

The Rota Master Plan

# ALTERNATIVE VISIONS REPORT

February 15, 1995



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## INTRODUCTION

The planning principles governing this project are relatively simple and will encompass the following three issues:

1. What do we have?
2. What do we want?
3. How do we get what we want?

This process is further outlined in the enclosed chart entitled "The Planning Process." We have completed the first phase of the project where we have assimilated information on the existing conditions of the island. The first public hearing marked the beginning of the second phase. This document presents three alternative visions which try to answer the second phase of the Masterplan process "What do we want?" We will also conduct a public hearing to discuss these visions and further refine the direction which the residents of Rota desire for the future.

Vision One provides for sustainable growth and an economy focused primarily on cultural tourism/ecotourism, agricultural and marine resource development, and the strengthening of the cottage industry. This vision is characterized by a straight 4% annual growth in the total population.

Vision Two provides for an economy that is changing from a passive to a very active tourism environment. After tourism, the next leading economic growth will be found in agriculture. In addition, light manufacturing and fisheries and fish processing will be developed as viable economic stimulus. This vision is characterized by an 8.15% straight-line growth in population.

Vision Three allows for economic development based on a large-scale tourism industry. Rota may become an investment destination which attracts foreign investors to the tourism industry. Or Rota's economy may be fueled by strong locally-owned businesses. In either case, many new jobs and opportunities will be created. However, to support the development on Rota, the government must invest millions of dollars into improving the island's infrastructure. This vision reflects a 15.5% straight-line growth in population.

Once the final plan is completed, the consultants will develop an implementation program that will ensure that the goals of the residents of Rota are met. The implementation program will include an infrastructure improvement program, a set of government regulations to ensure that projects are designed and built properly, and a generalized economic program.

**VISION ONE**

**SUSTAINABLE GROWTH 1995-2015**



## Overview

The people of Rota are self-reliant and in charge of their own fate. They want businesses that are ecologically sound, not ones that radically alter their land, beaches, reefs, and ocean. Rota's people want a diversified economy that will complement the Chamorro culture.

This vision is based on the natural growth of the resident population, with a sustainable economy focused on ecotourism, and agricultural and marine resource development. It provides for economy that supplies many of the island's needs for food, goods, services, and finances. It allows for local control with the residents of Rota making their own decisions about the type of development to occur. Training programs are established to insure local control over all levels of operation and management. The ideal development project is local in all respects. It is owned and managed locally; it reflects the values of the community. Economic development being pursued will provide work for the for local people and this development supports the use of locally-available material resources.

## Agriculture

Rota continues to be the principal farming island of the Northern Marianas. The agriculture industry is dominated by family farms supplying local and tourist needs. Crops include suni, kamuti, dago, tropical fruits, and vegetables. Local gourmet foods (herbs and spices) are grown to supply Guam and Saipan's tourism and restaurant industries.

The Northern Marianas College Cooperative Extension Service (CES) provides technical assistance to farmers by providing proven practices for farming, as well as providing research on the cultivation of plants for the tourist and export markets. Exotic products for the gourmet market niche, such as donni, mangu, vanilla, and allspice, are grown while farmers continue to explore new plant products. Exotic tropical flowers and hybrid ornamental plants are grown for export to Guam, Saipan, and Japan. Aloe plants and native medicinal plants are grown for pharmaceutical products.

Agriculture cooperative enterprises are established to sell crops and livestock, and buy supplies such as seeds, building materials, and high-volume farm machinery. Farmers have the opportunity to sell their products to local and regional outlets, including major stores, public markets, hotels, restaurants, and government lunch programs.

The government continues to develop programs which provide opportunities for farmers to develop and improve their farm operations, including:

- regulations protecting farmland
- farmland tax exemptions
- an agricultural water-rate program

- insect- and disease-spraying services
- the government sale of vegetable and fruit seedlings
- slaughter services
- farm loans
- extension programs
- pilot and demonstration projects.

## **Aquaculture**

Small-scale aquaculture farms that produce lobsters, prawns, talapia, and catfish are exporting these high-value products to Guam, Saipan, and Japan. The local government sees that aquaculture could develop into a significant component of Rota's economy. The government, in partnership with the private sector, has committed to expanding into new agricultural products and will build a hatchery and aquaculture experiment station. In the meantime, Guam's aquaculture leaders have been working with Rota officials in developing aquaculture and supplying the postlarvae and fry to Rota's commercial aquaculture farmers.

## **Tourism**

Ecotourism provides a means of economically sustainable growth because it protects and enhances the environment and culture. Nature tours, cultural tours, village stays, bed-and-breakfast inns, and small-scale tourism activities will enhance the creation of private-sector jobs. Ecotourism also supports and maintains the traditional practices which visitors come to see.

Ecotourism ventures are fairly small-scale developments which tap onto existing infrastructure without overtaxing its capacity. The government is able to plan for long-term capital improvement projects to improve the roads, water, sewer, electricity, waste disposal, etc.

## **Cultural Tourism**

A bird sanctuary offers local residents and visitors the opportunity to witness first-hand the natural habitat of native bird species. The cultural center will promote self-reliance activities of the Chamorros and include demonstrations of the traditional lifestyle, art, language, crafts, history, and philosophy. The center serves a number of functions including:

- operates as a source of income and employment while using relatively little capital;
- employs a number of sustaining activities that utilize local materials;
- acts as a practical training ground for entrepreneurs.

Small hotels and restaurants highlight local hospitality and promote high-quality local products including arts and crafts and specialty foodstuffs. However, modern amenities are also available



including spas, health centers, and retreat centers. These facilities feature health advisors who work with wealthy clients from all over the world in health-related areas such as prevention, wellness, nutrition, and spiritual healing. Local-style architecture depicting Chamorro cultural themes are incorporated into building designs. (See Figure 1.)

Water sports, diving, windsurfing, and canoe paddling businesses provide visitors with recreational activities. Traditional recreational, water activities will also be developed. Cliffline fishing derbies, and deep- and shallow-bottom tours will be featured. Glass-bottom boat tours will also be available.

The government provides a supportive business climate for the private sector by providing incentives and avoiding overly restrictive controls that make it difficult for firms to get started or to succeed. Infrastructure improvements to support these areas are being designed and funded.

## **Manufacturing and Other Industries**

Local businesses operate facilities which process fruits, vegetables, taro, fish, and meat for local consumption and for sale in Guam, Saipan, and the region. These small food-processing facilities provide farmers and fishermen with the opportunity to increase their income and profits by adding greater value to their goods.

The local labor market will have access to a variety of jobs in diverse occupations and industries ranging from bottling water to various cottage-type industries. Locally-produced arts and crafts offered for sale to tourists enhance preservation and appreciation of the traditional culture. Other industries specializing in the substitution of import products continue to be developed. Local residents own and manage their own cottage businesses. Handicraft co-op outlets have formed to sustain quality production by furnishing necessary supplies and training programs, and by providing marketing programs for both retail and wholesale enterprises.

Community-based enterprises, including small bed-and-breakfast inns, are locally owned and managed. These enterprises reflect the values of the community, employ local people, and use locally-available resources. Money stays in Rota because residents own facilities and share profits from the supply of food, furnishings, and services.

A few community banks and credit unions help to stimulate the local economy by providing effective mechanisms for making credit available to low- and moderate-income people. Loans are available to residents to improve housing, and to finance small business enterprises and non-profit organizations. The community bank raises capital for foundations, churches, and public corporations. Revolving-loan funds will be made available to developers and non-profit organizations for the construction of affordable housing units.

## **Villages**

Songsong and Sinapalo are the most concentrated villages characterized by a mixture of open spaces and medium-density neighborhoods. These integrated neighborhoods which contain work sites, shops, schools, and recreational areas, are close together and create feelings of ownership and belonging among all residents of the community. The area continues to retain its rural character. The people live in a variety of housing arrangements, including single, condominium, and rental units. Low-density side streets are filled with single-dwelling units, low-rise apartments, townhouse apartments, and row houses. Neighborhood mini-parks are found throughout the village. Pathways through the village give everyone, including children, safe access to shops, schools, and civic and recreational amenities.

Rota residents are proud of their island's natural resources and their ability to protect these resources. They take an active role in scrutinizing new projects to insure that they are compatible with their neighborhood areas. At the same time, residents work at beautifying their parks and public facilities, as well as their home surroundings.

## **Potential Growth Impacts**

This vision supports an economy that is sustainable, self-reliant, and community-based. It encourages sound ecological practices, the preservation of Chamorro culture, and local control. Improvements will need to be made in the infrastructure, roads, water, and sewer to accommodate the additional growth in population.

Total resident population in the year 2015 is projected to be 4,610 with an overall growth rate of 80%. Total daily resident and tourist population is forecasted to be 5,716. The total number of daily visitors at peak is projected to be 1,106.

The natural growth of the population will allow for the government to keep pace with the infrastructure needs of the island. Capital improvement programs have been programmed for the next five years with priority placed on the water and sewer projects, airport and seaport expansion, and roadway improvements to accommodate present and future demands.

The basic services of health, education, and public safety have kept up with the steady demand of the population allowing each resident of Rota to receive a high standard of government services. To accommodate this growth, an additional 466 dwelling units (estimated at 4.4 persons per household) requiring 111 more acres for residential housing is needed.

Based on the projected population growth, the additional potable water demand is estimated to be 386,500 gallons per day. The wastewater generated by the new population will be an additional 328,525 gallons per day. An additional 11,859 pounds of solid waste will be generated and will need to be disposed of in the existing landfill or be recycled. A landfill on 2.7 acres is required to dispose of this solid waste.

An additional 820 automobiles will be traveling on Rota's roads. Currently, 977 vehicles are registered on Rota. Five more police officers and 4 new fire fighters will have to be hired and will be essential to accommodate the needs of the community. Ideally, three healthcare beds should be added to support the health care needs of the island. A total of four doctors is required to support this population.

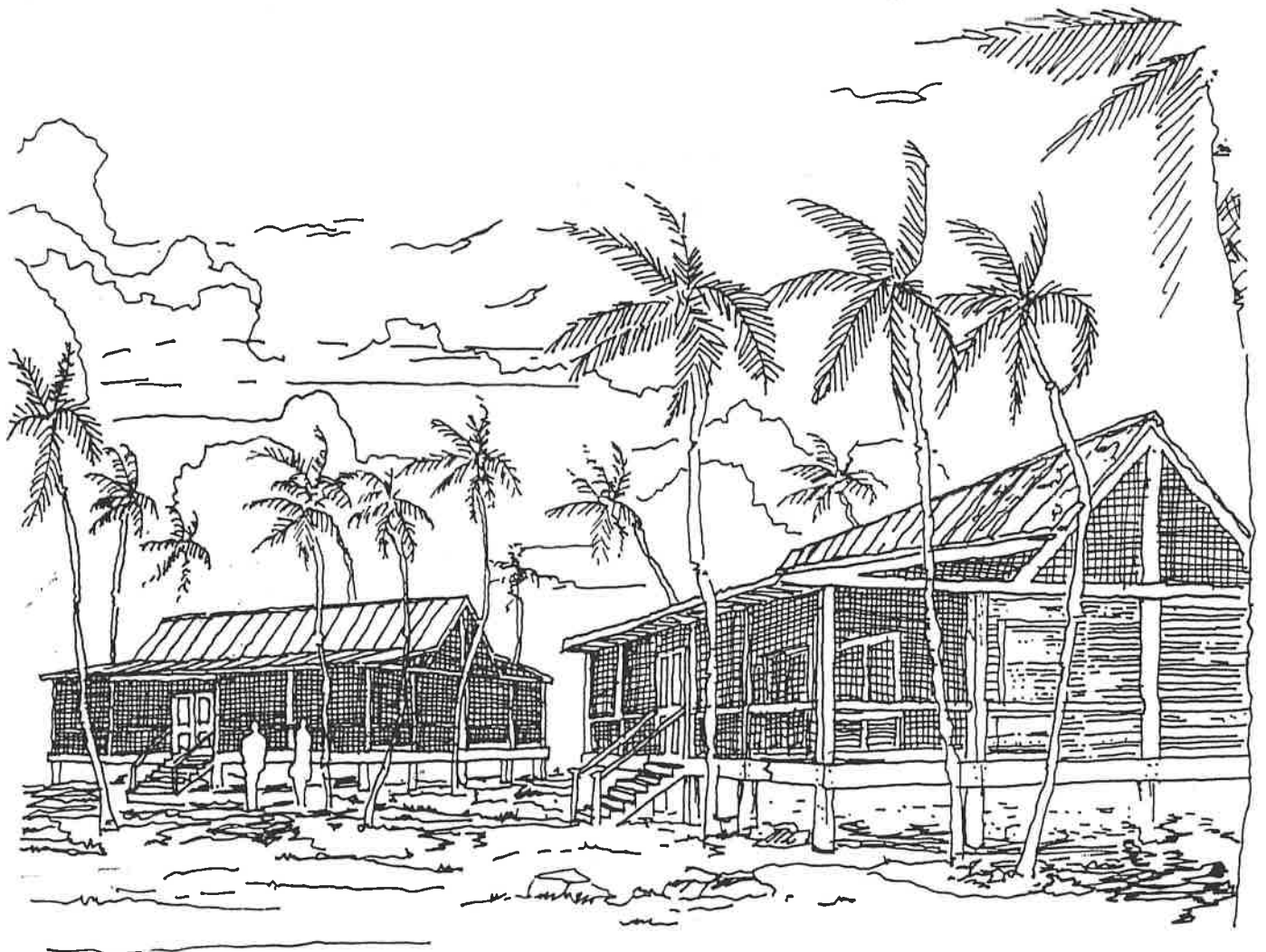
Five hundred and thirty new hotel rooms are projected to be built and added to the inventory bringing the island's total number of hotel rooms to 647. These new hotel rooms will be responsible for the creation of 398 new jobs. In addition, 530 jobs will be created indirectly, bringing the total number of new jobs to 928.

**TABLE 1: VISION 1 POTENTIAL GROWTH IMPACTS (1995-2015)**

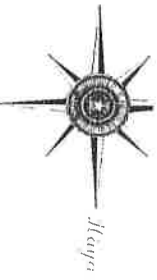
	<b>CURRENT</b>	<b>ADDITIONAL</b>	<b>TOTAL</b>
Resident Population Year 2015	2,999 <sup>1</sup>	1,611	4,610
Number of Hotel Rooms	117	530	647
Residential/Hotel Water Demand (gpd)	300,950	386,500	687,450
Golf Course/Agricultural Water Demand (gpd)	500,000 <sup>2</sup>	8.5 - 16.5 million	9 - 17 million
Residential Acres	515	111	626
Residential/Hotel Wastewater (gpd)	255,807	328,525	584,332
Solid Waste (lbs)	15,340	11,859	27,199
Automobiles	977	820	1,797
Police Officers	14	3	17
Firefighters	10	4	14
Healthcare Beds	4	0	4
Doctors	1	3	4

<sup>1</sup>Based on 1992 population with a constant 5.5% annual growth.

<sup>2</sup>Figure for a golf course only, agricultural data is unknown.



**FIGURE 1. A Cultural Tourism Scene**



*Kuchan*

# LAND OF ROTA VISION 1 (PROPOSED)



Several government programs are in place for existing and potential farmers which help them develop and improve their farm operations. The agriculture industry is dominated by several large farms supplying local and tourists needs. Crops include suni, kamuti, dago, and tropical fruits and vegetables. Local gourmet foods (herbs and spices) are grown to supply Guam and Saipan's tourist and restaurant industries.

Some of the programs available to farmers in Rota include:

- an agricultural water rate program,
- an insect- and disease-spraying service,
- the government sale of vegetable and fruit seedlings,
- veterinary services,
- farm loans,
- management assistance to cooperatives,
- extension programs,
- pilot or demonstration projects.

## **Healthcare Facility**

An effort to build a specialized burn-treatment center is being pursued by the government. A joint partnership with private investors is being explored with several interested parties. The government is willing to provide public-land leases, tax incentives, and infrastructure development to illustrate their commitment to developing a facility. However, the government is not in a position to develop such a center on its own. (See Figure 5.)

## **Manufacturing**

Near the harbor, an industrial park provides an environment for small businesses to succeed. The park provides a business support system that includes office and warehousing spaces, computer training, financing, and technical expertise to help new businesses maximize their success.

Many small and specialized local manufacturing firms are developing products for specific markets and are realizing healthy profits. These manufacturers produce a wide range of goods including dairy products, souvenir items, textiles, furniture, chocolate candy, baked goods, handicrafts, and concrete products.

Light manufacturing, air-transportation users, freightforwarders, warehousing, overseas suppliers/importers, perishable-food handlers, fumigation, and other related industries are also located in the industrial park.



## **Fisheries**

A number of federal regulations are being modified to remove constraints and to stimulate fisheries development in the Northern Marianas. Both public and private industry officials are working together to provide an environment which will stimulate this sector.

The Magnuson Fishery conservation Management Act was recently amended to include tunas within the exclusive management authority inside of the 200-mile Fishery Conservation Zone. This change enables the Federal Government to control foreign tuna fishing vessels within the Conservation Zone. As the CNMI territorial jurisdiction extends out only 3 miles, the Commonwealth may not be able to profit from the licensing of tuna fishing vessels in the Conservation Zone. It is presently unclear whether the Commonwealth can exercise jurisdiction and license vessels within the entire 200-mile Conservation Zone. Leaders are currently trying to resolve this issue to allow for the CNMI to control this resource.

Rota's Fisherman's Cooperative Association is an active, market outlet for the small-boat fishery catch. The Co-op is run by a strong management team chosen by the membership and it operates clean, efficient processing facilities. The market is supplied by local fisherman as well as by other external sources offering a diversified range of fish-products for sale.

## **Off-Shore Mineral Resources**

The cost of exploration and extraction of manganese nodules and other mineral resources is very high. The technology for the mining of the seafloor is very new and expensive. Large ocean-going vessels and shoreside facilities for the unloading and processing of the minerals are required. Large quantities of power and water for the processing of the raw mineral are required. All of these facts effectively exclude Rota from direct participation in any deep-sea mining efforts. Licensing the extraction of the resource within the CNMI Exclusive Economic Zone (EEZ) is a more likely scenario. The CNMI government will continue to pursue assistance from the U.S. and other nations, such as Japan, in assessing the potential off-shore mineral resources.

## **Transportation**

Several commuter airlines connect Rota with Guam, Tinian, and Saipan. Airport expansion has improved the airport facilities, and transshipment services become a reality. Larger aircraft begin to service Rota with direct flights from Japan, Korea, Taiwan and the Philippines. Jet aircraft (including DC-10's) service the airport continually with a total of 20 flights per day. The loud noise the aircraft make while taking off or landing will be more common and will affect the once-tranquil rural environment of Rota. However, because the airlines must accommodate Guam and Saipan travelers, a day schedule is not always possible.

Several government programs are in place for existing and potential farmers which help them develop and improve their farm operations. The agriculture industry is dominated by several large farms supplying local and tourists needs. Crops include suni, kamuti, dago, and tropical fruits and vegetables. Local gourmet foods (herbs and spices) are grown to supply Guam and Saipan's tourist and restaurant industries.

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Small, medium, and large, pleasure boatcraft operating out of Guam and Saipan frequently make stops in Rota. Rota takes advantage of this boating activity by developing a harbor and marina capable of providing services to yachtsman and chartered fishing boats. There are a number of charter companies, restaurants, dock spaces, sailing schools, and other facilities and services able to support a diverse maritime industry. The government has invested in establishing these facilities and has been successful in enticing private businesses to locate there. Other activities at the harbor include small inter-island tours, tourist cruises, dinner cruises, and sports cruises. The Port Authority collects rental fees and business taxes, and is self-sufficient.

Rota is heavily reliant upon imports and will continue to be in order to keep pace with the growth in the island's economy. Rota's exports are expected to increase as well. Seaport improvements have been made to meet present and future cargo demands. The seaport expansion is a critical factor in developing and diversifying Rota's economy. The commercial harbor facilities are being expanded to accommodate large transshipment activities.

The bustling growth of the island brings significant new automobile traffic as well as growing concern regarding the degradation of coastal and groundwater quality. Traffic jams in Songsong and Sinapalo are common during peak hours of business operations and aircraft arrivals.

## **Villages**

The village homestead program has been successful in retaining the rural village lifestyle of Rota. The housing areas have flowers and fruit trees lining the streets of single-family homes. Bicycle paths run everywhere, with small parks nestled between the homes. Individual and community gardens, as well as porches and outdoor kitchens are nicely kept and are visible throughout the village. Rota's people embrace the traditional Chamorro concept of a self-reliant way of life in harmony with nature. The homes are sewerred and many homes have their own water catchment systems, and solar energy panels. They have been designed with energy-efficiency in mind.

The schools are neighborhood schools and students have walkways and bicycle paths to insure safety. Small neighborhood stores are conveniently located along major traffic areas. A mini-bus system is run efficiently by a private company and provides residents and visitors alike with transportation options to town and the resort areas.

## **Potential Growth Impacts**

Total resident population is projected to be 10,493 with an overall growth rate of 310 percent over 20 years. The total daily resident and tourist population is forecasted to be 13,959. The daily peak tourist population is projected to be 3,466. To accommodate the growth, an additional 1,803 new dwelling units is needed, or an additional 428 acres. There will be an

additional 3,173 cars on the streets of Rota. Twenty more police officers must be added to the force and an additional 16 fire fighters will also need to be hired.

One thousand, nine-hundred and ten new hotel rooms are projected to be built and added to the inventory to bring the total to 2,027 hotel rooms. These new hotel rooms will directly create 1,433 new jobs. In addition, 1,910 jobs will be indirectly created bringing the total to 3,343 new jobs.

**TABLE 3: VISION 3 POTENTIAL GROWTH IMPACTS (1995-2015)**

	CURRENT	ADDITIONAL	TOTAL
Resident Population Year 2015	2,999 <sup>1</sup>	7,494	10,493
Number of Hotel Rooms	117	1,910	2,027
Residential/Hotel Water Demand (gpd)	300,950	1,199,050	1.5 million
Golf Course/Agricultural Water Demand (gpd)	500,000 <sup>2</sup>	6 - 12 million	6.5 -12.5 million
Residential Acres	515	428	943
Residential/Hotel Wastewater (gpd)	255,807	1,019,193	1,275,000
Solid Waste (lbs)	15,340	46,569	61,909
Automobiles	977	3,173	4,150
Police Officers	14	18	32
Firefighters	10	16	26
Healthcare Beds	4	9	13
Doctors	1	9	10

<sup>1</sup>Based on 1992 population with a constant 5.5% annual growth.

<sup>2</sup>Figure for a golf course only, agricultural data is unknown.

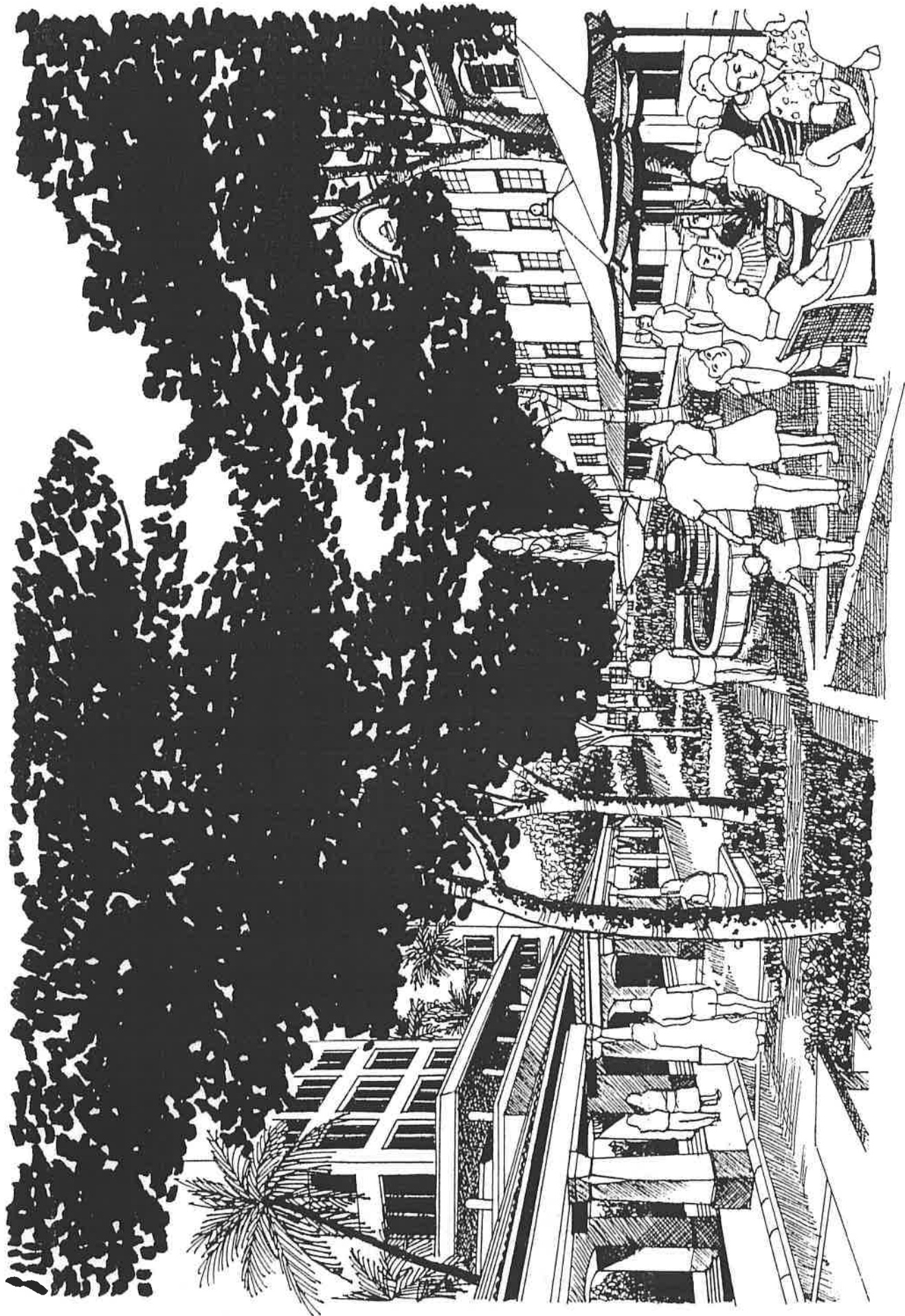
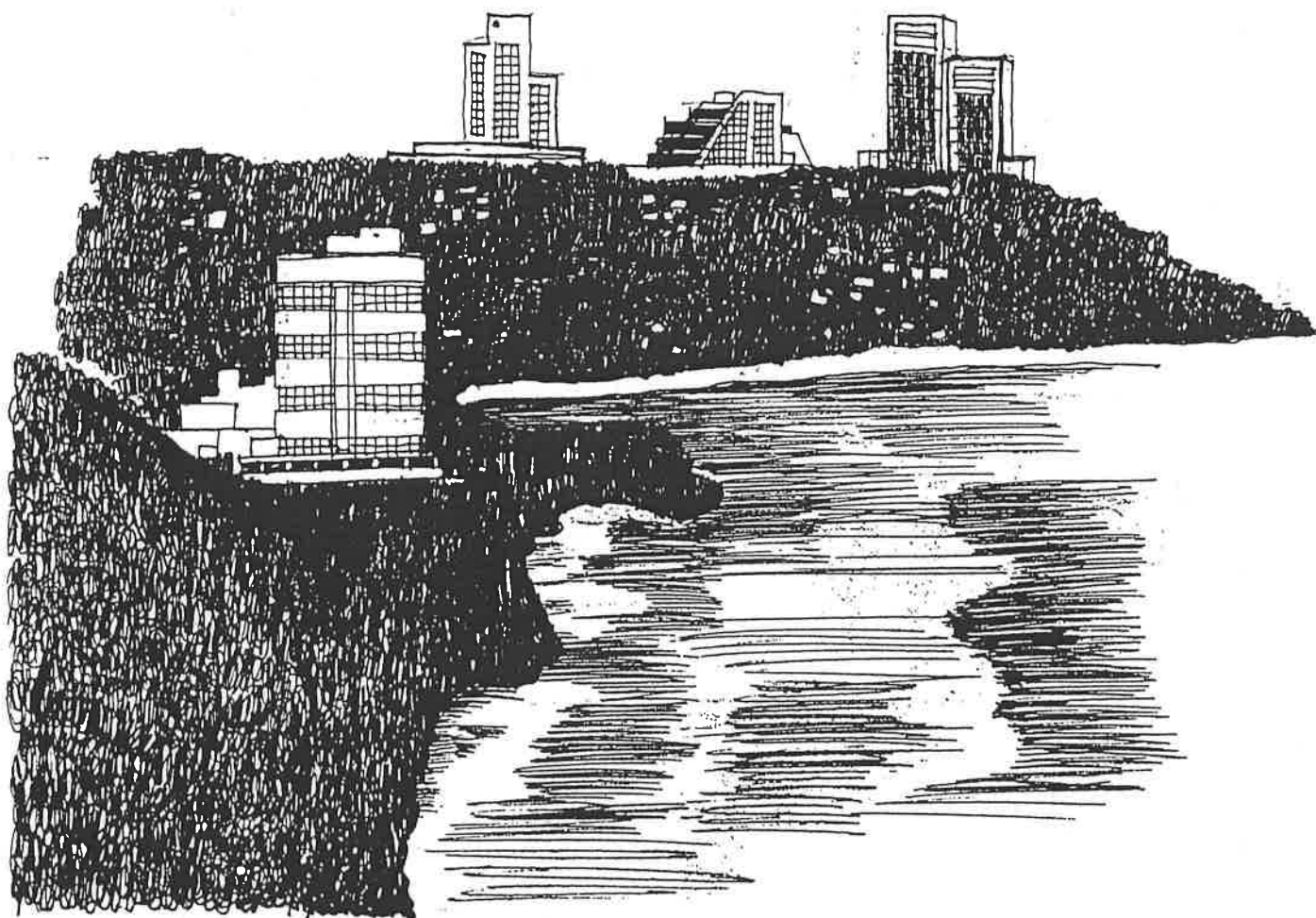
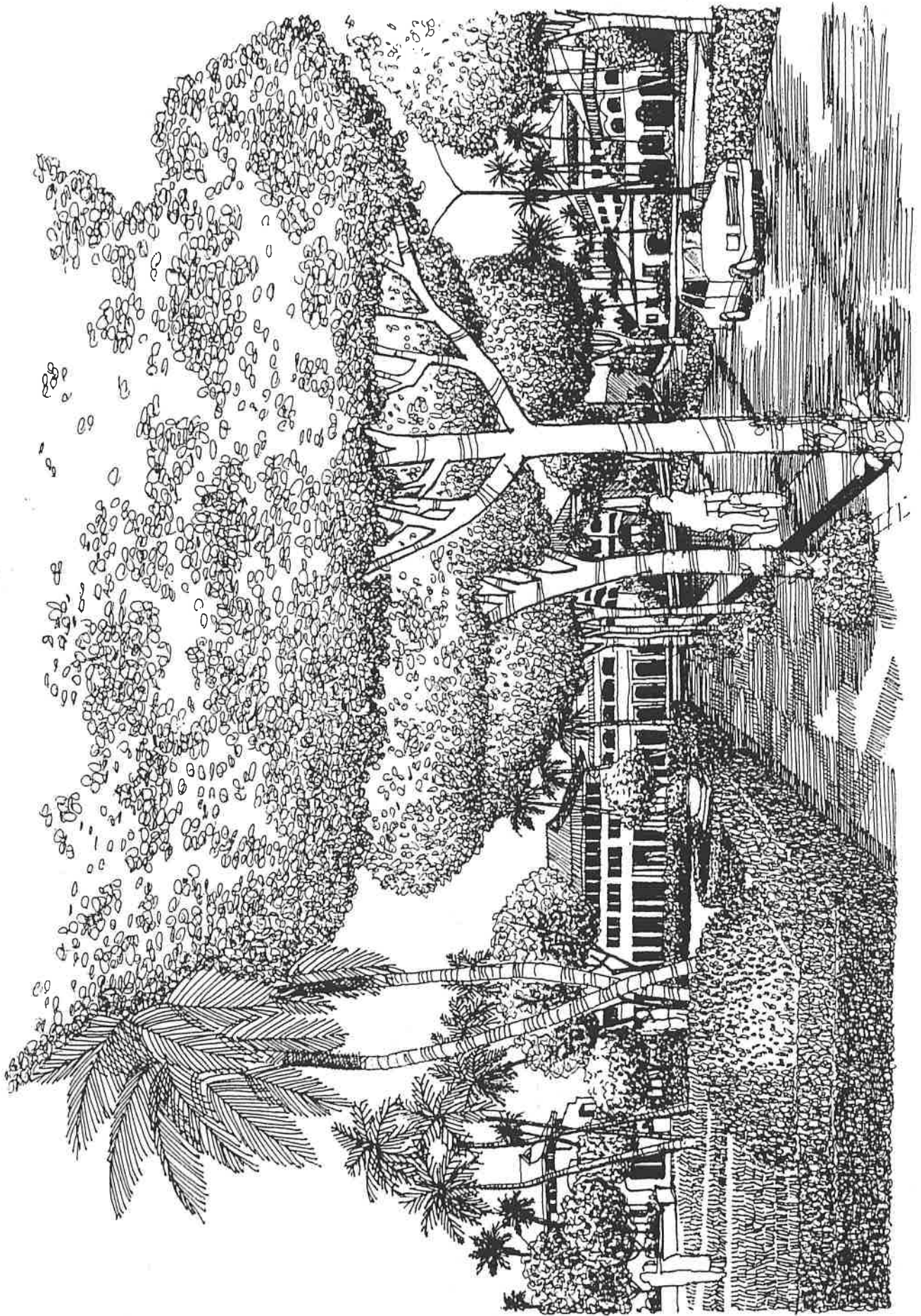


FIGURE 2. First-Class Tourism Attraction





**FIGURE 3. Hotel/Resort Area**



**FIGURE 4. Cultural Education Center**

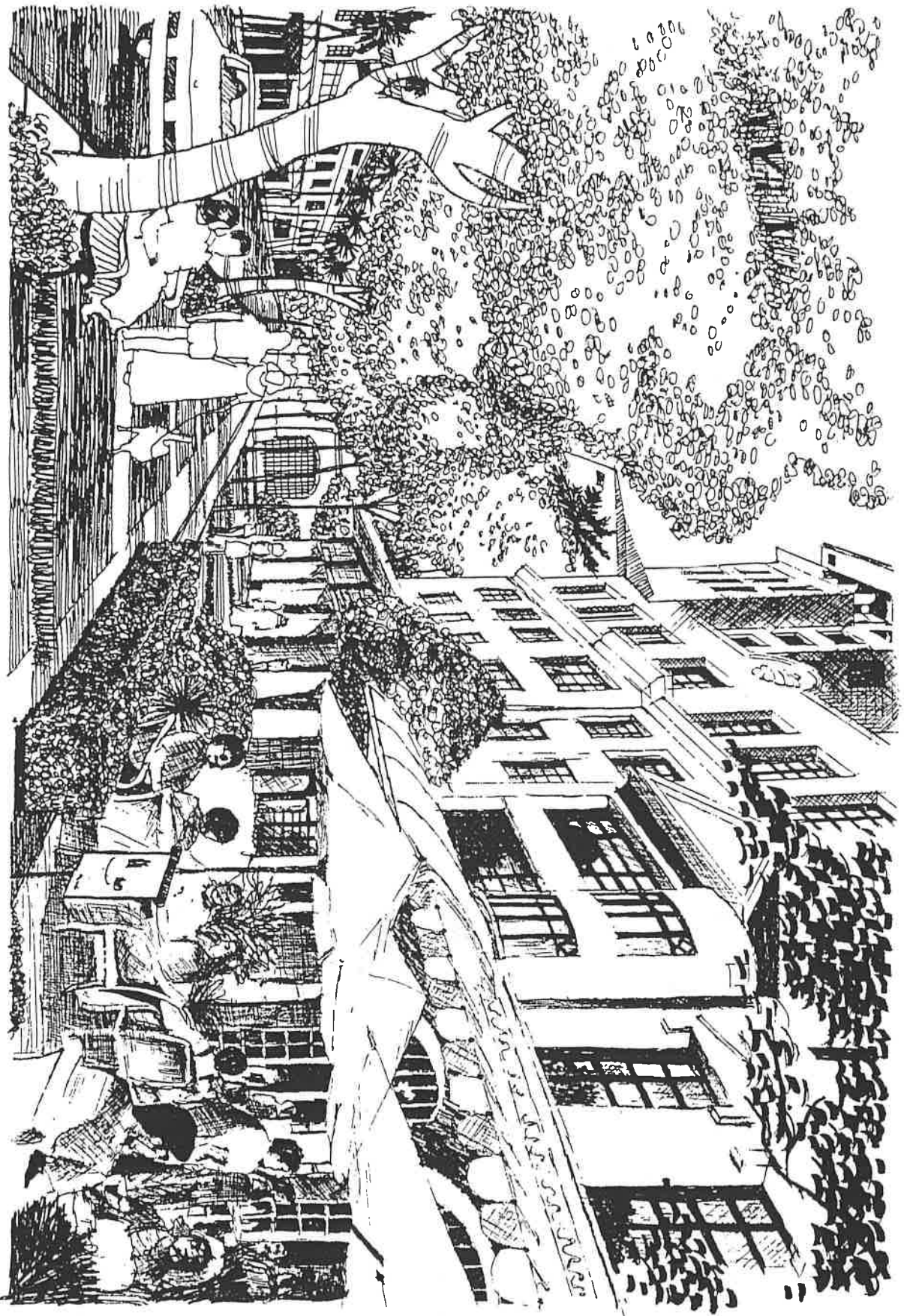
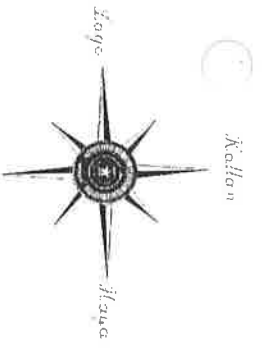


FIGURE 5. Healthcare Facility





# ISLAND OF ROTA VISION 3 ( PROPOSED )





- LEGEND:**
- ACRUCULTURAL HOMESTEAD
  - CONSERVATION
  - HOTEL RESORT
  - INDUSTRIAL AIRPORT / SEAPORT
  - MARINE PRESERVE
  - MEDICAL / EDUCATION
  - MIXED USE
  - MODERATE RESORT
  - OPEN SPACE
  - RECREATION; BEACH PARKS
  - RESIDENTIAL
  - TOURISM / MARINE
  - EXISTING ROADS
  - PROPOSED ROADS

## *Health Center*

### *Existing Condition*

The existing Rota Health Center, located in Songsong, is undersized to meet the island's existing demand. The Health Center contains only three holding rooms. Occasionally, patients are treated in the hallway or the delivery room. Currently, the facility is not able to handle mental health patients, to file medical records, or to accommodate a nursing lounge. The outdoor lighting system is insufficient and the air conditioning system needs to be replaced with maintenance-free units.

### *Proposed Improvements and Costs*

This vision will require a total of 10 doctors to serve the projected population growth. In addition, a new Health Center is necessary. The size of the property is a major criteria in site selection. The center should be removed from the main business area but also be accessible to common carriers. Groundspace should be large enough to allow for future expansion and to meet community needs. Space requirements indicate a minimum need for 14 acres to include the five main areas:

- the main entrance, including the public waiting area;
- the administrative area, including the records space and offices for the health officer, sanitary engineers, and nurses;
- the clinic area;
- the auditorium;
- the service area, including the storage area and maintenance rooms.

Infrastructure should be available that is capable of accommodating the amount and type of facility needs. Infrastructure which should be provided include adequate road access, water and sewer systems, electricity, and telephone service.

The concept of the squared adaptation of the circular nursing wing should be developed to promote efficiency and convenience for patients. Patient room-partitions will be arranged radially around a central square nursing station providing visual control and short walking distances for nursing routines. Further, the concept is said to permit operation with a minimum of professional staff, which is an advantage in these times when nursing personnel are in short supply. The center will be designed for an initial 20-bed capacity but can be extended in the future with additional floors or another wing. The cost estimates for a new Health Center are shown on Table 4.



**TABLE 4: HEALTH CENTER  
COST ESTIMATES**

ITEM	QUANTITY	UNIT COST	TOTAL
<b>SITE PREPARATION</b>			
Clearing, Grubbing	20 AC <sup>1</sup>	\$6,000.00/AC	\$ 120,000
Grading: Cut	60,000 CY <sup>2</sup>	\$ 4.50/CY	\$ 270,000
Fill	30,000 CY	\$ 8.00/CY	\$ 160,000
Environmental Protection	LS <sup>3</sup>		\$ 60,000
<b>INFRASTRUCTURE</b>			
Roads, Driveways, Parking	LS		\$ 659,682
Storm Drainage System	LS		\$ 416,179
Water Supply System	LS		\$ 158,730
Waste Water Disposal System	LS		\$ 576,410
Chain Link Fence, Retaining Walls	LS		\$ 274,538
<b>FACILITIES</b>			
Health Center	16,000/SF <sup>4</sup>	\$ 250.00/SF	\$ 4,000,000
Landscaping	LS		\$ 684,000
<b>TOTAL</b>			<b>\$ 7,379,539</b>

<sup>1</sup> AC - Acres

<sup>2</sup> CY - Cubic Yard

<sup>3</sup> LS - Lump Sum

<sup>4</sup> SF - Square Feet

## *Police Station and Fire Department*

Although Rota will have a population projected to be, the island will require less jail space than most urban settings. Nevertheless, space for traffic reports and a courtroom is needed. Also, it is very important to have a one-story plan well-arranged as personnel is very limited. The space requirements for circulation, isolation, and public and private entrances are also important.

Adequate parking facilities should be provided, including space for vehicles belonging to all agencies using the building, as well as on-duty personnel, clients, and visitors. Plans should include reasonable space for emergency needs. A minimum square footage of 10,000 is recommended for the building. The cost estimates are shown on Table 5.

The Fire Department building should include administrative offices; stations, houses, or halls to house the apparatus and equipment; fire alarms and communication centers; fire training facilities; maintenance and supply facilities including shops and storerooms. The station should have a parking area large enough to provide off-street parking for each fireman who is on duty or is scheduled to respond to fires.

Design for stations should have a meet a minimum building space requirement of 2,500 square feet. The minimum recommended plot size is 45,000 square feet. The shape of the lot may vary with local circumstances. The plan for a station should provide space for two pumpers. The apparatus area should be of modern garage-type construction. It will be provided with automatic sprinklers for a fire department station.

The space footage is provided for further cost information. The cost estimates are shown on Table 5.

**TABLE 5: PUBLIC SAFETY SUBSTATION AND FIRE STATION  
COST ESTIMATES**

ITEM	QUANTITY	UNIT COST	TOTAL
<b>SITE PREPARATION</b>			
Clearing, Grubbing	3 AC <sup>1</sup>	\$ 6,000.00/AC	\$ 18,000
Grading: Cut	9,700 CY <sup>2</sup>	\$ 4.50/CY	\$ 43,650
Fill	4,850 CY	\$ 8.00/CY	\$ 38,800
Environmental Protection	LS <sup>3</sup>		\$ 30,000
<b>INFRASTRUCTURE</b>			
Roads, Driveways, Parking	LS		\$ 100,000
Storm Drainage System	LS		\$ 62,427
Water Supply System	LS		\$ 50,000
Waste Water Disposal System	LS		\$ 150,000
Chain Link Fence, Retaining Walls	LS		\$ 41,250
<b>FACILITIES</b>			
Public Safety Substation	7,000/SF <sup>4</sup>	\$ 200.00/SF	\$ 1,400,000
Fire Station	2,500/SF	\$ 150.00/SF	\$ 375,000
Landscaping	LS		\$ 102,600
<b>TOTAL</b>			<b>\$ 2,411,727</b>

<sup>1</sup> AC - Acres

<sup>2</sup> CY - Cubic Yard

<sup>3</sup> LS - Lump Sum

<sup>4</sup> SF - Square Feet

## Water

### Water Use Estimates

An accurate estimate of water production and consumption on Rota may not be readily determined due to the lack of available information. It will be necessary over the next several years to quantify any information which is collected from production wells at resort properties, residential meter readings, and hydrogeological studies in an effort to accurately plan for the development and management of Rota's groundwater resources. The U.S. Geological Survey (USGS) has proposed a study which would aid in developing the necessary database and would enable planners to quantify the groundwater resources of the island, and determine the feasibility and consequences of using that groundwater to serve the projected population of the island. This study would also determine infiltration rates, and general physical and chemical characteristics of the groundwater. The study would also assist in assessing the water quality impact of agricultural practices on the Sabana.

Figures showing the approximate water demands under current conditions and under each of the proposed visions are shown in Table 6. The information on current consumption should be used for comparison purposes only, as it does not reflect actual consumption for the various categories of use. All of the figures were developed using typical standard values for Pacific islands' residential consumption, hotel development, golf courses, and other uses. Water demand in agricultural areas will depend largely upon the amount of rainfall for the specific area of Rota (i.e., the Sabana receives a higher rainfall amount than the eastern part of the island), as well as the specific agricultural use of the properties. Several factors must be considered including the type of crop, estimated crop yield, and percent of land used for grazing. As a result, a possible *range* of agricultural water demand values is shown in the table. Additional consumption figures for industrial and commercial areas are more difficult to estimate, again, without specific information as to the types and sizes of industries involved. These figures should be negligible compared with the agricultural, and the residential and tourist population water consumption.

An analysis of the potential groundwater production capability of Rota's aquifers gives a *conservative* estimate of available groundwater production at 8-9 million gallons (MG) per annual average day, excluding seasonal variations. This includes the existing water supply from Matanhanom and As Onaan, as well as future production via springs and/or wells. As noted in Table 6, the acreage of productive agricultural lands largely determines the overall water needs of the island. A savings in this area is achievable through the use of properly treated wastewater effluent as irrigation water for golf courses.

TABLE 6: ESTIMATED AVERAGE YEAR-ROUND WATER DEMAND  
(Gallons per Day--gpd)

	CURRENT		VISION ONE		VISION TWO		VISION THREE	
	Quantity	gpd	Quantity	gpd	Quantity	gpd	Quantity	gpd
Consumer								
Permanent Residents	2600	260,000	4610	461,000	6737	673,700	10,493	1,049,300
Hotel Rooms	117	40,950	647	226,450	1000	350,000	2027	709,450
<b>Total Potable Water Demand</b>	----	300,950	----	687,450	----	1,023,700	----	1,500,000
18-Hole Golf Courses	1	500,000	2	1 million	2	1 million	3	1.5 million
Agricultural Acres	Unknown	Unknown	3140	8 - 16 million	4938	12 - 25 million	2176	5 - 11 million
<b>Total Non-Potable Water Demand</b>	----	Unknown	----	9 - 17 million	----	13 - 26 million	----	6.5 - 12.5 million

### *Water System*

Public water systems should be designed so that they provide an adequate amount of water to each consumer at the required pressures on a daily basis. Sufficient quantity and pressure should also be available for firefighting, and the lines should be of such size and location to provide adequate placement of fire hydrants. Overpressure of lines and reservoir overflow problems are normally controlled by use of altitude and pressure regulating valves. Insufficient pressures may be improved through use of elevated water supplies, which require little maintenance, or by use of pump systems, which cost more to operate and maintain.

### *Existing Condition*

As discussed earlier, there is no accurate estimate of actual water demand and production for the current population. Approximate average supply rates from Matanhanom and As Onaan to Songsong and Sinapalo were obtained from Commonwealth Utilities Corporation personnel, based on meter readings taken at the caves.

The existing water supply and distribution system is barely providing for the minimum needs of the population of Rota. The primary areas of concern are the lack of adequate pressure in some areas of both Songsong and Sinapalo, lack of supply during certain time periods, and the inability to provide for adequate disinfection (chlorination) of the water supply.

### *Current Maintenance*

Water distribution lines are already designed for the Sinapalo II, and Sinapalo III areas. The project to install water distribution lines and meters in Sinapalo I is currently under construction. The condition, types, and sizes of the existing lines in the village of Songsong are largely unknown, making repairs and trouble-shooting difficult.

The existing water system is not operating as designed due to a lack of repair parts for various components, such as the storage tank for Sinapalo. Chlorination is difficult due to the lack of proper equipment.

### *Proposed Improvements and Costs*

A comprehensive preventive maintenance program, including employee training, should be developed and implemented. This would enable the employees to provide the best possible service to the island's water customers at the lowest cost, and would provide appropriate information to be used in planning and budgeting maintenance needs.

An island-wide seismic refraction study should be performed. At a cost of about \$150,000, such a study would allow the determination of the thickness of the limestone aquifer overlying the volcanic material.

The U.S. Geological Survey (USGS) has proposed assisting Rota in conducting a Water Resource Assessment. This project would delineate recharge areas, determine infiltration rates and aquifer boundaries, determine quality characteristics, and quantify the available groundwater resources of Rota. In addition, the USGS has proposed to provide training so that municipal employees may continue to collect information which would improve the available database regarding the fresh water supply. Many of the wells required to conduct this study may be converted to production wells. This study, if conducted as proposed, is estimated to cost nearly \$1.6 million over a four-year period.

The distribution lines in Songsong will require replacement. At the time of the upgrade, water meters should be installed to enable the Commonwealth Utilities Commission (CUC) and the users to monitor water use patterns. The cost would be in the neighborhood of \$1.5 million.

Additional storage capacity will be required. An additional .5 MG of storage is needed in the Sinapalo area now, and should be sufficiently elevated to maintain proper pressures for the customers. Provision of adequate water supplies and pressures for Vision 3 would require a total additional 2 MG of storage in the Sinapalo and resort areas. Costs may be estimated at approximately \$1.00 per gallon stored or \$2 million.

Supply will need to be increased to meet the demand. Assuming the USGS study was funded and that additional supply was made available from 10 wells drilled in that study, an additional



2,250 gallons per minute (gpm) pumping capacity could be realized for approximately \$1.5 million. This may be decreased by requiring resort developers to provide their own water supplies.

## *Power*

### *Existing Condition*

The 5.2 MW power plant located in the western part of the island in Songsong village is the heart of the Rota Power System. The plant consists of two identical 2.5 MW marine-type generators. The load profile allows for the operation of one unit to satisfy the normal load hour with the second unit required only during peak conditions. The loss of either unit results in the need for load shedding during peak hours. There is no transmission system installed. The distribution system of the island is served exclusively from two feeder originating from the power plant control room to the various customers.

### *Proposed Improvements*

#### Generation

The development of large hotel resort-type facilities and their associated support industries will require large amounts of power. While the tourism industry will directly effect the power system, the residential, government, and social markets will also see increases in power consumption.

Because of these factors, generation capacity must be expanded to satisfy the needs of the people of Rota. The CUC will be faced with the task of deciding how to best satisfy this need. Some factors to consider in expanding generation expansion include environmental, social, and technological criteria. The permit process for new power plants is extensive and requires federal as well as local environmental approval. The CUC must also be sensitive to the public in regard to location of new facilities. There shouldn't be any problems with expanding the existing power plant to accommodate additional facilities. The CUC must determine the best technology available to satisfy their needs and at the same time comply with their permits. The size of the power plant is dependant upon the load forecast for the island. The residential loads are somewhat predictable, however, large developments require significant coordination with the utility due to their typically large power requirements. Rota is especially susceptible to this problem due to its limited power-producing capability at this time. Therefore, the various developments already permitted and under consideration should be required to submit their anticipated load demands for the first years of operation to allow for the CUC to adequately prepare to serve them as customers.

#### Transmission System

The load profiles and generator requirements are currently low enough for the distribution

system to adequately serve the island. It is envisioned that none will be necessary until sometime after 2015.

### Distribution System

The development of large hotel resort type facilities in the northeastern, central, and possibly southern parts of the island dictate the need for vast improvement to the current distribution system philosophy.

In order to establish itself as a reliable location for the tourism and manufacturing industries, the power system must be protected from unnecessary tripping of the power plant due to minor faults on the distribution system. Therefore, the primary protection for the distribution lines must be separated from the power plant. A distribution substation should be constructed adjacent to the existing power plant. The substation should be constructed to accommodate new generating facilities possibly within the same compound. The distribution system would then be broken into four to six feeder circuits. This configuration would allow for greater flexibility in addressing load-growth concern. More importantly, the power plant as a single part of failure within the distribution system will be eliminated. This is possibly the most important step in providing reliable power service to the island.

Additional protective measures include the use of load-break type fuse cutouts for transformer and lateral-feeder protection, a comprehensive pole hardening program, and line reconductering in these areas of high development.

### *Costs*

A 10 MW power plant will cost approximately \$5 million. A distribution system upgrade would consist of 4 circuits totalling about 35 miles (based on information provided for new-road construction in the section "Roadway and Bicycle Path Transportation"). The estimated cost of these circuits plus installation is \$4,312,000. The approximate cost for a substation building and equipment is \$2 million.

### *Sewer*

Sufficient wastewater facilities should be made available to cost-effectively collect, treat, and dispose of wastewater on the island of Rota. Projects should be selected which best meet the local public concerns, and which meet the regulatory requirements of protecting the health, safety, and welfare of the population, including the protection of Rota's groundwater source.

### *Existing Condition*

Presently, Rota does not have an operating sewer system. The Variable Grade Sewer system in Songsong was never completed after a storm destroyed the outfall shortly after it was

constructed. The repair of this outfall is currently under design. Septic tanks are pumped by CUC personnel on an as-needed basis at a minimum charge of \$60.00 per service.

### *Proposed Improvements and Costs*

The 100% designed sewer collection systems for Sinapalo I, II, and III should be constructed. The cost estimate for these projects is about \$10 million.

Vision 3 will require treatment of approximately 1.5 MG of domestic wastewater. A single treatment facility should be constructed in the vicinity of Sinapalo to serve the entire island. This would require the installation of a collection and transmission system for conveying the wastewater from Songsong toward Sinapalo, and would allow the resort developments to reuse the effluent as golf course irrigation.

### *Solid Waste*

According to the *Integrated Waste Management Cost/Benefit Analysis and Planning Considerations*, prepared by EMCON Associates, the waste generation rate on Saipan is 5.9 pounds per person per day. They use this figure to estimate the generation rate on Rota, because there are no actual generation figures available for the island. Obviously, the residents on Rota do not generate waste at the same rate as those on Saipan, due to Saipan's higher rate of commerce per person.

The U.S. mainland uses a standard generation rate of 4.0 pounds per person per day. The consultants preparing the above report believe, based on their experience, that the actual rate is about 6 to 9 pounds per person per day, again because the U.S. mainland experiences a higher rate of commercial/industrial activity per person.

### *Existing Condition*

Assuming a population of 2,600, Rota currently generates 15,340 pounds of solid waste per day, or 7.67 tons per day (tpd). (This conservatively assumes the same generation rate as that of Saipan). In terms of level of service, the residents are provided with a site to place these wastes. The dump site, however, is not manned or maintained in a safe and healthy manner. In addition, no fencing exists and a roadway passes through the site.

Rota needs to do something about their solid waste as soon as possible! For example, some controls should be implemented. A "litter control fence" would be a big help in controlling the refuse at the dump site. On a less realistic note, some sort of daily cover is needed for the dump site, and it would be wonderful if some segregation system for aluminum, glass, and/or plastic was made available to the residents.

Unfortunately, a source would have to be located for the daily cover, or an alternative type of

cover identified. Segregation of the waste stream, while environmentally friendly, is not realistic at this time because the waste stream does not make recycling a cost-effective alternative.

### *Proposed Improvements and Costs*

In this vision, Rota might approach the same ratio of commercial/industrial activity per person as Saipan. Using the same generation rate of 5.9 pounds per person per day, 61,909 pounds of solid waste is being generated daily (31 tpd).

The study identified above indicates that a 5-acre landfill cell has a capacity of 185,000 tons. Using that estimate, and a 20-year lifespan, this vision would require about 6.1 acres of space for the landfill.

Landfills are normally constructed one cell at a time, and increased in area as they age. In the case of Rota, we might consider constructing 1-acre cells, for example. The ECON study quotes Dames and Moore as estimating an average cost of \$4.5 million for a 5-acre cell. The first cell of any landfill more expensive than the others due to the fact that the initial cell requires all supporting infrastructure. U.S. Mainland estimates for landfill construction are about \$750,000/acre. We could conservatively use \$1 M per acre for the purposes of this study.

### *Telecommunications*

#### *Existing Condition*

The capacity of the Central Office lines is unclear at this time but apparently they are capable of serving the entire island's population without major problems. The Central Office in Sinapalo is connected to Saipan via a 260-foot, 2 ghz Microwave system which is located on Mt. Sabana. This feeds a 20-foot tower disc in the Songsong office. The trunking system between the Host and the Remote is through pulse code modulation (PCM) signaling. Several PCM repeaters exist along the road but it is unclear how many PCM systems are involved. A conduit system was installed between the two offices, apparently in anticipation of installing Fiber Optics Cables. Portions of the trunk cables are also used as feeders and distributions to feed subscribers along the way. The telephone feeder system is mostly underground. The cables may vary in size but are probably mostly small.

#### *Proposed Improvements and Costs*

The high growth projected in this plan requires a dynamic improvement in telecommunications services. The communication facilities required to support this growth include:

- a major telephone outside plant expansion,
- a cellular or personal communication system (PCS),
- additional Central Office line equipment.

Ideally, these facilities should be built at the same time that the housing units are built.

Because the major areas of expansion are within the Songsong and Sinapalo areas, the main feeder should emanate toward these areas. All cables should either be install buried (cables are simply buried) or placed underground (cables are placed in underground conduits), and should be jelly-filled to minimize water entry to the cables.

About 50 pay stations should be installed along the road from Sinapalo to Songsong; 10 alone should be along the beach area. The construction of infrastructure will probably bring along the need for cellular telephone service.

To hasten the growth of the business community, a new telephone service such as Private Automatic Branch Exchange (PABX) should be offered by the local telephone company. If PABX is not available, interconnect companies (private companies that install phones) should be able to establish themselves on Rota to provide for the installation of new and small telephone systems with features such as conference calling, call forwarding, speed calling, and caller identification.

The population expansion will undoubtedly increase the number of toll-calling customers creating competition between interexchange carriers. This competition should provide the people of Rota with a reduction of rates enabling residents to communicate more often with their children and relatives attending school or working off-island.

The construction of a cultural center will require a sophisticated telephone system to support conventions, conferences, and seminars which might use data, imaging, and video systems. Healthcare facilities need complex communication systems whereby billings and other medical information can be kept up-to-date by means of a database passing through telephone and wireless lines. The increase of the resident population to 10,493 people will make a major telecommunication rearrangement necessary. It may be too costly to operate two existing central offices. A new central office building may be required and should be built near the major growth area, probably the area west of Sinapalo.

The addition of 1,803 dwelling units will require more than 2000 central-office (co) lines and 3,600 cable pairs. The addition of 2,027 hotel rooms will require more than 400 co. lines and 3,000 cable pairs. The approximate cost for these additions is \$1.5 million. These new telecommunication demands will help to provide jobs for the residents of Rota and keep the tourism industry flourishing.

## *Air Transportation*

### *Existing Condition*

Rota International Airport is located at an elevation of 600 feet above sea level, on a plateau, in the central northeast half of the island of Rota, about 11 miles north east of Songsong. The facility is situated on 800 acres of land surrounded by agricultural activities and pasture land. The airport is served by a single asphalt runway 150 feet wide by 6,000 feet long and designated Runway 9-27. The terminal area lies roughly 2,400 feet from the east (Runway 27) end and is positioned on the south side of the airfield. The area on the south side of the airfield is currently undeveloped. A single 75-foot wide stub taxiway connects the runway with the air passenger terminal aircraft parking apron. The apron dimensions are roughly 175 feet by 375 feet (approximately 1.5 acres).

The current terminal facility with its recent renovation is adequate for current and near future needs.

### *Proposed Improvements*

Rota's growth, whether it develops a strong local economy based on small business or becomes an investment destination attracting foreign investors to capitalize on a burgeoning tourism market, is dependent on a viable airport that anticipates the surge in arrivals/departures to the island commensurate with this growth. The *Rota International Airport Master Plan*, completed in 1992 by the planning/architectural/engineering firm, Leo A. Daly, does an excellent job in addressing those anticipated airport enhancements to meet Rota's requirements for its Vision Three.

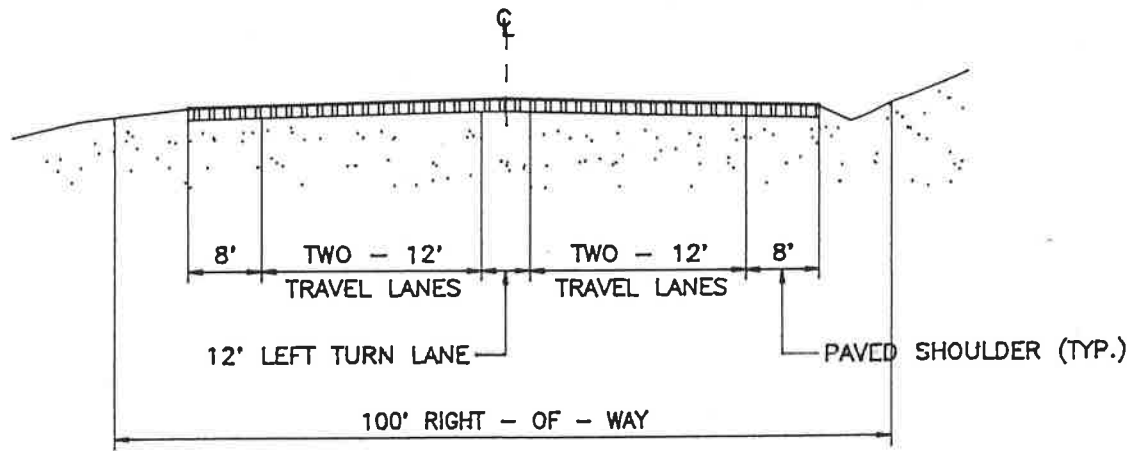
Airport development will be phased in. Phase I enhancements are designed to meet current airport traffic needs. To accomplish this, a new runway will be constructed to the north and parallel to the existing runway. This will free up the current runway to be used as a parallel taxiway. Part of Phase I apron expansion is undergoing construction. Phase I taxiway and the rest of the apron expansion have been approved by FAA but not initiated.

Phase II will incorporate improvements to accommodate the larger carrier aircraft types. Paved blast pads at both ends of the runway and paved runway shoulders are scheduled for this phase.

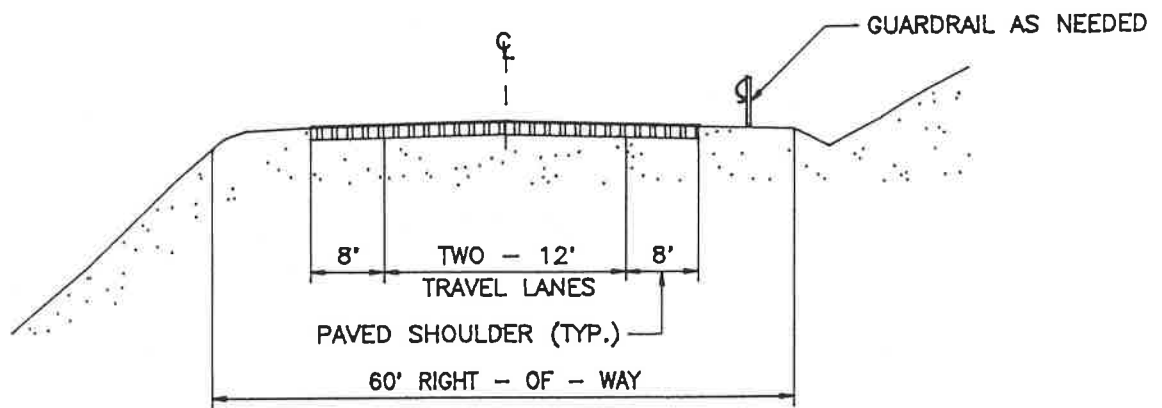
Phase III will require an extension of both the runway and parallel taxiway to an overall length of 8,600 feet. These improvements are again to accommodate even larger aircraft because of increased passenger demands.

Facilities at the airport should be provided which will accommodate expected high levels of passenger activities. The terminal will be a multi-level facility equipped with mechanical boarding linegear, and inspection and immigration facilities. All major areas, such as departures, arrivals, holding areas and concessions, will be expanded.

**ROADWAY & BICYCLE PATH  
TYPICAL CROSS - SECTIONS**

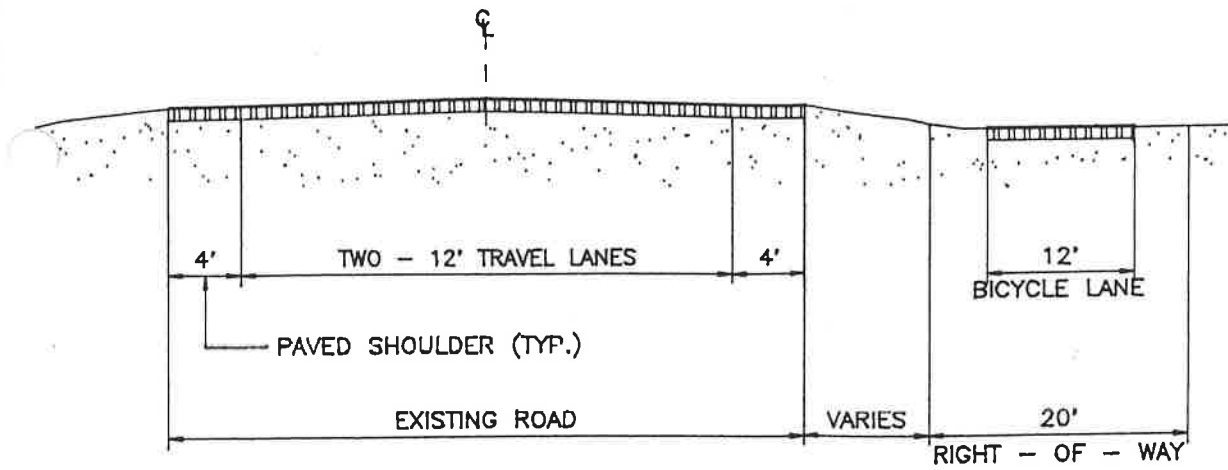


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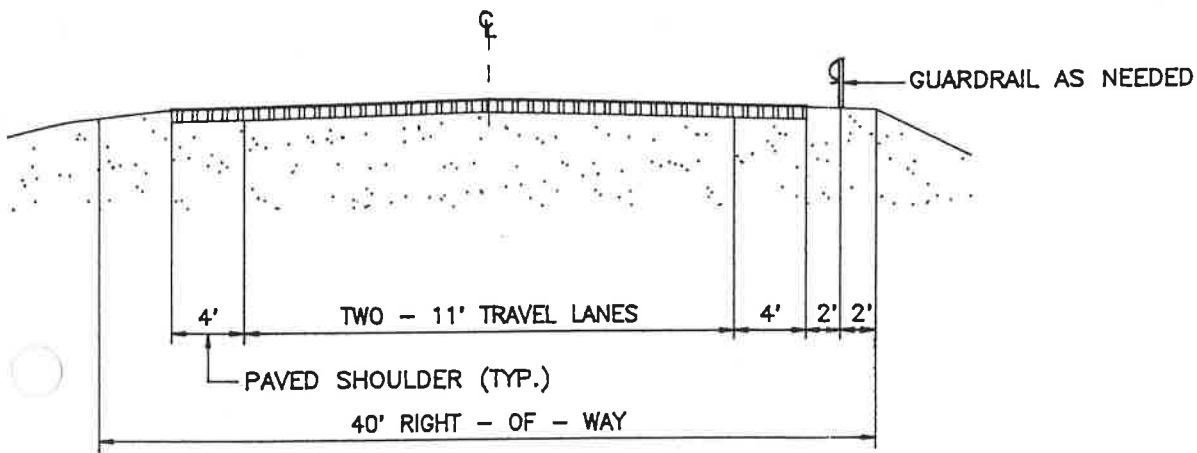


SINAPALO TO TATGUA VIA MACHON &  
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AS IGNA TO SABANA VIA AS ROSALIA

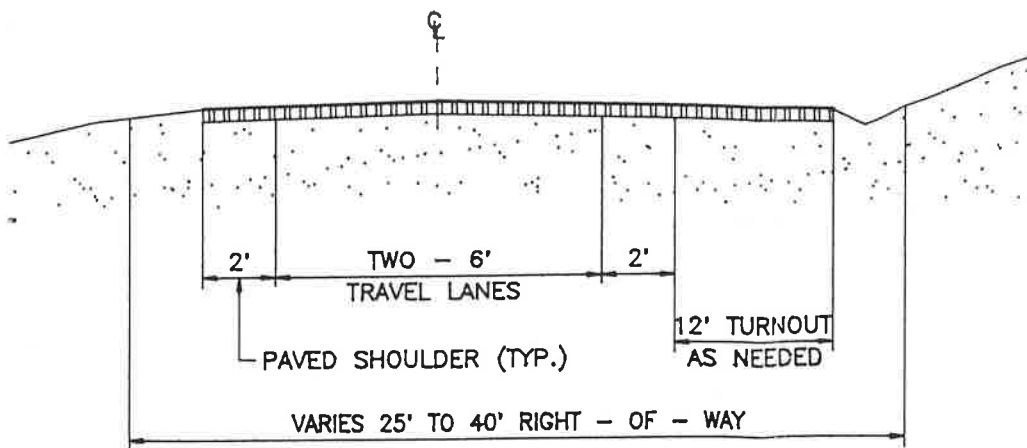




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SONGSONG TO GINALANGAN VIA PUNTAN PONA



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SOURCE: JUAN C. TENORIO & ASSOCIATES

Juan C. Tenorio & Associates, Inc. / W.B. Flores & Associates

## *Rota Ports*

### *Existing Condition*

At the request of the Commonwealth Ports Authority (CPA), the Honolulu Engineer District (HED) of the U.S. Army Corps of Engineers (USCOE), conducted a study to ". . . determine the feasibility of providing navigation improvements to insure the safe and efficient transportation of waterborne commerce to and from Rota Island, and to determine whether planning should proceed further based on a preliminary appraisal of the public interest and if the potential solutions are in concert with current policies and budgetary priorities." The CPA based its request for the study on the following:

- The turning basin is too small.
- The layout of the harbor and entrance channel allows penetration into the berthing area.
- The depths are inadequate.
- The docking facility is too small.
- The aids to navigation are inadequate.
- Shoaling results in the need for maintenance dredging.

When the Corps initiated its study, it considered three alternatives. But it is noteworthy that it considered three alternative designs of the West Harbor area *only* and did not consider other sites, such as the East Harbor. There was no mention about the viability of the East Harbor being developed as a commercial port for Rota. Without consulting the Corps on its rationale for ignoring the East Harbor site, it can only be concluded that HED must have ruled out the East Harbor altogether as the main port for various legitimate reasons.

The HED study was completed in October 1994. The complete title of the study is *Rota Harbor Navigation Improvements, Rota, CNMI: Section 107 Reconnaissance Report*. The main portion of the report follows the format of an Environmental Assessment (EA). In addition, three appendices are included:

- Appendix A - Design Analysis
- Appendix B - Economic Analysis
- Appendix C - Pertinent Correspondence

It is noteworthy that the contents of the appendices are equally as important as the contents of the study itself.

### *Proposed Improvements and Costs*

The HED engineers considered three alternatives and prepared a cost estimate, a design analysis, and an economic analysis for each of the alternatives. Ultimately, the HED

engineers select and recommend Plan C. This plan provides a harbor and port improvement that would support the growth and planned development in Vision Three. It is a well-designed comprehensive plan that can be readily adapted to fit Rota's needs. (See Plate 5.) The major features of Plan C are:

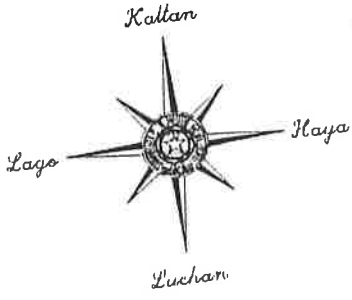
- Entrance Channel: 300 feet wide, 32 feet Mean Sea Level (MSL) deep, 765 feet long.
- Turning basin: 720-foot radius, 30 feet deep.
- Existing entrance channel to be closed by a breakwater.
- A revetted mole to be constructed to the east of the new channel.
- A new 280-foot-long dock extension.

Total project cost: Plan C = \$29,157,500 vs. Plan A = \$65,506,600, and Plan B = \$41,629,600.

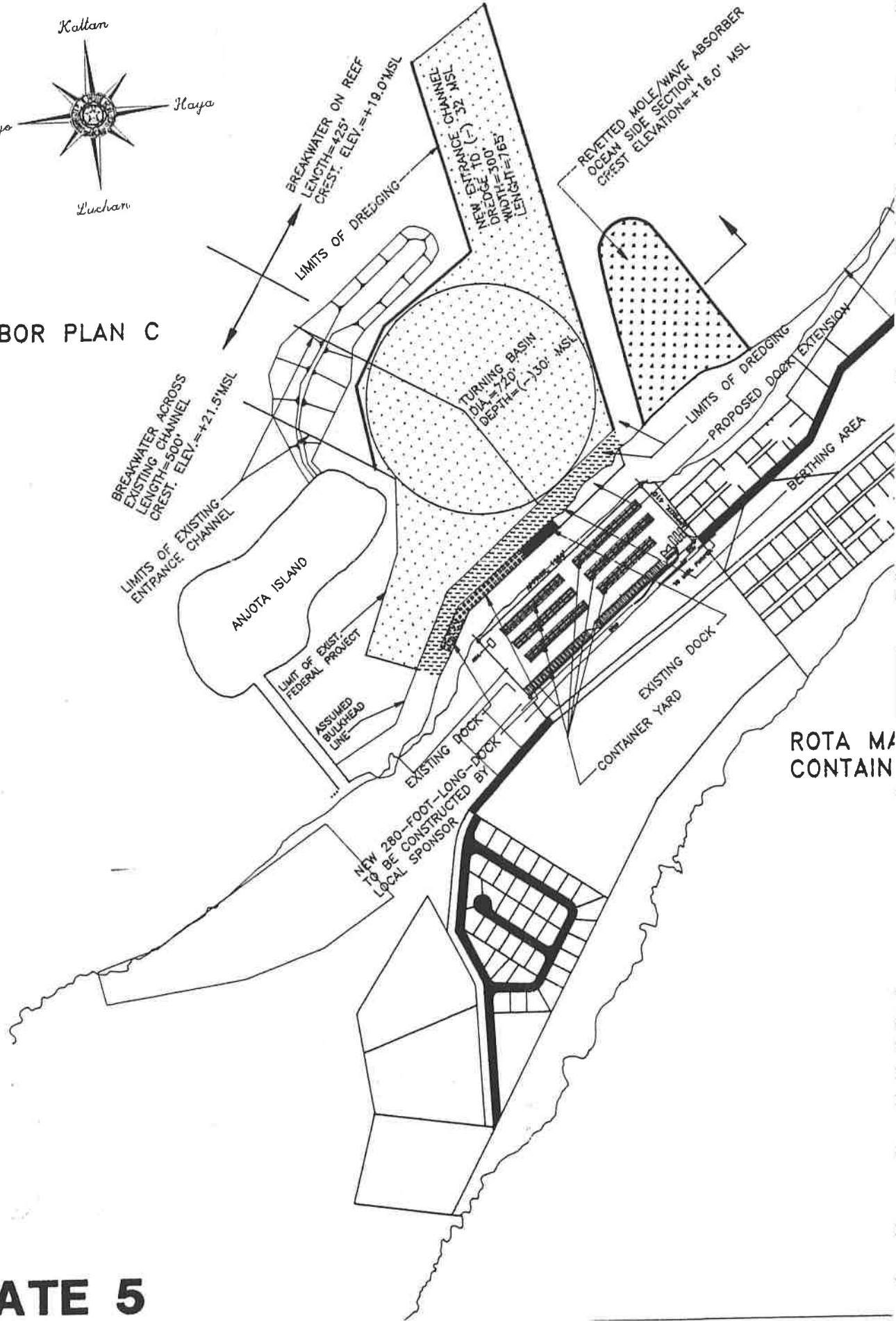
Benefit-cost ratio (BCR): Plan C = 3.3 vs. Plan A = 1.5, and Plan B = 2.5.

As can be seen from the above summary, the governing criteria for selecting Plan C are the total project cost and the BCR.

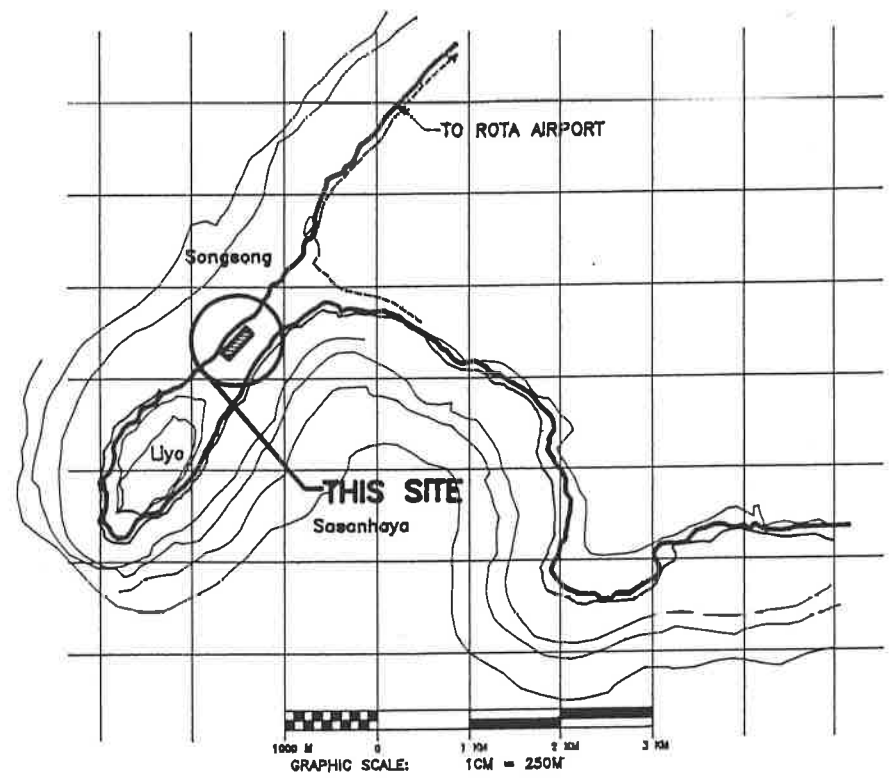
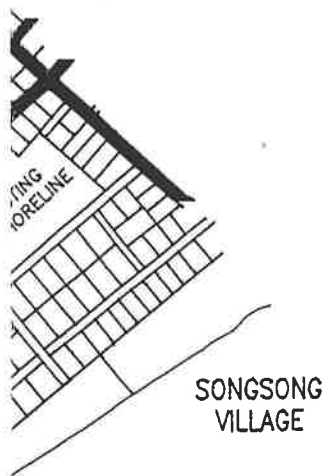
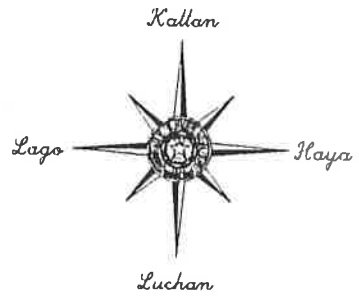
In addition to the harbor itself, extensive improvements to the dock are required. Plate 5 shows the Rota dock being improved for containerized shipping in conjunction with the harbor improvements.



HARBOR PLAN C

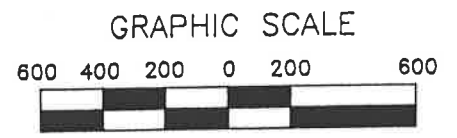


ROTA MA CONTAIN



**LOCATION MAP OF ROTA(LUTA)**  
SCALE: AS SHOWN ON THE GRAPHIC SCALE

PLAN  
RD FACILITY



SOURCE: U.S. ARMY ENGINEERS HED STUDY  
Juan C. Tenorio & Associates, Inc. / W.B. Flores & Associates

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