
Congress of Micronesia	\$ 37,000	Road and Street Lighting (NMI-wide); Road Surface dividers, Saipan	72
Trust Territory	\$ 50,000	Grading and coral surfacing of Rota Airfield - to Song-song Village Road	70
Congress of Micronesia	\$ 47,000	Purchase of Road Equipment	69

TABLE 43

SAIPAN AS-BUILT ROADWAY SYSTEM

Improved Primary Roads	-	35 to 40 miles
Unimproved Primary and Secondary Roads	-	20 to 25 miles
Municipal (Local) streets	-	11 miles

classification of the "as-built" roadway system into primary, secondary and local roads for Saipan is presented in Table 43 (see preceding page) and illustrated on Plate 28.

It is interesting to note that there is a striking imbalance in the ratio of primary and secondary roads to local streets. This "inverted pyramid" of primary to local roads resulted from an intense, accelerated roadway development program conducted by the Japanese before World War II and subsequently by the U. S. Military forces. In contrast, in mainland communities where roadway development has been gradual, the mileage of local streets greatly exceeds that of primary and secondary roads. The costs of upkeep and maintenance of the present system far exceed the ability to pay for such a massive road network which has been in existence since World War II.

Vehicle Registration

In 1976 there were 3,775 private vehicles registered in Saipan. There were approximately 475 government vehicles registered by either the Trust Territory or the Northern Marianas Government. Total number of vehicles on Saipan was slightly in excess of 4,200 vehicles. Table 44 indicates private vehicle registration on Saipan for the years 1965 to 1976. The number of privately owned registered vehicles on Saipan has almost quadrupled since 1966 and since 1974 has more than doubled.

It is anticipated that the number of private vehicles will increase dramatically with increasing population and increased income. Should the car/population ratio approach that of Guam it can be expected that private vehicle ownership will increase to eight or nine thousand during the short range plan period.

General Traffic Conditions

Generally traffic conditions in Saipan are good with most traffic moving freely on the expansive roadway system constructed by the U. S. Military shortly after the island's occupation in 1944.

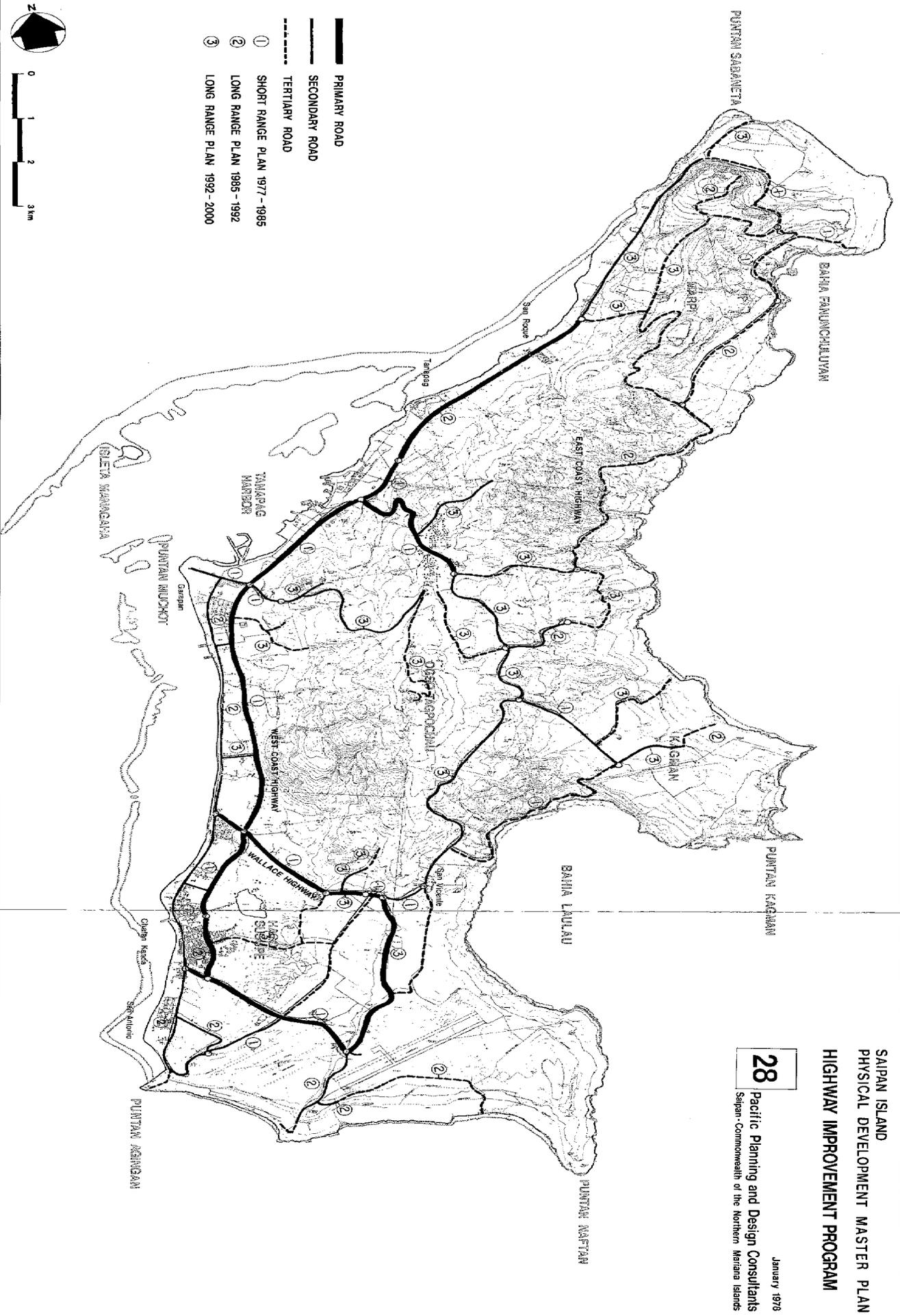
TABLE 44
VEHICLE REGISTRATION FOR SAIPAN, M. I.

	<u>SEDAN</u>	<u>JEEP</u>	<u>PICK/UP</u>	<u>TRUCK</u>	<u>BUS</u>	<u>M/CYCLE</u>	<u>TOTAL</u>
9/9/76	2769	150	623	88	50	95	3775
1975	2343	151	624	66	36	111	3331
1974	2189	159	487	76	40	144	3095
1973	1992	145	461	69	23	180	2870
1972	1783	144	403	52	23	233	2638
1971	1655	170	384	55	23	125	2412
1970	1422	187	340	58	19	98	2124
1969	1229	202	279	42	16	74	1857
1968	1032	279	220	45	19	85	1680
1967	663	290	131	21	21	85	1211

Source: Saipan Municipal Government
Vehicle Registration

SAIPAN ISLAND
 PHYSICAL DEVELOPMENT MASTER PLAN
HIGHWAY IMPROVEMENT PROGRAM

28
 Pacific Planning and Design Consultants
 Saipan - Commonwealth of the Northern Mariana Islands
 January 1978



One area of Saipan and one road in particular does have some significant traffic congestion problems - specifically, the village of Chalan Kanoa and Beach Road. Beach Road is a two-lane roadway which presently functions as the primary road for north - south traffic on the Island. In Chalan Kanoa it also functions as the major arterial, and the main collector road for all local traffic. Beach Road is the only road which provides continuous access to many of the island's major traffic generators including the dock and harbor, government offices, Civic Center, hotels and commercial centers, and four of the seven villages.

To date there has been no continuous or systematic traffic counting program for the Northern Marianas. Therefore, one-week manual count at 9 different locations was conducted in order to measure traffic trends. Results of these counts are presented and analyzed in the next section.

Traffic Volumes and Analysis

Although traffic conditions are qualitatively observed by all users on the road network, it is essential to quantify traffic volumes for several reasons:

- * Trends must be identified. Rates of traffic growth on specific highway and road segments are prime indicators in setting priorities for repairs, maintenance, and upgrading.
- * Precise volumes for segments are vital for determining the number of traffic lanes, their widths, and proper shoulder and appurtenances configurations.
- * The location of traffic control devices such as signing, lane markings, and signals are directly determined by present and projected volumes.

- * Finally, present and potential bottlenecks in the circulation system are best determined through quantitative analysis of volume counts.

For these reasons, immediate action has been taken to develop an initial traffic count program. Nine locations were selected, based on qualitative analysis of the present circulation system. A series of sixteen-hour turning and volume counts was conducted. Although limited in sample observation, a sufficient number of cross-checks were made to validate the data. The sixteen-hour counts were extrapolated to show average daily volume for the count day. Several important initial findings are evident from an analysis of the counts.

- * Beach Road from the Wallace Highway intersection towards Susupe/Chalan Kanoa carries the highest volume of traffic, with an extrapolated total daily count of 11,500. Based on a peak hour volume of 10 percent of this amount (1,150), this segment may well exceed its maximum carrying capacity during this planning horizon, i. e., by 1985.
- * Beach Road from the Wallace Highway intersection towards Garapan carries the next highest volume of 8200 vehicles per day, considerably more than the parallel West Coast Highway.
- * The Beach Road/Wallace Highway and the West Coast Highway/Wallace Highway intersections have significant volumes. Although not of magnitudes requiring immediate signalization, these adjacent intersections constitute a system which could require signalization if present growth trends continue.
- * Wallace Highway volumes already exceed 6000 vehicles per day. Given accelerated growth of airport activity and normal growth trends, this segment could reach the maximum tolerable carrying capacity within the plan period.

If present trends continue, and there is no reason to assume otherwise, the following scenario can be anticipated to occur within the plan period. Beach Road, especially the segment from the Wallace Highway intersection towards Chalan Kanoa will become annoyingly congested, leading to excessive travel time delays and greatly increased accident rates. Congestion will develop at the intersections of Wallace Highway with Beach Road and the West Coast Highway, resulting from queues of traffic waiting to negotiate cross-traffic movements.

A solution to these problems would be to widen Beach Road to four or more lanes, and to install traffic lights along Wallace Highway at the Beach Road and West Coast Highway intersections. However, intersection signalization requires an entirely new maintenance and control technology which is very expensive and which will create hazards during times of power outages. Such solutions, however, are often self-defeating, for short term improvements in flow soon generate additional traffic which outpaces the additional carrying capacity provided by the improvements.

An alternate solution would be to disperse the traffic flow, and to provide redundancy within and build flexibility into the network. Alternate routes provide minimum overall network travel times, insure network serviceability in the event of a natural disaster such as typhoon or earthquake, and provide for support of a balanced urban development pattern. For these reasons, management of the highway transportation system may best be accomplished through the development of a dual access highway system.

Highway Development Alternatives

The development of roads in the Northern Mariana Islands falls into four basic alternative types of improvement:

1. New Construction
2. Major Reconstruction

3. Surface Treatment
4. Stabilization

New construction will involve the full-scale development, including paving and construction of roads and drainage facilities, on presently unimproved roads or trails, or the creation of routes where none now exist. Major reconstruction will involve the reconstruction of existing paved roads to include the major upgrading of the complete road structural section, paving and appropriate roadside drainage facilities. New construction and major reconstruction will be chiefly confined to the Primary and Secondary road network and important village Collector Streets.

Surface treatments involve overlays, slurry sealing or fine grading of base course followed by successive single or multiple applications of asphalt and aggregate. Surface treatments can be classified in most cases, as semi-permanent road improvements which are designed to either prolong the life of certain existing primary and secondary roads, or to upgrade local roads with anticipated light, intermittent traffic loadings.

Finally, stabilization improvements involve road travel surface or shoulder treatment with oil or asphalt derivatives to provide a temporary weather-resistant surface and to control dust. Stabilization improvements will be limited to existing rural roads with very light traffic loadings such as access roads to agricultural homesteads, grazing lands and certain scenic roads.

Highway Development Costs

The 1976 study prepared by the Northern Marianas Department of Public Works (Roads and Grounds Branch) estimated capital improvement costs to be in excess of \$40,000,000 for the Northern Marianas for a full-scale road development program.

Although this amount may be difficult to accept considering available resources, it is certainly indicative of the magnitude of highway funds that will be required in the future to upgrade the present roadway system.

The cost for developing each segment of road will depend upon the type and extent of improvements. New construction and major reconstruction efforts will cost more than surface treatments or stabilization. Furthermore, a two-lane highway facility would be less expensive for a given length than a four-lane facility. Road development program costs have been standardized by categories of improvement in order to provide a basis for preparing and prioritizing a highway program budget.

Table 45 presents design and construction cost estimates for various categories of highway improvements. Typical Cross Sections of the principal roads are illustrated on Plate 29.

HIGHWAY TRANSPORTATION PROGRAM DEVELOPMENT

It is essential to define goals and objectives of the Highway Transportation program to ensure the development of standards by which program recommendations can be evaluated. The plan envisions a transportation system that will provide access to and from residential, commercial and industrial centers, as well as public facilities.

Objectives are realized through the implementation of policies and capital improvements over a finite, reasonable span of time commensurate with available resources. The goals and associated objectives of the program are presented in Table 46.

Recommended Program Implementation Strategy

The most crucial step in the highway transportation planning process is the development of an implementation strategy. The goals and objectives established for the program require

TABLE 45
HIGHWAY PROGRAM DEVELOPMENT COSTS

I. New Construction or Major Reconstruction Development Costs

ROAD	TS WIDTH	SHLDR WIDTH	PVMT TH	BASE TH	COST PER MILE	COST PER L.F.	REMARKS
A. Primary-Rural	24'	8' (paved)	2.5"	8"	\$ 55.70	\$ 294,096	A. Includes provisions for road side surface drainage facilities
B. Primary-Urban	48'	8' (paved)	3"	8"	97.25	513,480	B. Includes 4 foot flush median and roadside drainage facilities
C. Primary-Ultimate	70'	---	3"	8"	192.90	1,018,512	C. Includes 16 foot flush media curbs, gutters, sidewalks and underground drainage facilities
D. Secondary-Rural	22'	8' (stab.)	2.5"	8"	44.40	234,432	D. Includes, roadside surface drainage
E. Secondary-Urban	44'	---	2.5"	8"	124.85	659,208	E. Includes, curbs, gutters, sidewalk and 16 foot median/turning lane
F. Tertiary-Collector	24'	10'	2"	6"	52.70	278,256	F. Includes two 10 foot parking lanes, curbs, gutters and sidewalks
G. Tertiary-Residential-Urban	24'	---	2"	6"	67.25	355,080	G. Includes curbs, gutters and sidewalks
H. Tertiary-Residential Rural	20'	4'	2"	6"	31.50	166,320	H. Includes limited roadside drainage and sidewalks

II. Double Surface Treatment: Includes grading, construction of 6 to 8 inches of base course and double bituminous surface treatment of a travel surface width of 22 feet. Four to six foot wide stabilized shoulder and minimal roadwise drainage improvements.

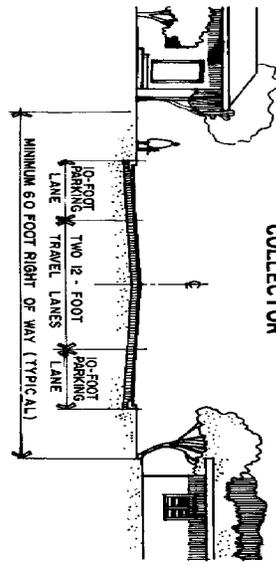
COST PER MILE \$ 85,000

III. Road Stabilization : Includes minimal grading and construction of 6 to 8 inches of base course and stabilization with asphalt emulsion of a 22 foot wide travel surface.

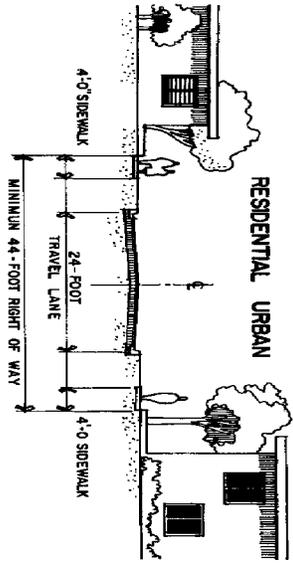
COST PER MILE \$ 75,000

TERTIARY ROADS

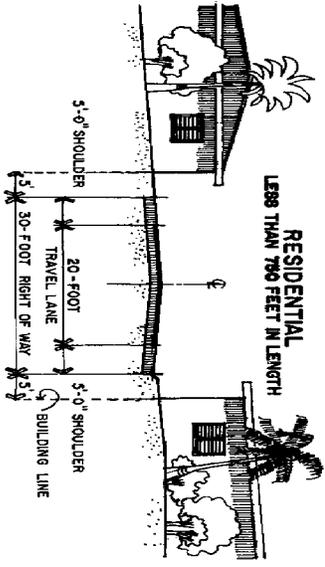
COLLECTOR



RESIDENTIAL URBAN

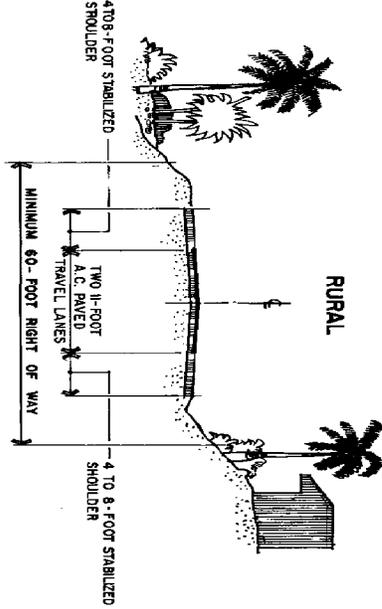


RESIDENTIAL LESS THAN 750 FEET IN LENGTH

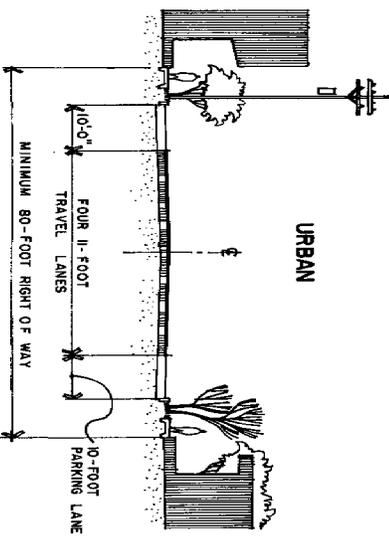


SECONDARY ROADS

RURAL

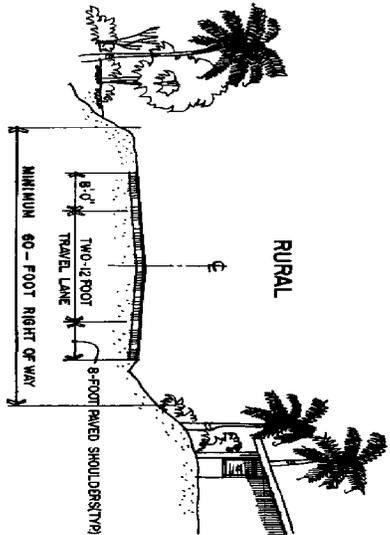


URBAN

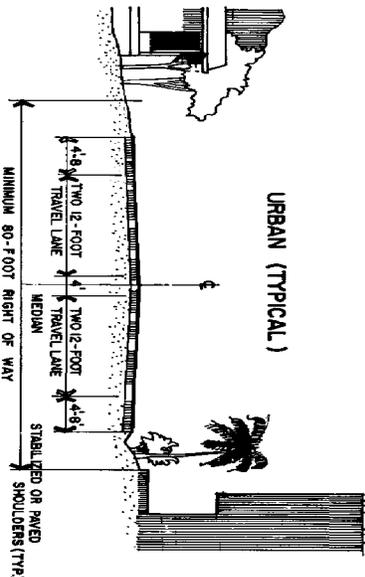


PRIMARY ROADS

RURAL



URBAN (TYPICAL)



SAIPAN ISLAND
PHYSICAL DEVELOPMENT MASTER PLAN
ROAD CROSS SECTIONS

TABLE 46

RECOMMENDED GOALS AND OBJECTIVES

Goals	Objectives
<p>I. <u>Transportation Performance</u></p> <p>To develop and implement a transportation system which ensures safe, efficient, and convenient transportation services responsive to the mobility requirement of the people and goods on the island.</p>	<p>To develop a transportation system which diminishes the dangers of driving-accidents, and resulting injuries.</p> <p>To develop a transportation system which improves accessibility to all activities on Saipan.</p> <p>To develop an efficient and economically feasible transportation system which meets present and future mobility requirements.</p>
<p>II. <u>Transportation Balance</u></p> <p>Provide the optimum highway transportation facilities to complement the social and political aspirations of the island.</p>	<p>To utilize transportation resources as a tool in the solution of Saipan's most pressing social and economic problems, to include the improvement of access to and from residential, commercial, industrial centers and public facilities.</p> <p>To develop a multimodal approach to transportation planning which avoids the total dependence on automobiles.</p>
<p>III. <u>Support National & Local Interests</u></p> <p>Incorporate and develop local transportation plans and programs within the context of developing national and local transportation interests.</p>	<p>To develop a transportation system which will function during a natural emergency or disaster.</p> <p>To develop a transportation network which supports or improves the economic diversity of Saipan and the Commonwealth.</p>
<p>IV. <u>Environmental Protection and Preservation</u></p> <p>To design and implement transportation systems that encourage users to realize the natural beauty of the island and that protects the social and ecological fabric of the community.</p>	<p>To design and construct transportation facilities to help conserve energy and other natural resources and which reduces the total need for new public investment.</p> <p>To coordinate and integrate Saipan's transportation facilities with surrounding activities so that these facilities contribute to the enrichment of the physical environment of the island.</p>

that ambitious and extensive plans be formulated within the financial capabilities of the Commonwealth and in accordance with development policies previously mentioned. It is evident, however, that the financial resources of the Commonwealth are limited and that initial highway transportation projects must be undertaken using NMI Capital Improvement Program funds identified by the Socioeconomic Plan in combination with U. S. Federal Highway Administration funds.

The following recommendations which deal with the administrative and operational activities of the program which must be set in motion as a prerequisite to the proper, logical planning design and construction of highway improvements.

- * GNMI must take immediate steps to cause the Federal Highway Act to be amended to include the Commonwealth of the Northern Mariana Islands. Furthermore, GNMI should request yearly federal fund apportionments commensurate with its ability to provide matching local funds.
- * The Government of the Northern Mariana Islands must organize and establish an administrative and operational hierarchy to properly undertake the highway transportation planning, engineering, construction and maintenance activities. The level of funding will dictate the level of staffing required. Qualified professional planners and engineers must be recruited and appropriately placed in the government with a mandate to instill in local professionals the administrative and technical skills necessary to operate and maintain the program.
- * It is recommended that the highway transportation planning, engineering and maintenance functions be placed under the Department of Public Works and in separate

divisions or sections. To optimize manpower and financial resources, GNMI should concentrate on program administration, operation and maintenance, and execute actual design and construction of transportation facilities through consultant and construction contracts.

- * Finally, it is recommended that GNMI identify and designate the function of each segment of road on Saipan and establish a Functional Road Classification System which will define the standards to which specific roads must be improved.

Table 47 sets forth functions, associated responsibilities and the type of professional resources required for proper operation and maintenance of a Highway Transportation Development Program.

It is recommended that implementation of the Highway Transportation Development Program be accomplished in three phases. The first phase, or the Short Range plan, will coincide with the plan period, or seven (7) years hence. The second and third phases, or, collectively, the Long Range Plan, will follow in successive increments beyond 1985.

The Short Range Plan - Phase 1

The physical measure of the success of highway program efforts is embodied in the actual construction of highway projects. The Short Range Plan will focus on the reconstruction of existing highways and the construction of major highways where only coral base roads now exist. It will also include the upgrading of certain roads which serve as access to scenic or tourist-attraction areas.

TABLE 47

HIGHWAY DEVELOPMENT PROGRAM FUNCTIONS/RESPONSIBILITIES

Function	Program Responsibility	Professional Staffing Requirements
I. Planning	<ul style="list-style-type: none"> *Develop and implement a Comprehensive Highway Transportation Plan for the island. *Establish the bases for the design and construction of highway improvements through collection, evaluation and synthesis of traffic data. *Maintain an inventory of condition of existing transportation facilities. *Determine highway improvement priorities and participate in the formulation of CIP budgets. *Administer and implement highway safety-related programs. 	<p>Transportation Planner</p> <p>Highway/Civil Engineer (with highway planning experience)</p> <p>Statistical Analyst</p> <p>Draftsman/Technician</p>
II. Engineering and Design	<ul style="list-style-type: none"> *Develop and establish highway design criteria and standards. *Design or contract for and administer the design of highway improvement projects. *Regulate the design of streets and roads which will eventually become public by prescriptive rights or dedication. 	<p>Highway/Civil Project Engineers.</p> <p>Surveyor and survey aids</p> <p>Draftsmen</p>
III. Construction Administration	<ul style="list-style-type: none"> *Administer contracts for the construction of highway projects. *Provide material quality control and inspection of highway projects. 	<p>Highway/Civil Project Engineers</p> <p>Inspectors/Technicians</p>
IV. Right-of-Way Acquisition	<ul style="list-style-type: none"> *Acquire rights-of-way (ROW) or easements required for the construction of highway facilities. *Prepare and process maps and other documents and negotiate for the acquisition of ROW's and easements. 	<p>Surveyor</p> <p>Survey aids</p> <p>Land agents</p>
V. Maintenance	<ul style="list-style-type: none"> *Operate and maintain highway transportation facilities. *Construct small segments of road. *Operate and maintain traffic signs and signals. *Develop and establish policies and procedures, as well as issue and enforce permits for highway encroachments and crossings. 	<p>Highway Maintenance (Civil) Engineer</p> <p>Traffic Signal Maintenance Technician (electrician with traffic signal maintenance experience)</p> <p>Heavy Equipment Operators and laborers</p>

The plan seeks to develop alternative routes to those that are presently heavily congested. Accordingly, the plan will emphasize utilization of West Coast Highways vis-a-vis Beach Road. This will require the reconstruction of West Coast Highway including its intersection with Wallace Highway and its extension southward to As Perdido Road along the alignment of what is now Texas Road.

This project will not only alleviate the most pressing problem associated with the present system -- the overcrowding of Beach Road from Wallace Highway toward Susupe/Chalan Kanoa -- it will also establish a multi-access primary circulation pattern throughout Susupe and Chalan Kanoa.

Included in the plan will be the upgrading of As Perdido Road to provide improved, quick access to the Airport and the proposed new residential subdivision at Kobler Field from Chalan Kanoa and other commercial, residential and industrial centers on the western side of the island.

Wallace Highway will be reconstructed from Beach Road to Cross Island Road leading to San Vicente Village to improve the existing travel surface as well as the level of service of this primary route.

The reconstruction of other major roads, namely Micro Beach Road and portions of Beach Road, will be undertaken to improve their travel surfaces and levels of service, as well as to enhance proposed commercial and institutional development along their rights-of-way.

Cha-Cha Road will be upgraded to improve access to agricultural developments in the Kagman area. A small segment of Navy Hill Road will be reconstructed to provide improved

access to the proposed new hospital site on Navy Hill. Certain village streets and roads which serve as access to scenic areas will be upgraded using local funds, totalling over \$1.7 million.

Table 48 lists the projects proposed to be undertaken during the plan period as well as the amounts of local and federal matching funds programmed over the next seven (7) years. The locations of the road proposed for construction are illustrated on Plate 28 (See Page

The Long Range Plan -- Phases 2 and 3

The Highway Transportation Development Program will continue beyond the plan period for as long as improvements to the transportation system are required. However, for planning purposes, the Long Range Plan will cover the next fourteen (14) years in successive seven (7) year increments, i. e., Program Phases 2 and 3. The Long Range Plan will continue to focus on the reconstruction of the existing highway network.

Since funds have not been identified beyond 1985, it is difficult to determine the financial resources which can be used to continue Phases 2 and 3 of the Highway Development Program. However, specific projects have been identified and recommended for implementation based on a subjective analysis of the remaining useful life of critical portions of the transportation network as well as the need to stimulate commercial and industrial development in certain areas. The segments of road recommended to be reconstructed under the Long Range Plan are also illustrated on Plate 28 (See Page 287).

TABLE 48

Proposed Saipan Highway Improvement Projects -- Short Range Plan

ROAD SEGMENT	Miles	NMI										
		(Federal) Contribution	FY 1978	FY 1979	FY 1980	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	FY 1978 - 85	
Wallace Road	1.5	270 (630)	--	--	--	--	--	--	--	--	900	
Beach Road	1.2	108 (252)	--	--	--	--	--	--	--	--	360	
(Oleai-Susupe)	(.2)											
(Chalan-Kanoa, Chalan Piao)	(1.0)											
Texas Road Bypass	2.0	300 (700)	--	--	200 (467)	100 (233)	--	--	--	--	1,000	
Micro Beach Road	.5	45 (105)	--	--	--	45 (105)	--	--	--	--	150	
Inner Road												
(Oleai-Capital Hill Turnoff)	5.5	515 (1,192)	--	--	--	256 (596)	259 (596)	--	--	--	1,707	
New Hospital Road	.3	27 (63)	--	--	--	--	27 (63)	--	--	--	90	
San Vicente Approach	.5	45 (105)	--	--	--	--	--	45 (105)	--	--	150	
Kagman Road	1.0	90 (210)	--	--	--	--	--	90 (210)	--	--	300	
South Island Airport Access Road	3.0	300 (700)	--	--	--	--	--	--	150 (350)	150 (350)	1,000	
Selected Scenic Roads					80	--	80	80	--	--	480	
Village Roads		200	180	--	--	--	180	180	360	360	1,280	

