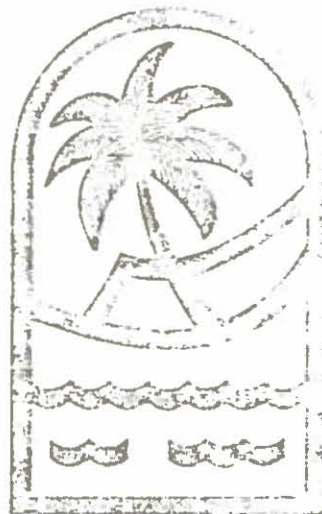




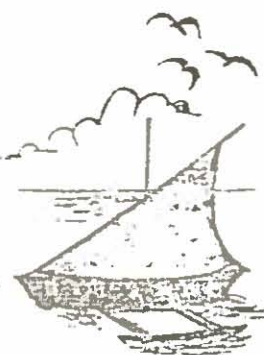
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the Sea



Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agaña, Guam, 96910

Volume I, No. 1
March, 1976

Y Tano Yan Y Tasi is a newsletter produced by the Government of Guam's Bureau of Planning to bring you news of the progress we are making toward developing a comprehensive plan for Guam.

The program directly responsible for producing the newsletter is the Coastal Zone Management Program, a new and federally-funded program which is responsible for developing Guam's land use plan.

The newsletter will contain information on new products being developed by the Bureau of Planning which may be useful to you. It will also keep you up-to-date on the progress being made on the plan.

The Bureau of Planning, one of the youngest of Government of Guam's departments, has accomplished much in its first year of life.

Planning elements, mandated by Public Law 12-200, including those dealing with land use, social-economic plans, housing, and transportation are underway. Goals have been postulated for community input, and our mapping programs, address system, and aerial mapping are on schedule. Specific programs relative to Coastal Zone Management, HUD, EDA and federal disaster planning have been staffed and are proceeding to accomplish the goals for which they were established.

The Bureau has a good staff which is doing an excellent job.

Paul B. Souder
PAUL B. SOUDER
Director

BIBLIOGRAPHY BEING PREPARED

A listing of all reports, papers, and studies written about Guam has been compiled by Mike Gawel of the Bureau of Planning. The bibliography includes all documents relating to land and water use in Guam which will aid in later planning efforts. However, it also contains studies and papers on many other subjects, such as education, history, and socio-economics.

The listing will include material held by Government of Guam agencies and departments which has never been printed or published. Also included will be information on where the document can be located.

Each month in this newsletter, we shall print a listing of several papers or documents in a particular category so that you may see exactly what is available. In the meantime, if you would like to see the bibliography, contact Mike Gawel at the Bureau of Planning.

MAPS. MAPS, MAPS - -

The Bureau of Planning now has a variety of new maps available for use.

a. The Island-wide Mapping Program

In cooperation with the Department of Public Works and the Guam Environmental Protection Agency, the Office of Coastal Zone Management is producing a set of large scale ortho-topo maps (maps with contour lines drawn over a photographic image). These maps, which will replace outdated ones which were produced in 1968, should be good for the next 10 to 20 years.

Phase I of this project, consisting of aerial photos and ground survey work, was completed in August. We now have on hand 110 aerial photos suitable for stereoscopic viewing.

Phase II, which will be the production of the ortho-topo maps, will be completed by June. The first nineteen of the complete set of 70 have already been delivered, and samples are on the wall at the Bureau of Planning Office, Room 402, Pacific Daily News Building.

AG. APAS MAPPED

Bureau of Planning officials met on February 27 with representatives from the Department of Agriculture, the University of Guam, and the US Geological Survey to map out areas of Guam which are presently being used for agriculture or which have the potential to be developed for agriculture. The designation of these lands is being done to prepare a complete land use map for Guam, showing areas for conservation, commercial, rural, and agricultural development.

The southern end of the island was the area on which the planners concentrated most heavily, and during the morning's workshop all agricultural zones were designated.

REEF STUDY

The Office of Coastal Zone Management is soliciting proposals to do a comprehensive study dealing with identification, classification, and mapping of physiographic features of Guam's coastline and reef flat features.

The objectives of the study will be the identification, classification, and mapping of the physical and major biological characteristics of the shoreline, reef flats, beaches, rocky shorelines, estuaries, and mangrove areas.

It will also include identification, classification and mapping of characteristics of the reef flat substrate and mapping of the distribution of live coral and seagrass zones.

The contractor will be selected by March 15.

"Close your eyes. Listen. If you don't hear harmful or irritating noises all around you, count yourself fortunate. If you do hear them, help to lessen them."
(US Environmental Protection Agency)

- b. We now have a 6-foot by 8-foot wall map available for planning purposes. It is the 1967 Geological Survey Maps with all the new roads added and an overlay of the uniform grid system (see below). We are making prints of this map to provide to other agencies for their use.
- c. A uniform grid system, required by executive order, has been developed by Billy Huckaby of Bureau of Planning. This grid system will allow the location of any point on a map by the use of coordinates, and that point will be the same on every map in use by the government.
- d. Using the large Geological Survey map as a base, we have developed 25 maps showing the geology of Guam, the location of recreational and historic areas, the land uses of Guam--such as agricultural, military and residential--the sound zones and the elevation level (topography), respectively. The sound zone map indicates the noise level in aircraft approach and take-off areas.
- e. We are in the process of developing an 80 page street atlas which will show every street with its name on Guam. Several government agencies, as well as the village commissioners, will be asked to review the maps for accuracy, after which they will be ready for use--probably in June.

Presently, we are adding the schools, churches, government offices, police and fire stations, and public health facilities.

All streets will be listed in the book with their grid coordinates so that they can be easily located. Places of interest will also be indexed.

- f. A new map of Southern Guam has been produced which shows the land use plan and population projections to the year 2000 for Merizo and Umatac.

From Umatac Village's entrance at Fort Santo Angel to the Merizo boundary, Umatac is projected to have a population of 1,630 and Merizo, between Bile Bay and Ajayan Bay, a population of 7,420.

The map shows where rural, urban, agricultural and conservation areas will be.



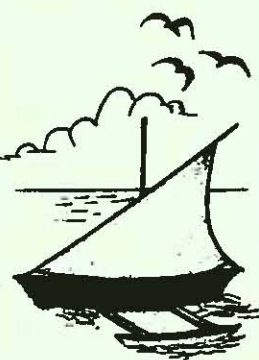
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the Sea



Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agana, Guam, 96910

Volume 1, No. 2
April, 1976

WHAT IS THE COASTAL ZONE PROGRAM?

Guam is an island of 212 square miles. On this small piece of land we find housing developments, commercial enterprises, farms, beaches, industries, quarries, airstrips, highways, and hotels. We also find open spaces, mountains, swamps, rivers, and forests.

Guam's land has not yet been totally consumed by the uses that people assign to it. Is it still possible to plan for orderly development of the island even as more and more people create demands on its use and consume its resources?

The Coastal Zone Mangement Program, which is producing this newsletter, is a new program which will produce within three years a management program for the use of land and water in Guam. This planning process is two-thirds federally funded under the 1972 Coastal Zone Management Act and may shortly receive 80% funding under a proposed amendment. The act gives assistance to all states and territories which want to develop efficient methods for planning the use of their coastal areas.

The three year planning will include defining the boundaries of the coastal zone, identifying areas of particular concern, devising techniques of management, setting up criteria by which land and water use decisions can be made, and recommending legislation.

Right now, Guam's Office of Coastal Zone Management is working on defining study area boundaries of the coastal zone-- those areas which will be considered for a federally funded management program. The federal law stipulates that any area having "direct and significant impact" on the surrounding waters should be included in the coastal zone. Because Guam is so small, there is no point on the island any more than five miles from the sea. Therefore, almost any activity on the land could affect the surrounding water. Leveling for a housing development can create erosion that allows streams of water to carry soil onto fragile reef flats. Water used to cool a power plant returns to the sea at a high temperature and heats the surrounding water. Storm water runoff is carried through pipes and is dumped into the ocean inside the reef line. This water carries in it pesticides

and herbicides from farming and gardening areas; it carries gasoline and oil that washes off the streets; it carries lead that comes from gasoline and from the tires of automobiles rubbing on the streets.

Because we have to examine all our activities on the land in terms of their possible effect on the water, the entire island of Guam will be designated as the "coastal zone." This means that the coastal zone program funds can be used to help develop the land use element for Guam's overall comprehensive plan.

In the next newsletter we will discuss one of the first tasks required by the Coastal Zone Program --that of deciding which areas of the island must be the subjects of "particular concern." These are areas that because of their potential development, their sensitivity, their importance to the environment, or their unique ecological significance must be the subject of careful planning.

GEPA ANNUAL MEETING

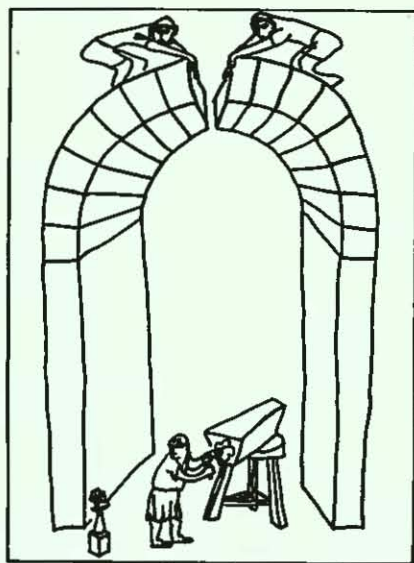
The Guam Environmental Protection Agency (GEPA) will hold its annual meeting and open house beginning at 5:30 p.m., April 23, at the EPA headquarters in Harmon Plaza.

The meeting will include a speaker, introduction of new board members, and remarks from the new board chairman. Maps and photographs of projects will be on display. Following the meeting will be a fiesta.

The public is welcome to attend this event. Come and find out what's happening in the agency that worries about the quality of your environment.

When on picnics or other outings, take your trash home with you or find a receptacle for it. Don't dig pits and bury trash. Thousands of campers doing that could soon turn a natural park into a dump, destroy soil and foul ground water.

*Etire estlow
defined*



Planning in Guam?

BIBLIOGRAPHY LISTING

As reported in last month's newsletter, a bibliography is being prepared consisting of titles of books, reports, studies, papers, etc., written strictly on Guam topics with notes on the subject matter, the location of the document, and the Bureau of Planning library number. All topics will be cross-referenced.

Below is a sample listing from the bibliography on the subjects of submarine physiography and marine geology. All information except the author, title, date, and location has been excluded for reasons of space.

Emery, Kenneth O., Marine Geology of Guam, 1962, BP, NFL, MARC, UOG

Keesling, Stuart Allan, The Submarine Geology of Pago Bay, Guam, Mariana Islands, 1957, MARC

Tayama, Risaburo, Coral Reefs In The South Seas, 1952, MARC

Wiseman, J. D. H. and N. I. Hendey, The Significance and Diatom Content of a Deep-Sea Floor Sample From the Neighborhood of the Greatest Oceanic Depth, 1953, UOG

Todd, Ruth, Smaller Foraminifera From Guam, 1966, BP, NFL, MARC UOG

Randall, R. J. and J. Holloman, Coastal Survey of Guam, 1974, BP, MARC, NFL, UOG, USGS

Ocean Science and Engineering, Inc., Environmental Analysis, Sub-Bottom Investigations and Wharf Orientation Recommendations For Sella Bay Area, Buam, MI, 1969, MARC

KEYS TO LOCATIONS:

BP = Bureau of Planning

NFL = Nieves Flores Memorial Library

MARC = Micronesian Area Research Center

UOG = University of Guam Library

USGS = United States Geological Survey

NOTES FROM PARKS AND RECREATION

1. The Department of Parks and Recreation reports that the draft of the environmental impact statement on the development of Gilan Beach is available for review until April 15th.

Gilan Beach is an Air Force beach just north of NCS Beach. Parks and Recreation has asked the Air Force for a 25-year permit to utilize the area as a public beach.

If you are interested in reviewing the statement, you may see a copy at the Department of Parks and Recreation in the ITC Building, Tamuning.

2. Parks and Recreation is beginning work on the preparation of a revised Outdoor Recreation Plan which must be completed by the end of 1976 in order for the Government of Guam to continue to qualify for federal funds from the Bureau of Outdoor Recreation. This plan will serve as the recreation element in the comprehensive development plan for the territory.

U.S. DEPT. OF COMMERCE, C. I. 3710

[illegible][illegible][illegible]

1. The first part of the document is a list of names and their corresponding dates. The names are: "John", "Mary", "James", "Elizabeth", "Thomas", "Sarah", "Michael", "David", "William", "Margaret", "Charles", "Anna", "George", "Catherine", "Edward", "Mary", "John", "Elizabeth", "Thomas", "Sarah", "Michael", "David", "William", "Margaret", "Charles", "Anna", "George", "Catherine", "Edward". The dates are: "1810", "1811", "1812", "1813", "1814", "1815", "1816", "1817", "1818", "1819", "1820", "1821", "1822", "1823", "1824", "1825", "1826", "1827", "1828", "1829", "1830", "1831", "1832", "1833", "1834", "1835", "1836", "1837", "1838", "1839", "1840", "1841", "1842", "1843", "1844", "1845", "1846", "1847", "1848", "1849", "1850", "1851", "1852", "1853", "1854", "1855", "1856", "1857", "1858", "1859", "1860", "1861", "1862", "1863", "1864", "1865", "1866", "1867", "1868", "1869", "1870", "1871", "1872", "1873", "1874", "1875", "1876", "1877", "1878", "1879", "1880", "1881", "1882", "1883", "1884", "1885", "1886", "1887", "1888", "1889", "1890", "1891", "1892", "1893", "1894", "1895", "1896", "1897", "1898", "1899", "1900", "1901", "1902", "1903", "1904", "1905", "1906", "1907", "1908", "1909", "1910", "1911", "1912", "1913", "1914", "1915", "1916", "1917", "1918", "1919", "1920", "1921", "1922", "1923", "1924", "1925", "1926", "1927", "1928", "1929", "1930", "1931", "1932", 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the delivery of the water, 3) to provide
that it is safe, there are plans for
localization, and 3) to provide an-
swers to all in enforcement of water
laws.

Director, U.S. Forest Service, Washington, D.C.

ANNOUNCEMENT: The Great Fishing and Boating Association is holding a new membership meeting to be held at 10:00 a.m. on 12/12/68 at the East Point clubhouse. Emphasis will be on enjoying water safety. Dues are \$12.00 per person. If interested, contact at South or Rivers (472-3168, 472-3169) or to the fire station.

A rural district will consist of a mix, low density residential areas, with an average of one house per acre, but with a maximum of four to an acre, plus small farms. Water, power, and roads will be provided to serve just that amount of development and no more.

Agricultural districts will be characterized by large scale crop production, orchards, grazing lands, and areas for animal husbandry and game and fish propagation. Areas which show good potential for such uses will also be classified as agricultural. The agricultural areas have already been mapped, with the help of officials from the Department of Agriculture.

Conservation districts will be designated where it is necessary to protect a water supply, to preserve scenic or historic areas, to provide a parkland, wilderness or beach, to conserve endemic plants, fish and wildlife, to prevent floods and erosion, and to provide forestry areas. An example of a conservation area would be the Mount Lamlam area. Special attention will be given to areas which are watersheds--that is, areas where streams and rivers of fresh water drain.

By July 1, 1976, the entire island will be classified and mapped in terms of the four districts and public hearings will be held to seek residents' approval.

NATIONAL CZM CONFERENCE

Coastal Zone Management Coordinator David Bonvouloir recently returned from a four day CZM national conference held in Hilton Head, South Carolina.

He reported that emphasis was placed on "networking"--or using existing authorities and formal inter-agency agreements to achieve land use control rather than promulgating massive amounts of new legislation.

Good news is that amendments to the CZM Act seem to have strong Congressional support. An 80% federal share in the cost of the program rather than the present 66 2/3% will be the main benefit to Guam.

QUESTION: How can we effectively plan for the many uses of our shore waters? Here a backhoe works at cleaning an outfall while a net fisherman passes by in the background.

PLANNING DISTRICTS FOR LAND USE

This article is to serve as an introduction to the process of land use planning now being done by the Bureau of Planning.

Public Law 12-200, which created the Bureau of Planning and which requires the development of a comprehensive master plan for Guam, sets forth five basic land uses for Guam: they are urban, rural, agricultural, conservation, and resort districts. The entire island will be classified in terms of these five categories, and each category will have its own set of distinct development standards.

Things found in an urban district would be commercial interests, housing, and industries, for example. In addition, resort areas will fall under the urban district category. Extensive infrastructure such as power, water, and roads, would be planned for the area. Urban districts will be located in all areas now intensively developed or which can support intensive development between now and the year 2000. The direction of development will be guided not only by the limiting factor of infrastructure but also by whether or not it encroaches on valuable resources.

Bureau of Planning
Office of Coastal Zone Management
Box 2950
Agana, Guam 96910

Le U. Bonvouloir



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the Sea



R. Dault
Very well done.
J. 7/1

Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agana, Guam, 96910

Volume I, No. 4
 June, 1976

THE NECESSITY OF LAND USE PLANNING

The Sunday, May 30 issue of the Pacific Daily News ran a front page story about the enforcement of building code and land use laws which will apply to post-typhoon construction and reconstruction. Along with that story were printed the responses of some home owners in southern Guam who were interviewed with regard to the Government's intention to enforce these laws. The replies received were extremely negative.

This issue of the newsletter, therefore, is an attempt to explain some of the reasons why there are such laws--the reasons behind planning for the use of our land and water resources.

The Law

First of all, it must be understood that there are certain laws which regulate land use in Guam which must be accepted as a "given" until they are amended or repealed. As they now stand, these laws govern the Territory of Guam, having already gone through the process of public review and public hearing at the times of their consideration by the Legislature.

The laws with which there is immediate concern are these:

Section 17300(d) of the Government Code of Guam, enacted in 1952 states that any building which does not conform to building regulations may not be repaired or reconstructed unless the entire building is made to conform to all the regulations for a new building. The regulations themselves are laws--part of the Government Code of Guam--and they set forth all the specifications for what must be included in any building to protect the health and safety of the inhabitants.

Section 17300(e) restricts building in the beach area; specifically, building is prohibited along any

beach in the Territory of Guam within 35 feet of the mean high water mark.

The Guam Territorial Seashore Protection Act (Public Law 12-108, 1974) provides for a "Territorial Seashore Protection Commission" to plan for the conservation of seashore resources and to prepare a plan for orderly management and development of the seashore reserve. The seashore reserve extends inland 100 meters from the high water mark. Within this area no building may occur without a permit from the Commission.

In addition to these laws which affect land use, there is the Guam Environmental Protection Agency established by Public Law 11-191, which concerns itself with keeping an attractive, healthful environment for Guam. In particular, it is concerned with the quality of our water.

Also on the books is the Historic Sites Preservation Act (PL 12-126) which is to promote the use and conservation of historic property for "education, inspiration, pleasure, and enrichment" of the residents. There is PL 12-255, which establishes agricultural preserves; PL 9-31 and PL 9-76, which are to protect the water resources of Guam; PL 10-74, governing air pollution; and PL 12-19, to preserve for use of the public the island's seashore. Another law governing land use is PL 12-226, creating the Chamorro Land Trust Commission and setting aside government land for lease to persons of Chamorro descent. There is a law authorizing urban renewal projects and creating the Guam Housing and Urban Renewal Authority to manage them. There are a number of zoning laws in existence which specifically designate what kinds of activities may be conducted in certain areas of the island.

Public Law 12-200, which set up the Bureau of Planning within the Government of Guam, recognizes the need for long-term planning for the use of our water and land resources. The legislative findings stated in the act defend the need for long-range planning, saying that undisciplined growth jeopardizes the historic, cultural, and natural aspects of the island, threatens to lower the quality of life, exploits natural

resources, and misdirects financial resources. Objectives of planning, as set forth by this law contain many references to the use of our land: To determine the extent of our natural resources; to establish four general areas of use (urban, rural, agricultural, and conservation); to reappraise the total land tenure of the territory, providing guidelines for relocation of inappropriate or inefficient uses; to plan for a high quality environment, free from pollution; to identify "substandard" neighborhoods; and to recommend new legislation regulating land use for the protection of future generations. Accordingly, PL 12-200 calls for a land use element in Guam's overall master plan.

A comment from Volume III of The Social Economic Impact of Modern Technology Upon a Developing Insular Region: Guam is relevant here: "A coordinated approach to land-use control is necessary, primarily through the establishment of a central planning authority and the adoption of an island-wide development plan. It is also essential that this system, once established, be adhered to and respected by the executive and legislative branches of government. To subvert plans and laws to accommodate the special interest of a few will only lead to more problems in the future."

Although we do not presently have a completed master plan, we do have some good laws meant to protect Guam's land and water resources on our books, and they, too, must be adhered to and respected.

The Resources

Agricultural Land: "A viable agricultural industry could contribute, conservatively, at least another \$7 million to the island's economy, raise the level of personal income, reduce food prices to some degree, and improve the balance of payments somewhat by reducing food imports." (from Socio-Economic Impacts, Volume II)

Minerals: At present, no minerals of significant economic value are found in Guam. Construction materials related to building activities appear to have the most economic value. Mining of these minerals has effects on the land, air, and water, however, which must be considered.

Fresh water: Our main civilian fresh water supply is a lens lying under northern Guam. Estimates have placed the available supply at about 50 million gallons a day. Overpumping of the water can draw salt water into the lens (evidence of this is already found in some communities) and covering of the ground above the lens will prevent rainwater from seeping in to recharge the lens. (Islander, "Pacific Daily News, October 26, 1975)

The ocean and the adjacent land: The sea and the seashore are extremely important resources of Guam. Legislative actions

have supported this fact, as a number of laws have already been passed to protect these areas. Uses of the ocean, present and potential, include industrial water supply, propagation of fish and other aquatic life, sewage disposal, commercial and sports fishing, aesthetic enjoyment, recreation, and scientific study. The land adjoining the ocean is likewise important, and concern has been expressed through legislation that this land be developed in an orderly fashion which guarantees the right of the public to have unrestricted access to the shore. (Territorial Seashore Protection Act, PL 12-108 and PL 12-19, which makes public all land 35 feet from the high water mark.)

Guam's marine life is particularly vulnerable to damage resulting from imprudent construction activities such as siltation caused by erosion of improperly graded, cleared sites. Damage also occurs from indiscriminate public and commercial coral and shell harvesting, illegal fish nets, use of explosives and poisons for killing reef fish, thermal outfalls, untreated sewage, and storm drains. (Governor's Environmental Policy, 1974) All of these activities, along with construction of industrial, commercial, or residential facilities near the coast, must be closely regulated.

One of the most promising uses of the sea, economically speaking (besides its benefits as a tourist attraction) is for fishing. By 1980, Guam will need approximately 5 million pounds of fish per year to satisfy residents and visitors. It is suggested that a means of broadening Guam's economic base might be a tuna fishing/processing industry. (Socio-Economic Impacts, Volume II) It is stated in the same article, however, that a present constraint is "conflicting economic use of the land and water resource"--again, a planning problem.

A Note on Tourism

The natural resources of Guam's unpolluted air, clear water, fascinating marine life, sandy beaches, scenic areas, and unusual plant life, are assets which must be protected not only for the enjoyment of future residents of Guam, but also for the thousands of visitors who are now travelling to the island each year. Our visitor industry rests on preserving these resources. And the visitor industry, which brings in an estimated \$100 million per year to Guam, has received enthusiastic backing from the present administration. During the 1975 Annual Economic Conference, Governor Bordallo stated, "The Government of Guam will do everything to encourage expansion of this vital industry."

In addition, it should be noted that in the same speech the Governor supported the development of farming, fresh fish raising, and marine fishing as economic potentials. All of these industries would require proper land and water use controls for their success.

The Need for Planning

The control of the use of land has deep historical roots. As early as 451 BC, the Roman Codes stated that whoever sets a hedge around his land shall not exceed the boundaries; in the case of a wall he shall leave one foot, in the case of a house, two feet. During 13th century in England, the statute of Winchester commanded land-owning lords to cut any tree or bush which came within 200 feet of a highway, so that evil doers could not lurk there. (Managing The Environment, US Environmental Protection Agency)

Today there is an even greater need to regulate the use of land and water, as many competing interests vie for the utilization of these valuable resources. In addition, we must contend with the question of public interest versus private interest: A balance must be achieved between the needs and wants of the majority and the rights of individual landowners. Private property rights are a basic part of the American system, yet the public welfare often seems to require increasing controls over individual property rights. An example of this conflict is occurring now as attempts are made by the Government to regulate post-typhoon building. (It should be remembered, however, that this "conflict" is primarily a verbal reaction to Government action--action which is supported by law. Until it is challenged legally, the right of the Government to act in this manner is upheld.)

There is no doubt that coordinated planning for the use of Guam's limited resources is necessary. It has received repeated backing from the legislative and executive branches of the Government and from private interests, such as the Chamber of Commerce. Comprehensive planning is essential if the future direction of Guam's growth is to be controlled and guided rather than allowed to develop haphazardly.

In the Ford survey (5000 samples) the residents of Guam supported land use controls along the coastline: 59% said residential development should be strictly limited; and 74% said that public access should be guaranteed. In addition, on the Goals Survey Form, distributed at Governor Bordallo's village meetings by the Bureau of Planning, the goal least often disagreed with was in the area of natural resources. Only two people of 159 disagreed with the goal, which stated "Develop Guam's natural resources according to their best uses and protect those areas, both natural and man-made, which are critical to our health, safety and livelihood."

Lack of planning and effective controls results in such things as

---a string of ramshackle buildings lining what could be an ocean view;

---raw sewage being dumped into the water, affecting the marine life;

---land being scraped for a development with no trees or parks and the runoff from the area flowing into the sea;

---buildings and paving being permitted over land where rainwater should filter down to replenish our water supply.

Urban Land Use Planning, a text by F. Stuart Chapin, states: "There are certain controls in land use planning which are exercised in the public interest; for example, control of population densities, control of the development of hazardous or valuable areas, control of exposure to accidents, noise, and pollution. Land use controls usually take the form of regulatory measures involved in zoning, subdivision regulation and the reservation of land for public uses."

Particularly relevant to Guam at this point in time is this statement: "Sometimes there are physiographic conditions and circumstances which warrant the use of control measures to protect man from himself, as it were--for example, an area subject to flooding.

"The most effective means for controlling the use of these areas is by public acquisition, developing them as an integral part of the permanent public open space system of the community.

"So, land use planning provides a rational approach to the channeling of development into the good areas and discouraging development in areas unsafe or unhealthy for development.

"The most tangible factor dictating the way in which controls are applied is the local physical characteristics--including both the natural and the settlement characteristics. Controls may be invoked to minimize the effects of the ravages of nature when they impinge on the public health and safety. Controls may also be employed to insure that natural features of the landscape may be wisely and pleasingly utilized, providing the amenities of a pleasant living environment.

"Sometimes this involves a whole complex of economic and social values stemming from the land, not to mention a multiplicity of property ownership rights. Yet at times, the public interest may be so compelling and critical as to involve stringent control measures. There are a number of instances where whole towns were moved to new sites to make way for flood control works."

We Are Not Alone--Case Studies

Guam is not the only place where the issue of public regulatory power over private interests is confronted as controls are imposed. Yet, the trend is obviously in the direction of the general public welfare:

- 1) Colorado and Oregon have adopted stringent requirements for the development of subdivisions;
- 2) the pre-emption of the local government to act in coastline areas has evolved in Georgia, Michigan, and Wisconsin;
- 3) Hawaii has adopted a zoning system categorizing all land into urban, rural, agricultural and conservation areas;
- 4) New York and New Mexico have tied capital expenditures such as airports and water facilities to land use planning;
- 5) New Mexico and Vermont have established regional planning commissions with veto power over land use decisions;
- 6) California, Maine, and Delaware are controlling land use in their coastal zones. (from Managing the Environment, US Environmental Protection Agency)

Since the early 1900's, the pressures of modern life have forced the courts to sanction a wide range of innovative regulatory devices which have steadily widened the power of government to limit the rights of landowners. (Bowden, "Legal Battles on the California Coast," Coastal Zone Management Journal, Volume 2, No. 3)

"Property rights have been redefined in response to a swelling demand that ownership be responsible and responsive to the needs of the social whole. Property rights cannot be used...to cloak conduct which adversely affects the welfare of others." (Powell, The Relationship Between Property Rights and Civil Rights, 15 Hastings Law Review, 1963)

In California, where intense arguments are now being generated over this issue, the courts have generally upheld regulations which have been set up to meet a legitimate legislative goal, such as the protection of natural resources. In one case in the San Francisco Bay area, a private company was denied a permit to fill its land because of policies set up by the Bay Conservation and Development Commission. The courts upheld the denial. In a

Wisconsin case, a shoreline regulation which sharply limited the ability of some landowners to develop their land was upheld in court. These cases demonstrate that conservation and preservation of environmental resources are valid goals to be protected by regulations and controls.

There have even been cases in which land values were significantly reduced in order to protect the public interest as a whole. In one case a polluting brick factory in Los Angeles was prohibited, reducing the land value from \$800,000 to \$60,000. Also, in Los Angeles, Consolidated Rock Products was prohibited from quarrying an area even though it was the only profitable use to which the land could be put. The courts chose to protect the nearby community from the irritant of quarry dust. The land value was reduced 100%. (Bowden, "Legal Battles on the California Coast," Coastal Zone Management Journal, Volume 2, No. 3)

It appears, generally, that courts are willing to sanction rigorous control measures needed to meet the goals of environmental protection and planning.

In Conclusion

In making a case for the protection and management of Guam's natural resources, we have noted the value of the resources we have and, in some cases, their limited supply; we have cited the legal basis that now exists to protect these resources. The need for planning is evident and has been supported by all sectors of the community; and the trend, as evidenced by actions of governments in the states and by court actions, is toward increased protection of the general public's interest.

This is not to suggest that the individual property owner's rights should be totally pre-empted; however, it must be recognized that we have a responsibility to every island resident, including future residents, to ensure that the irreplaceable natural resources are protected for the use and enjoyment of everyone and that a pattern of development is planned for so that a high quality of life is ensured for all.



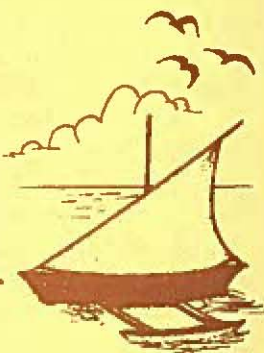
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Land and



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the Sea



Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agana, Guam, 96910

Volume I, No. 4
June, 1976

THE NECESSITY OF LAND USE PLANNING

The Sunday, May 30 issue of the Pacific Daily News ran a front page story about the enforcement of building code and land use laws which will apply to post-typhoon construction and reconstruction. Along with that story were printed the responses of some home owners in southern Guam who were interviewed with regard to the Government's intention to enforce these laws. The replies received were extremely negative.

This issue of the newsletter, therefore, is an attempt to explain some of the reasons why there are such laws--the reasons behind planning for the use of our land and water resources.

The Law

First of all, it must be understood that there are certain laws which regulate land use in Guam which must be accepted as a "given" until they are amended or repealed. As they now stand, these laws govern the Territory of Guam, having already gone through the process of public review and public hearing at the times of their consideration by the Legislature.

The laws with which there is immediate concern are these:

Section 17300(d) of the Government Code of Guam, enacted in 1952 states that any building which does not conform to building regulations may not be repaired or reconstructed unless the entire building is made to conform to all the regulations for a new building. The regulations themselves are laws--part of the Government Code of Guam--and they set forth all the specifications for what must be included in any building to protect the health and safety of the inhabitants.

Section 17300(e) restricts building in the beach area; specifically, building is prohibited along any

beach in the Territory of Guam within 35 feet of the mean high water mark.

The Guam Territorial Seashore Protection Act (Public Law 12-108, 1974) provides for a "Territorial Seashore Protection Commission" to plan for the conservation of seashore resources and to prepare a plan for orderly management and development of the seashore reserve. The seashore reserve extends inland 100 meters from the high water mark. Within this area no building may occur without a permit from the Commission.

In addition to these laws which affect land use, there is the Guam Environmental Protection Agency established by Public Law 11-191, which concerns itself with keeping an attractive, healthful environment for Guam. In particular, it is concerned with the quality of our water.

Also on the books is the Historic Sites Preservation Act (PL 12-126) which is to promote the use and conservation of historic property for "education, inspiration, pleasure, and enrichment" of the residents. There is PL 12-255, which establishes agricultural preserves; PL 9-31 and PL 9-76, which are to protect the water resources of Guam; PL 10-74, governing air pollution; and PL 12-19, to preserve for use of the public the island's seashore. Another law governing land use is PL 12-226, creating the Chamorro Land Trust Commission and setting aside government land for lease to persons of Chamorro descent. There is a law authorizing urban renewal projects and creating the Guam Housing and Urban Renewal Authority to manage them. There are a number of zoning laws in existence which specifically designate what kinds of activities may be conducted in certain areas of the island.

Public Law 12-200, which set up the Bureau of Planning within the Government of Guam, recognizes the need for long-term planning for the use of our water and land resources. The legislative findings stated in the act defend the need for long-range planning, saying that undisciplined growth jeopardizes the historic, cultural, and natural aspects of the island, threatens to lower the quality of life, exploits natural

resources, and misdirects financial resources. Objectives of planning, as set forth by this law contain many references to the use of our land: To determine the extent of our natural resources; to establish four general areas of use (urban, rural, agricultural, and conservation); to reappraise the total land tenure of the territory, providing guidelines for relocation of inappropriate or inefficient uses; to plan for a high quality environment, free from pollution; to identify "substandard" neighborhoods; and to recommend new legislation regulating land use for the protection of future generations. Accordingly, PL 12-200 calls for a land use element in Guam's overall master plan.

A comment from Volume III of The Social Economic Impact of Modern Technology Upon a Developing Insular Region: Guam is relevant here: "A coordinated approach to land-use control is necessary, primarily through the establishment of a central planning authority and the adoption of an island-wide development plan. It is also essential that this system, once established, be adhered to and respected by the executive and legislative branches of government. To subvert plans and laws to accommodate the special interest of a few will only lead to more problems in the future."

Although we do not presently have a completed master plan, we do have some good laws meant to protect Guam's land and water resources on our books, and they, too, must be adhered to and respected.

The Resources

Agricultural Land: "A viable agricultural industry could contribute, conservatively, at least another \$7 million to the island's economy, raise the level of personal income, reduce food prices to some degree, and improve the balance of payments somewhat by reducing food imports." (from Socio-Economic Impacts, Volume II)

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There is no doubt that coordinated planning for the use of Guam's limited resources is necessary. It has received repeated backing from the legislative and executive branches of the Government and from private interests, such as the Chamber of Commerce. Comprehensive planning is essential if the future direction of Guam's growth is to be controlled and guided rather than allowed to develop haphazardly.

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In Conclusion

In making a case for the protection and management of Guam's natural resources, we have noted the value of the resources we have and, in some cases, their limited supply; we have cited the legal basis that now exists to protect these resources. The need for planning is evident and has been supported by all sectors of the community; and the trend, as evidenced by actions of governments in the states and by court actions, is toward increased protection of the general public's interest.

This is not to suggest that the individual property owner's rights should be totally pre-empted; however, it must be recognized that we have a responsibility to every island resident, including future residents, to ensure that the irreplaceable natural resources are protected for the use and enjoyment of everyone and that a pattern of development is planned for so that a high quality of life is ensured for all.



I Tano

Land and



Yan I Tasi

the Sea



Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agana, Guam, 96910

Volume 1, No. 5
July/August 1976

CRITICAL AREAS ON GUAM

The last issue of I Tano Yan I Tasi discussed the increasing importance of land-use planning on Guam. This issue will be concerned with a major aspect of the Bureau of Planning's approach to this task, that of "critical areas."

In every geographical place, there are certain areas which are important for the well-being of the people living there. This is particularly true of an island like Guam where there are very limited resources and a very limited amount of space for future growth. Decisions must be made now as to how these areas are to be protected for future use.

Everyone should be aware that water is the most limited resource on the island. This is followed closely by a long list of limited resources both natural and economic. These are agricultural lands, beaches, areas with high natural value and heavily developed areas where further unplanned development may cause a threat to the people living there. Critical areas also include places on Guam where development may actually be dangerous; these include flood areas, fault zones strongly affected by earthquakes, slide and erosion zones and protective area around the island's airports. Others include areas that are necessary for economic growth such as locations for future power plants or port development.

Each of these areas are called "critical areas," and development must be planned carefully to avoid future problems.

For example, parts of the Northern end of the island must be conserved to protect our water supply. At a recent meeting with many representatives of the island's government and private agencies, it was agreed that agriculture would be encouraged in these areas rather than residential, commercial or industrial development. Even then, certain types of fertilizers and insecticides cannot be used as poisons may end up in our drinking water. Sink holes (the large ponds where

water collects after rain) must not be filled, and the drainage patterns should not be changed as this affects the amount of water which collects underground and then is pumped by wells to homes and businesses on the island.

The Bureau of Planning would like to organize citizen groups, as well as continue to talk to existing groups about the critical areas and the overall planning effort. Questions should be addressed to:

Land-Use Planning
Bureau of Planning
P. O. Box 2950
Agana, Guam 96910

Telephone # 477-9639 or
472-8711

THE TERRITORIAL SEASHORE PROTECTION ACT--RECENT DEVELOPMENTS

The Territorial Seashore Protection Act (PL 12-108) was enacted in 1974, to "preserve and protect the resources of the seashore reserve for the enlargement of current and succeeding generations."

On Wednesday, July 7, the Legislature overrode the Governor's veto on Bill #839, thereby providing temporary (90 days) suspension of building codes relative to restoring dwellings to habitable states following a presidential declaration of a disaster area. Under post-typhoon conditions, this had some merit; however, a rider, or attached provision of this bill, included an unrelated and arbitrary reduction of the size of the 100m Seashore Reserve area to 10m or to the nearest public right-of-way. This attached provision has effectively destroyed the intent of the Seashore Protection Act by only requiring a permit from the Seashore Protection Commission for proposed development within 10m or 39 feet from the mean high water.

Admittedly, a uniform 100m protection zone was somewhat arbitrary in a number of locations on Guam; however, it did afford a degree of additional protection for a most valuable resource on Guam--the sea-shore. It will be the intent of the Bureau of Planning to redefine the Seashore Reserve with respect to more exact geographical and cultural considerations, thereby establishing an effective planned development area for the seashore. As it stands, a 10 meter reserve is not sufficient to carry out any sort of effective management program. Any comments on this matter should be addressed to:

Coastal Zone Management Program
Bureau of Planning
P.O. Box 2950
Agana, Guam 96910

PLANNING NOTES

-Amendments to the Coastal Zone Management Act signed by President Ford on July 26, 1976, have provided an unexpected windfall for the Bureau of Planning's land-use planning effort. Local match requirements have been reduced from 33% to 20% meaning that the Bureau of Planning will receive \$187,000 instead of \$164,000 for \$32,000 less local matching funds.

-The Central Planning Council on August 3, 1976, reviewed and approved the transportation and recreation elements of the Comprehensive Master Plan for submittal to a public hearing scheduled for August 23, 1976.

-The Inventory of Planning Information, an extensive document analyzing a wide range of planning data is being printed.

-The Comprehensive Planning Bibliography of Land and Water Use is undergoing final revision and will be going to print in early September.

-The urban, rural, agricultural, and conservation district identification task as part of the Land Use element of the Comprehensive Plan will be completed by August 20.

-An identification summary of Federal lands has been completed by the Bureau of Planning and is now being sent to 15 local and 21 Federal agencies.

MARINE RESOURCES INTEREST GROUPS

Starting in mid-August, the Bureau of Planning will be mailing copies of 1:25,000 scale Unified Mapping System sheets to organizations and groups directly involved with the use of marine resources. It is hoped that groups contacted will provide information to the Bureau regarding use, intensity of use, specific location of use for various activities such as surfing, sport fishing, boating, etc. This will enable us to more accurately assess negative impacts of proposed development on various marine water uses.

NATIONAL SWINE FLU IMMUNIZATION

I Tano Yan I Tasi has been asked by Public Health to announce that \$18,500 has been granted to Guam for the National Swine Flu. Immunization teams will be going to villages (6-10 p.m. weekdays; 1-5 p.m. on weekends) and government agencies (8-5 p.m. weekdays) when supplies of vaccine arrive. Clinic dates will be scheduled at that time. Further information on Swine Flu can be obtained from the Health Education Office, Public Health and Social Services, Room 103, Phone #734-9901, extension 200.



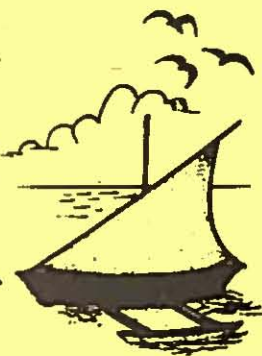
I Tano

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the Sea



Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agana, Guam, 96910

Volume 2, No. 1
January, 1977

WETLANDS

This is the first discussion in a series designed to familiarize readers with specific geographic areas of critical concern on Guam. The uniqueness of an area may be that it contains fragile historical, scientific or natural resources that are in immediate danger from potentially harmful development. Different areas often overlap, are interrelated and undergoing change. However, a delineation will enable the reader to see the importance of specific resources.

Wetlands are unique components of the island ecosystem. Some wetland areas, such as Agana Swamp and the Agat floodplain, have been designated as areas of critical concern. These and other areas, which are constantly inundated with water, provide a wildlife habitat for many species of fish, shellfish, crustaceans and waterfowl. For some species, they provide a nursery ground until an organism reaches a stage of growth when it can venture into another ecological niche. In some areas, wetlands are an important source of freshwater supply or assist in recharging the aquifer. They also host a diversity of plant life, many species which assist in maintaining the balance of the habitat, supplying nutrients to the water and having ethnobotanical value as food, medicine or material culture.

Agana Swamp

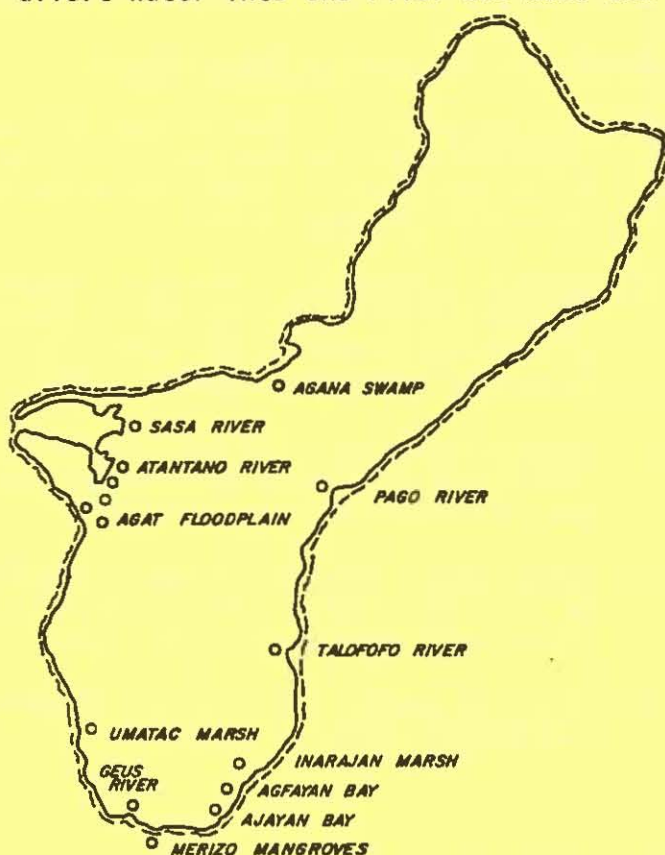
The island's largest swamp lies on the west coast near the center of the island. The source of the water is Agana Spring. The water disperses over a floodplain, Agana Swamp Proper, after which it converges into the Agana River and flows into the bay.

The spring hosts a diverse variety of aquatic plants and animals. Water lilies, water hyacinth and wild taro can be seen in the spring itself.

Numerous grasses and sedges border the edge. There are introduced mouth-breeders, known locally as tilapia and catfish, itu, and varieties of freshwater shrimp and snails.

At the spring outlet, the dominant vegetation becomes Phragmites karka. The tall reeds are known locally as kariso and are valued in traditional medicine. The impenetrable stand shelters numerous species of endangered birds. As the swamp merges with the Agana River, the vegetation becomes diverse again with many of the same species found in the spring. The river hosts a population of tilapia and hasule, a freshwater eel, popularly caught for their food value. The river mouth is constantly polluted by stormwater drainage.

Within the swamp, there is a little-known historical site. The Spanish Dikes were built in the early 19th century to divert water into the river and make the



WETLAND AREAS CURRENTLY UNDER STUDY
BY THE U.S. ARMY CORP. OF ENGINEERS

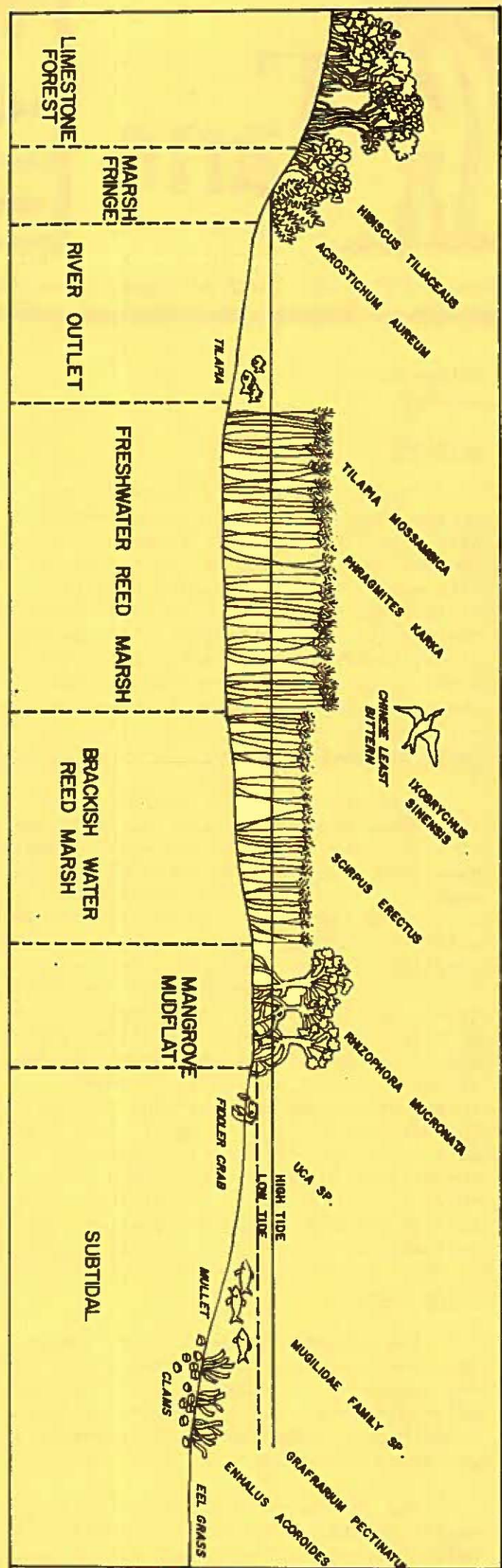
area suitable for rice production. There have been many times when the local government has considered draining the swamp. Currently, the swamp and other wetlands are under the jurisdiction of the U.S. Army Corp of Engineers. A permit must be obtained from the Corp before filling or draining any portion of a designated wetlands area. There has been a proposal by the Corp for channeling the water through Agana Swamp which would drain some of the outlying areas. A current botanical survey of wetlands in Guam, Saipan and Tinian is nearing completion. The final report, submitted to the Corp, will be a valuable source of environmental data to be used in planning for the development or preservation of Guam's wetlands. This recorded data will enable coastal zone management to further outline wetland areas of critical concern.

Included in the report will be numerous mangroves, reed, sedge and grass marshes, as well as several major river valleys. The Talofofu and Atantano Rivers are two examples. One of the most beautiful and interesting areas is found at the Sasa River mouth. This area can be seen at the bridge on Route 1 between the Drydock Island Road and Polaris Point Road. Here, the mangroves blend with a brackish water reed marsh and eventually into a freshwater zone of water flowing from the river. The zonation of vegetation is clearly defined as some species are more salt-tolerant than others (see cross section).

The wetlands of Guam should be preserved for future generations and not developed unless it is for a purpose that would provide overwhelming public benefit. If developmental change is eminent, the plans should be carefully evaluated to assure that the environmental impact is fully realized by the public and that resource use is minimized whenever possible.

Guidelines for Wetland Preservation

1. Habitat quantity. The acreage of a wetland should not be reduced by filling it at the edges or dumping material over any submerged grass beds.
2. Habitat suitability. The water quality should not be lowered by the introduction of adverse pollution, nor should the bottom be covered by harmful sediments.
3. Energy resources. The nutrient supply should not be altered by removing any part of the productive plant life.
4. Water flow. The flow of water should not be altered, whether fresh or saline, by blocking rivers or the tidal flow.
5. Wildlife refuge. The removal of animals and plants should be restricted.



PLANNING NOTES

It is a primary objective of the CZM program to provide legal analysis of alternative land and water uses and submit recommendations for legislation. In accordance with this aspect of planning, the Bureau of Planning has recently gained the services of Robin Grove. A graduate of the Franklin Pierce Law Center, Concord N.H., Mr. Grove is a VISTA volunteer. He is currently analyzing current land-use laws and recommending revisions.

Alex Chan, a CZM planner has completed An Inventory of the Present and Projected Coastal Land and Water Uses on Guam. Bob Gomez is currently working on Activities for Management of the Seashore Preserve Area. The seashore or coastal strand will be the subject of the next newsletter.

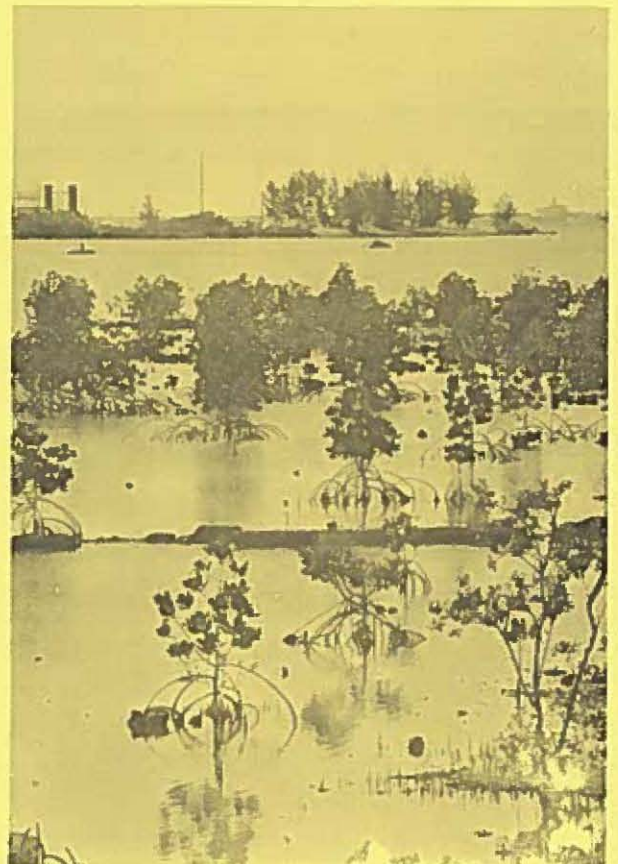
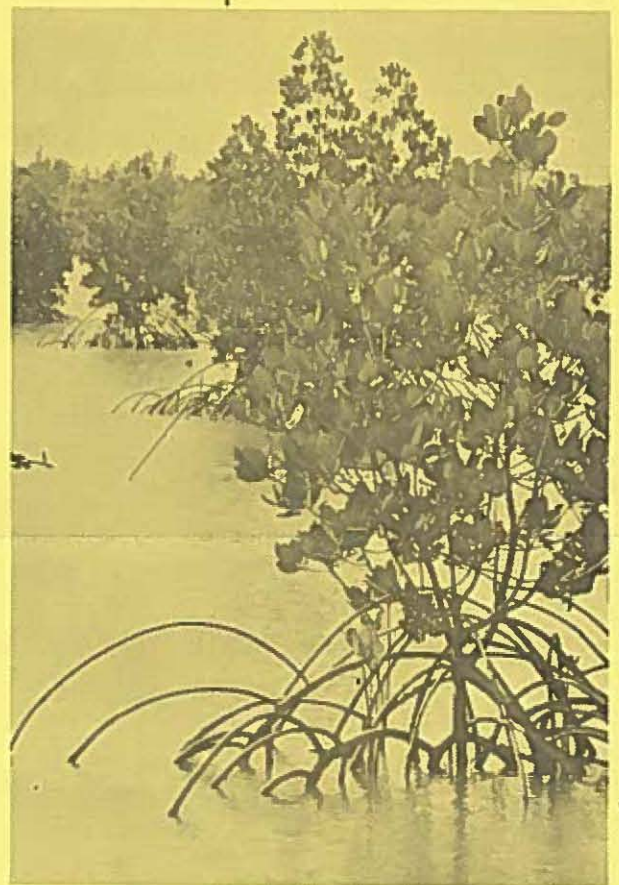
The Urban-Rural-Agricultural Land-Conservation Districting Map is constantly changing in response to public opinion. This and other maps can be viewed by interested persons at the Office of Coastal Zone Management, 4th Floor, Pacific Daily News Building, Room 402.

ENVIRONMENTAL PROTECTION AGENCY

The 208 Program headed by Larry Gomoll at GEPA, has begun the initial stage of its work. Linda Shidel and Susanne De C. Wilkins, Environmental Analyst I and II, are monitoring and studying the point and non-point sources of pollution throughout the island. The formulation of alternative plans for the reduction or elimination of point and non-point pollution is one purpose of the 208 Program. Joan Cabreza has been named planner for the 208 Program.

Public Involvement from elected officials, private interest groups and citizens play an important role in the 208 areawide wastewater treatment plan. Marilyn Abalos, Public Involvement Coordinator, is working on a series of public information tools necessary to inform the public, groups, and officials about the 208 Program.

Further information on the 208 Program can be obtained from GEPA, phone 646-8863-64 or 65.



Bureau of Planning
Office of Coastal Zone Management
Box 2950
Agana, Guam 96910

Community Design

Community design plans depict different land uses within an area of human settlement. As communities, these are places where residents have a strong identification with the geographic area in which they reside. The plans show residents how both present and projected land uses can be planned to provide the greatest benefit in the long-range future. As the plans are presented in meetings, public input is used to develop plans that will benefit the community as a whole.

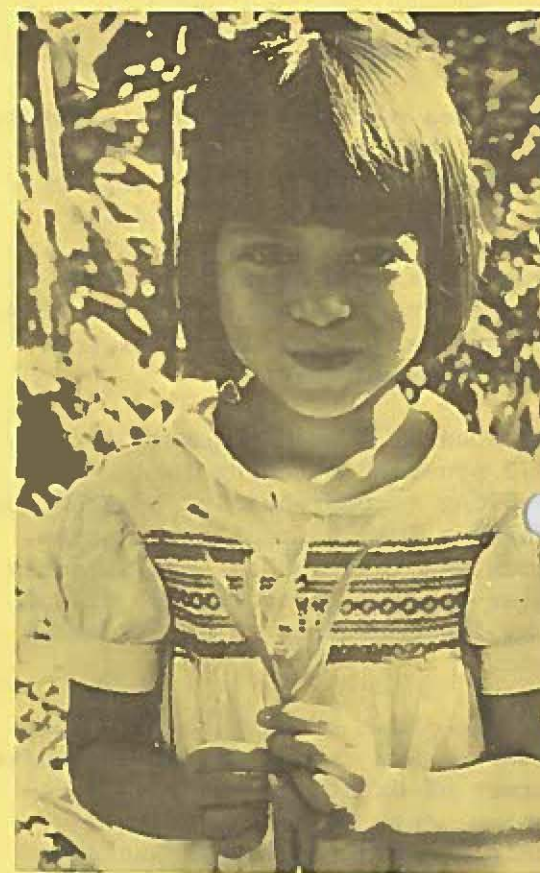
Once included with the other elements of the Comprehensive Development Plan, community design plans will add to an overall attempt to meet a balance of developmental and preservation needs for the entire island.

Included on community design maps are land-use areas that are more specific breakdowns of the four main land-use districts. For example, urban districts are divided into low-density (single family homes), medium-high density (apartments and condominiums), commercial, resort, public institution, industrial, and airport areas. Also incorporated into community design planning are the areas of particular concern as types of conservation land uses.

As a land-use planning effort, community designs are the middle phase between districting and the more specific planning for revised zoning.

Public Involvement

While planners do their best to act upon the needs and desires of the islanders, they often have difficulty in recognizing these needs until the people themselves speak out. The public is ultimately responsible for providing guidance that will determine the future appearance of Guam. Become informed about current plans and express your feelings. Only through proper planning and wise implementation can we continue to enjoy the island's gifts of the land and sea.



*Planning
for
Guam's Future*

☐ I would like to receive the monthly newsletter of the Coastal Management Section, I Tano Yan I Tasi.

Name _____

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☐ My organization would be interested in having a presentation on Coastal Management.

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TO: Coastal Management Section

Bureau of Planning

P. O. Box 2950

Agana, Guam 96910



Background

Effective planning for Guam's future is the challenging task facing the Bureau of Planning. The complexity of pressures affecting land and water resources necessitates an agency designed to monitor rapid change, preserve valuable resources, and present conceptual plans for needed development.

The Coastal Zone Management Act of 1972 provided matching funds, enabling a comprehensive program for managing Guam's fragile resources. Since the land and sea are directly inter-related on an island, all of Guam is considered to be a coastal zone.

In this phase of the program, the planners are conducting an extensive survey of existing resources, preparing maps and conceptual plans, administering interviews and presenting the results to residents in a public involvement program.

Currently being completed are the Land-Use and Community Design elements of the Comprehensive Development Plan being prepared by the Bureau of Planning. Comprehensive planning involves an analysis of a wide range of data including population projections, public input, and the specific plans of various agencies. The final plan is designed as a guide for both governmental and private policies and actions. It will outline the recommended performance standards for effective development and utilization of human and natural resources as well as patterns of land-use on the entire island.

Districting

Four basic areas of land use on Guam have been designated as having special interest. They are urban, rural, agricultural and conservation districts. The mapping of these areas assists planners in managing the specific performance standards for land and water use in each district.

Urban Areas

Man is an inevitable member of the island ecosystem. Commercial development and residential housing are necessary to meet the demands of a rising population. The management of urban growth enhances the island's appearance, stimulates the economy and protects adjacent areas.

Rural Areas

In some village communities, a more traditional lifestyle is preferred. Rural areas have less infrastructure of roads and utilities, but most are adjacent to urban areas. They provide possible locations for future urban development and can thus be easily connected to urban facilities to meet desirable expansive demands.

Agricultural Areas

The potential for agriculture must improve if self-sufficiency is valued. There is a limited number of acres of potential farmland that is fairly level and contains fertile topsoil. A small fraction of this land is now utilized for agriculture. With the designation of agricultural lands, the needs of farmers can be better recognized by governmental agencies.

Conservation Areas

Included with wetlands and the seashore as valuable wildlife habitats are the limestone forest and the savannah grasslands. These undeveloped areas can provide a place for nature observation, scientific study, and preservation of the aesthetic appearance of Guam.

Areas of Particular Concern

The uniqueness of an area of particular concern may be that it contains fragile and valuable historical, resources that could be affected by potentially harmful development.

Among areas that have been designated by the Coastal Management Program are:

The Seashore Reserve

The sandy beaches, rocky shore, reefs and mangroves along Guam's coast provide natural island beauty for all to enjoy. Especially the sandy beaches, which are well suited for tourism, boating, fishing, and other activities, are under the constant pressure of the residents' and the tourists' recreational needs. In order to preserve these fragile resources against misuse, the Coastal Management Program is developing a Seashore Reserve Plan and supports related agencies attempts to protect the environment and promote responsible development that will enhance the economy.

Wetlands

The little-known wetlands of Guam are valuable geographic areas, which, if lost, would be an irreplaceable resource. They include numerous swamps, floodplains, marshes, and river valleys. As wildlife habitats, they are the most biologically productive ecosystem on the island. Many varieties of fish, shellfish, and crustaceans grow amidst a diversity of specialized plants. The water within such areas as Agana Swamp assists in recharging the aquifer. To fill, dredge, or otherwise disturb wetlands can potentially degrade an important resource area on Guam.

Historical Sites

It has been stated that Guam is one large archaeological site. Because historical reports of early life are scarce, the artifacts left behind are the remaining link with a rich cultural heritage. To destroy historical sites, further isolates us from the mysteries of the past. The value of areas, such as those containing the majestic latte house supports, has warranted the designation of historical sites as areas of particular concern.





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the Sea



Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agana, Guam, 96910

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February, 1977

THE SEASHORE RESERVE

The seashore or coastal strand of Guam is a continual resource that surrounds the entire island. Its value as the aesthetic interface where land meets the sea can never be measured. The sandy beaches, rocky cliff lines and mangroves provide natural island beauty and, as one of the island's most valuable geographic areas, should be protected from misuse for residents and visitors alike.

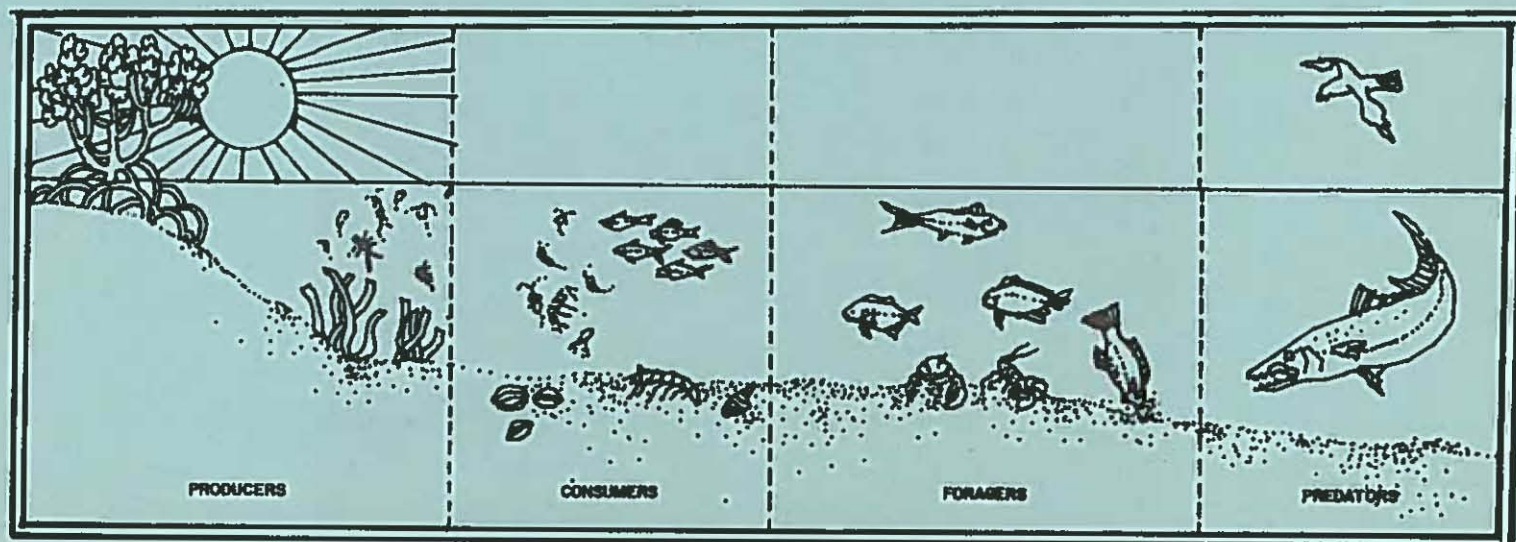
The seashore is the narrow band at the water's edge and includes both land and sea. Its serene beauty masks dynamic natural processes. Here, the physical contour of the coast is being changed by wind, wave and tide. Plants and animals have adapted to unique requirements, making the seashore a unique ecosystem (see food chain). The beach plants grow in salt-laden sand and over rocks at the water's edge, where shellfish secure themselves on rocks and the reef to brunt the force of the waves and backwash.

In this terrestrial/aquatic ecosystem, the interrelationship between the island and the ocean is most evident. Perhaps this is where much of the beauty is found in the seashore. The islander is an inevitable member of the seashore ecosystem. He can improve it, preserve it or make changes with undesirable consequences.

It is a basic policy of Coastal Management to improve seashore quality through planning. The seashore preserve program is conservational, but not necessarily anti-developmental. The program, however, necessitates permits for development so that changes are properly evaluated. The broad objectives of seashore preservation involve:

1. Preservation of the natural character and beauty.
2. Protection of the fragile resources and ecology.
3. Increased recreational activities that do not threaten the visual appearance and ecology.
4. Increased public access.
5. Carefully planned, multi-use development. (Development with a balance of maximum benefit and minimal expenditure of resources).

Three main variations in the physical features of the seashore exist on Guam. There is the mangrove swamp, depicted in the last newsletter, the sandy beach and the rocky shore. The rocky



shores are generally inaccessible to much of the population and lie undisturbed. They are characterized by jagged, eroded limestone or high cliffs with an algal bench. The rocks are exposed to continuous wave action, but are stable enough to permit the attachment of shellfish such as tridacna clams, limpets and nerites. The algal bench is a flat terrace, cut by wave action, at the base of a steep cliff. The water on the bench hosts a diversity of shellfish, small fish and seaweed growth. The circulation of the water is determined by waves and tides.

Currently, the most pressured areas are the sandy beaches that border much of the island. The beaches on Guam are sloping landforms composed of loose sand, gravel or broken shells. The appeal of beaches generates the forces which threaten them. They benefit man by providing a buffer zone between the land and sea--protecting property from wave action. They provide a launching point for small boats. They are also a favored recreation site for activities such as swimming, diving, and surfing. Of utmost importance, they are a wildlife habitat of economic value, particularly for some types of net fishing which are popular on Guam and rely on a sandy bottom to prevent snags.

PROBLEMS AT THE SEASHORE

Visual Appearance

The uninterrupted or easy view of the seashore and its activities is referred to as visual access. Just to enjoy the inspiring beauty of the coastline is a resource in itself. The tourist, who is essential to the economy, has visions of island beauty before arriving on Guam, he travels far in order to enjoy visual access and the aesthetic beauty of the tropical seashore. Scenic areas can be hurt in two ways. They can be directly destroyed by overdevelopment or indirectly destroyed when all points from which they can be viewed are blocked by development. This does not mean that all development should be stopped. High aesthetic quality can be realized in populated areas as well as in undisturbed natural environments. Planning should, however, protect aesthetic quality by preserving vegetation and controlling density where it

is feasible. The building of structures too close to the shoreline should be restricted for health, safety (from natural disaster), conservational, and scenic reasons. Outdoor advertising should also be discouraged from shoreline areas. Certain laws regulate the building of structures and utilization of signs, however, these are often ignored by developers. It is thoughtless or unplanned development that causes destruction. In visual planning, Coastal Management is concerned with:

1. Landscape--the composition of natural and man-made forms.
2. Visibility--the physical view zone or distance relationship between the viewer and the landscape.
3. Interpretation--the viewer's psychological analysis of a view's content and meaning. (People experience the seashore in different ways).

Despite the beauty of Guam's seashore, there are some areas that need improvement. The Tumon Bay resort area is one example. In a recent meeting of the Hotel Owner's Association, several major problems were conveyed to Coastal Management planners. Tumon Bay itself could be dredged to clear the buildup of sand and debris. In its present condition, there is little live coral growth and the shallow water promotes algae growth. The bay would be cleared of detritus that is offensive to the ecosystem, daytime tourists, and evening local fishermen who value the area for net fishing.

Another problem is the need for consistent and uniform governmental cleanup of the beach sand. The major obstacle, however--according to the hotel association--is the fact that much of the vacant land in the resort area is ill-kept and owned by non-residents. People off-island are sometimes unconcerned or unaware of visual quality. The association suggests improving legislation and enforcement pertaining to mandatory cleanup of property by owners and leasees. At present, the Department of Public Health



and Guam Environmental Protection Agency are the agencies that should be contacted in regards to complaints concerning property negligence--when trash and deteriorating structures are left unremoved.

One way special interest groups can promote area cleanup is to designate an "improvement district" and establish objectives. With a formal plan, they can more effectively channel their own funds and energies and provide a concise list of needs to media, legislators and government agencies. If Tumon Bay and other areas are visually enhanced, the effect could be one to benefit residents, business and tourists alike.

Public Access

Growing population and intensive land use are increasingly sealing off the coastline from much of the general public. Besides disrupting environmental balance, development often restricts access to the beach by people seeking needed recreation. The seashore is open to the public, but entrance ways become increasingly scarce when private homes, fences, businesses and private recreation areas restrict public access and promote crowding at a limited number of public beach parks or necessitate walking long distances to avoid trespassing on private property. Planning for public access involves the needs of the entire island population. In various states, it has been discovered that access can be required without undue hardship to private property owners. Public Law 12-19 guarantees the right of all people to use the seashore for recreational activity, but does not take into account that restricted access between the public road and the public beach could become a problem on Guam. Improvements will involve legislative revision, the construction of pathways so that access is channeled and convenient to both the public and private landowners, and restrictions on signs that deter access.

Sand Loss

Sand loss is a growing problem on Guam. Sand removal degrades the visual quality of the seashore, destroys recreational areas and affects the seashore habitat by disturbing strand vegetation and altering the underwater sand level where numerous small fish, shellfish and crustaceans find haven.

The Seashore Protection Act requires a permit for coastal development (including sand removal) within the seashore reserve. Violations can involve a maximum fine of \$10,000 and, in addition, up to \$500 per day of violation. The Seashore Protection Commission can utilize the Attorney General's Office in cases of violation. Under the law, permits for coastal use must be obtained from the Territorial Seashore Protection Commission. Violations can be reported to the same commission.



The seashore is not only a place where natural forces are dramatically displayed, but also a place where the adverse affects of insensitive actions can become dramatically evident. One example--sand mining at Ipan Beach.

People often remove sand to be used as an additive to concrete and for landscaping (including fill for golf course sand traps). Protective measures for the prevention of beach sand loss not only involved restrictions on sand mining, but the establishment of conservation areas where maintenance of strand vegetation is in effect as an important deterrent against sand erosion. There are also restrictions on construction of unsightly jetties and seawalls in urban/tourist areas. These confine sand in one locality, but can severely limit the overall supply of beach sand because the natural sand flow along the coast is disturbed.



On many southern beaches, the beach dropseed or salt grass (*Sporobolus virginicus*), known locally as totoput, provides a buffer strip for stabilization of sand resources and purification of runoff water.

Pollution

As a growing problem, affecting every facet of the delicate island ecosystem, pollution deservedly receives the most recognition by the public and governmental agencies. Its adverse affects can be devastating, particularly at the seashore. Through the ages, the wildlife has adapted to the unique requirements of the seashore habitat, but can not tolerate radical changes that have recently been introduced by man. Aesthetic quality can also be ruined by unsightly pollution.

Prevention of pollution most importantly involves public awareness, but also involves enforcement of restrictions by the Guam Environmental Protection Agency and effective planning in the Coastal Management Program.

Pollution is extraneous matter that may be harmful to humans and other living things. It can be in the form of bacteria, chemical, trash or heat. The specific types of pollution that have the most critical effect on the seashore are:

1. Storm Water Runoff. This is a problem of urban development. It is the debris that is drained from streets - sidewalks, ditches, parking lots and other places. It can contain as much pollution as sewage and should be disposed of in a manner that insures that harmful ingredients such as tire rubbings, chemicals, dirt and bacteria are not deposited at the seashore. Examples of offensive storm drains can be seen at the Agana River Mouth and the NAS storm drain in East Agana Bay adjacent to Marine Drive.

2. Sewage Disposal. The dumping of human and animal waste into the seashore environment is obviously totally detrimental to all aspects of seashore quality. Behind the ugly smell and appearance is a coliform level of disease microorganisms that infect humans and animals and cause those seafood animals, left living, to be unfit for consumption. Despite improved sewage disposal systems in parts of the island, some areas are constantly polluted by ineffective systems. In a recent public workshop in Merizo, residents pointed out that their septic tanks were affected by the tide changes--an indication that sewage disposal systems are too close to the sea. The sewage treatment station at the Pago River Mouth is in a constant state of disrepair and raw sewage cascades down the cliff side at Marbo on the Northeast coast.

3. Trash Dumping. (Solid Waste Disposal). There are laws against dumping trash in unauthorized areas and to prevent littering, but the problem continues to magnify without public cooperation and sufficient enforcement. The careless disposal of refuse degrades the visual quality of the seashore and presents a health problem. Though the problem is islandwide, it is very evident at the seashore, where recreation involves the extensive use of bottles, cans and paper products. In a May, 1974 report from the GEPA, it was noted that the amount of litter on Tumon Bay Road increased over 200% between 1972 and 1974. The problem still exists. Coastal Management planners recognize the problem, but it is the responsibility of the public to stop littering.

4. Chemical Effluent. Another problem in which public awareness is the greatest cure is in the use of pesticides, fertilizer and detergents that can run off into rivers and eventually reach the seashore. Mosquito spraying can also endanger life on the seashore by killing small fish and beneficial insects. The existing regulatory measures for pesticide control are outlined in the Guam Pesticides Profile, GEPA, March, 1975. Toxic chemicals endanger all forms of life and other residues such as phosphates and nitrates, promote the growth of objectionable vegetation. Algae clouds the water and consumes oxygen as it decomposes--upsetting the ecosystem balance and destroying visual quality.

5. Thermal Discharge. Because power plants rely on large amounts of water for their cooling systems, they are located at the seashore. The cooling water that emerges from power plants is 10-15 degrees hotter than when it went in. This may not seem like much of a temperature change, but scientists have found that even slight increases can have an effect on aquatic life. The thermal discharges at Piti and Tanguisson power plants are constantly monitored to gauge adverse effects. Scientific studies have noted that the thermal discharge has had little adverse effect at the Cabras and Piti Power Plant, but the marine life at Tanguisson, on NCS Beach, has been drastically reduced. An upcoming newsletter will discuss the reef and the problem of thermal discharge in depth.

6. Siltation. As evidenced by the silt screens needed for the current dredging of the Agana Boat Basin, disturbed sediments can severely upset a wildlife habitat. Dredging along the seashore has to be minimized in order to limit ecological damage. Ports and marina development involves dredging, thus planning for these facilities involves placing them near high-use areas so as to discourage the proliferation of single-purpose private docks. They must also be situated so as to minimize fish and shellfish damage and be aesthetically compatible with adjacent areas. Another source of harmful sediments is from erosion. Due to the nature of the volcanic soils in the southern part of the island, the loose soils wash into rivers and quickly reach the seashore. Heavy siltation accounts for the brown water in Talofof Bay. Also a major source of this form of pollution, is improperly planned construction. Leaving scraped land (adjacent to floodplains, river valleys, and the shore) exposed to rainfall for prolonged periods of time, invites erosion. Reforestation efforts by the Department of Agriculture, fire prevention and carefully planned development are the forces resisting erosion.

7. Oil Spills. Also related to ports and marinas is the threat of oil spills. Whenever shipping occurs, there is a chance of contamination from petroleum products. This type of pollution is incidental and not yet a problem on Guam. The Coast Guard is the agency that isolates oil spills and removes the offensive substance.

It is sometimes difficult to clearly define the extent of the seashore, but this should not deter efforts for its preservation or improvement. There is obviously a line where the water meets the land, around the entire island. However, the seashore extends further inland and further into the sea. Inland, the coastal strand can be botanically delineated by a line of salt-tolerant vegetation that abruptly ends when other terrestrial vegetation becomes dominant. Legally, the seashore can become either a measured, single distance from the high-tide mark or geographically from the water's edge to the nearest major terrain feature such as a road or cliff line. Whatever criteria is used, it is evident that proper planning is a necessity for what is one of the island's most valuable, fragile and beautiful areas of particular concern.

PLANNING NOTES

Your Opinions Are Needed

You may have questions about the Coastal Management Program or viewpoints concerning land and water use on Guam. Let us hear them so that we can respond in the upcoming newsletters.

Turn Your Dial to Citizen Participation

Coming soon on KGTF will be a series of half-hour programs that outline specific aspects of the Coastal Management Program and the Bureau of Planning. The first program will be a general introduction to the Coastal Management Program and the planning process. Subsequent programs will visually depict areas of particular concern such as the seashore and the reef and specific aspects of planning such as legislative revision, districting and disaster preparedness. A program schedule will be announced in the news and on TV. For a valuable insight into an important GovGuam agency, watch Island Interface.

Surfing Spots

The Guam Surfer's Association recently provided the coastal planners with maps of the surfing locations on Guam. The information will be an added variable to be considered in planning. The expertise of special interest groups is welcomed as public involvement is an essential aspect of the planning process.

Reef Study Completed

Drs. Lou Eldredge and Richard H. Randall have recently submitted The Physiographic Description of Guam's Reefs and Beaches to the Coastal Management Section. The scientific data contained within this report, to be released in January, will enable planners to more effectively protect this valuable resource area. The coral reef will be the subject of the next newsletter's presentation of an area of particular concern on Guam.

Semantics

As has been noted in previous newsletters, a three-tiered system of land-use planning is envisioned for the land-use element of the Master Plan. One tier involves the establishment of general land-use districts (Urban, Rural, Agriculture and Conservation), another, the revised zoning within the Urban Districts, and third, the so called "areas of critical concern" or

designation and guidelines for development or certain areas which, due to their unique nature, deserve special management attention. These areas range from fragile coral reefs, wetlands, etc., to air field sound zones and aquifer recharge areas. It has been pointed out through discussions with various officials that, although needful of special management programs, many of these areas are not "critical" in the sense that their development would not pose immediate hazards to the health, safety and welfare of the citizens on Guam. For this reason, the Bureau of Planning has decided to call this part of the land and water use planning approach "areas of particular concern" (APC's). While perhaps a minor point, we feel that revision of what could become misleading terminology will avoid misunderstanding in the future.

Federal Consistency

Approximately one third of Guam is owned by the Federal Government. To be effective, land and water use plans must be consistent throughout the island. While excluded by law from the definition of the coastal zone, any proposed federal activities having "spillover" impacts upon Guam coastal zone must be consistent with the objectives of the coastal management plan. When approved by the Secretary of Commerce, the coastal management enforcement mechanism will be able to request revision of major actions taking place on federal lands if the impacts of such development are considered unacceptable. Thus, federal consistency is an important facet of the program.

Recycle

On the island, there is little space for "environmental sinks" or areas where waste materials can be dumped. We must daily import goods, which tend to flow one-way and stop--from producer, to consumer and lastly to the dump. If materials such as scrap metal from old cars, aluminum cans and glass bottles can be returned to producers, the result could be lower costs, a more aesthetic island appearance and less waste of limited resources.



The building of structures at the water's edge can be of personal convenience, but does little to enhance the ecology, beauty and availability of the seashore for the rest of the island.



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the Sea



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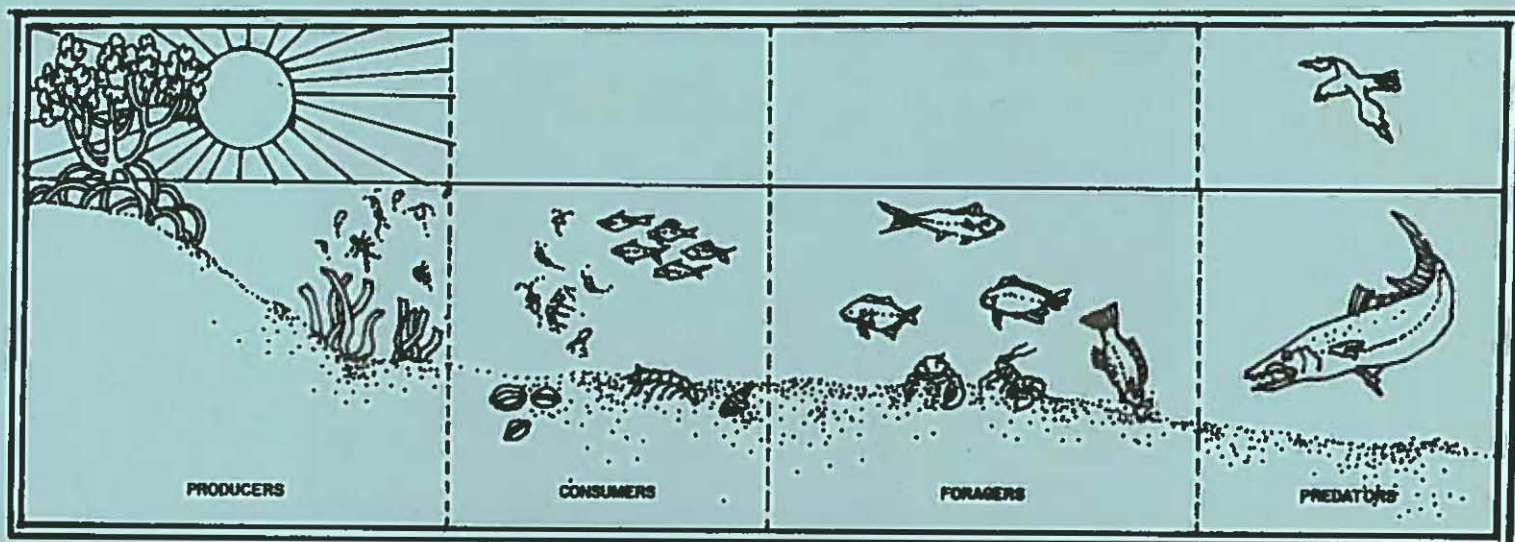
The seashore is the narrow band at the water's edge and includes both land and sea. Its serene beauty masks dynamic natural processes. Here, the physical contour of the coast is being changed by wind, wave and tide. Plants and animals have adapted to unique requirements, making the seashore a unique ecosystem (see food chain). The beach plants grow in salt-laden sand and over rocks at the water's edge, where shellfish secure themselves on rocks and the reef to brunt the force of the waves and backwash.

In this terrestrial/aquatic ecosystem, the interrelationship between the island and the ocean is most evident. Perhaps this is where much of the beauty is found in the seashore. The islander is an inevitable member of the seashore ecosystem. He can improve it, preserve it or make changes with undesirable consequences.

It is a basic policy of Coastal Management to improve seashore quality through planning. The seashore preserve program is conservational, but not necessarily anti-developmental. The program, however, necessitates permits for development so that changes are properly evaluated. The broad objectives of seashore preservation involve:

1. Preservation of the natural character and beauty.
2. Protection of the fragile resources and ecology.
3. Increased recreational activities that do not threaten the visual appearance and ecology.
4. Increased public access.
5. Carefully planned, multi-use development. (Development with a balance of maximum benefit and minimal expenditure of resources).

Three main variations in the physical features of the seashore exist on Guam. There is the mangrove swamp, depicted in the last newsletter, the sandy beach and the rocky shore. The rocky



shores are generally inaccessible to much of the population and lie undisturbed. They are characterized by jagged, eroded limestone or high cliffs with an algal bench. The rocks are exposed to continuous wave action, but are stable enough to permit the attachment of shellfish such as tridacna clams, limpets and nerites. The algal bench is a flat terrace, cut by wave action, at the base of a steep cliff. The water on the bench hosts a diversity of shellfish, small fish and seaweed growth. The circulation of the water is determined by waves and tides.

Currently, the most pressured areas are the sandy beaches that border much of the island. The beaches on Guam are sloping landforms composed of loose sand, gravel or broken shells. The appeal of beaches generates the forces which threaten them. They benefit man by providing a buffer zone between the land and sea--protecting property from wave action. They provide a launching point for small boats. They are also a favored recreation site for activities such as swimming, diving, and surfing. Of utmost importance, they are a wildlife habitat of economic value, particularly for some types of net fishing which are popular on Guam and rely on a sandy bottom to prevent snags.

PROBLEMS AT THE SEASHORE

Visual Appearance

The uninterrupted or easy view of the seashore and its activities is referred to as visual access. Just to enjoy the inspiring beauty of the coastline is a resource in itself. The tourist, who is essential to the economy, has visions of island beauty before arriving on Guam, he travels far in order to enjoy visual access and the aesthetic beauty of the tropical seashore. Scenic areas can be hurt in two ways. They can be directly destroyed by overdevelopment or indirectly destroyed when all points from which they can be viewed are blocked by development. This does not mean that all development should be stopped. High aesthetic quality can be realized in populated areas as well as in undisturbed natural environments. Planning should, however, protect aesthetic quality by preserving vegetation and controlling density where it

is feasible. The building of structures too close to the shoreline should be restricted for health, safety (from natural disaster), conservational, and scenic reasons. Outdoor advertising should also be discouraged from shoreline areas. Certain laws regulate the building of structures and utilization of signs, however, these are often ignored by developers. It is thoughtless or unplanned development that causes destruction. In visual planning, Coastal Management is concerned with:

1. Landscape--the composition of natural and man-made forms.
2. Visibility--the physical view zone or distance relationship between the viewer and the landscape.
3. Interpretation--the viewer's psychological analysis of a view's content and meaning. (People experience the seashore in different ways).

Despite the beauty of Guam's seashore, there are some areas that need improvement. The Tumon Bay resort area is one example. In a recent meeting of the Hotel Owner's Association, several major problems were conveyed to Coastal Management planners. Tumon Bay itself could be dredged to clear the buildup of sand and debris. In its present condition, there is little live coral growth and the shallow water promotes algae growth. The bay would be cleared of detritus that is offensive to the ecosystem, daytime tourists, and evening local fishermen who value the area for net fishing.

Another problem is the need for consistent and uniform governmental cleanup of the beach sand. The major obstacle, however--according to the hotel association--is the fact that much of the vacant land in the resort area is ill-kept and owned by non-residents. People off-island are sometimes unconcerned or unaware of visual quality. The association suggests improving legislation and enforcement pertaining to mandatory cleanup of property by owners and leasees. At present, the Department of Public Health



and Guam Environmental Protection Agency are the agencies that should be contacted in regards to complaints concerning property negligence--when trash and deteriorating structures are left unremoved.

One way special interest groups can promote area cleanup is to designate an "improvement district" and establish objectives. With a formal plan, they can more effectively channel their own funds and energies and provide a concise list of needs to media, legislators and government agencies. If Tumon Bay and other areas are visually enhanced, the effect could be one to benefit residents, business and tourists alike.

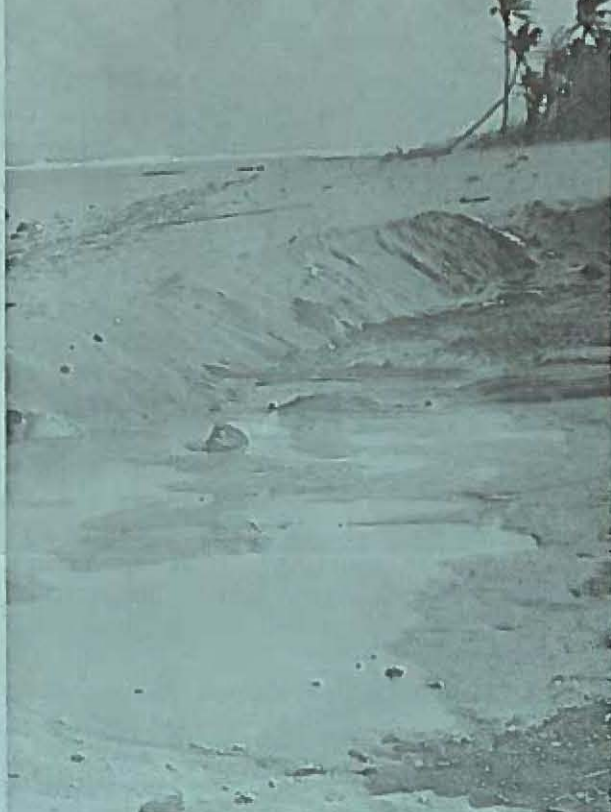
Public Access

Growing population and intensive land use are increasingly sealing off the coastline from much of the general public. Besides disrupting environmental balance, development often restricts access to the beach by people seeking needed recreation. The seashore is open to the public, but entrance ways become increasingly scarce when private homes, fences, businesses and private recreation areas restrict public access and promote crowding at a limited number of public beach parks or necessitate walking long distances to avoid trespassing on private property. Planning for public access involves the needs of the entire island population. In various states, it has been discovered that access can be required without undue hardship to private property owners. Public Law 12-19 guarantees the right of all people to use the seashore for recreational activity, but does not take into account that restricted access between the public road and the public beach could become a problem on Guam. Improvements will involve legislative revision, the construction of pathways so that access is channeled and convenient to both the public and private landowners, and restrictions on signs that deter access.

Sand Loss

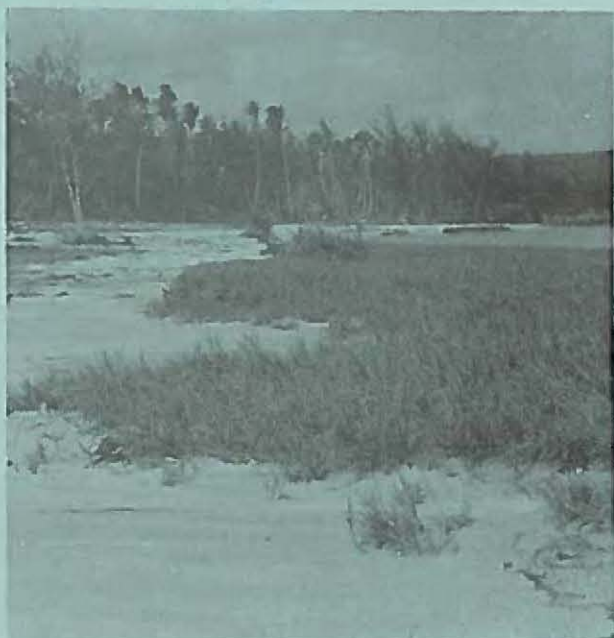
Sand loss is a growing problem on Guam. Sand removal degrades the visual quality of the seashore, destroys recreational areas and affects the seashore habitat by disturbing strand vegetation and altering the underwater sand level where numerous small fish, shellfish and crustaceans find haven.

The Seashore Protection Act requires a permit for coastal development (including sand removal) within the seashore reserve. Violations can involve a maximum fine of \$10,000 and, in addition, up to \$500 per day of violation. The Seashore Protection Commission can utilize the Attorney General's Office in cases of violation. Under the law, permits for coastal use must be obtained from the Territorial Seashore Protection Commission. Violations can be reported to the same commission.



The seashore is not only a place where natural forces are dramatically displayed, but also a place where the adverse affects of insensitive actions can become dramatically evident. One example--sand mining at Ipan Beach.

People often remove sand to be used as an additive to concrete and for landscaping (including fill for golf course sand traps). Protective measures for the prevention of beach sand loss not only involved restrictions on sand mining, but the establishment of conservation areas where maintenance of strand vegetation is in effect as an important deterrent against sand erosion. There are also restrictions on construction of unsightly jetties and seawalls in urban/tourist areas. These confine sand in one locality, but can severely limit the overall supply of beach sand because the natural sand flow along the coast is disturbed.



On many southern beaches, the beach dropseed or salt grass (*Sporobolus virginicus*), known locally as totoput, provides a buffer strip for stabilization of sand resources and purification of runoffwater.

Pollution

As a growing problem, affecting every facet of the delicate island ecosystem, pollution deservedly receives the most recognition by the public and governmental agencies. Its adverse affects can be devastating, particularly at the seashore. Through the ages, the wildlife has adapted to the unique requirements of the seashore habitat, but can not tolerate radical changes that have recently been introduced by man. Aesthetic quality can also be ruined by unsightly pollution.

Prevention of pollution most importantly involves public awareness, but also involves enforcement of restrictions by the Guam Environmental Protection Agency and effective planning in the Coastal Management Program.

Pollution is extraneous matter that may be harmful to humans and other living things. It can be in the form of bacteria, chemical, trash or heat. The specific types of pollution that have the most critical effect on the seashore are:

1. Storm Water Runoff. This is a problem of urban development. It is the debris that is drained from streets - sidewalks, ditches, parking lots and other places. It can contain as much pollution as sewage and should be disposed of in a manner that insures that harmful ingredients such as tire rubbings, chemicals, dirt and bacteria are not deposited at the seashore. Examples of offensive storm drains can be seen at the Agana River Mouth and the NAS storm drain in East Agana Bay adjacent to Marine Drive.

2. Sewage Disposal. The dumping of human and animal waste into the seashore environment is obviously totally detrimental to all aspects of seashore quality. Behind the ugly smell and appearance is a coliform level of disease microorganisms that infect humans and animals and cause those seafood animals, left living, to be unfit for consumption. Despite improved sewage disposal systems in parts of the island, some areas are constantly polluted by ineffective systems. In a recent public workshop in Merizo, residents pointed out that their septic tanks were affected by the tide changes--an indication that sewage disposal systems are too close to the sea. The sewage treatment station at the Pago River Mouth is in a constant state of disrepair and raw sewage cascades down the cliff side at Marbo on the Northeast coast.

3. Trash Dumping. (Solid Waste Disposal). There are laws against dumping trash in unauthorized areas and to prevent littering, but the problem continues to magnify without public cooperation and sufficient enforcement. The careless disposal of refuse degrades the visual quality of the seashore and presents a health problem. Though the problem is islandwide, it is very evident at the seashore, where recreation involves the extensive use of bottles, cans and paper products. In a May, 1974 report from the GEPA, it was noted that the amount of litter on Tumon Bay Road increased over 200% between 1972 and 1974. The problem still exists. Coastal Management planners recognize the problem, but it is the responsibility of the public to stop littering.

4. Chemical Effluent. Another problem in which public awareness is the greatest cure is in the use of pesticides, fertilizer and detergents that can run off into rivers and eventually reach the seashore. Mosquito spraying can also endanger life on the seashore by killing small fish and beneficial insects. The existing regulatory measures for pesticide control are outlined in the Guam Pesticides Profile, GEPA, March, 1975. Toxic chemicals endanger all forms of life and other residues such as phosphates and nitrates, promote the growth of objectionable vegetation. Algae clouds the water and consumes oxygen as it decomposes--upsetting the ecosystem balance and destroying visual quality.

5. Thermal Discharge. Because power plants rely on large amounts of water for their cooling systems, they are located at the seashore. The cooling water that emerges from power plants is 10-15 degrees hotter than when it went in. This may not seem like much of a temperature change, but scientists have found that even slight increases can have an effect on aquatic life. The thermal discharges at Piti and Tanguisson power plants are constantly monitored to gauge adverse effects. Scientific studies have noted that the thermal discharge has had little adverse effect at the Cabras and Piti Power Plant, but the marine life at Tanguisson, on NCS Beach, has been drastically reduced. An upcoming newsletter will discuss the reef and the problem of thermal discharge in depth.

6. Siltation. As evidenced by the silt screens needed for the current dredging of the Agana Boat Basin, disturbed sediments can severely upset a wildlife habitat. Dredging along the seashore has to be minimized in order to limit ecological damage. Ports and marina development involves dredging, thus planning for these facilities involves placing them near high-use areas so as to discourage the proliferation of single-purpose private docks. They must also be situated so as to minimize fish and shellfish damage and be aesthetically compatible with adjacent areas. Another source of harmful sediments is from erosion. Due to the nature of the volcanic soils in the southern part of the island, the loose soils wash into rivers and quickly reach the seashore. Heavy siltation accounts for the brown water in Talofofo Bay. Also a major source of this form of pollution, is improperly planned construction. Leaving scraped land (adjacent to floodplains, river valleys, and the shore) exposed to rainfall for prolonged periods of time, invites erosion. Reforestation efforts by the Department of Agriculture, fire prevention and carefully planned development are the forces resisting erosion.

7. Oil Spills. Also related to ports and marinas is the threat of oil spills. Whenever shipping occurs, there is a chance of contamination from petroleum products. This type of pollution is incidental and not yet a problem on Guam. The Coast Guard is the agency that isolates oil spills and removes the offensive substance.

It is sometimes difficult to clearly define the extent of the seashore, but this should not deter efforts for its preservation or improvement. There is obviously a line where the water meets the land, around the entire island. However, the seashore extends further inland and further into the sea. Inland, the coastal strand can be botanically delineated by a line of salt-tolerant vegetation that abruptly ends when other terrestrial vegetation becomes dominant. Legally, the seashore can become either a measured, single distance from the high-tide mark or geographically from the water's edge to the nearest major terrain feature such as a road or cliff line. Whatever criteria is used, it is evident that proper planning is a necessity for what is one of the island's most valuable, fragile and beautiful areas of particular concern.

PLANNING NOTES

Your Opinions Are Needed

You may have questions about the Coastal Management Program or viewpoints concerning land and water use on Guam. Let us hear them so that we can respond in the upcoming newsletters.

Turn Your Dial to Citizen Participation

Coming soon on KGTF will be a series of half-hour programs that outline specific aspects of the Coastal Management Program and the Bureau of Planning. The first program will be a general introduction to the Coastal Management Program and the planning process. Subsequent programs will visually depict areas of particular concern such as the seashore and the reef and specific aspects of planning such as legislative revision, districting and disaster preparedness. A program schedule will be announced in the news and on TV. For a valuable insight into an important GovGuam agency, watch Island Interface.

Surfing Spots

The Guam Surfer's Association recently provided the coastal planners with maps of the surfing locations on Guam. The information will be an added variable to be considered in planning. The expertise of special interest groups is welcomed as public involvement is an essential aspect of the planning process.

Reef Study Completed

Drs. Lou Eldredge and Richard H. Randall have recently submitted The Physiographic Description of Guam's Reefs and Beaches to the Coastal Management Section. The scientific data contained within this report, to be released in January, will enable planners to more effectively protect this valuable resource area. The coral reef will be the subject of the next newsletter's presentation of an area of particular concern on Guam.

Semantics

As has been noted in previous newsletters, a three-tiered system of land-use planning is envisioned for the land-use element of the Master Plan. One tier involves the establishment of general land-use districts (Urban, Rural, Agriculture and Conservation), another, the revised zoning within the Urban Districts, and third, the so called "areas of critical concern" or

designation and guidelines for development or certain areas which, due to their unique nature, deserve special management attention. These areas range from fragile coral reefs, wetlands, etc., to air field sound zones and aquifer recharge areas. It has been pointed out through discussions with various officials that, although needful of special management programs, many of these areas are not "critical" in the sense that their development would not pose immediate hazards to the health, safety and welfare of the citizens on Guam. For this reason, the Bureau of Planning has decided to call this part of the land and water use planning approach "areas of particular concern" (APC's). While perhaps a minor point, we feel that revision of what could become misleading terminology will avoid misunderstanding in the future.

Federal Consistency

Approximately one third of Guam is owned by the Federal Government. To be effective, land and water use plans must be consistent throughout the island. While excluded by law from the definition of the coastal zone, any proposed federal activities having "spillover" impacts upon Guam coastal zone must be consistent with the objectives of the coastal management plan. When approved by the Secretary of Commerce, the coastal management enforcement mechanism will be able to request revision of major actions taking place on federal lands if the impacts of such development are considered unacceptable. Thus, federal consistency is an important facet of the program.

Recycle

On the island, there is little space for "environmental sinks" or areas where waste materials can be dumped. We must daily import goods, which tend to flow one-way and stop--from producer, to consumer and lastly to the dump. If materials such as scrap metal from old cars, aluminum cans and glass bottles can be returned to producers, the result could be lower costs, a more aesthetic island appearance and less waste of limited resources.



The building of structures at the water's edge can be of personal convenience, but does little to enhance the ecology, beauty and availability of the seashore for the rest of the island.



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Land and



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the Sea



Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agana, Guam, 96910

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THE CORAL REEF

Coral reefs are one of Guam's most important resources. They are composed of physical structures of the limestone remains of marine plants and animals. A living community covers the upper surface of a reef. Because of their beauty, economic and scientific value--and fragile nature--the coral reef has been designated as an area of particular concern on Guam. The recent study, An Atlas of Guam's Reef and Beaches, by Dr. Lucius Eldredge and Richard Randall has provided the technical data for the delineation of this area by the Coastal Management Section as deserving special attention.

The coral reef front is found beyond where the surf breaks on the shallow edge of the reef with the reef flat covering the area between the surf and the shore. The reef flat is composed of sand, sparse patches of coral and calcareous and fleshy algae. Coral growth itself is not an important component of this area because the warmer water, poor circulation and lack of adequate salinity (due to freshwater runoff) are not favorable for coral growth. This area, however, is vitally important as the transition zone between the reef and the shoreline.

During typhoons, coral reefs are subject to wave erosion. The reef protects the island, but as pieces are broken off, the coral fragments shells and other rubble contribute to the amount of beach sand and the configuration of the coast.

The fringing reef which surrounds much of the island, brunts the force of the waves, thus protecting the land and influencing the flow of water along the shore. It is instrumental in the formation and maintenance of sandy beaches. Separate areas such as the reef, the reef flat and the shoreline have a different appearance, but are extremely interdependent. Such areas are so interrelated, that if one is disturbed, the others are also in danger and the entire system may never return to its original state of productivity.

At Cocos Island, there is a barrier reef with atoll-like characteristics. An even platform of coral growth protects a shallow lagoon between Cocos and the coast. The shallow water

within the barrier reef provides ideal protection for schools of fish from deep-water predators. The most common species are the lagua parrot fish, hugupau surgeon fish, suksuk squirrel fish and the beautiful ababang butterfly fish.

Coral consists of colonies of small animals called polyps. The polyps produce hard skeletons and as they multiply and die, a formation of calcium carbonate develops. This eventually turns into limestone rock. The polyps feed off of microscopic plankton (even smaller animals) in the water. Coral colonies grow at an incredibly slow rate of speed. Some heads of coral growth that span ten feet in width take between one and two centuries to form. Precious, deep-water corals take centuries to grow inches. Thus once destroyed, recolonization is painfully slow, sometimes nonexistent.

In addition to corals, other reef organisms contribute to the growth and expansion of a reef. These additional plants and animals are equally as important in contributing to the maintenance of the habitat. One variety of calcareous algae, a tiny form of plant life with a hard skeleton, consolidates at the edge of the reef and cements loose objects with a limestone veneer. Thus it helps protect the reef from wave erosion and provides a base for further coral growth. The calcareous algae also helps build the reef by filling in the pores and valleys in the coral, thus converting old skeletons into limestone and expanding the base from which the living coral multiplies. Numerous other animals also contribute to the appearance and processes within the reef ecosystem. They balance the habitat and include such animals as fish, shrimp, crabs, octopus, sea urchins, sea worms, sponges and starfish.

Coral is one of the most environmentally specific marine animals. This means that it must have the right conditions to grow. The maintenance of water circulation is vital. The coral polyps rely on a continual supply of oxygen and plankton. Reef-building corals also require sunlight. These necessities are most abundant at the surf line where the wave action stirs up the water. For this reason, coral growth is most abundant in this area. Corals rarely develop reef features in water depths beyond 45-55 meters. They will only grow upwards to the level of low-water neap tides. The temperature for optimal reef coral growth is

73-80 degrees and the required salinity is 35 parts per thousand. Any development that disturbs these requirements would have a damaging, long-term effect upon a beautiful and valuable resource area.

Coral is classified into two general types, reef forming and non-reef forming. The hard, branching, lobbed and brain corals are responsible for the buildup of limestone. However, soft corals are also a conspicuous part of the reef habitat. They do not have the solid, calcareous skeleton of hard corals. A low, spreading base with numerous fingerlike branches that subdivide as they grow are characteristics of soft corals. Their colors range from pinkish to beige and green and change as they expand or retract their polyps.

Marine grass beds are another reef area. Enhalus acoroides, often called turtle or eel grass, is found on tidal flats adjacent to coral reefs. The dense growth of blade-like leaves provide an important cover for many varieties of fish, shellfish and crustaceans. Most commonly seen amidst the grass beds are karakot cowrie shells, manahak rabbit fish and alimasak swimming crabs.

MAN AND THE REEF

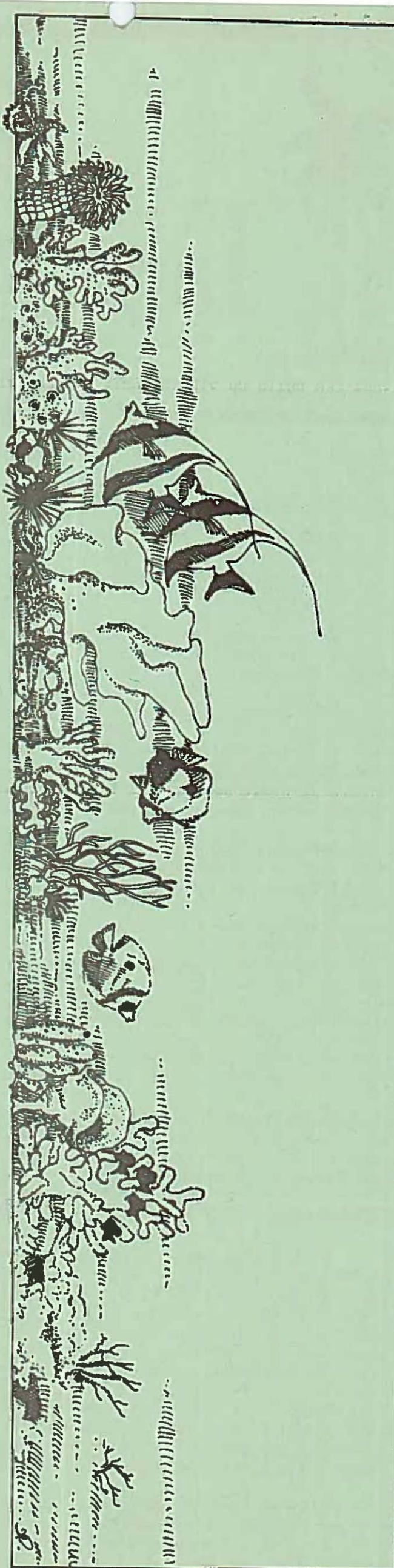
Throughout the early centuries when the island and reef formed, only natural events affected the reef environment. Once man arrived, the reef became subjected to pressures of which there were no adaptive mechanisms or natural defense to counteract. All of a sudden, man was the primary predator upon all levels of the food chain. If he did not eat reef animals and plants, he had the potential to otherwise destroy them.

The early islanders, despite comparable populations with today, had taboos concerning misuse of the environment and did little to degrade the reef habitat, simply because they had a less complex technology than today. As evidenced by remains found in archaeological excavations, fish, shellfish and crustaceans were a staple food in a starch-fish dietary balance. Shells and coral were fashioned into tools. The reef was extensively harvested, but continued to flourish. Today it is different. Modern technology, increasing demands and new values place a complexity of pressures on the reef environment.

Land Development and Sedimentation

Land development can adversely affect an offshore reef if siltation is involved. Fine particles of earth can enter the water when rainfall causes surface erosion or dredging and filling at the shore can stir up or create sediments. When these particles are suspended in water, they block out needed sunlight and settle upon living coral polyps, filling in their habitats. Fish and other animals, if not directly destroyed, find cloudy water inconducive to normal life and they seek shelter elsewhere. In this case, they often fall prey to predators if forced to move from the protection of the coral.

The Guam Environmental Protection Agency monitors sedimentation in various areas of abundant reef growth. Tests are usually conducted in locations that may be subject to increased sedimentation from adjacent land development. Over a long period of time, the adverse effects of development may become evident from the data that is collected. An example of harmful sedimentation resulting from land development was seen in the heavy siltation of Piti Bay during construction on Nimitz Hill. A current regional study of reefs by the UOG



recently completed study by Eldredge and Randall. It will concentrate on collecting additional data pertaining to sedimentation.

Pesticides

Another way man can destroy reef organisms is by poisoning them with toxic wastes. Pesticides enter the water of rivers as they run off from adjacent urban or agricultural lands. The toxic substances then flow into the sea and onto the reef. Pesticides can also kill reef organisms when aerial spraying of the land "spills over" onto the seashore. During the period when the Vietnamese refugees were evacuated to Guam, extensive spraying for dengue fever caused a large fish kill of species found on the shallow reef flat. If not directly killing animals, poisons can build up within their systems with the levels increasing up the food chain and in the long run affecting man as well if he consumes an animal that contains harmful poisons.

Raw Sewage

Unfortunately, the reef has long served as a dumping ground for raw sewage. Besides carrying offensive disease microorganisms, sewage contains an abundance of nitrate and phosphate nutrients. It is a rich solution which promotes dense growths of phytoplankton (tiny microscopic plant life) and seaweeds. As excessive amounts of these plants die, they produce a mass of organic matter which decomposes and, while doing so, deoxygenates the water. Without an abundance of oxygen and clear water, coral growth is stunted. There are ten areas on Guam where raw sewage is dumped onto the reef front. Sewage should be treated until rendered harmless or dumped far at sea. By releasing nutrients at great depths, the excessive growth of phytoplankton can support the food chain and increase fish productivity--enhancing deep-water fishing grounds.

Oil Spill Threat

Island planning and public cooperation are limited in their effect upon oil transportation and the threat of oil spills. Now is the critical period when tankers built in the past two decades are depreciating to the extent that corrosion and stress are increasing the potential

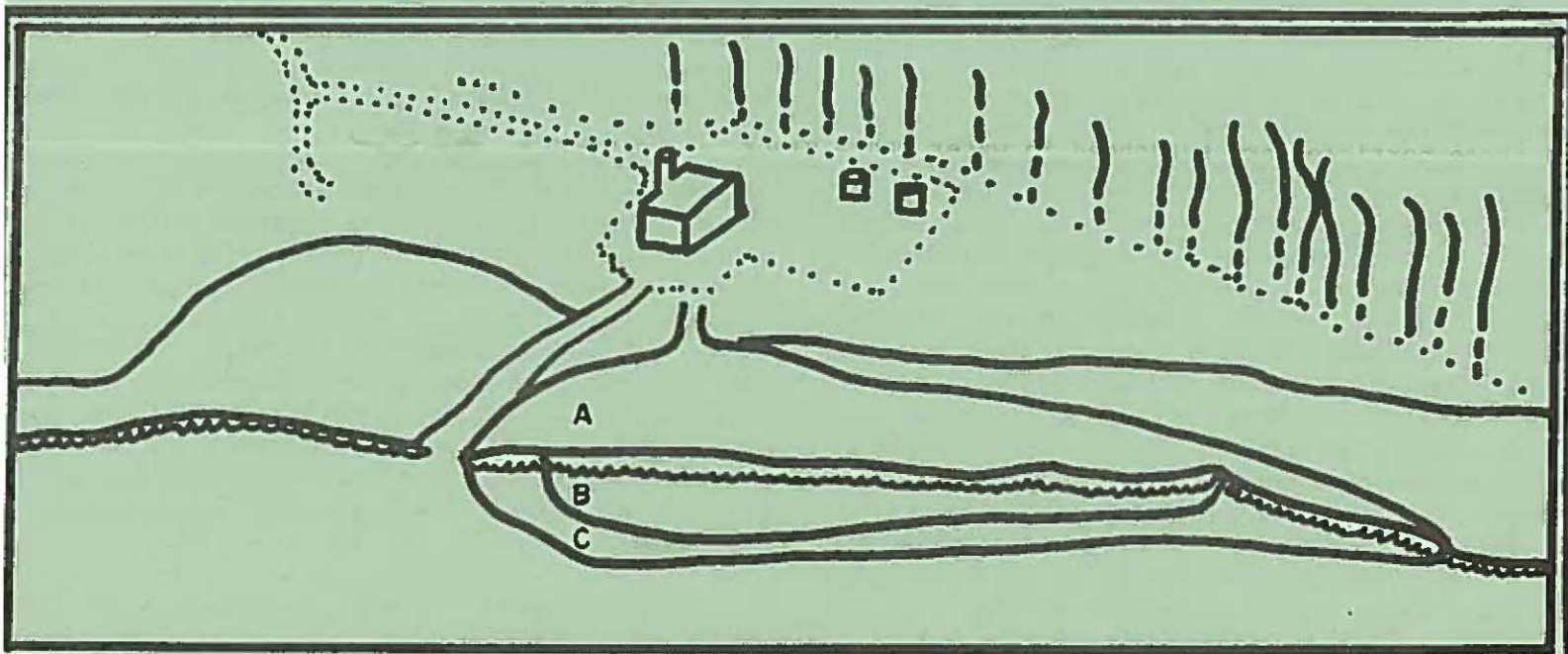
reef, suffocating all life as it oxidizes. It has been estimated that one litre of oil can use up all the oxygen in 400,000 litres of seawater (88,000 gallons).

Thermal Discharge

As mentioned in the previous newsletter, thermal discharge is the release of coolant water from power plants onto the reef. The water is returned to the sea approximately ten degrees hotter than when it went in. Thermal discharges are present at Piti, Cabras and Tanguisson power plants. In scientific field studies, it has been found that the discharge at Tanguisson on NCS Beach has the most destructive effects on a coral reef. A UOG Marine Lab study by Steve Neudecker (1976) has defined the extent of the damage. The kill zone (see illustration) is extensive and recolonization will not take place as long as the area is affected by waste heat.

Fishing the Reef

Besides its scientific and aesthetic value, the reef has recreational and economic importance as a fishing area. Since pre-contact times, the islander has fished the reefs. Today, there are fewer fish and fewer fisherman. Thus, the dwindling supply of fish is most aptly blamed on pollution rather than overfishing. Yet there are still regulations enforced by the Dept. of Agriculture's Division of Fish and Wildlife. Public Law 12-215 restricts the use of fishing nets with a stretched mesh of less than 1½ inch except for the catching of manahak, the local name for juvenile rabbit fish. Of more crucial importance in reef protection are laws against the use of explosives and poisons to harvest the reef. Dynamite and clorox totally devastate the reef and constitute of total lack of environmental awareness. Clorox kills every living organism, unlike the ancient practice of using plant poisons such as derris (*Derris eclipia* and *Derris trifoliata*) and puting (*Barringtonia asiatica*) which were used to stun fish in a localized area. The traditional preparation of fish poisons is no longer practiced.



The Limits of the Coral Kill at Tanguisson, 1974, A. Thermal influence on the reef flat where few corals existed. B. The core zone of the coral kill. C. The peripheral zone.

Shell Collecting

It is obvious to all who visit the sea-shore that the numbers of shells to be seen on the reef has drastically decreased in the last few years. The beauty and value of shells makes them a prime target for the collector's eye. The collecting of the rare triton shell, the major predator of the adult crown of thorns starfish, may be a factor in the population rise of these coral-eating animals that have devastated much of Guam's living reef. When shell collecting, the basic rule should be keep the dead, empty shells and return the live ones to the ecosystem. They constitute an important facet of the reef habitat.

Coral Harvesting

Another devastating practice that has necessitated legislation is the harvesting of live coral. People will remove coral from the reef for personal and commercial purposes. It can be cleaned and displayed as a curio or sold as souvenirs. Coral specimens are a favorite of tourists and sold in many gift shops on Guam. Public Law 12-186 states that it is unlawful to remove live coral from the shore outwards to a depth of ten fathoms (60 ft.). This still allows for the removal of deep-water precious corals and commercial harvesting within the nearshore area is possible with the acquisition of a license from the Director of Agriculture. There is a growing need for legislative revision pertaining to coral harvesting.

Artificial Reef Habitats

Artificial reefs have been made from old tires that are stacked in pyramids under the water. Discarded tires are one form of solid waste that cannot be recycled, does not biodegrade and produces pollution if burned. In this way, they can be put to good use. Algal growth soon covers the tires and the arrangement provides protection for small fish. Thus, wildlife preservation, increased fishing potential and extended resource use are in effect. Experiments with artificial reefs have been continuing on Guam for several years and the increased number of fish in these areas has been noted.

Undersea Parks?

There are only two places in the United States where coral reefs exist. These are Hawaii and southern Florida. National Undersea Parks have been established in both these states to encompass rich coral areas. Other undersea reserves or parks protect coral reefs in the U.S. Virgin Island and American Samoa. Local or state parks have also been created in Hawaii, Florida and Puerto Rico for protection and recreational use of coral reefs. However, none of these preserves and parks have the numbers of species and accessibility of Guam's reefs. Designation of a territorial undersea park in an area of Guam's coral reefs would stop fishing, shelling, coral harvesting or other exploitive uses of an area. The result would be an increase in the numbers of exploited species to be viewed by divers, scientists and passengers on glass-bottom boats. It would also serve as a resource for stocks of fish and other marine life to repopulate other areas.

PLANNING NOTES

AICUZ ON GUAM

The U.S. Navy has recognized the problems created by urban encroachment at military airfields. To ease the problem, they have developed the AICUZ Program of Air Installations Compatible Use Zones. Captain Robert A. Schade of ComNavMar addressed a meeting of the Coastal Zone Advisory Committee and explained the program. He has a color documentary film that should be of interest to the public and special interest groups. The two major problems that are considered in AICUZ plans are noise levels and potential accident zones. The delineation of hazardous zones suggests that low population density-oriented activities be encouraged in these mapped areas. The reduction of noise levels is especially pertinent to Coastal Management as airport sound zones are an area of particular concern. Noise levels can be incompatible with activities such as school and church services, become a source of displeasure in the home or business and upset wildlife as animal breeding can decline in a noisy environment. The Navy's efforts can involve a reduction of night takeoffs, acoustical enclosures for testing jet engines and adjustment of the approach and landing slopes over populated areas. This is important as the Naval Air Station is a necessity, especially if increased withdrawal from Asian facilities is affected. The AICUZ planning is a valuable asset in the maintenance of Coastal Management's federal consistency objective.

Mineral Extraction to be Studied

The Coastal Management Program is contracting a consultant to study the best potential locations for mineral extraction on Guam. Quarrying is an ongoing activity that must be monitored and planned as it can be one of the most devastating of developmental activities. Its basic function of producing building materials, however, is indispensable. Thus, quarries have to be situated in areas where the supply of materials is of high quality, compatibility with adjacent land is in effect and the mining itself done in such a fashion that the land can be utilized for another use when the quarrying is completed.

At present, there are four main commercial quarries in operation: Hawaiian Rock, Perez Bros., Hyundai and RSEA. Most quarrying is done near the northeast coast of Guam. It is in this area that the hardest limestone is found. Further inland, the limestone becomes softer and the frequency of crumbly coral, called "sugar coral" is higher.

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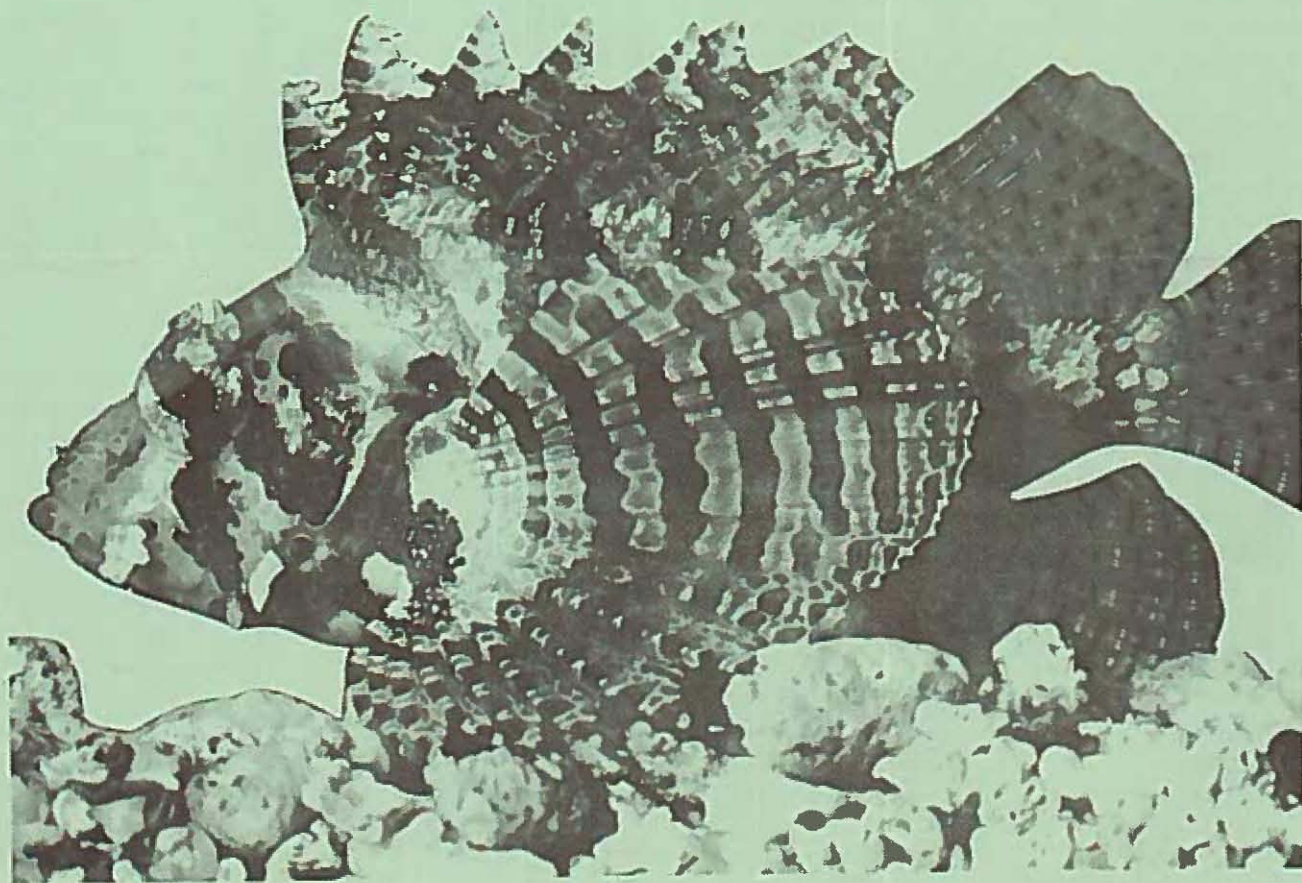
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Coastal Management Section
Bureau of Planning
P. O. Box 2950
Agana, Guam 96910



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the Sea



Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agaña, Guam, 96910

Vol. 2, No. 3
March, 1977

THE CORAL REEF

Coral reefs are one of Guam's most important resources. They are composed of physical structures of the limestone remains of marine plants and animals. A living community covers the upper surface of a reef. Because of their beauty, economic and scientific value--and fragile nature--the coral reef has been designated as an area of particular concern on Guam. The recent study, An Atlas of Guam's Reef and Beaches, by Dr. Lucius Eldredge and Richard Randall has provided the technical data for the delineation of this area by the Coastal Management Section as deserving special attention.

The coral reef front is found beyond where the surf breaks on the shallow edge of the reef with the reef flat covering the area between the surf and the shore. The reef flat is composed of sand, sparse patches of coral and calcareous and fleshy algae. Coral growth itself is not an important component of this area because the warmer water, poor circulation and lack of adequate salinity (due to freshwater runoff) are not favorable for coral growth. This area, however, is vitally important as the transition zone between the reef and the shoreline.

During typhoons, coral reefs are subject to wave erosion. The reef protects the island, but as pieces are broken off, the coral fragments shells and other rubble contribute to the amount of beach sand and the configuration of the coast.

The fringing reef which surrounds much of the island, brunts the force of the waves, thus protecting the land and influencing the flow of water along the shore. It is instrumental in the formation and maintenance of sandy beaches. Separate areas such as the reef, the reef flat and the shoreline have a different appearance, but are extremely interdependent. Such areas are so interrelated, that if one is disturbed, the others are also in danger and the entire system may never return to its original state of productivity.

At Cocos Island, there is a barrier reef with atoll-like characteristics. An even platform of coral growth protects a shallow lagoon between Cocos and the coast. The shallow water

within the barrier reef provides ideal protection for schools of fish from deep-water predators. The most common species are the lagua parrot fish, hugupau surgeon fish, suksuk squirrel fish and the beautiful ababang butterfly fish.

Coral consists of colonies of small animals called polyps. The polyps produce hard skeletons and as they multiply and die, a formation of calcium carbonate develops. This eventually turns into limestone rock. The polyps feed off of microscopic plankton (even smaller animals) in the water. Coral colonies grow at an incredibly slow rate of speed. Some heads of coral growth that span ten feet in width take between one and two centuries to form. Precious, deep-water corals take centuries to grow inches. Thus once destroyed, recolonization is painfully slow, sometimes nonexistent.

In addition to corals, other reef organisms contribute to the growth and expansion of a reef. These additional plants and animals are equally as important in contributing to the maintenance of the habitat. One variety of calcareous algae, a tiny form of plant life with a hard skeleton, consolidates at the edge of the reef and cements loose objects with a limestone veneer. Thus it helps protect the reef from wave erosion and provides a base for further coral growth. The calcareous algae also helps build the reef by filling in the pores and valleys in the coral, thus converting old skeletons into limestone and expanding the base from which the living coral multiplies. Numerous other animals also contribute to the appearance and processes within the reef ecosystem. They balance the habitat and include such animals as fish, shrimp, crabs, octopus, sea urchins, sea worms, sponges and starfish.

Coral is one of the most environmentally specific marine animals. This means that it must have the right conditions to grow. The maintenance of water circulation is vital. The coral polyps rely on a continual supply of oxygen and plankton. Reef-building corals also require sunlight. These necessities are most abundant at the surf line where the wave action stirs up the water. For this reason, coral growth is most abundant in this area. Corals rarely develop reef features in water depths beyond 45-55 meters. They will only grow upwards to the level of low-water neap tides. The temperature for optimal reef coral growth is

73-80 degrees and the required salinity is 35 parts per thousand. Any development that disturbs these requirements would have a damaging, long-term effect upon a beautiful and valuable resource area.

Coral is classified into two general types, reef forming and non-reef forming. The hard, branching, lobbed and brain corals are responsible for the buildup of limestone. However, soft corals are also a conspicuous part of the reef habitat. They do not have the solid, calcareous skeleton of hard corals. A low, spreading base with numerous fingerlike branches that subdivide as they grow are characteristics of soft corals. Their colors range from pinkish to beige and green and change as they expand or retract their polyps.

Marine grass beds are another reef area. Enhalus acoroides, often called turtle or eel grass, is found on tidal flats adjacent to coral reefs. The dense growth of blade-like leaves provide an important cover for many varieties of fish, shellfish and crustaceans. Most commonly seen amidst the grass beds are karakot cowrie shells, manahak rabbit fish and alimasak swimming crabs.

MAN AND THE REEF

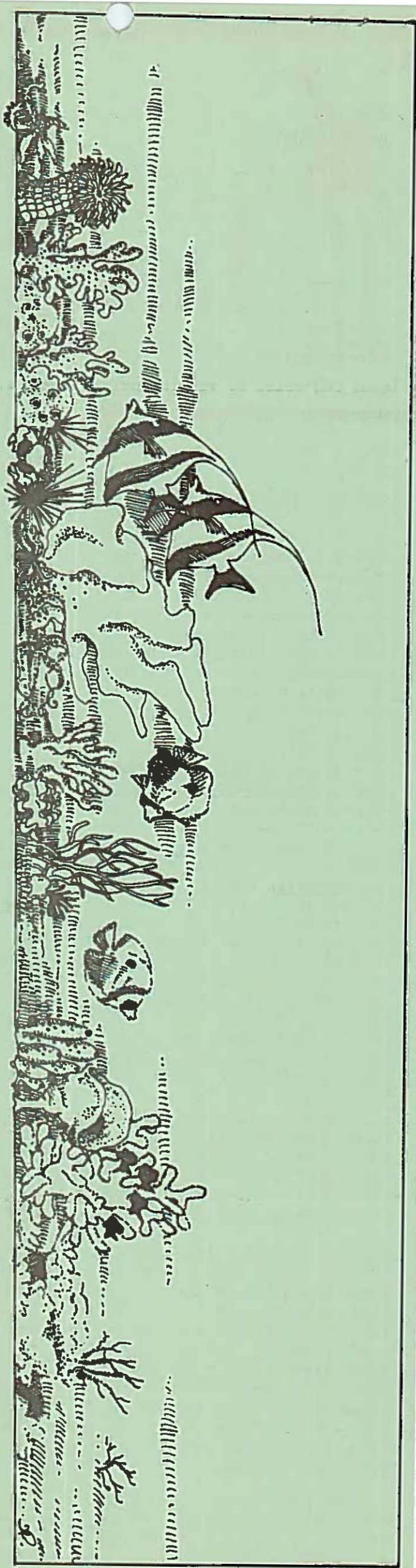
Throughout the early centuries when the island and reef formed, only natural events affected the reef environment. Once man arrived, the reef became subjected to pressures of which there were no adaptive mechanisms or natural defense to counteract. All of a sudden, man was the primary predator upon all levels of the food chain. If he did not eat reef animals and plants, he had the potential to otherwise destroy them.

The early islanders, despite comparable populations with today, had taboos concerning misuse of the environment and did little to degrade the reef habitat, simply because they had a less complex technology than today. As evidenced by remains found in archaeological excavations, fish, shellfish and crustaceans were a staple food in a starch-fish dietary balance. Shells and coral were fashioned into tools. The reef was extensively harvested, but continued to flourish. Today it is different. Modern technology, increasing demands and new values place a complexity of pressures on the reef environment.

Land Development and Sedimentation

Land development can adversely affect an offshore reef if siltation is involved. Fine particles of earth can enter the water when rainfall causes surface erosion or dredging and filling at the shore can stir up or create sediments. When these particles are suspended in water, they block out needed sunlight and settle upon living coral polyps, filling in their habitats. Fish and other animals, if not directly destroyed, find cloudy water inconducive to normal life and they seek shelter elsewhere. In this case, they often fall prey to predators if forced to move from the protection of the coral.

The Guam Environmental Protection Agency monitors sedimentation in various areas of abundant reef growth. Tests are usually conducted in locations that may be subject to increased sedimentation from adjacent land development. Over a long period of time, the adverse effects of development may become evident from the data that is collected. An example of harmful sedimentation resulting from land development was seen in the heavy siltation of Piti Bay during construction on Nimitz Hill. A current regional study of reefs by the UOG



recently completed study by Eldredge and Randall. It will concentrate on collecting additional data pertaining to sedimentation.

Pesticides

Another way man can destroy reef organisms is by poisoning them with toxic wastes. Pesticides enter the water of rivers as they run off from adjacent urban or agricultural lands. The toxic substances then flow into the sea and onto the reef. Pesticides can also kill reef organisms when aerial spraying of the land "spills over" onto the seashore. During the period when the Vietnamese refugees were evacuated to Guam, extensive spraying for dengue fever caused a large fish kill of species found on the shallow reef flat. If not directly killing animals, poisons can build up within their systems with the levels increasing up the food chain and in the long run affecting man as well if he consumes an animal that contains harmful poisons.

Raw Sewage

Unfortunately, the reef has long served as a dumping ground for raw sewage. Besides carrying offensive disease microorganisms, sewage contains an abundance of nitrate and phosphate nutrients. It is a rich solution which promotes dense growths of phytoplankton (tiny microscopic plant life) and seaweeds. As excessive amounts of these plants die, they produce a mass of organic matter which decomposes and, while doing so, deoxygenates the water. Without an abundance of oxygen and clear water, coral growth is stunted. There are ten areas on Guam where raw sewage is dumped onto the reef front. Sewage should be treated until rendered harmless or dumped far at sea. By releasing nutrients at great depths, the excessive growth of phytoplankton can support the food chain and increase fish productivity--enhancing deep-water fishing grounds.

Oil Spill Threat

Island planning and public cooperation are limited in their effect upon oil transportation and the threat of oil spills. Now is the critical period when tankers built in the past two decades are depreciating to the extent that corrosion and stress are increasing the potential

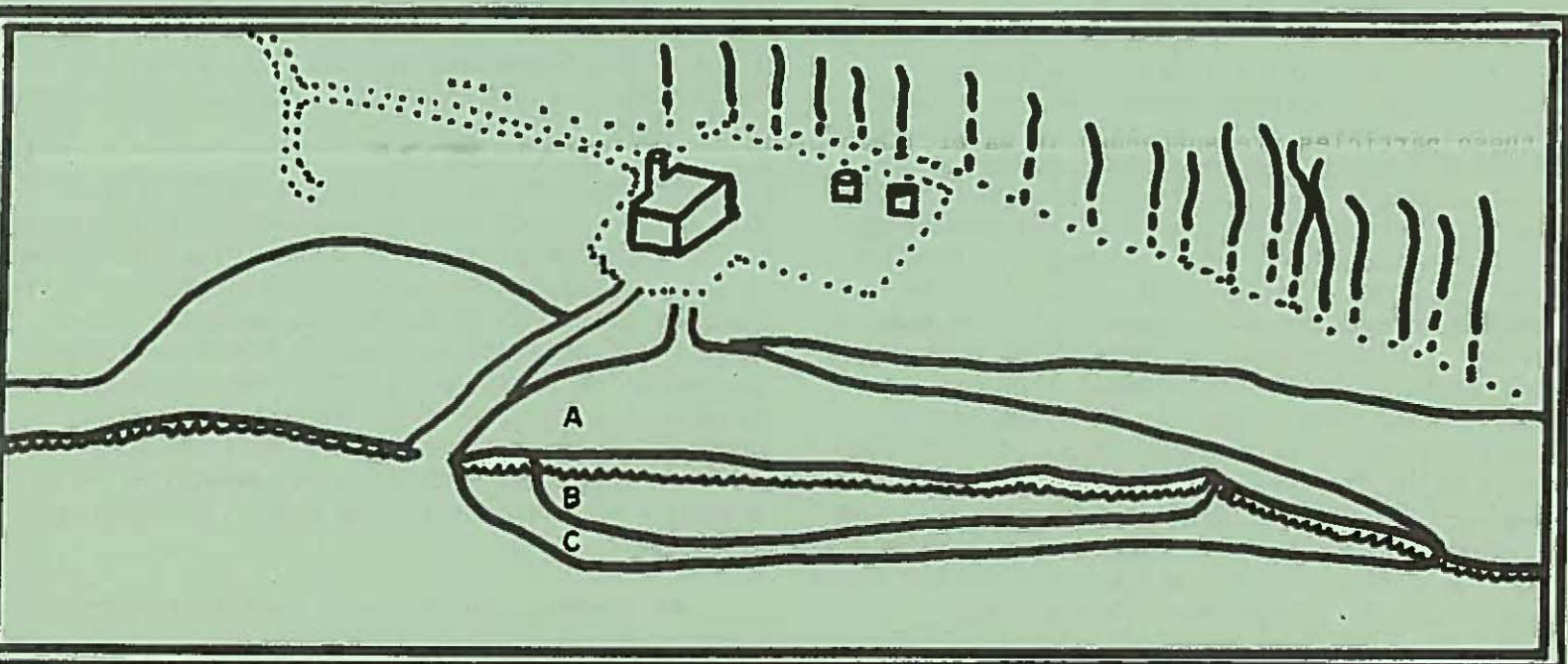
reef, suffocating all life as it oxidizes. It has been estimated that one litre of oil can use up all the oxygen in 400,000 litres of seawater (88,000 gallons).

Thermal Discharge

As mentioned in the previous newsletter, thermal discharge is the release of coolant water from power plants onto the reef. The water is returned to the sea approximately ten degrees hotter than when it went in. Thermal discharges are present at Piti, Cabras and Tanguisson power plants. In scientific field studies, it has been found that the discharge at Tanguisson on NCS Beach has the most destructive effects on a coral reef. A UOG Marine Lab study by Steve Neudecker (1976) has defined the extent of the damage. The kill zone (see illustration) is extensive and recolonization will not take place as long as the area is affected by waste heat.

Fishing the Reef

Besides its scientific and aesthetic value, the reef has recreational and economic importance as a fishing area. Since pre-contact times, the islander has fished the reefs. Today, there are fewer fish and fewer fisherman. Thus, the dwindling supply of fish is most aptly blamed on pollution rather than overfishing. Yet there are still regulations enforced by the Dept. of Agriculture's Division of Fish and Wildlife. Public Law 12-215 restricts the use of fishing nets with a stretched mesh of less than 1½ inch except for the catching of manahak, the local name for juvenile rabbit fish. Of more crucial importance in reef protection are laws against the use of explosives and poisons to harvest the reef. Dynamite and clorox totally devastate the reef and constitute of total lack of environmental awareness. Clorox kills every living organism, unlike the ancient practice of using plant poisons such as derris (*Derris eclipita* and *Derris trifoliata*) and puting (*Barringtonia asiatica*) which were used to stun fish in a localized area. The traditional preparation of fish poisons is no longer practiced.



The Limits of the Coral Kill at Tanguisson, 1974, A. Thermal influence on the reef flat where few corals existed. B. The core zone of the coral kill. C. The peripheral zone.

Shell Collecting

It is obvious to all who visit the sea-shore that the numbers of shells to be seen on the reef has drastically decreased in the last few years. The beauty and value of shells makes them a prime target for the collector's eye. The collecting of the rare triton shell, the major predator of the adult crown of thorns starfish, may be a factor in the population rise of these coral-eating animals that have devastated much of Guam's living reef. When shell collecting, the basic rule should be keep the dead, empty shells and return the live ones to the ecosystem. They constitute an important facet of the reef habitat.

Coral Harvesting

Another devastating practice that has necessitated legislation is the harvesting of live coral. People will remove coral from the reef for personal and commercial purposes. It can be cleaned and displayed as a curio or sold as souvenirs. Coral specimens are a favorite of tourists and sold in many gift shops on Guam. Public Law 12-186 states that it is unlawful to remove live coral from the shore outwards to a depth of ten fathoms (60 ft.). This still allows for the removal of deep-water precious corals and commercial harvesting within the nearshore area is possible with the acquisition of a license from the Director of Agriculture. There is a growing need for legislative revision pertaining to coral harvesting.

Artificial Reef Habitats

Artificial reefs have been made from old tires that are stacked in pyramids under the water. Discarded tires are one form of solid waste that cannot be recycled, does not biodegrade and produces pollution if burned. In this way, they can be put to good use. Algal growth soon covers the tires and the arrangement provides protection for small fish. Thus, wildlife preservation, increased fishing potential and extended resource use are in effect. Experiments with artificial reefs have been continuing on Guam for several years and the increased number of fish in these areas has been noted.

Undersea Parks?

There are only two places in the United States where coral reefs exist. These are Hawaii and southern Florida. National Undersea Parks have been established in both these states to encompass rich coral areas. Other undersea reserves or parks protect coral reefs in the U.S. Virgin Island and American Samoa. Local or state parks have also been created in Hawaii, Florida and Puerto Rico for protection and recreational use of coral reefs. However, none of these preserves and parks have the numbers of species and accessibility of Guam's reefs. Designation of a territorial undersea park in an area of Guam's coral reefs would stop fishing, shelling, coral harvesting or other exploitive uses of an area. The result would be an increase in the numbers of exploited species to be viewed by divers, scientists and passengers on glass-bottom boats. It would also serve as a resource for stocks of fish and other marine life to repopulate other areas.

PLANNING NOTES

AICUZ ON GUAM

The U.S. Navy has recognized the problems created by urban encroachment at military airfields. To ease the problem, they have developed the AICUZ Program of Air Installations Compatible Use Zones. Captain Robert A. Schade of ComNavMar addressed a meeting of the Coastal Zone Advisory Committee and explained the program. He has a color documentary film that should be of interest to the public and special interest groups. The two major problems that are considered in AICUZ plans are noise levels and potential accident zones. The delineation of hazardous zones suggests that low population density-oriented activities be encouraged in these mapped areas. The reduction of noise levels is especially pertinent to Coastal Management as airport sound zones are an area of particular concern. Noise levels can be incompatible with activities such as school and church services, become a source of displeasure in the home or business and upset wildlife as animal breeding can decline in a noisy environment. The Navy's efforts can involve a reduction of night takeoffs, acoustical enclosures for testing jet engines and adjustment of the approach and landing slopes over populated areas. This is important as the Naval Air Station is a necessity, especially if increased withdrawal from Asian facilities is affected. The AICUZ planning is a valuable asset in the maintenance of Coastal Management's federal consistency objective.

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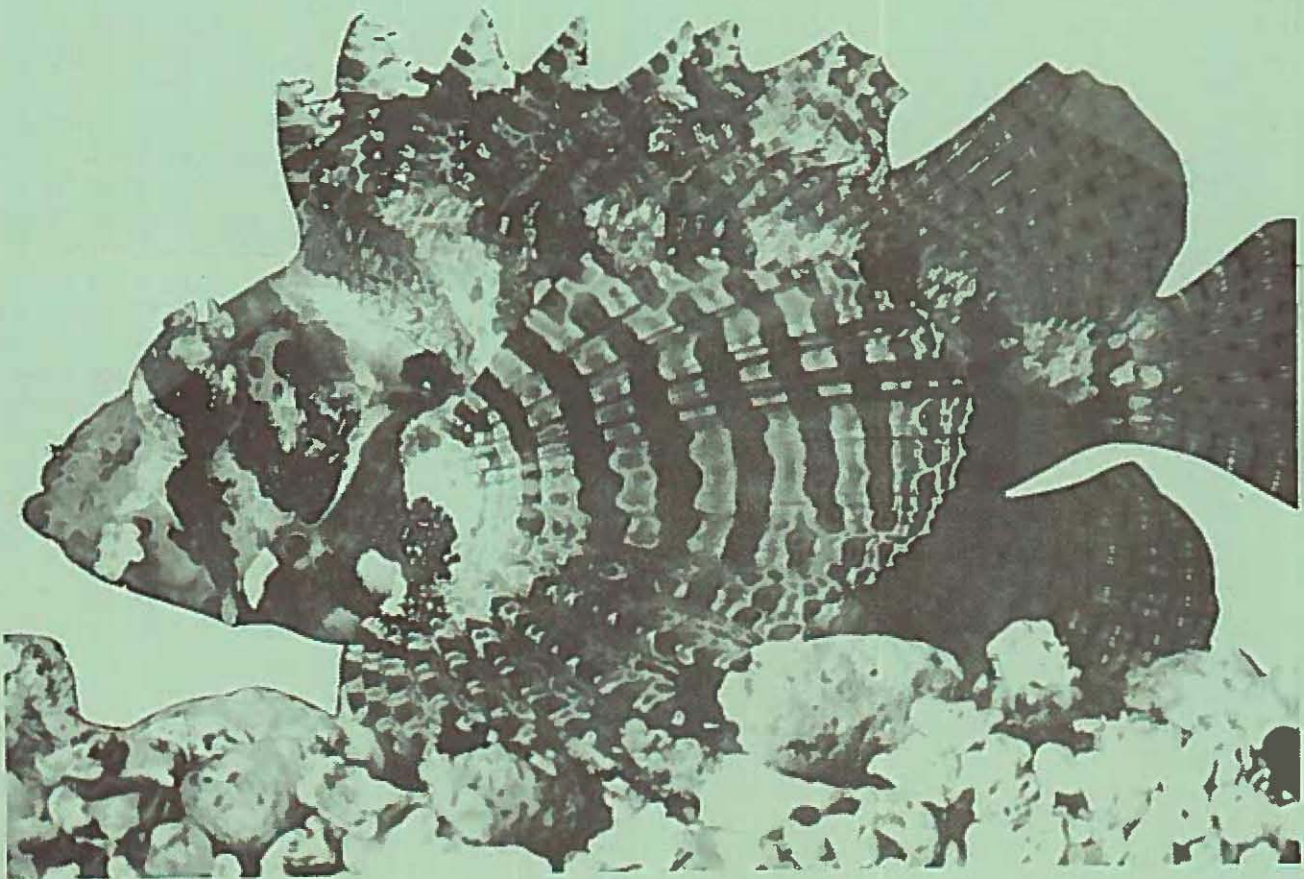
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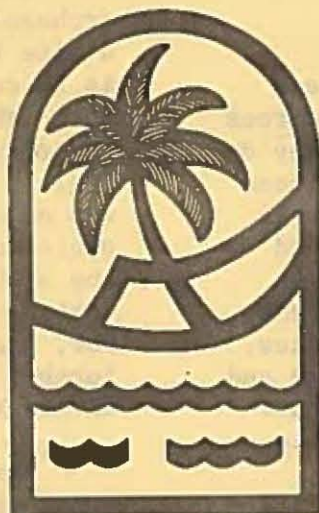


Coastal Management Section
Bureau of Planning
P. O. Box 2950
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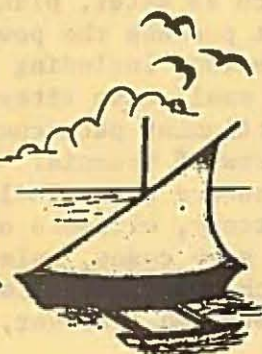
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Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agana, Guam, 96910

Vol. 2, No. 4
April, 1977

COASTAL MANAGEMENT AND HISTORICAL PRESERVATION

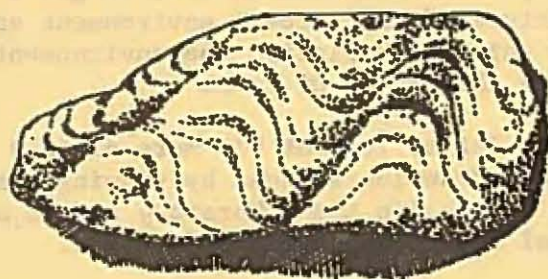
As the developmental needs of island residents expand at an ever-increasing pace, it is imperative that steps be taken to protect Guam's unique cultural heritage. Historical sites are natural libraries where man can enjoy history in its own setting. These areas are vital for scientific research and educational experience. Like an extinct plant that could have had a medicinal value, if a historical area is destroyed, its value is lost forever and future generations might only see it in a book. To contemplate the mysteries of archaeological sites or learn from the investigation of the past are vital activities that can only lead to increased awareness. Many untouched wildlife areas and existing parks have been the scene of fascinating historical events and lifestyle. Measures taken to protect valuable areas of archaeological and historical significance involve delineation of areas of particular concern by the Coastal Management Program and the plans and maintenance of the Department of Parks and Recreation. Public awareness of the importance of historical preservation is vital.

THE PRECONTACT CHAMORRO

It has been stated that Guam is one large archaeological site. Around 1500 BC, the precontact Chamorros migrated from the direction of islands in Southeast Asia and established multiple chiefdoms. In other words, the island was divided like slices of a pie and individual royal families, who traced their ancestry through a female line, ruled over the common people. The Chamorros flourished with an advanced fishing, horticultural and hunting technology. Sporadic warfare among chiefdoms added to the characteristics of the lifestyle. Much cultural reconstruction is speculative and based upon comparisons with similar chiefdoms on other Pacific islands and the analysis of remains such as artifacts and skeletons or area features such as latte stones or cliff shelters.

From archaeological evidence, it is estimated that the population grew to 80-100,000 members or relatively the same number of people as inhabit the island today. Some of the artifacts or evidence can be seen in the Guam Museum, located between the Spanish Governor's Palace and the Administration Building in Agana.

With rapid colonization, the population declined and a Chamorro Mestizo culture emerged. Many new customs and values were introduced from Spain, Mexico, the Philippines and other island groups. Major changes in technology took place with the introduction of steel. Ovens replaced underground firepits. Catholicism dominated beliefs in ancient spirits and new foods were introduced. There was a major shift from growing rice to growing corn. These changes happened so rapidly, that historical reports are scarce and brief. For this reason, the areas that contain fragments of the precontact culture are the only remaining link with this aspect of the island's rich heritage. To destroy historical sites further isolates us from the mysteries of the past. The Department of Parks and Recreation has developed the Historical Preservation Plan. The data contained in this plan was gathered by both visiting and resident staff archaeologists. The data presented is vital to the Coastal Management Program's delineation of these areas. In this issue of our newsletter, Dr. Sam Price, a Professor of Anthropology at the University of Guam elaborates further upon the archaeologist's role in historical preservation.



ARCHAEOLOGY

By Dr. Sam Price

The archaeological remains of Guam are valuable resources, but unlike other resources such as water, plants or the seashore, they do not possess the power of regeneration. These remains, including large latte sites as well as small cave sites, exhibit technology and settlement patterns characteristic of many parts of Oceania. Characteristically, these resource areas include stone and shell adzes, pottery, evidence of a sedentary lifestyle and, in some cases, relatively dense populations. Archaeological sites and their remains once destroyed, however, are gone forever!

There has been little long-term, systematic research into Guam's vast prehistoric record, and only limited information about ancient Chamorro society and culture exists. For many people, archaeology and archaeologists are just as much a mystery as Guam prehistory. For these reasons, let us examine what archaeology is and how archaeologists work in this issue of I Tano Yan I Tasi.

What is Archaeology?

The word "archaeology" is actually composed of two different Greek words: archaios or ancient and logia or the study of, which taken together give the meaning, "the study of the ancient." In fact, archaeology can be considered to be the anthropology of ancient people, and in many respects it is exactly that.

Archaeology is one part of anthropology, the larger, overall view of mankind. It occupies a very special position in the scheme of anthropology primarily because archaeologists have taken on the monumental task of interpreting most of man's history on earth. Archaeologists are well aware of the vast amount of time involved and have divided their approaches according to two variables: the written and unwritten record. Historical archaeology is most concerned with man's recent history and is aided by written records. The excavation of a Spanish fort on Guam would fall within the period of Guam's written past. Prehistoric archaeology, on the other hand, focuses upon the unwritten part of mankind's life on earth and prehistoric archaeologists must rely on evidence preserved in the ground.

What Archaeologists Do

Today's archaeologist must be knowledgeable about geology, botany, zoology and a host of complicated mapping and excavating techniques. The soil (geology) houses the remains of the past, which not only include artifacts of human origin, but also the remains of plants (botany) and animals (zoology) that may indicate the diet of prehistoric man. By combining these natural sciences, archaeologists are able to get a rather good picture of man's total environment and the ways in which he exploited the environment in supplying the basics of life.

But, let us look at it more closely at what the archaeologist does by viewing him at work on a site, in the laboratory and in writing the final report about his excavation.

Two of the initial tasks facing the archaeologist after he has determined that a site has been located and is worth excavating is to completely photograph and map the site. After the photographic work, mapping can utilize existing maps such as those from the U.S. Geological Survey or it could mean making a field map and later locating the site on a more complete topographical sheet. By mapping the site the archaeologist makes it possible for future workers to find the exact location of the site. For, once the site is completely excavated, no further record will be available. This is the first step in preserving archaeological data.

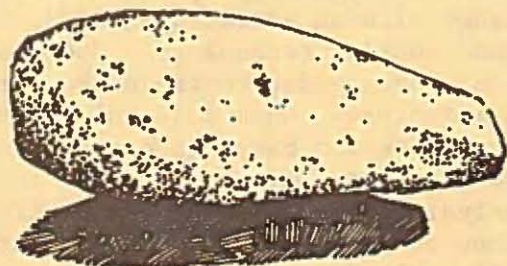
Next, the site is excavated, with every artifact and feature (firepit, latte stones, or other unmovable feature) located on the field maps as to the depth and distance from established control points. Removable artifacts are placed in a container bearing a special number that allows for inventory control.

As the layers of soil are carefully removed, one by one, a vertical record of the site's built-up debris appears. While the archaeologist completes many test pits and trenches, he draws profile maps of the soil deposits and also maps of the artifacts locating their relationship to one another. All of this field data, maps and artifacts, are then analyzed in the laboratory.

It is in the laboratory that a complete analysis of all artifacts is undertaken. Bits and pieces of bone, stone, shell and pottery must be cleaned as they are brought from the field to the laboratory. After proper cleaning and careful handling, the archaeologist begins the long and laborious task of assessing the prehistoric material he has gathered.

Some of the specimens will be radiocarbon dated in a physicist's laboratory and other artifacts will be examined by their respective experts. The archaeologist will utilize this varied expertise in compiling the final report or cultural reconstruction.

The final report is a complete statement as possible based upon the data recovered from the excavation and other available information. Any reader will find that the final report contains a description of the site and its artifacts as well as photographs and drawings. The final report must describe label and identify the material cultural remains from the site as well as other pertinent data such as mentioned earlier (from geology, botany, zoology). In this way, the archaeologist has preserved for all time the material he or she has removed from the ground and offers a view of prehistoric lifestyles long since passed.



During the Spanish Colonial Period, from 1521-1899, new styles of architecture appeared on Guam. Due to WWII and the effects of time, many original Spanish structures were destroyed and only remnants remain. These also need to be protected as a facet of the island's heritage. They include the remnants of Fort Apugan and Fort Soledad, the Spanish Governor's Palace and Spanish bridges. The bridges, constructed of hand-hewn stones, are seen in Agana, Nimitz Beach and Sella Bay.

World War II, which added to the disappearance of many structures, left its own unique relics that now have historical value. Especially tourists, are fascinated with the War in the Pacific. Massive artillery, tanks and important battle sites and command posts add another link in the chain of events that lead to the present.

Presently, many people value the traditional architecture of southern villages and desire to retain their present appearance. Though, this adds to the scenic character of the island, some homeowners wish to improve their property with modern technology. The Department of Parks and Recreation has developed a plan for Inarajan Village that could alleviate some of the problems. In their plan, the village proper could retain its appearance and homeowners would receive federal assistance in home improvements. Specific guidelines would suggest improvement measures that would preserve the existing 'flavor of the area. As with the Bureau of Planning's community design plans, the acceptance is the choice of the area residents themselves. The Bureau of Planning has closely coordinated the Inarajan Historical Plan with the Inarajan Community Design Plan and input from the public has been gained in initial meetings.

THE HISTORICAL SIGNIFICANCE OF INARAJAN

The Inarajan Historical Plan, developed by the Department of Parks and Recreation contains an in-depth description of the historical significance of Inarajan Village Proper. Some of the historical importance that is described in their plan is:

The Inarajan Historic Architectural District is comprised of sixty-six significant structures. Of these, eighteen date from 1901 to 1925. Another thirteen are pre-WWII. Another thirty-five are sympathetic in character and were built shortly after the end of the war. The village as a whole represents the urban and architectural scale that was once common on the island.

The type of architecture is residential in scale and character. The building style is a blend of the elevated older tropical structures of the 18th and 19th century with the everchanging building methods and materials available on the island.

The most history-wrought structure in the village is the Agustin M. San Nicolas home. Built in 1918, the structure is two stories high. Both structures are constructed of manposteria. The interior framing and flooring is of hardwood ifil. This building has a very cruel history during WWII.

The Marian Leon Guerrero house was built in 1901 and is one of the two oldest structures in the district. The building is almost entirely in its original condition. It is one of the three dwellings with the original steeply-peaked roofs dating in design from the 18th and 19th century.

The focal point of the village is St. Joseph's Church. The church, badly damaged in WWII, was immediately restored and has not been appreciably altered since. The town hall is prewar construction and in scale and character with the residences.

The repetitive materials, colors and spaces between the houses and church tend to draw the village together and creates an identifiable urban and architectural character unique to Guam. Inarajan's historic district is the last remaining concentration of this character and building style.

COMMUNITY DESIGN PLANNING

The specific planning of the Inarajan Historical District is one factor used in the broader planning of land-use areas within the entire community area. Community design plans are one element of the Comprehensive Development Master Plan being compiled by the Bureau of Planning.

Community design plans primarily bring different land uses, within an area of human settlement, into a composite plan. As communities, these are areas where residents have continued social interaction, a strong identification with the area and reside within a specific geographic location. The community formation that is depicted on the design maps is projected more importantly by historic, current and proposed area land uses rather than existing municipality lines. For example, separate municipalities such as Agat and Santa Rita are both within one community design area. Their close proximity and similar adjacent land-uses necessitates a cohesive plan. Another example is that Baza Garden's infrastructure, identity formation and land proximity is more associated with Talofoto than Yona despite its legal jurisdiction within the Yona district.

The land uses projected on design plans are presented as a logical progression of developmental needs and preservation requirements to fit the unique resources and expansion needs within an area. Population projections are a dominant factor in the consideration of land-use delineations.

Existing land uses and analysis of their environmental and economic value are also considered in the planning process. Previous planning efforts and ongoing specific area plans of different agencies are all important to community design planning. In addition, ongoing research by the Coastal Management Program has delineated areas of particular concern. These are areas of a fragile nature with resources of high aesthetic, scientific, historical or economic value. In a community design plan, areas such as the seashore and wetlands are delineated as types of conservation land-use areas and adjacent land uses are planned for compatibility with the efforts to preserve these extremely valuable and sensitive areas.

Community design plans for Umatac, Tamuning, Inarajan, Talofofo, Yona and Agat-Santa Rita are the latest to be presented in initial public meetings. They are constantly being modified in response to public input and can be viewed in the Office of the Bureau of Planning. The following description of Talofofo illustrates how the unique character of a community area affects land-use area planning.

TALOFOFO

A unique variety of terrain features and land uses characterizes the Talofofo area. The village proper retains a traditional island atmosphere, but houses are rather equally subdivided as the community evolved from a Japanese wartime civilian encampment to a post-war settlement. Today, the village proper is a slow-growing urban community. The same basic process of rapid urban community development, not a result of terrain restrictions, is also responsible for Baza Gardens in this community design area. Land development enterprise of lot subdivision has initiated the emergence of a new community and now expansion has arrived at a pace that is comparable to a slowly increasing demand for an urban lifestyle.



Both Talofofo Village Proper and Baza Gardens are off the main route of traffic and retain a cohesive pattern or urban living as coastal areas are the areas for the natural spread of rural growth. The shoreline areas and cliff-lines of the coastal area are a resource of aesthetic and ecological importance--an area of particular concern. When preserved, they economically enhance the tourist potential of the entire island as visitors come to experience scenic vistas. The value of natural communities at the shore and in forested cliff-lines should be preserved for wildlife preservation and nature observation. For this reason, the present low density land use of the rural community between these areas is kept at its present state.

Talofofo Bay is a favorite surfing location and has a nice park for picnicking and relaxation. Hiking over savannah terrain into the ravine forest and Tarzan Falls is a favorite recreational pastime in the area. The tourist potential of the cave of Japanese straggler, Shoichi Yokoi, has yet to be realized. Especially, Japanese tourists are fascinated by the life of a man who hid in the jungles for 28 years.

Perhaps the greatest potential economic base, in the area, are the large expanses of fertile farmland that exist at the village's backdoor into the interior basin between the southern hills. With good topsoil and relatively flat terrain, agricultural development is possible if deemed economically feasible or if self-sufficiency in produce becomes an island objective.

The surface drainage area within the interior hills, west of the agricultural lands, could provide the vital ingredient to farming endeavors.

Waters from a proposed reservoir site on the Talofofo River could supply adjacent prime agricultural land.

A more intensified agricultural use with performance standards could exist within the community without an adverse affect upon a wetland area of particular concern. The lower Talofofo River Valley forms a natural flood-plain and aquatic plant and animal life form a natural community near the river's opening into the sea. A past use of aquaculture development, however, has proven compatible with the adjacent ecosystem. If environmentally sensitive performance standards are met, a future potential for aquaculture development could add to the agricultural growth within the Talofofo area.

TALOFOFO COMMUNITY DESIGN

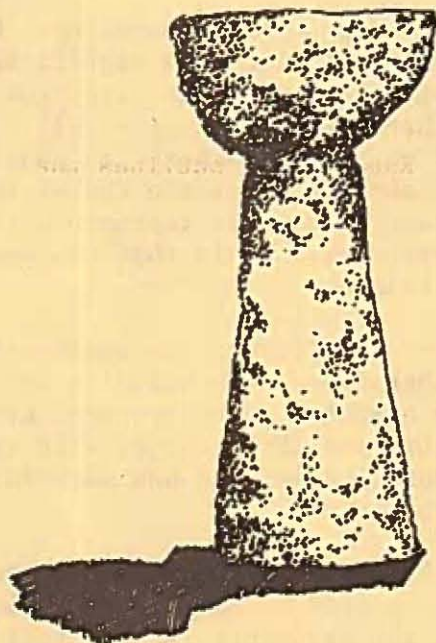
If one were to view the map of Talofofo Community Design, the following land-use area designations would be seen:

The Talofofo community area extends along the southeast coast from the Talofofo River to the Ylig River and inland to include the savannah, slopes, the southern interior basin and central developed areas along the Cross-Island Road. The Cross-Island Road or Route 7 includes Baza Gardens, Windward Hills and the Country Club of the Pacific.

In the plan, Talofofo Village Proper is designated as urban with a commercial block in the center of the village. Baza Gardens residential area and adjacent land is also an urban land-use area. Expansive rural areas include Windward Hills, lands adjacent to Route 7 and extends along the landward side of the entire length of Route 4 through the community area.

The entire seaward site of Route 4 is designated as a conservation, open-space recreational land-use area.

The Talofofo Elementary, Notre Dame Academy, village churches, a proposed school site for Baza Gardens and Seventh-Day Adventist Academy on Route 7 are all designated as public use areas. A proposed commercial area, adjacent to Baza Gardens is also delineated.



land are outlined within the interior basin between hilly terrain. A proposed watershed, inland of the proposed Talofofo River reservoir is delineated as a water resource conservation area.

PLANNING NOTES

Pristine Ecological Surveys

The Coastal Management Program is contracting consultants to survey pristine ecological communities on Guam. Pristine areas are those that contain a high incidence of endangered and threatened species. These are species of plants and animals whose numbers have been reduced to a critical level and are in immediate danger of extinction or becoming more endangered. Pristine areas are of a fragile nature such that any land use beyond intensive conservation would destroy their character. Primarily, they are the most untouched representatives of specific areas known as the limestone forest, ravine forest, savannah, coastal strand and wetlands. These areas are of utmost importance for scientific investigation.

An inventory of pristine marine ecological communities will be of similar scope as the survey of land areas. Various off-shore areas will be the subject of the survey. They include areas described in past issues of the newsletter as the fringing reef, barrier reef, estuaries and mangrove communities. The areas will be delineated on maps and the geographic and ecological significance will be outlined in the final reports.

Included in both land and marine surveys will be lists of species and recommended performance standards for each specific area. These studies will further Coastal Management's efforts to delineate areas of particular concern.

Federal Visit

Federal officials from the Office of Coastal Zone Management in Washington, D.C. visited Guam this past month. They were shown various areas of particular concern on Guam. Their visit was for the purpose of evaluating the local Coastal Management Program's development in relation to the unique requirements of planning in an island environment.

Clean Water Report

The Guam Environmental Protection Agency has a new and interesting newsletter called the Clean Water Report. It outlines the objectives of the 208 Areawide Wastewater Treatment Plan and discusses the major aspects of the ongoing planning process. All persons interested in cleaner water on Guam should request to be on their mailing list. For copies write: 208 Program, Guam Environmental Protection Agency, Box 2999, Agana, Guam 96911

Study of Coral, Shell and Algae Harvesting

In order to promote the best long-range use of resources, other than fish, within the reef flat area, a short study is being produced for the Coastal Management Program. It will analyze the most important species of corals, shells and algae that are being harvested from Guam's reefs, estimate the amounts being harvested, assess the impacts of harvesting and determine which species need protection. The

related to the harvesting of reef organisms.

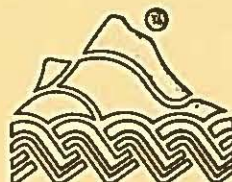
The Seashore Park Plan

In addition to a specific area plan for Inarajan's historical village, the Department of Parks and Recreation is developing a Seashore Park Plan which encompasses a significant portion of the southern areas of Umatac, Merizo and Inarajan. The plan is conservation-oriented, but recognizes the developmental needs of the area. As with the Coastal Management Program, they seek a balance by delineating various types of land-use within the area. For this reason, they are working closely with the Bureau of Planning so that the land-use districting and community design plans will be compatible with the Seashore Park Plan. The major objectives of the plan involve:

1. Conservation of significant geological, ecological and scenic landscape features along with open-space. These natural features include volcanic uplands, interior basins, coastal lowlands and valley floors. Coral reefs are also included as natural areas that should be protected for scientific study and nature observation.
2. Conservation of significant historical features. Numerous historical features of significance, dating from prehistoric times through WWII, are found in these areas.
3. Provision of opportunities for outdoor recreation. Guam's growing population plus the visitors to the island necessitates that this outdoor resource be utilized.
4. Insurance that certain resources are available for the long-term use of the island's residents. Resources such as the water supply are critically important to Guam's growing population and economy.
5. Insurance that an opportunity exists for area residents to live a lifestyle associated with southern Guam and allow for the expansion of the present communities.
6. Provision of economic benefits for this region of Guam. This region of Guam should be able to contribute and share in the prosperity with the rest of Guam.

Aquaculture Study

The Coastal Management Program has agreed to fund a study of aquaculture on Guam. It will assess the potential, resource use and the impacts on lands and water adjacent to aquaculture development. The study will also list species suitable for aquaculture on Guam, describe the structures, infrastructure and resources needed to raise the species and discuss methods for minimizing negative impacts, particularly those related to effluent disposal. Maps will be produced showing areas of existing aquaculture developments and general areas with potential for aquaculture development.



Coastal Management Program
Bureau of Planning
P. O. Box 2950
Agana, Guam 96910



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Bureau of Planning, Office of Coastal Zone Management

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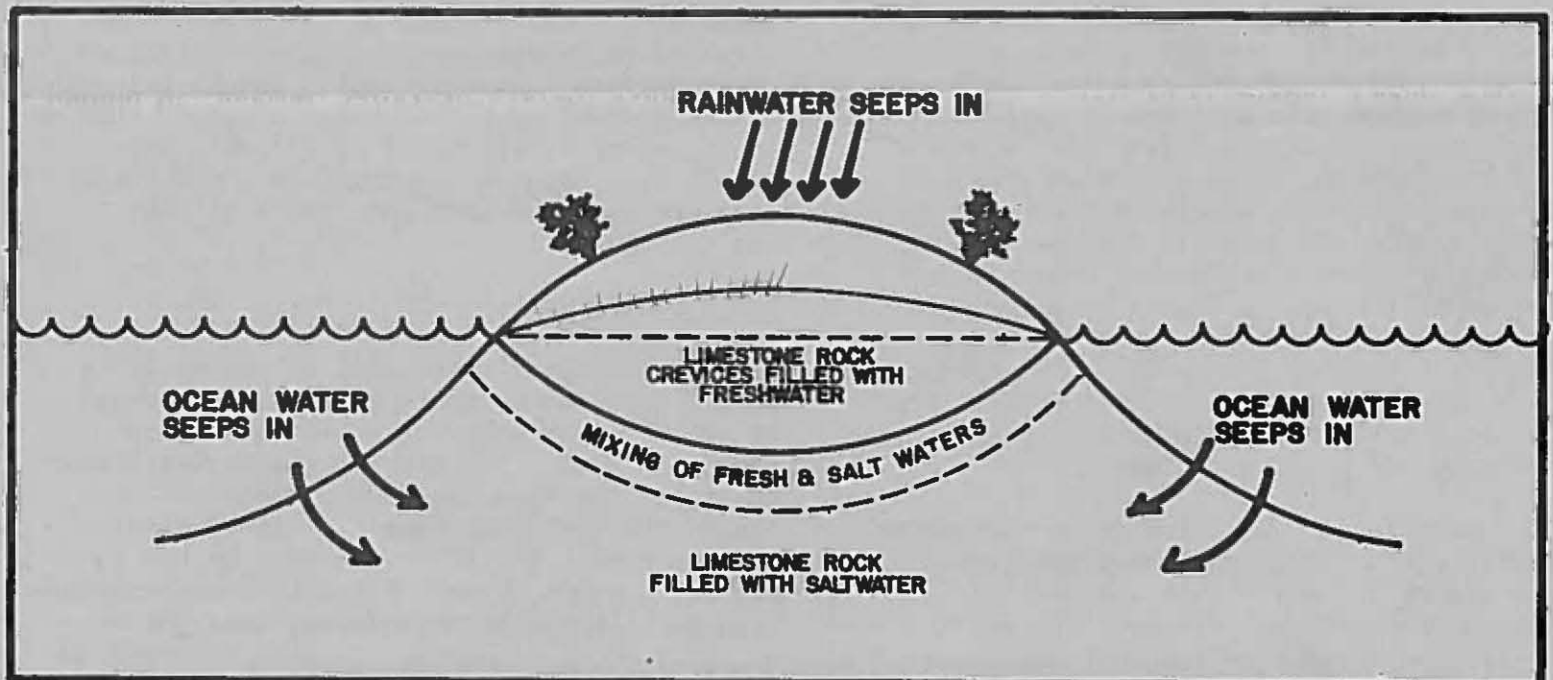
WATER RESOURCE PLANNING

Like the air we breathe and the food we consume, water is a basic need of man. Because it is so easy to turn on the tap or visit the seashore to experience an abundance of water, its quantity and quality are often taken for granted. In actuality, however, water resources on Guam are one of our most fragile, valuable and limited resources. Pollution threatens both fresh and marine waters and the size of Guam gives us a limited supply of freshwater. For these reasons, certain water resources have been delineated as areas of particular concern in the Bureau of Planning's Land-Use Element of the Comprehensive Development Plan. The Bureau is fortunate that there are other agencies that assist in the many-faceted and continuous job of bringing residents clean water to drink and maintaining water quality for household, commercial, agricultural and recreational needs as well as for wildlife habitats. This issue of the newsletter seeks to outline the nature of our water resources and the role of various governmental interests in water resource use. We can begin by classifying Guam's water into three types--groundwater, surface water and marine waters.

The Underground Aquifer

The bulk of the water supply on Guam is encapsulized and limited in the form of the underground lens or aquifer. A layer of freshwater floats upon saltwater and provides a supply of water necessary for survival. This underground source lies beneath Northern Guam and provides for the freshwater needs of 90% of the island's population. The lens is unseen and despite current studies, there is some difference in opinion as to whether it contains enough water to meet the demands of a rising population. It is still a theory that the bubble of freshwater is lighter than the saltwater upon which it floats, however, ongoing research continues to define the nature of this occurrence.

The aquifer exists in Northern Guam because this half of the island is composed of raised limestone that can hold water. The limestone is composed of the coral remains of an ancient reef that was gradually raised from the sea over time. Coral is highly porous and rainwater quickly soaks through and recharges the underground lens. When the dry season occurs, the size of the lens is reduced and the danger of saltwater intrusion is greater. Between the layer of freshwater and saltwater is a transition zone of mixed fresh and saltwater. In May, 1975, there was an extremely dry season and it was feared that the size of the lens was below normal. The public was urged to conserve water by limiting car washing and lawn watering until a time of adequate replenishment.



Sinkholes

The groundwater resources of Northern Guam are concentrated in three main areas or theoretically separate aquifers. The northernmost area is beneath Yigo and Dededo. Sinkholes are common throughout this area. These are depressions, up to 75 feet deep, where water has eroded the limestone over time. They serve as drainage systems for localized areas. Infiltration of water around sinkholes is so rapid that water is directly recharged into the lens. Thus, even a partial cleansing process is not in effect and pollution can be a particularly threatening problem if open space is not maintained around these areas. If development surrounds natural sinks, added costs are needed to divert drainage to other areas for normal infiltration.

Rainwater Recharge

The northern limestone plateau is interrupted by exposed volcanic areas at Mt. Santa Rosa and Mataguac Hill in Yigo. The volcanic base rock is relatively impermeable or will not hold much water. However, it is important as a surface for rainwater recharge into the surrounding lens system. In the central area of the three aquifers, Barrigada Hill is composed of raised limestone with a volcanic base. Thus, it interrupts the surrounding Barrigada lens, but is important as far as providing a sloped surface for replenishment of the underground supply by rainwater runoff.

Land-Use and Aquifer Recharge

Because of the natural process of rainwater recharge and the associated problems of development, land directly over the lens is designated for conservation use in land-use planning and community design. Currently, a rural residential density exists over the Yigo-Dededo lens, however, a conservation delineation recommends that the present density remain stable or decrease as other land areas are better suited for urban growth in relation to water resources.

Ponding Basins and Dry Wells

Ponding basins at the base of the Barrigada Heights housing development necessarily assist in recharging the aquifer as surface covering of the land, by roads and homes, causes rainwater runoff to be more rapid than would occur over open-space or natural terrain. Ponding basins are also necessary in other developed areas so that water than would normally be diverted into sewage or stormwater systems would be returned to the lens. In the Latte Heights subdivision, four basins that serve 266 homes can be seen. In other areas over the lens, such as NCS housing, natural terrain contours and composition do not necessitate the need for ponding basins.

Another method of assisting the natural recharge of underground water supplies is the use of dry wells that are drilled through the land surface over the aquifer. A system of dry wells returns stormwater

from the AAFB runways directly into the lens. The Air Force conducts a water monitoring program, however, it is yet to be determined if direct injection of wastewater has adverse effects upon water quality.

Interior Basins

The underground water resources beneath the Chalan Pago-Ordot area are of lesser capacity than the more northern lens areas. However, they are more central and less apt to be threatened by saltwater intrusion. For this reason, they are also importantly protected from too much development over recharge areas. Central Guam is geologically characterized as a transition from the northern limestone plateau to the volcanic uplands of Southern Guam. Rainwater drains from the sloping terrain into low-lying interior basins that intersect the Chalan Pago-Ordot area. These basins appear as grassy fields that are periodically flooded during the rainy season. Conservation of these areas is crucial for the protection of our water supply. They are delineated on community design maps for this reason.

Springs, Seeps and Wetlands

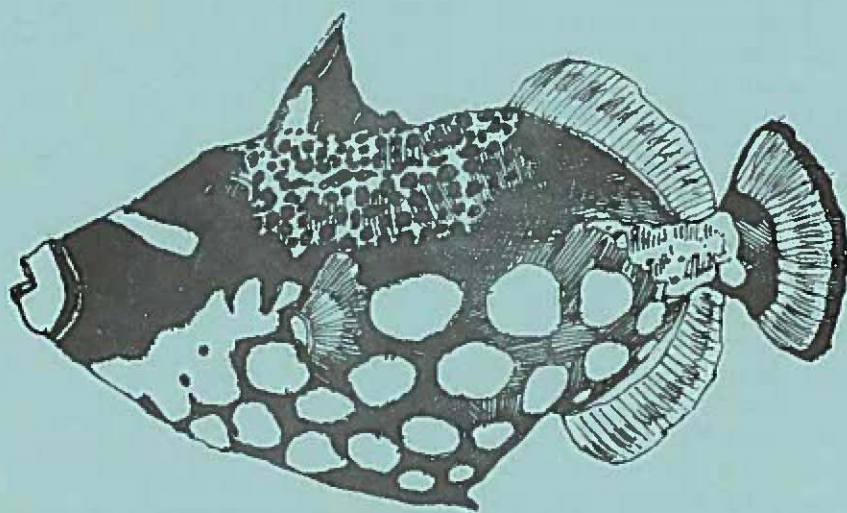
Northwest of Chalan Pago-Ordot, Agana Springs discharges freshwater at the surface along the edge of the aquifer. The amount of flow varies depending upon whether it is the wet or dry season. The water disperses over a floodplain known as Agana Swamp and supports an important wetland wildlife habitat. Agana Springs represents the northernmost wetland. Other wetland areas are the result of surface drainage systems in southern areas. Some of the water from Agana Swamp flows into the sea while some returns to the ground and maintains a balanced aquifer recharge along the transition zone. The only other areas where water naturally emerges from the underground supplies in the north are seen in the form of freshwater seeps that come from the rocks along the northwest and northeast coastlines of the island. Freshwater seeps can be seen along NCS, Uruno and Ritidian Beaches, and Janum Point.

Southern Limestone Terraces

Along the southeast coast, limestone terraces border the inland volcanic terrain. This uplifted, porous rock has a base of volcanic rock. This area is known as a para-basal water area because water is thought to soak through the limestone and rest in pockets on the underlying basaltic rock. Though this area is theoretical in scope, usage suggests that it is an important source of developable water. Currently, golf courses maintain small wells that are used for lawn watering and other limited uses.

The Northern Wells

The drinking water that we use daily is pumped from the northern lens system through 60 wells operated by the Public Utilities Agency of Guam. The Air Force operates 8 deep wells and the Navy has four. Estimates have placed the available supply at 40-50 million gallons a day, which is more than enough to satisfy current needs. Present island consumption is 15 mgd with a projected increase of 2 mgd per year. However, because the lens is



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Bureau of Planning
P.O. Box 2950
Agana, Guam 96910

The Importance of Water

The importance of our water is seen in basic uses such as human consumption, industrial production, agricultural irrigation and recreation. As an essential need of mankind, water is also a critical need of wildlife that inhabits the island. It provides the primary link and differentiation between diverse communities of plants and animals. The coral reef relies upon clean marine waters, while wetlands thrive off of the dispersal of freshwater over a coastal floodplain. The savannah grasslands have adapted to rapid surface runoff. Whether aquatic or terrestrial, life can not exist without water and the quality of water directly affects the quality of life.

PLANNING NOTES

Coastal Management Reviews Orote Point Ammunition Pier EIS

The U.S. Navy is asking Congress for funds to build a new ammunition wharf at Orote Island at the mouth of Apra Harbor. The draft Environmental Impact Statement points out that proposed construction will build a bridge to Orote Island and level half of the island while filling in much of the adjacent reef flat and dredging about 800,000 cubic yards of reef to produce a 45' deep anchorage area.

It was fortunate that the original proposed location at Sella Bay was halted through legislative action because of the history, ecology, and astounding pristine beauty of the area. These resources make it a favorite of both residents and the economically important tourist. The new location at Orote Point is unfortunately another relatively pristine area. However, an ammo wharf is a necessity and must be placed away from coastal development because of the hazard zone associated with ammo handling. Other alternatives such as Tarague Beach are also relatively untouched areas. The rationale for the Orote Point area is that it is the most economically feasible and the area is inaccessible for recreation. After it is completed and the hazard zone is established, it will be forever inaccessible.

As with most needed coastal development, a compromise with environmental quality is made. The EIS points out that the historical Spanish steps and well in the area will not be greatly affected. The beauty of Orote Island, however, will be sacrificed and subsequently, the wildlife that find refuge from man and animal predators, on Orote Island, could also be sacrificed.

The EIS states: "It is the Navy's intent that the siting of the proposed facilities be "consistent to the maximum extent practicable" with the final approved Guam Coastal Management Plan." We have reviewed the EIS and found the siting to be a feasible location and suggest prompt implementation to relieve the hazardous conditions that currently exist with ammo handling at Hotel Wharf, and in compliance with the proposed expansion of Cabras Island facilities. Minor inconsistencies were pointed out in the review, with the exception of the major absence of a complete discussion of the wildlife on Orote Island that will be affected by the disturbances that are associated with development.

Orote Island is a nesting and roosting area for endangered and threatened brown boobies and noddy terns. The large population of recreational and subsistence fishermen who troll for offshore fish, such as billfish and tuna, depend almost exclusively on these birds as a means of locating schools of fish. Proposed commercial tuna fishing industry would also depend heavily upon these flocks of birds. A decline in fishing would have secondary impacts on commercial businesses that provide fishing gear, boats, repairs and recreational supplies as well as a decline in the market of fresh fish and utility of boat basins. Orote Island is Guam's only nesting site of the brown booby, a large seabird, and it is suggested that careful monitoring of wildlife be implemented along with measures to prevent the disturbance of these species.

Energy Report Submitted

A report entitled, Future Power Production and Transmission Alternative Plans, Guam, U.S.A., has been presented to the Coastal Management Section by contractual consultants of Walter F. Pinckert and Associates. The study provides an initial collection of data to assist in the delineation of energy development areas of particular concern. It will also compliment the Coastal Energy Impact Program, as a facet of the Coastal Management Program that is currently in a formulary stage and may eventually be implemented on Guam.

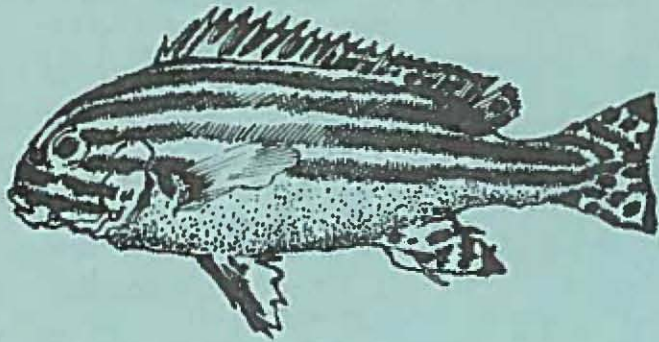
Based upon population projections, the study estimated future power needs. These estimates provide a basis for discussion of future problems in energy development and alternative systems that could prove feasible. Of primary importance are the impacts of energy development upon land and water resources. It is inevitable that increased power facilities, from major plants to transmission lines will be needed. It is important that these facilities are planned to maximize the economic benefit while minimizing interference with scenic views and fragile environmental resources. Included in the study are maps of expected areas of use for power plants, refineries, fuel storage, pipelines and major transmission lines. The data incorporates both GPA's plans and the consultant's research findings. The report can be viewed in the Bureau of Planning's Office, 4th Floor, PDN Bldg., Agana.

Division of Fish and Wildlife Name Change

The Division of Fish and Wildlife, within the Department of Agriculture, has changed its name to the Division of Aquatic and Wildlife Resources to reflect the fact that protection of aquatic life encompasses a diversity of animals other than just fish. During GEPA's Environmental Tour, Wildlife Biologist Ron Strong pointed out that a main goal of the Division is to minimize impacts upon wildlife habitats. This objective involves enforcement of regulations, management of conservation areas and the delineation of critical habitats for endangered and threatened species of wildlife. A critical habitat is the natural area where a particular animal finds the specific requirements for survival such as food, shelter and protection from predators. The critical habitat for most birds are around the northern clifflines, the fringes of Fena Reservoir, Orote Point and Cocos Island. The ironwood trees on Cocos Island are the nesting site for white fairy terns. Ron Strong also points out that many critical habitats are on federal properties which is perhaps a blessing in disguise because entry restrictions reduce hunting and development and leave animals in a more pristine environment.

planning program to be completed by July, 1978, is the identification of pollution problems. This involves both non-point sources, as previously discussed, and point sources of pollution. Point sources are places where pollutants are directly discharged into water through pipes or drains. These are the highly visible areas such as sewage outfalls and storm drains.

A most important aspect of the 208 Program is the establishment of performance standards for water resource use. These standards will be incorporated into the Land-Use Element of the Comprehensive Development Plan and will provide a base for enforcement and decision-making by both private developers and government agencies.



Marine Waters

Until recently, the ocean has been considered a limitless and no-cost dumping ground for developmental and domestic wastes. Economically, it has been a free ride for commercial and residential areas to discharge sewage or divert stormwater into the ocean. Much of this wastewater receives treatment, however some of it does not. The average daily flow of untreated sewage at the Marbo outfall on the northeast coast, is .35 mgd. The flow increases 1.3 times during the wet season. 2.21 mgd flows from two outfalls on AAFB during the dry season. Because marine waters are important for a number of reasons and the environmental costs of pollution are high, GEPA has classified marine waters as A and AA.

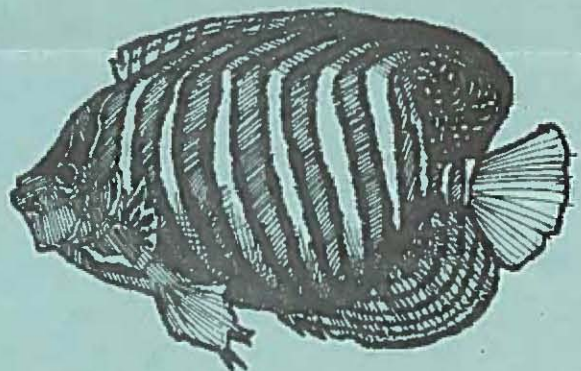
A is defined as: "waters used for recreation (including swimming, surfing, skin and SCUBA diving, skiing and other sports), aesthetic enjoyment, propagation of aquatic and associated wildlife, commercial, industrial and navigational uses. It is the objective that discharges of any pollutant be controlled to the degree necessary to protect the waters for their specified uses. This category allows the discharges of certain wastes if they are first treated to protect the water for the uses described above."

AA is defined as: "waters used for marine research, propagation of aquatic life (particularly coral reef organisms), conservation of wilderness areas, aesthetic enjoyment, and such uses as do not impair the other established uses. This category of waters should remain free from pollution attributed to domestic, commercial, industrial, agricultural or construction discharges. No discharge of pollutants is permitted. In such areas where there are existing recreational facilities, these uses are permitted so long as their pollution impacts are controlled."

New Legislation and Agreements

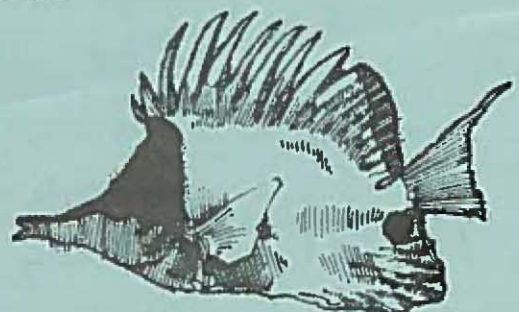
Recently, GEPA has drafted and submitted for legislative and executive approval, the Guam Safe Drinking Water Act. If passed, this bill will publicly declare that water supplies should be kept free of contamination in order to protect human health and safety to the greatest degree practicable. It outlines GEPA's authority to maintain federal water quality standards. This includes agency activities such as coordinated planning, monitoring problem areas, research, data collection, permit issuance and enforcement regulation. The Bureau of Planning has reviewed the act and found its content and provisions to be consistent with their planning efforts.

As federal consistency in land-use planning coordinates local programs with those for federal properties, the 208 Program also seeks to insure that all Guam's waters are clean. Sources of pollution, originating from military installations, must be eliminated along with the many problems on locally-owned properties. As an initial step in assuring islandwide effectiveness, the 208 Program has recently drafted and submitted for review a memorandum of understanding between GEPA and the U.S. Naval Forces Marianas. The memorandum outlines the responsibility of both parties in enacting the federal Water Pollution Control Act of 1972. In effect, it gives GEPA the authority to plan and manage water quality on federal properties in addition to their activities on local properties. This is to insure that water resource objectives are met on an islandwide scale.



The Water Resources Research Center

A fact sheet distributed by the Water Resources Research Center at the University of Guam Marine Laboratory states that it was: "established in May, 1975 as a research unit of the University of Guam. Its purpose is to plan, initiate and undertake research projects relating to the quantity and quality of freshwater that is available to Guam and Micronesia and to make the results of this research readily available to interested technical and non-technical agencies and individuals. The Center is the only research agency of this type in the Western Pacific. General areas of research interest for which projects are in progress or are planned involve groundwater sources, surface water sources, coastal waters and water distribution."



Pollution Control

Surface Water Resources

The Army Corps of Engineers has several projects in the planning stage for the construction of new reservoirs in the southern area. The proposed watershed and reservoir sites will not only provide freshwater for household use, but will be an important source of irrigation water for prime agricultural land. Proposed watershed and reservoir sites are within conservation dis-

GEPA and USGS

In cooperation with the Guam Environmental Protection Agency, the U.S. Geological Survey, a federal agency, monitors rainfall, stream-flow, groundwater levels, chemical composition and water pumpage amounts. Figures are issued in a monthly Guam Water Resources Memorandum, jointly published by both agencies.



In a federal Water Pollution Control Act, Section 208 recognizes a need for increased efforts in water planning on a local level. The 208 Program, within GEPA, is in the planning stage of the Areawide Wastewater Treatment Management Program. Their main objective is to make Guam's waters clean enough for fishing and swimming by 1985. Included in the 2-year



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the Sea



Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agaña, Guam, 96910

July, 1977
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AGRICULTURAL LAND USE

The use or abuse of land has fundamental economic effects on society. The availability of prime agricultural land was one resource which enabled the rapid growth of America. Even though Guam is relatively "land poor", prime agricultural land is available for use. All of Guam's land will soon be districted into urban, rural, conservation or agricultural use. This is essential for an island society, as there is a limited amount of land. The potential for agriculture on Guam must improve if self-sufficiency is a valued objective. This issue of the newsletter seeks to discuss the various governmental efforts directed toward meeting the goal of increased agricultural growth. Outlined for the reader are the problems facing agricultural development and the positive actions being taken to alleviate some of the adverse conditions.

The Green Revolution Concept

As a strategy for increased worldwide survival, the concept of the Green Revolution was developed. In the early seventies, intensive efforts were made to upgrade the agricultural yields in developing countries. From extensive research, an effort was made to introduce technical innovations, new strains of food plants, and the knowledge to apply the introduced techniques to areas where there are vast amounts of arable land. A multitude of people in the world are dependent upon an agrarian lifestyle and there was a critical need to offset massive scale threats of food shortages. Many problems arose with the Green Revolution. Some farmers could not meet the labor demands of the new technology and new types of food crops required more and expensive fertilizer. Many traditionalists resisted change as social and work aspects of life are often tightly woven. However, a mass of recent studies has concluded that the world Green Revolution has been successful on an overall scale. On Guam, the present executive administration took the name Green Revolution, and though Guam does not have a large agrarian society, the concept's main objective of enhancing agricultural production was deemed applicable and desirable on Guam.

Agricultural Growth Policy and the OEDP

Two documents have been recently completed by the social and economic planners within the Bureau of Planning. They are the Growth Policy for Guam and the Overall Economic Development Plan for Guam. The growth policies generally discuss the multitude of factors relating to development of various industries on Guam and outlines the major objectives and directions the Government of Guam should take to meet these objectives. As a plan, the OEDP more specifically outlines the methods, funding, and incentives needed for development of these industries. Both documents address agriculture as an industry in which growth and development can benefit the island society. The growth policy classifies agricultural production into four elements: Field farming, hydroponics, mariculture (fish farming and raising of other aquatic species) and livestock farming. Field farming is the major branch of agriculture that involves cultivation of the soil and raising of food crops, mostly fresh vegetables and fruits. Livestock involves the raising of domestic animals for food. On Guam, there is beef, swine, poultry and egg production. Most of the meat on Guam is imported. Only 5% of the beef that was consumed in 1971 was from local livestock. Increased production in beef does not appear promising due to the large acreage required for grazing. Livestock is not one of the better alternative uses for Guam's limited land. More promising are development plans of the Department of Agriculture for production of 30,000 head of swine by 1979. Roasting pigs are important for the numerous fiestas and social occasions that occur on Guam. The most remarkable agricultural growth on Guam has occurred in egg production. Prior to Typhoon Pamela, the island was 80% self-sufficient in egg production. As the amount of land becomes more limited, the importance of hydroponics and aquaculture is expected to become increasingly evident. As land uses, both of these elements of agriculture must be sensitively studied so they can be developed in compatibility with environmental resources. Hydroponics will be further discussed in this newsletter and aquaculture will be the topic of a forthcoming newsletter.

The growth policy for agriculture concludes that agriculture has historically been a major source of livelihood for Guamanians, however, its importance has been steadily declining since World War II due to competition with other

industries that have emerged, namely commerce, tourism, government and the military. Increased government support such as the Green Revolution should promote field farming because it promotes open space which is a means of preserving the beauty of our island. Also, field farming has proven successful with some island farmers and can potentially reduce Guam's dependence on imported foods.

The OEDP outlines the more specific developments needed to meet the growth policy objectives. Needed are a centrally-located public market, a system of access roads, a cannery, fumigation plant, fisheries, water resources development, land-use planning and public support. Land-use planning is predominantly accomplished through the Land-Use and Community Design Elements of the Comprehensive Development Plan being prepared by the Bureau of Planning. These two documents are approaching completion by the Coastal Management Section within the Bureau. Central in planning for agricultural land-use is the delineation of Agricultural Districts.

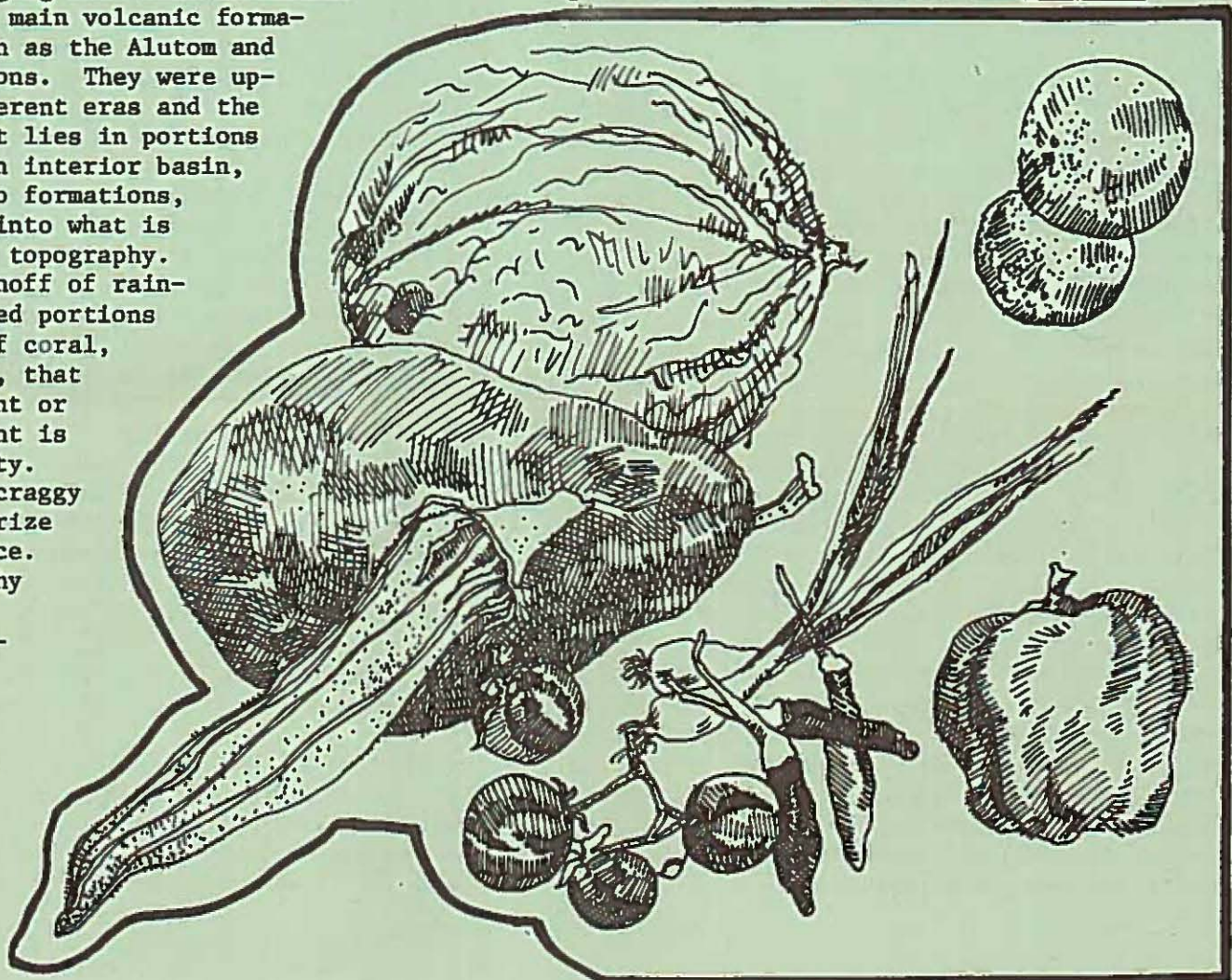
Agricultural Districting

It is obvious that on a small island, with volcanic uplands and a limestone plateau, that the amount of arable land is limited. The soil that surrounds the island on the coastal strand is composed of clay and sand. This soil is not rich in nutrients and can only support hardy, salt-tolerant vegetation. On the limestone plateau that covers most of the northern half of Guam, the soil layer is pitifully thin due to the permeability of and composition of the limestone. Agriculture is discouraged in northern areas that lie over the underground aquifer. Fertilizers and pesticides easily penetrate the ground and can pollute the island's limited supplies of freshwater. The southern portion of the island is composed mostly of volcanic uplands. Disturbing the savannah grasslands on slopes in excess of 15% invites erosion which scars the land, pollutes rivers and kills the fringing reef with sedimentation. The two main volcanic formations are known as the Alutom and Umatac formations. They were uplifted in different eras and the reef coral that lies in portions of the southern interior basin, between the two formations, has developed into what is known as karst topography. The surface runoff of rainwater has eroded portions of ancient reef coral, so extensively, that human settlement or land development is an impossibility. Sinkholes and craggy rocks characterize the land surface. Karst topography is an area of particular concern in land-use planning. With a population exceeding 100,000, growing human

settlements exist on much of the remaining flat land. That leaves only limited areas of relatively flat land where enough topsoil exists for agriculture.

Utilizing a wide range of available data, the Bureau of Planning has delineated the prime agricultural land. The major potential agricultural areas are in Inarajan, Malojloj and Talofofo. Smaller areas are inland of Yona, Merizo and Umatac. The only area of agricultural land in the northern half of the island is located in Yigo. Inland of Mt. Santa Rosa, soil that has developed as a result of the abrasion of volcanic material has been deposited in the areas between Lupog and Mataguac. The total amount of agricultural land that has been districted is approximately 15.5 square miles. With an island of 212 square miles of land surface, the potential agricultural land is roughly 7.3% of the island. This doesn't sound like much land, however, only a small amount is currently used for agricultural production and if preserved for agricultural use, it is enough to meet long-range objectives for agricultural growth. With the designation of prime agricultural lands, the needs of farmers can be better realized by governmental agencies and private interests.

Three main factors are utilized in the delineation of agricultural districts. These are aerial photographs that depict topography, soil data, and climate. Land classification has been greatly facilitated by a set of aerial photographs that were taken in 1975. Aerial photos, with an overlay of contour lines, show such features as slopes, rivers and existing areas of cultivation. Lands that are level or gently sloping are well adapted for agriculture. The climate, mostly rainfall, is an important factor in agricultural development, as rainfall is not only needed for crops, but for the replenishment of watershed areas that are necessarily proposed for irrigation purposes. (See rainfall graph). Soil data is the basic element in the delineation of agricultural land. The major source of soil data is the Military



Army Corps of Engineers in conjunction with the U. S. Geological Survey in 1959. There have been no exhaustive studies of agricultural land since this date, so this engineering soils study is the basic source of data. Soil data more specifically analyzes five soil characteristics:

1. Soil Texture. Texture refers to the proportion of sand, silt and clay in a soil and affects the water-holding and nutrient retention properties as well as the workability of the soil. Medium-textured soils are most desirable for crops. Fine textured soils can be desirable for wet crops such as taro. Coarse-textured soils such as coral sands are not suitable for crops unless excessive irrigation and fertilizer is used.
2. Soil Depth. Depth refers to the thickness of the soil layer that is available to the roots of plants. Deeper soils provide a larger volume of soil from which the plants can obtain moisture, nutrients and anchorage.
3. Soil Drainage. Drainage refers to the rapidity and the extent of removal of excess water from the soil. Soils that are well-drained are best suited for most crop production. Special crops such as taro and rice can be cultivated on poorly drained soils.
4. Stoniness. Stones in the soil profile or on the surface affect the use of the land, especially if tillage machinery is used. Rocks can hinder or prohibit the use of such machinery.
5. Soil Fertility. Fertility refers to the capacity of the soil to provide the required nutrients to the crop for optimum growth. Some lands require large quantities of fertilizer to maintain optimum crop yields. Soil tests are used to determine the degree of soil fertility.

All of the above considerations are utilized in the delineation of Agricultural Districts. It is a distinct possibility that, in the long-range future, worldwide food demands may force Guam to become more self-sufficient. For this reason, prime agricultural lands must be preserved. However, agricultural uses, depicted on Community Design maps, are approved first by residents themselves.

Cultural Considerations

In a public meeting in Merizo, several residents who own land in the major community location for agriculture in Merizo spoke out. Their comments, though expressing individual aspirations were reflective of the growing population which will require expanded residential areas adjacent to agricultural lands. The residents were aware that if the agricultural area was to be used for urban expansion, increased density of houses and roads would further limit the amount of agricultural land. Some residents said that they had room for their gardens and did not want to farm on a larger scale. Their main concern was that they had large families and wished to subdivide their land for heirs rather than consolidate it for farming. In a different meeting in Sinajana, however, residents overwhelmingly expressed the

lands that were depicted on the land-use districting map. Most of these residents, however, were not owners of land in agricultural districts.

Increased affluence and an orientation to a Western style of living are becoming increasingly evident with each emerging generation. Many older residents also remember the period of Japanese Occupation when larger scale agricultural production was imposed and they now prefer other forms of employment and land-use. The ranch and backyard garden may be the last cultural link between the traditional Chamorro reliance on horticulture and a Western system of production. Traveling around the island, it is evident that many residents consider backyard gardens and small ranches to be the most adaptive or useful form of agriculture for family level demands.

The Guamanian ranch house spans two extremes in subsistence--traditional horticulture and a dependence on Western economic production. During the prewar years, the villager grew his crops around his village homesite. Postwar economic developmental change found land prices rising, population increasing and a greater number of people moving closer to trade centers for lucrative employment opportunities. Subdivisions and multiple family dwellings such as apartments were hardly optimum conditions for subsistence gardening. Thus, many people purchased, leased or "squatted" on land in an undeveloped area. Hence, they could continue the traditional raising of fruits and vegetables. Ranches are most often tended on weekends, holidays and after-work hours. The yield is adequate for family consumption and some reciprocal exchange among family and friends, but is not adequate to meet the demands of large-scale food outlets that requires a consistent flow of goods to maintain a profitable business. Backyard farming is expected to decline as the value of land rises and it would be difficult to find a way for government to subsidize backyard farming.

Environmental Considerations

Besides changing values, land tenure systems and the limited amount of land, there are adverse environmental conditions that must be dealt with in agricultural development.

When Guam became a resupply point on a trade route between Mexico and the Philippines, during the colonial era, the seeds of many invader species of plants found their way to Guam. Many Meso-American grasses and other weed pests can be seen in fields and along roadsides. Keeping crops clear of these weeds is a persistent problem.

It is accepted knowledge that the incidence of pests in the tropics is much greater than in more moderate regions. A host of harmful insects must be fought with pesticides. Pesticides are expensive and exact their toll on both humans and the environment.

In 1946, the Japanese introduced the giant African snail as a food item. The prolific snails found the limestone and tropical vegetation on Guam to be ideal. They are considered repulsive as a food item to most residents and their value as fertilizer is far

outweighed by the constant battle to keep them away from farm crops.

Lying within the typhoon belt, Guam is periodically exposed to high winds and salt spray. A direct hit can totally devastate crops, but even a near miss is damaging. Fruit trees are especially vulnerable. Trees such as mangos and avocados have shallow-based root systems and topple or break easily. The persistent winds and salt spray eliminate fragile leaves, flowers and fruits. It takes approximately 10 years for many fruit trees to grow to a size where their yield begins to compensate for the effort placed in caring for them. When this is compared to the incidence of tropical storms, the risk of large-scale production is great. Governmental assistance in the form of crop insurance could offset the problem. However, as the Growth Policy warns, governmental incentives can easily develop a new group of welfare recipients if not carefully planned. Low interest loans and tax rebates are other governmental incentives that could potentially offset the risks involved in agricultural production.

Radio Barrigada Agricultural Subdivision

Many people have expressed the viewpoint that the federal government owns much of the prime agricultural land on Guam and that opening of federal properties could enhance the potential for agriculture. In actuality, very little prime agricultural land exists on federal properties. Most federal property is covered with military development, lies over the aquifer systems, includes sloping terrain, cliffhines or watershed areas. One area along Route 8 in the community of Barrigada, however, has been leased to the Government of Guam from the federal government for a period of 5 years, with a renewable clause. The subdivision at Radio Barrigada is an 80-acre tract with garden plots available for 1-year renewable leases. The subdivision leases are managed by the Department of Land Management. The parcels each contain approximately 3,800 square meters and are served by a 20-foot wide access and water easement. They are primarily available to families residing within the Municipality of Barrigada. Some parcels are reserved for the Department of Parks and Recreation, other interested Government of Guam agencies or non-profit organizations. Any and all variety of crops are permitted and encouraged. Livestock is permitted only within specifically designated parcels and only permitted with assurance that they will not harm adjoining lots or become a source of pollution. Each permittee is required to plant a combination of six varieties of indigenous fruit-bearing or non-bearing trees, the total of which shall not be less than 36 trees. Examples of these trees include avocados, betelnuts, coconuts, mangos, lemons and star apples. Further information can be obtained from the Department of Land Management.

Hydroponics Potential

Hydroponics is the science of growing plants without soil in nutrient solutions with controlled temperature, humidity, light and carbon dioxide in the air. The technique controls all environmental factors that affect the growth and development of plants. On Guam, where land values are high, soils are thin, water is scarce, pests are abundant and labor

is unavailable, hydroponics has a special applicability or potential for development. Prior to Typhoon Pamela, six hydroponics farms produced over 200,000 pounds of vegetables per year. It is expected that hydroponics will play an increasingly important role in agricultural growth and land-use on Guam.



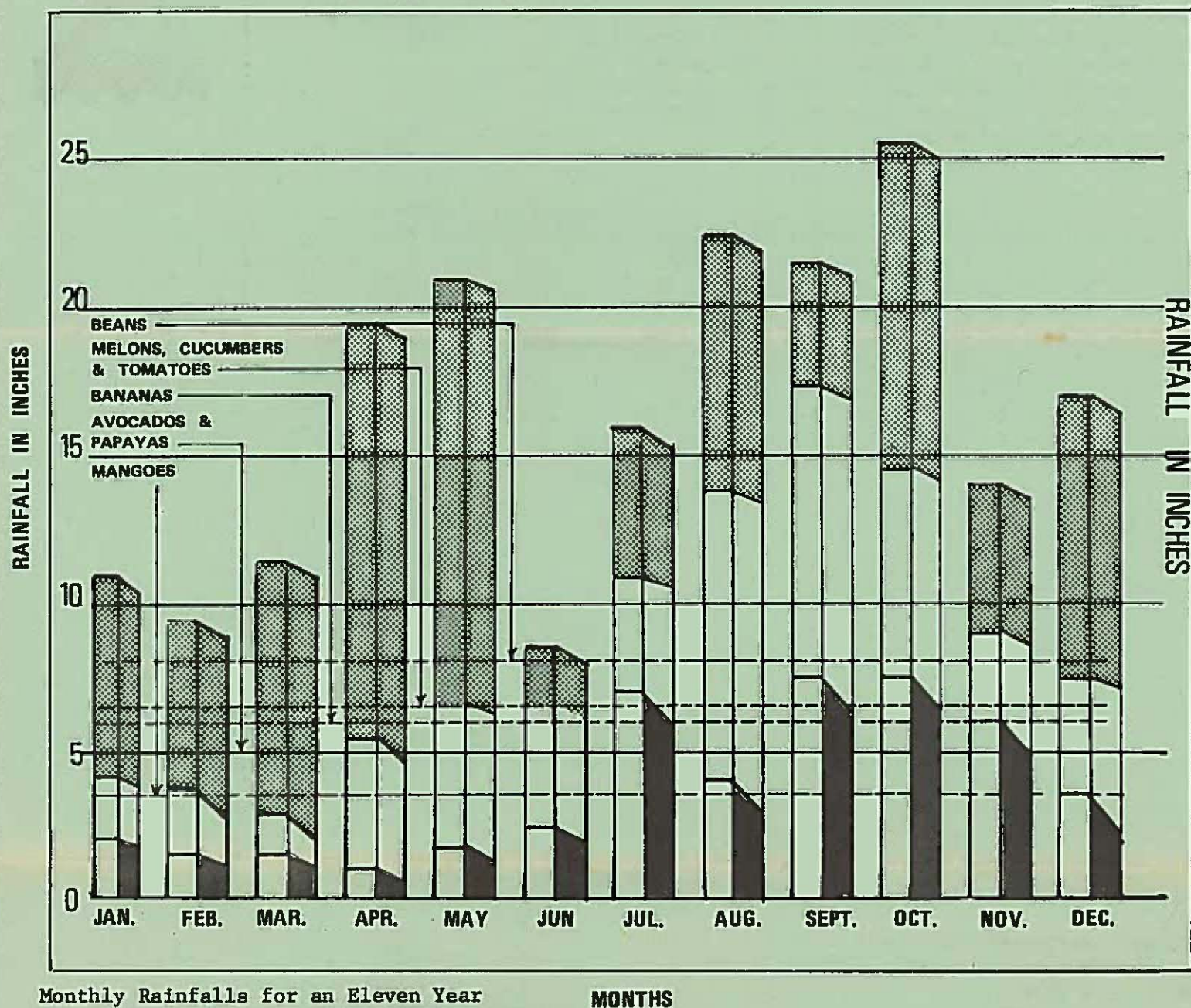
Various Agency Interests in Agriculture

This issue of the newsletter has outlined various adverse factors that hinder agricultural growth. Don't be too discouraged, however, because, although self-sufficiency is a long way off, Guam has experienced agricultural growth. Agriculture had ground to halt in the past decade because of many factors. Due to the efforts of many agencies, we have just begun to make positive strides in agriculture development. From 1964 to 1974, the value of local agriculture products increased from approximately \$750,000 to 3½ million. This figure includes livestock, poultry and aquaculture. The various agencies involved in agricultural growth are outlined in a report recently published by the South Pacific Commission entitled, Agriculture in Guam: Observation on Problems and Research Needs. The report was compiled by visiting economist Dr. Te'o Ian Fairbairn. The outline on the last page was adapted from his report.

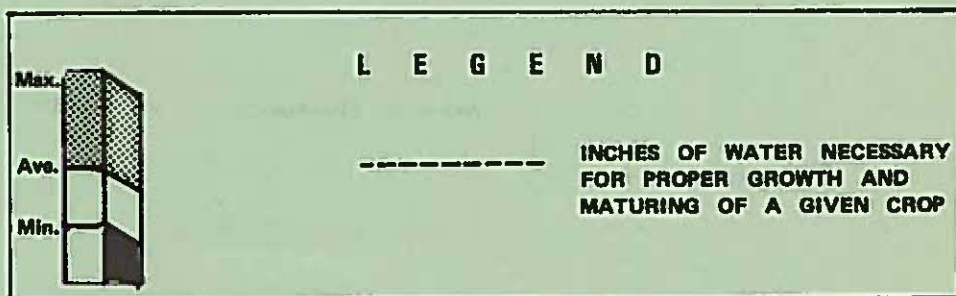
Agricultural Irrigation Needs

The availability of water is the most critical input that would enhance agricultural growth potential. Water of good quality is essential for all agricultural operations and some potential agricultural lands do not have an adequate supply of water to meet irrigation demands during the dry season. Droughts are a common occurrence on Guam and, as indicated in the graph of rainfall and the amounts needed for production of various crops, periods of minimum and sometimes even average rainfall do not provide the needed amounts of water. The graph was part of A Report Covering the Domestic and Agricultural Irrigation Water Supplies of the Island of Guam Which Indicates the Need for Conservation Areas. The report was prepared in 1970 by Austin, Smith and Associates, Inc. for PUAG. As the lengthy title suggests, watershed or reservoir areas are essential for agricultural growth. Reservoir and watershed sites have been proposed by the U. S. Army Corps of Engineers

for the Umatac, Inarajan, Geus (Merizo) and Ugum (Talofofo) Rivers. The planning for the Ugum River Reservoir is furthest towards completion. Implementation could potentially supply the largest sectors of agricultural land in the south with irrigation water. The Hydrological Study for Potential Water Supply Reservoir, Ugum River, Territory of Guam was recently completed by Sunn, Low, Tom and Hara for the U. S. Army Corps of Engineers. The study was conducted to determine the surface water availability and storage requirements for the Ugum River basin. Water from the basin would be used to serve the domestic consumption needs in the Year 2040 for the southern districts of Yona, Talofofo, Inarajan, Merizo, Umatac and Agat. A recommended dam site was presented in the study. Further planning, involving impacts on the flora and fauna of the area, are still forthcoming before feasibility and implementation would occur. All of the Corp's proposed watersheds are depicted on the Community Design maps that are being prepared for this element of the Comprehensive Development Plan.



Monthly Rainfalls for an Eleven Year Period Using the Years 1959-1969 Inclusive and Based on the Guam W. B. Rainfall Station



Agencies Involved in Agriculture Growth

A. Green Revolution Committee. Consists of representatives of key departments and agencies acting as an advisory and coordinating committee to the Governor on policy and related matters affecting the practical implementation of the Green Revolution.

B. Department of Agriculture. Carries out a variety of functions including the growing of seedlings and distribution of breeding stock to farmers; quarantine and produce inspection services, renting of farm equipment, collection of production statistics, crop insurance, processing of applications for alien farm labourers, forestry development and conservation work.

C. The University of Guam. The University's College of Agriculture is committed to teaching and research work in the field of agriculture. It is also committed to carrying out extension work in agriculture via its Agricultural Extension Services Unit.

D. Guam Economic Development Authority. This body is responsible for a number of major function relating to the economic development of Guam including administration of an Agricultural Development Fund and an Agricultural expense Insurance Fund. Loans for agricultural projects are made upon recommendations put forward by the Department of Agriculture.

E. Farmer Cooperative Association. This organization runs a store in the central town area where basic farm materials are sold and where farm produce can be sold to both the public and to big buyers on contract.

F. Farmers' Market. This is intended to serve as a public market for farmers as well as an outlet for handicrafts, cooked traditional foods, etc.

G. Bureau of Planning. This agency is responsible for long-range comprehensive planning for the social, economic and physical development of Guam.

H. Department of Commerce. Concerned with promoting and facilitating the development of private, commercial and industrial sectors and with Customs work. Located within this department is the Bureau of Economic Research which is responsible for compiling statistical data for the whole economy and for reviewing annual economic conditions and trends.



Coastal Management Section
Bureau of Planning
P. O. Box 2950
Agana, Guam 96910



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Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agana, Guam, 96910

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LAND-USE PLAN IN REVIEW

During the past year, the Coastal Management staff and Physical Planning Section within the Bureau of Planning have merged to work on the Land-Use and Community Design elements of a Comprehensive Development Plan for Guam. The Land-Use Plan has been completed after exhaustive research which has involved mapping and describing the districts and areas of particular concern which have been the subject of previous newsletters. A combination of public and advisory group input, research by the Bureau of Planning, coordination with federal and GovGuam agencies, and contractual consultant studies have been synthesized to produce the lengthy and much-needed document. Draft copies are being reviewed by relative agencies, commissions and interest groups for comment. Comments will be incorporated into the plan prior to submittal to the Central Planning Council for review. Completion of this plan is the first major step towards responsible land use which is vital to the integrity of a delicate island ecosystem.

The small size of Guam is not an adequate index of the magnitude or complexity of land-use problems and interrelationships. Problems cover the same range as in larger mainland areas because land-use patterns are increasingly related to those used and imported from the mainland through an accelerated Westernization process.

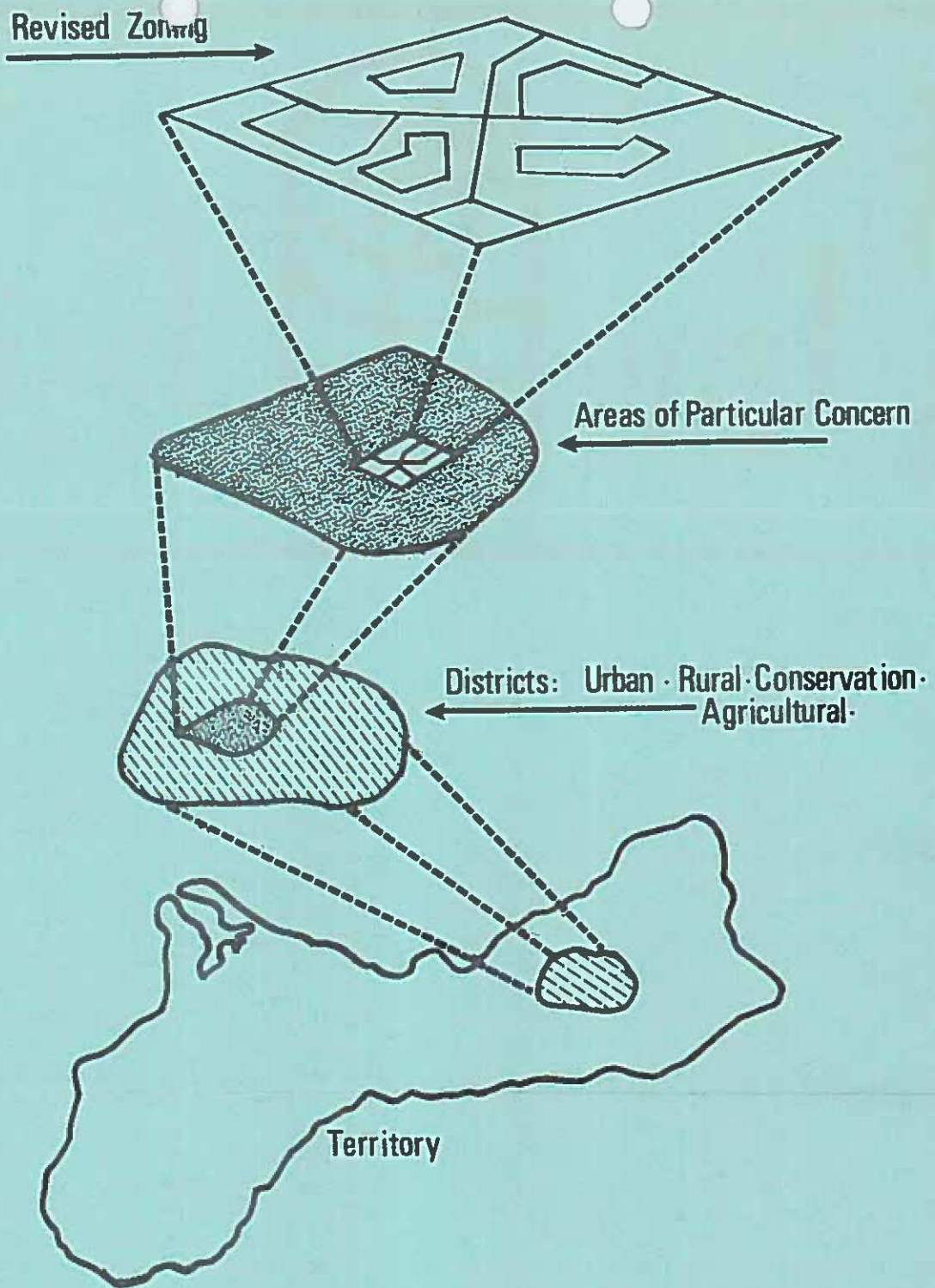
In common with much of the United States, increased numbers of people are seeking employment, housing, services and space for recreation on Guam. It is clear that if a quality environment and responsible development are included among the goals of a developing territory, care will be required in the allocation of land and water resources. Logic suggests that development should occur in a manner responsible to environmental limitations.

The Land-Use Plan has been kept at a level of conceptualization that enables flexibility in response to changing needs and unpredictable events. It is intended as a tool for responsible decision-making by all interests in resource use. Chapters address the purpose and objectives of comprehensive (islandwide) land-use planning, policy guidelines for various types of development, physical and cultural considerations in planning, regulatory mechanisms, and further refinements and recommendations. These chapters provide a basis for the major chapter which is the Land-Use Plan or the three-tiered system of land-use planning.

The three-tiered system of land-use planning involves the delineation of four main districts: Urban, Rural, Agricultural and Conservation. The next step is the delineation of areas of particular concern which are areas of ecological, economic, historical, or scenic value such that performance guidelines are needed to ensure their responsible development or preservation. Areas of significant hazard such as airport sound and accident potential zones, floodplains or seismic fault zones are also considered areas of particular concern.



Revised Zoning



The Three-Tiered System of Land-Use Planning

CEIP COMES TO GUAM*

What is it?

CEIP stands for Coastal Energy Impact Program. This program was established through 1976 amendments to the federal Coastal Zone Management Act. The Office of Coastal Zone Management of the U.S. Department of Commerce administers the program at the federal level. The Bureau of Planning administers the program for Guam as part of its ongoing Coastal Management Program.

What is the purpose of the program?

The CEIP was created as a way to strike the difficult balance between the interrelated national objectives of greater energy self-sufficiency and long-term management and protection of coastal resources. It provides coastal states and territories with the financial assistance to meet their social, eco-

nomical and environmental needs resulting from new or expanded coastal-dependent energy activity.

What kinds of financial assistance are available? Four kinds are available:

1. Planning grants to help prepare for the social, economic and environmental consequences of new or expanded energy facilities in the coastal zone (all of Guam) such as:

- . electric generating plants
- . petroleum refineries
- . oil and gas storage tanks
- . marine pipeline systems
- . oil and gas processing plants
- . deepwater ports and terminals for transfer of petroleum or fuel offloading
- . manufacturing facilities for energy-related equipment
- . marine service or support bases

*Adapted from Shoreline/Coastal Zone Management, Newsletter of the Washington State, Department of Ecology. Vol. 1, No. 12. May, 1977

2. Credit assistance in the form of direct loans or loan and bond guarantees to help finance new or improved public facilities and new public services required as a result of "coastal energy activity." Coastal energy activity on Guam involves existing or proposed activity relating to the production of energy and transportation, processing or storage of fuel. The above-mentioned list depicts the facilities required to support coastal energy activity.

3. Repayment assistance (refinancing, modification of terms, supplemental loans, or repayment grants) to a borrowing government when it cannot meet its credit obligations because revenues from coastal energy activities are less than expected.

4. Environmental grants to help prevent, reduce or repair damage to or loss of valuable environmental or recreational resources but only when the source of the damage cannot be identified and charged for the damage.



How much Funding for Guam?

Initially, \$16,556 has been allocated for the placement of an energy planner in the Guam Energy Office to coordinate land-use planning objectives with the activities of the Guam Energy Office. The Guam Energy Office has the function of assuring the Territory of an adequate supply of fuel for its use and encouraging conservation and energy consumption practices for the benefit and welfare of all residents. They also develop and demonstrate alternative energy sources and systems and conduct research and inventory of current fuel supplies with projections of future energy consumption demands.

The CEIP planning grant was made available to the Territory to help prepare for the consequences of new or expanded energy facilities. In order to identify a suitable location for a facility for example, the Territory may have to conduct an area natural resource inventory. It may also have to plan for improved means of transportation to and from the facility, locate new homes and business to support new development and locate and schedule required new infrastructure or other public facilities. An energy planner can coordinate this type of planning.

Guam's initial planning grant will also be used to study the effects of proposed energy facilities on fishing, tourism, water quality, visual access, reefs and beaches and other shoreline activities and features. Also involved will be an analysis of governmental or private siting policies and development of methods to protect valuable environmental resources threatened by the siting of energy facilities.

AQUACULTURE DEVELOPMENT ON GUAM

Aquaculture is the culture or husbandry of aquatic plants and animals. Stocking man-made ponds and rice paddies has been an age-old method of subsistence in Asian and European countries. In recent decades, wild stocking has evolved into scientific aquaculture via interrelated studies and technological development in fields such as biology, chemistry, economics, engineering, environmental protection, genetics, marketing, nutrition, pathology and processing. Worldwide aquaculture production has doubled in the last five years and is now 6 million metric tons (roughly 10% of the world fish production). The increasing interest in aquaculture development is beginning to make its presence felt on Guam.

Given the numerous, geologic, climatic and ecological constraints facing field farming and livestock production on Guam, a growing interest and developments in aquaculture has markedly arisen in the last few years. Development has necessitated pioneer efforts to guide the responsible growth of this sector of the agricultural industry. Aquaculture offers a viable contribution to the Green Revolution and self-sufficiency demands by producing food for both local consumption and export.

A 14-acre eel farm complex, in the Agfayan Bay area of Inarajan, has initially begun operation and expects to produce 100 tons of eel between November, 1977 and May, 1978. Five ponds, covering 2½ acres in the Talofofu River Valley, produce 55,000 prawns per half acre during each growth cycle. Two other prawn farms are in operation and two are under construction. The Department of Agriculture is seeking federal funds for the development of a \$300,000 hatchery for the provision of local stock.

Four major existing aquaculture sites have been delineated on Community Design maps for inclusion in this element of the forthcoming Comprehensive Development Plan. All of these sites are situated within estuarine (river mouth) wetland areas of particular concern. They are also located in coastal areas such that developments must not only be sen-

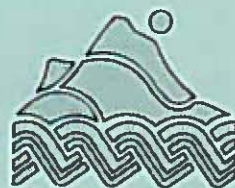
sitive to wetland ecology, but also that of shoreline/reef ecosystems. A continuous supply of water is a key resource input and a critical factor in site selection, hence the locations in wetland adjacent to major rivers. Future developments may involve marine aquaculture in shallow offshore locations. Among the animals and plants that could be produced with aquaculture are fish, shrimp, prawns, mangrove crabs, oysters and algae (edible seaweed). One mainland corporation has even recently expressed interest in the aquaculture of abalone, a deepwater shellfish of high economic value.



Milkfish (*Chanos chanos*) known locally as pulang aquas or by its Tagalog name bangus, can be potentially raised in a brackish water aquaculture system. They are caught locally with nets, near river mouths or in the marsh at Sumay. A source of juvenile stock would be needed to raise milkfish on Guam. Currently, the Philippines has banned the export of juvenile milkfish in a move to corner the market. This illustrates the fact that in addition to the many ecological considerations in aquaculture development, economic factors can also play an important role in the growth of the industry.

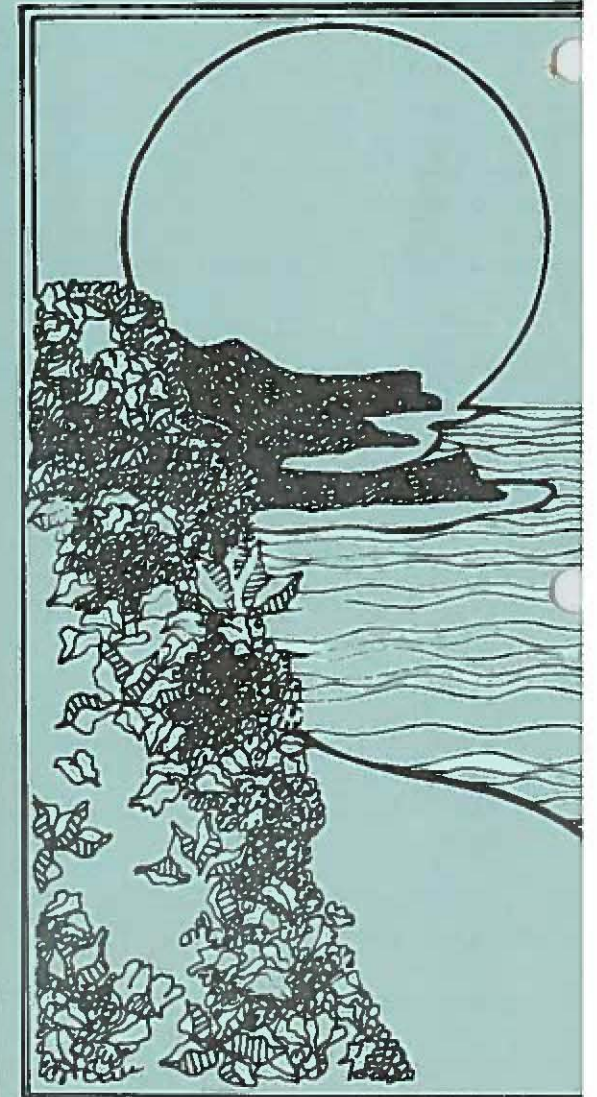
A study entitled, Aquaculture and Its Potential Environmental Impacts on Guam's Coastal Waters was completed for the Guam Coastal Management Program in order that environmental impacts on water resources and strategies for pollution control would be outlined in a document which, as a base of information would be useful in the delineation of aquaculture as an area of particular concern. As discussed in a previous newsletter, water resources are also an area of particular concern. The document will ultimately assist in the site selection and management of future development sites. Potential aquaculture sites were mapped at a scale of 1:25,000. The map can be viewed in the Office of the Bureau of Planning. Persons interested in initiating aquaculture development should request a copy of the study.

The author, William J. FitzGerald, Jr., as head of the Commercial Fisheries Section of the Department of Agriculture, provided insights into the role of the Division of Aquatic and Wildlife Resources, as well as a thorough discussion of the potentially developable species. This document fulfills Guam's Coastal Management Program's requirements for much-needed background information in this area.



Coastal Management Section
Bureau of Planning
P. O. Box 2950
Agana, Guam 96910

GUAM'S COASTAL MANAGEMENT PROGRAM

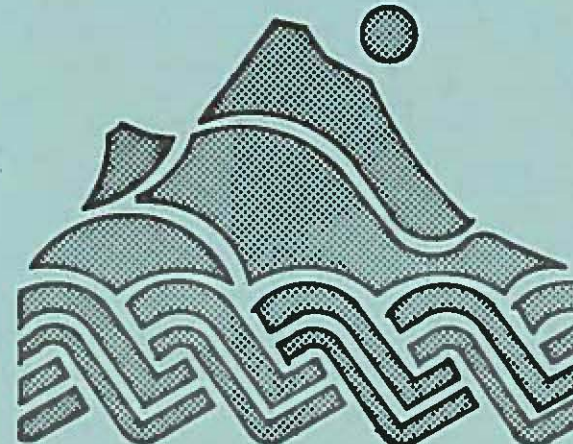


Conservation Areas

Included with wetlands and the seashore as valuable wildlife habitats are the limestone forest and the savannah grasslands. These undeveloped areas can provide a place for nature observation, scientific study and preservation of the aesthetic appearance of Guam.

PUBLIC INVOLVEMENT

While planners do their best to act upon the needs and desires of the islanders, they often have difficulty in recognizing these needs until the people themselves speak out. The public is ultimately responsible for providing guidance that will determine the future appearance of Guam. Become informed about current plans and express your feelings. Only through proper planning and wise implementation can we continue to enjoy the island's gifts of the land and sea.



DISTRICTING

Four basic areas of land use on Guam have been designated as having special interest. They are urban, rural, agricultural and conservation districts. The mapping of these areas assists planners in managing the specific performance standards for land and water use in each district.

Urban Areas

Man is an inevitable member of the island ecosystem. Commercial development and residential housing are necessary to meet the demands of a rising population. The management of urban areas enhances the island's appearance, stimulates the economy and protects adjacent areas.

Rural Areas

In some village communities, a more traditional lifestyle is preferred. Rural areas have less infrastructure of roads and utilities, but most are adjacent to urban areas. They provide possible zones for future urban development and can thus be easily connected to urban facilities to meet desirable expansive demands.

Agricultural Areas

The potential for agriculture must improve if self-sufficiency is valued. There is a limited number of acres of potential farmland that is fairly level and contains fertile topsoil. A small fraction of this land is now utilized for agriculture. With the designation of agricultural lands, the needs of farmers can be better recognized by governmental agencies.

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BACKGROUND

Effective planning for Guam's future is the challenging task facing the Bureau of Planning. The complexity of pressures affecting land and water resources necessitates an agency designed to monitor rapid change, preserve valuable resources and present conceptual plans for needed development.

The Coastal Zone Management Act of 1972 provided matching funds, enabling a comprehensive program for managing Guam's fragile resources. Since the land and sea are so directly inter-related on an island, all of Guam is considered to be a coastal zone.

The goals of the Coastal Management Program are to:

- Improve the quality of life by improving and preserving the quality of the island environment.
- Encourage the scientific research of island resources to further knowledge.
- Promote the orderly and responsible development of island resources thereby creating employment opportunities and increasing local revenues.
- Coordinate relevant GovGuam and federal agencies' interest in programs concerning the island's land and water resources.
- Promote public awareness and utilize public input in planning.

— Provide legal analysis of alternative land and water uses, submit recommendations for legislation and assist in the implementation of existing laws.

— Identify and designate areas that possess unique values.

In this phase of the program, the planners are conducting an extensive survey of existing resources, preparing maps and conceptual plans, administering interviews and presenting the results to the islanders in a public involvement program.

FEDERAL CONSISTENCY

Approximately one third of Guam is owned by the Federal Government. To be effective, land and water use plans must be consistent throughout the island. While excluded by law from the definition of the coastal zone, any proposed federal activities having "spillover" impacts upon Guam's coastal zone must be consistent with the objectives of the coastal management plan. When approved by the Secretary of Commerce, the coastal management enforcement mechanism will be able to request revision of major actions taking place on federal lands if the impacts of such development are considered unacceptable. Thus, federal consistency is an important facet of the program.

AREAS OF PARTICULAR CONCERN

The uniqueness of an area of particular concern may be that it contains fragile and valuable historical, scientific or natural resources that could be affected by potentially harmful development.

Among areas that have been designated by the Coastal Management Section are:

The Seashore Preserve

The sandy beaches, rocky shore, reefs and mangroves along Guam's coast provide natural island beauty for all to enjoy. Especially the sandy beaches, which are well suited for tourism, boating, fishing and other activities, are under the constant pressure of the islander's and the tourist's recreational needs. In order to preserve these fragile resources against misuse, the Coastal Management Program is developing a seashore preserve plan and supports related agencies attempts to protect the environment and promote responsible commercial development that will enhance the economy.

Wetlands

The little-known wetlands of Guam are valuable geographic areas which, if lost, would be an irreplaceable resource. They include numerous swamps, floodplains, marshes and river valleys. As wildlife habitats, they are the most biologically productive ecosystem on the island. Many varieties of fish, shellfish and crustaceans grows amidst a diversity of specialized plants. The water within such areas as Agana Swamp assists in recharging the aquifer. To fill, dredge or otherwise disturb wetlands can potentially degrade an important resource area on Guam.

Historical Sites

It has been stated that Guam is one large archaeological site. Because historical reports of early life are scarce, the artifacts left behind are the remaining link with a rich cultural

heritage. To destroy historical sites, further isolates us from the mysteries of the past. The value of areas, such as those containing the majestic latte house supports, has warranted the designation of historical sites as areas of particular concern.

Water Resources

The bulk of the water supply on Guam is confined and limited in the form of the underground lens system or aquifer. A layer of water floats upon salt water and provides a supply of water necessary for survival. In addition, there are the rivers of southern Guam. If too much fresh water is taken from resource areas, the loss is formidable. Overdevelopment of land over the lens can cause water to runoff into the sea rather than percolate into the underground supply. In addition, pollution control is necessary for the maintenance of water quality.





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the Sea



Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agana, Guam, 96910

September, 1977
Vol. 2, No. 9

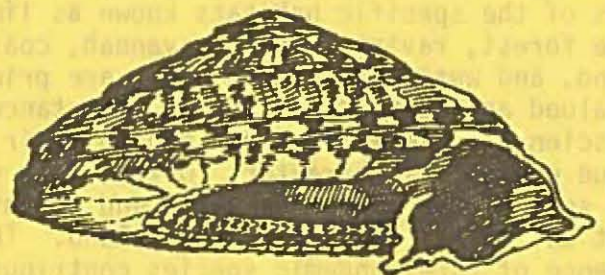
MAN AND THE ISLAND ECOSYSTEM

Ecology is the study of the relationship between the various living and non-living parts of an environment. These parts or components of an ecosystem include the plants, animals, rocks, soil, weather conditions, etc. No form of life in the ecosystem lives along. Each animal or plant depends upon specific requirements of sunlight, water, and food which are a direct result of the life and geology that comprises its immediate surroundings or ecological niche. Some ecological niches are very fragile. To remove or alter a segment of an ecological niche, such as cutting down all of a certain type of tree or grading the soil, can upset the other parts of the niche. The introduction of new things into a niche, such as pollution or an invader species (i.e., tangantangan or African snails) can also change the ecology of an area. By changing specific areas, changes in the total environment often become noticeable. In other words, changes in one ecological niche often lead to spillover impacts that affect adjacent areas. In general, island ecosystems are very fragile. They have evolved in relation to specific geologic and climatic conditions such as a limited supply of fertile soil and freshwater or a high incidence of typhoons.

The day man set foot on Guam a new component was added to the island ecosystem. Here was a being that could easily move from one ecological niche to another and exploit the resources needed for his survival. In one day, man could take fish from the deep ocean; collect shells, coral, and algae from the reefs; harvest wild fruits from the limestone forest; and clear a plot of land to plant introduced species of food plants. Though the island is fragile, its carrying capacity allowed man to exist without destroying the environment. The primitive society was extremely sensitive to environmental limitations for their day-to-day survival was dependent upon the maintenance of natural processes. However, as time has passed, man has developed advanced technological capabilities which, while making life easier, place more stress upon natural resources.

The ecological side effects of human use of natural resources, man's interaction with the island ecosystem, must now be anticipated before irreversible damage or ecocide is in effect. For example, very little of Guam's natural limestone forest is now left for support of endangered wildlife, scientific study, nature observation or aesthetic appearance. Other impacts of man's activities do not become evident until later or are unintentional. For example, spraying coastal wetland areas for mosquitoes to reduce the threat of dengue fever, during the influx of Vietnamese refugees, also killed beneficial insects such as the praying mantis and honey bees. Small fish on the reef flat have been killed by aerial spraying of coastal regions. Living animals can store harmful toxins in their systems and pass them along the food chain in increasing concentrations--eventually back to man.

The fragile, interrelated, and complicated nature of the island ecosystem does not mean that man must stop developments or cease to interact with the natural environment. Development is a necessary and inevitable accompaniment to man's very existence. An understanding of ecology suggests that with the capabilities and knowledge that man possesses today, environmental assessment of the impacts of change, prior to new developments, can foresee many of the dangers or possible adverse effects of resource use. With studies of both present and projected resource use, viable alternatives or carefully planned development can seek to ensure that an optimum balance of both developmental and preservation needs is met.



For an informative discussion of the relationship of man and the island ecosystem read Life on Guam: Human Impact. This educational text, by Margie Cushing Falanruw provides an in-depth discussion that is of interest to students and anyone wishing to familiarize themselves with the natural processes that are characteristic of our island ecosystem.

In the delineation of areas of particular concern or components of the island ecosystem that deserve special planning and management consideration, the Coastal Management Program has contracted scientists and consultants to map and describe areas that are both natural and highly modified by man's activities in order that a truly comprehensive and balanced perspective can be taken in the preparation of a Coastal Management Plan for the entire island. The staff of the Coastal Management Section of the Bureau of Planning has also completed in-house research and analysis of various aspects of resource use. The recently completed Land-Use Plan, as an element of the Comprehensive Development Plan provides the basis for Guam's forthcoming Coastal Management Plan. The technical reports which assist in the delineation of areas of particular concern will soon be compiled into a data source document that will consist of studies reviewed in this and previous issues of the newsletter. Included will be studies of aquaculture, power production, pristine communities ; coral, shell, and algae harvesting, as well as an Inventory of Present and Projected Coastal Land and Water Uses on Guam and Analysis of Results: CZM Land-Use Opinion Survey. Other technical reports such as the second phase of a reef study, a mineralogical survey and a study of Guam's pristine marine communities are still in preparation.

Pristine Terrestrial Communities

A study entitled, An Ecological Survey of Pristine Terrestrial Communities on Guam was recently completed and submitted to the Guam Coastal Management Program. This report will assist in the delineation of a previously ill-defined area of particular concern and assist in the establishment of performance standards and a management program for the protection of pristine areas. Following is an excerpt from the report which contains maps, descriptions, and listing of species within five natural communities on Guam. The report was prepared by Philip H. Moore, a local botanist and Chairman of the Science Department, GWSH.

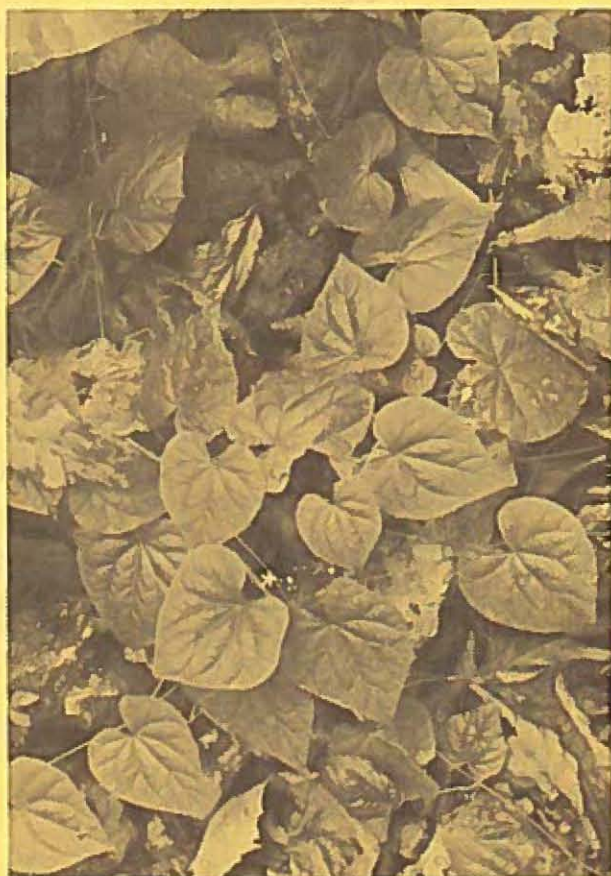
"Terrestrial pristine ecological communities are basically the most untouched representatives of the specific habitats known as limestone forest, ravine forest, savannah, coastal strand, and wetlands. These areas are primarily valued as locations of utmost importance for scientific investigation, due to their unique ecological character. Often, they contain some of the most endangered and threatened plant and animal species on the island. The presence of rare, endemic species contributes to the extremely fragile nature of pristine communities and suggests that land and water use must comply with performance standards that are much more rigid, from a conservation perspective, than those which are established for other areas of particular concern."

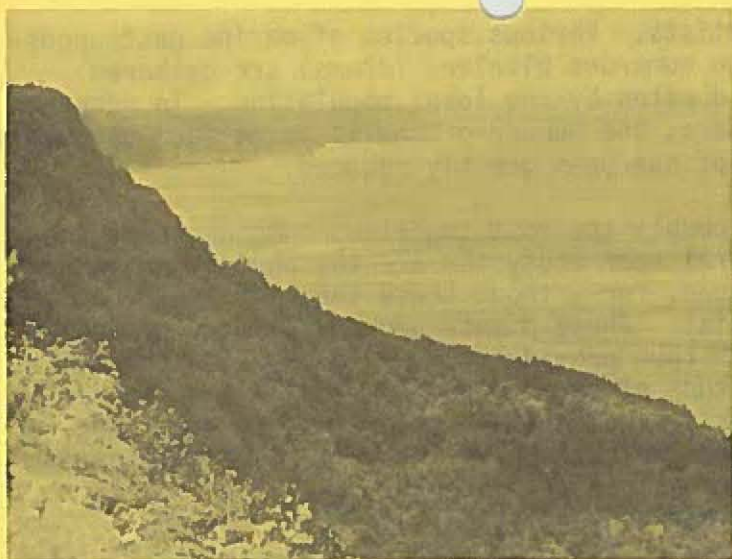
The five pristine terrestrial communities that were chosen were the Uruno Point limestone forest and coastal strand, the NCS freshwater pool area, the Tarzan Falls ravine forest and savannah, a wetland reed marsh in the Dandan area, and the coastal strand that fringes Cetti and Sella Bays.

The NCS freshwater pool is the result of freshwater seepage from the northern aquifer, collecting in a shallow depression within a limestone forest that fringes the coastline. The microcosmic community of plants and animals is extremely unique as freshwater pools are not a usual component of the limestone forest.



Several species of fish; tilapia, mosquitofish, and carp, as well as freshwater snails are found in the pool itself. Fringing the pool are characteristic wetland plants that are shaded by surrounding limestone forest species.

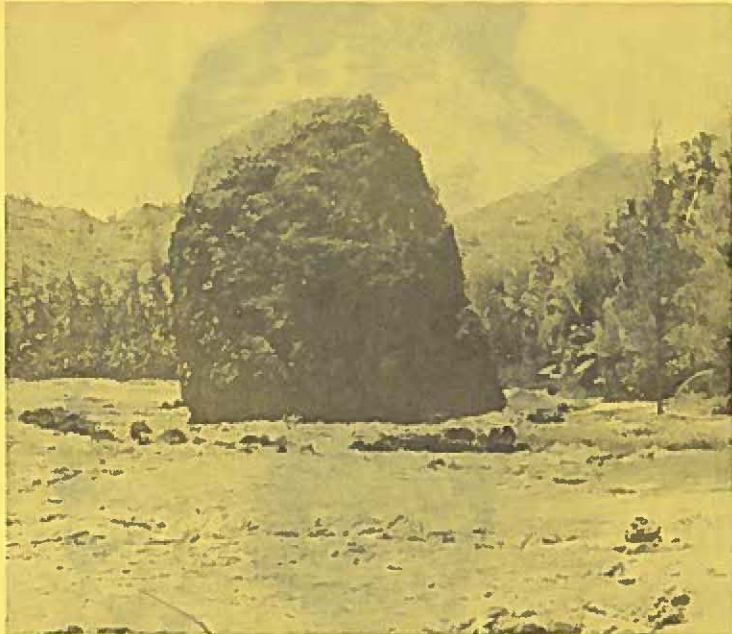
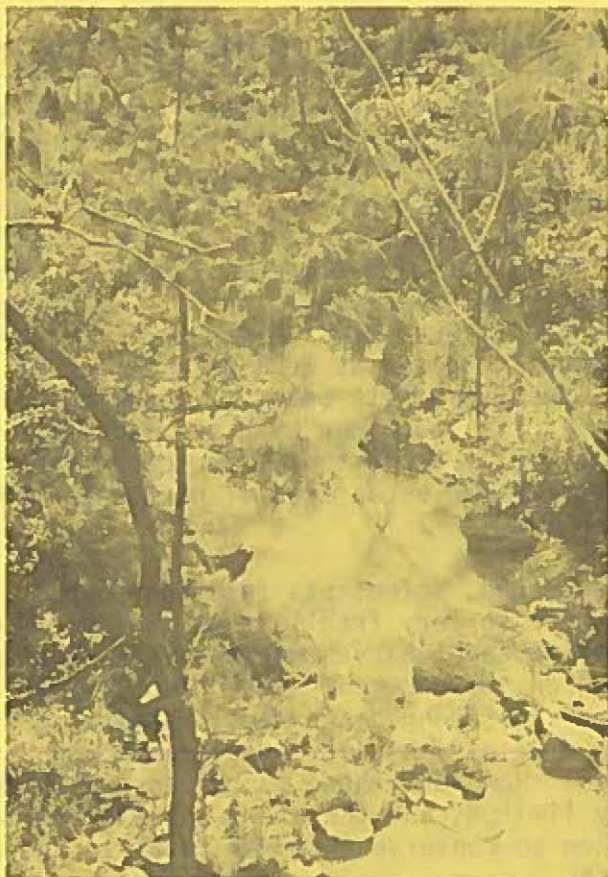




The Uruno Point area represents one of the most untouched portions of limestone forest on the island. The restricted access through adjacent military property has been the primary reason that its current state is probably similar to original forest vegetation that covered much of Guam. It is a critical habitat for endangered species of both plants and animals.



The Tarzan River, winding through ravine forest and upland savannah grasslands provides one of the most aesthetic locations for recreational hiking and nature observation as well as a living laboratory for scientific investigation of natural ecology. In addition, rare and endangered trees, known as Serianthes nelsonii or by its Chamorro name hagun layo are found in the Tarzan River area.



Complimenting the natural coastal strand flora of the Cetti-Sella Bay area are prehistoric sites, a Spanish bridge, and a unique geologic feature called a volcanic stack.



A wetland reed marsh in the Dandan area of central-southern Guam has resulted from the blockage of surface drainage of the Fintasa River. Being constantly inundated with water, the area supports a diversity of aquatic plant and animal life amidst the contrasting dry savannah grasslands.



Coral, Shell, and Algae Harvesting

Since man has lived on Guam, the reef has provided a source of both food and material resources. A technical report entitled, The Extent of Coral, Shell, and Algal Harvesting in Guam's Waters, by Steven E. Hedlund, graduate student, University of Guam Marine Laboratory, provides mapping of the locations of coral, shell, and algal harvesting, checklists of exploited species, discussion of existing legislation concerning use of these resources and recommendations for more effective management. Following are excerpts from the report.

"The single most important natural resource on a tropical Pacific island is its coral reef, for without the reef there would be no island. The coral reef acts as a barrier to reduce the force of wave action upon the land. In addition, the reef provides a natural habitat for a variety of plant and animal life which integrate with the environment to form the most complex ecosystem in our world today. The people of Guam utilize the reef for recreational purposes as well as a source of food. Because of its beauty, economic and scientific value, along with the fact that it is potentially exploitable, the coral reef has been designated as an area of particular concern on Guam.

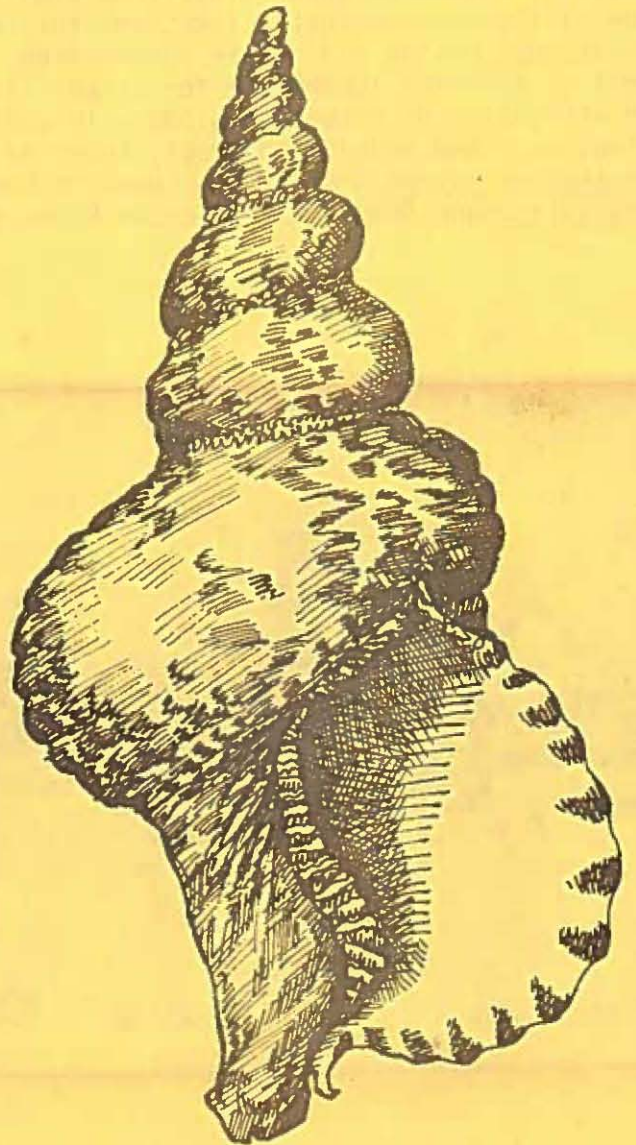
Ten years ago, scientists felt that coral reefs were so very fragile that man should not even think about harvesting the very substance from which they are composed. Today, this attitude has changed and reef organisms are regarded as harvestable and renewable resources. However, these resources are potentially limited, and therefore, great care must be taken to conserve them and regulate their harvest.

In recent years, more and more people have begun collecting corals, shells, and algae for their ornamental beauty and food, and commercial harvesting has also increased greatly.

The natural beauty of dried and mounted coral make it a much desired ornamental product of nature. Some species cut and polish nicely and are thus in great demand by local jewelers. These are the two main reasons why coral is harvested from Guam waters, for ornamental use and jewelry work. The natural beauty of marine shells makes them also a prime target for collector's eye. The main reasons shells are gathered from Guam's reef is for display in private collections. A very minute quantity is sold in curio shops and some species are cut, polished and made into jewelry by local

artists. Various species of marine gastropods and numerous bivalves (clams) are gathered and eaten by the local population. In recent years, the number of shells to be seen on Guam's reef has been greatly reduced.

Probably the most important components of the coral reef ecosystem are the phytoplankton and algae, for without these the reef could not exist. These plants are the primary producers and thus provide food and energy for the multitude of other organisms inhabiting the reef. Besides being a source of food to many creatures which inhabit the reef, some species of macro-algae are eaten by man. A survey of island grocery stores and small markets revealed that currently no local algae is marketed on a regular basis. However, it was discovered that the green algae Caulerpa racemosa is sometimes sold. This species, commonly known to Guamanians as ado is one of the two marine algae eaten by local people. The other seaweed that is harvested for food is the red alga Gracilaria edulis, better known as chaguan tasi."





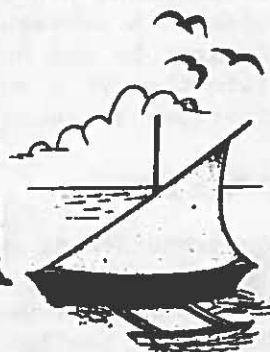
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Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agaña, Guam, 96910

October, 1977
Vol. 2, No. 10

PLANNING NOTES

Community Design Plans Near Completion

The village public meetings for community design have all been held and the amended maps returned to commissioners' offices for further review. The color-keyed maps are in the final stages of completion as well as the accompanying text which explains the use classifications projected on the design maps. As discussed in previous issues of the newsletter, community design plans depict different land uses within an area of human settlement. Communities are places where residents have a strong identification with the geographic area in which they reside. Like its companion Land-Use Plan, the Community Design Element of the Comprehensive Development Plan seeks a balanced use of Guam's land and water resources and an efficient environment which meets the needs of area residents. The community design plans are now slated for review by the Central Planning Council prior to legislative review.

Legislative Hearing on Land-Use Bills Held

On September 26, the Committee on Manpower, Resources and Economic Development, 14 Guam Legislature held a legislative hearing on Bills 233 and 234. The session brought forth some frank and productive discussion concerning this land-use legislation. Passage of these bills is critical as they provide the enforcement basis for implementation of the Land-Use Plan and forthcoming Guam Coastal Management Plan. The two bills now return to the Committee for amendment and/or presentation to the Legislature for vote. Following is a portion of the Bureau's testimony on the bills.

Approximately two years ago, the 12th Guam Legislature enacted P.L. 12-200 which, in part, directed the Bureau of Planning to develop creative legislation for the designation and regulation of land uses on Guam. Bills 233 and 234 are presented in accordance with this legislative directive and, as amended, provide a sound basis upon which both legislative and administrative decisions regarding land use can be made.

Bill 233 accomplishes essentially four objectives:

1. The establishment of a system for designating areas within urban, rural, agricultural, conservation and resort contexts.
2. A procedure for development of necessary performance standards to regulate uses within these district classifications.
3. A means to designate certain areas of particular concern, which, because of their unique recreation, economic or resource value require special consideration.
4. Amendment of The Chamorro Land Trust Commission Act to reflect the new districting system.

The districting system under Bill 233, modeled after Hawaii's highly successful legislation has been reviewed and endorsed by the federal Office of Coastal Zone Management.

Bill 234 simply amends the current zoning law to reflect the institution of the districting system in Bill 233 and the changes in the island's land uses since its initial enactment in 1952. Included in the bill are new lot size, yard, and area standards to reflect the increasing trend toward multi-family and subdivision development.

Through adoption of these two bills, the Territory will be able to take significant steps toward achieving a truly effective system of land-use control and planning.

Talofofa Park Approval Questioned

Contrary to recommendations voiced by several local government agencies, the Territorial Planning Commission, on August 26, 1977, granted a conditional use permit to Hamilton Tourist Inc. for development of a 17-acre multi-million dollar tourist facility at Talofofa Falls. Though the TPC provided for subsequent review of the developer's plans, serious concerns by the agencies regarding the site's susceptibility to severe erosion, provision of adequate waste disposal systems and the variety of different uses proposed within the facility prompted their suggestion that approval through a Planned Unit Development was more appropriate.

Responding to an inquiry by the Bureau of Planning as to the legality of the TPC's actions, the Attorney General, on September 20, 1977, issued an opinion that a conditional use permit may not be granted for such a development under the category of "recreational uses." A subsequent request of the Attorney General by the Bureau of Planning inquires into the TPC's authority to revoke the improperly issued permit.

AICUZ Update

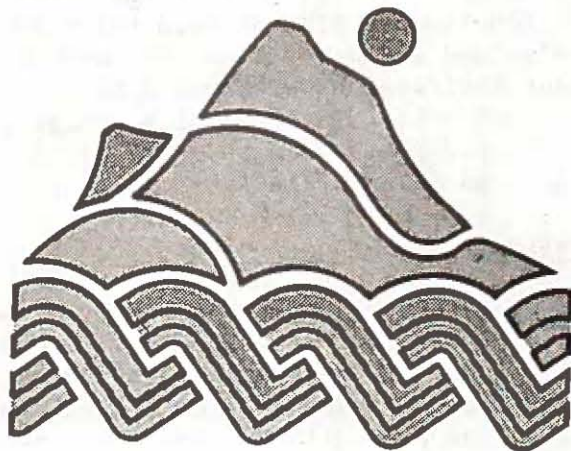
As discussed in a previous issue of the newsletter, the Navy has initiated an AICUZ (Air Installation Compatible Use Zone) Program and Naval Air Station, Agana has been the target of an ongoing study toward better land-use relationships between airfields and adjacent lands. The Federal Register, Vol. 42, No. 2 states the priority policy of the AICUZ Program as "... all reasonable, economical, and practical measures will be taken to reduce and/or control noise from flying and flying-related activities. Typical measures include siting of engine test and runup facilities in remote areas if practical, provision of sound suppression equipment where necessary and may include such additional measures such as adjustment of traffic patterns to avoid built-up areas where such can be accomplished with safety and without significant impairment of operational effectiveness. After all reasonable noise source control measures have been taken, there will usually remain significant land areas wherein the total noise exposure (and/or accident potential) is such as to be incompatible with certain uses."

In order to meet federal AICUZ Program objectives, the Pacific Division of the Naval Facilities Engineering Command (PACDIVNAV-FACENCOM) on Guam contracted CH₂M Hill consultants to do the environmental impact assessment, station analysis and implementation program for NAS, Agana. The Guam Coastal Management Program was given the opportunity to participate in discussion meetings and review and comment on the preliminary operational alternatives reports. Our major comments concerned recommended flight paths that would involve takeoffs and approaches over least populated areas. It was recommended that more alternative patterns should have been presented in the preliminary report. It has also been suggested by our office that more strict control of day-to-day flight patterns, particularly on "touch and go" operations be exercised by the Control Tower.

Overall, the AICUZ Program has tremendously assisted the Guam Coastal Management Program in designating sound and accident potential zones as an area of particular concern (APC) in the recently completed Land-Use Plan. The most current information, supplied by AICUZ planners, has been incorporated into the major plan which is now in print. AICUZ data has also been incorporated into Community Design Plans. Particularly in the Mongmong-Toto-Maite area, sound and accident potential zones are the dominant factor in land-use planning. Crash zones are delineated on the design map and it is projected that much residential land in sound and crash zones will eventually change to a low-population density industrial use.

Erosion and Sediment Control Guide For Guam

The Guam Environmental Protection Agency has recently published an erosion control guide with the above title. The guidebook supplements GEPA's Erosion and Sediment Control Rules and Regulations which are included in the appendix of the text. The guidebook contains essential information for developers seeking to alter terrain surfaces by outlining procedures for developing an erosion control master plan. The text also describes methods of erosion control such as ground cover planting and construction of proper runoff channels or ponding basins. Excellent photographs bring the discussion into visual perspective. Copies are available at GEPA's office located in Harmon Plaza.



Coastal Management Section
Bureau of Planning
P.O. Box 2950
Agana, Guam 96910



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Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agana, Guam, 96910

Vol. 2, No. 11
November, 1977

Agricultural Leases, Water Conservation and
Astumbo: A New Land-Use Issue

A variety of completed and ongoing studies have defined and seek to more precisely address the nature of the underground aquifer system. A previous newsletter fully discussed the freshwater lens system that provides the bulk of the island's finite supply of water. Water resources is an area of particular concern in the Land-Use Plan and land in recharge areas is delineated as open-space, sinkholes and wildlife refuges on Dededo and Yigo community design plans. These land-use classifications seek to protect both the quantity and quality of water and guidelines precisely define both permissible and non-permissible uses in the area, the main portion of which is situated within the Dededo Loop.

Within a portion of the Dededo Water Conservation Area, Tract 1 was transferred from the control of the Department of Land Management to the Department of Agriculture in order to provide agricultural leases. This move was taken prior to the Bureau's delineation of better agricultural lands than exist in this area. Also, it has become evident that pesticides and fertilizers, associated with agricultural land use, pose a threat of non-point source pollution of the underground water supplies. Of 88 granted leases in Tract 1, 53 are engaged in some sort of land use.

With the advent of studies that delineated the occurrence of groundwater resources, the Governor issued Executive Order No. 75-26 which directs that unleased land in Tract 1 be returned to the Department of Land Management for designation as a portion of the Dededo Water Conservation Area. This order also directs the evaluation of leased land as to whether it is being effectively used in keeping with the Green Revolution Program.

Since the Executive Order was issued, a year's time elapsed and implementation of the order faced a multitude of obstacles and complications. To expedite the needed measures to emphasize conservation in this area, the Guam Environmental Protection Agency is coordinating with the Bureau of Planning, Dept. of Land Management, Dept. of Agriculture and GHURA to address the problems.

At initial inter-agency meetings, the Bureau presented maps of the water conservation area and prime agricultural land in Yigo (between Lupog and Mataguac, inland of Mt. Santa Rosa) which

we feel is better suited for agricultural production and the objectives of the Green Revolution. It was suggested that a new agricultural subdivision, similar to the Radio Barrigada subdivision, be developed if sufficient GovGuam land is available. This would not require northern farmers to move south--a potential threat to community identification and the local economic structure.

A basic socio-economic problem with relocation from Tract 1 is that some lease holders have built ranches and substandard residences that though violating the conditions of an agricultural lease, now represent an integral part of their lifestyle. To minimize social problems, it was concluded that it be determined if people requiring residences qualify for application for GHURA low-cost housing in Dededo and Yigo. Those not qualifying for low-cost housing could possibly be given a land lease in the Astumbo area.

The Astumbo residential area is a potential problem area within itself, further complicating the desired use of the recharge area for more environmentally sensitive uses such as wildlife refuges or reforestation. Currently, dozens of families reside in the Astumbo area, north of NCS, between Route 3 and Y-Sengsong Rd. These residences are mostly substandard, in random association, unsewered and some are even within a low-lying sinkhole basin. The Department of Land Management has developed an Astumbo Subdivision Plan for the area and an Act to Create the Astumbo Subdivision was submitted to the 14th Guam Legislature. The Bureau of Planning had serious reservations concerning the plan which represented further urban encroachment on the water lens, contained subdivided lots in the sink area and had a road system that conflicted with current residential patterns, making the plan difficult to implement. To alleviate problems in Tract 1, more problems rose in Astumbo. However, updated maps, depicting residential expansion, open-space conservation in drainage areas and green space in the major sinkhole were provided for revised planning and the proposed bill was amended to alleviate some problem areas.

Leases in the subdivision propose to offer residents currently residing in the Astumbo area first priority. Second priority goes to citizens residing within the water conservation area and third to those residing within the Seashore Reserve. Forth priority is for those residents residing elsewhere on GovGuam

land under a Department of Land Management Land-Use Permit.

At the inter-agency meeting to implement the Executive Order it was decided there will be no extension of current leases in the conservation area and a public hearing will be held to revoke the 33 expired leases. The 53 remaining leases will be reviewed by the Green Revolution Committee. This will be accomplished through field inspection. Also, GEPA will prepare an amendment to the GHURA 500 Law to set priorities for applicants and will coordinate the preparation of an Environmental Impact Assessment concerning the actions discussed in this article. The Bureau of Planning is preparing the sections of the EIA addressing social, economic and land-use impacts. Hopefully, the end result will be a combination of increased water conservation, better agricultural production on more suitable land and improved residential locations, all of which would enhance the quality of life of area residents.

Technical Documents Completed

Several more major technical documents which provide base data for the delineation of areas of particular concern have been completed. Technical studies specifically identify and map resources as well as provide recommended guidelines for management programs. Volume I of Coastal Management Program Technical Reports, as reviewed in last month's newsletter, is in press with its companion Volume II which has recently been compiled. With the completion of these needed technical studies, the program's major direction will be the development of the Guam Coastal Management Plan. Only Phase II of a study of Guam's reefs remains to be completed pending analysis of sedimentation samples for inclusion in the last of the many reports completed in the past year.

Volume II contains an exhaustive study of the pristine marine ecological communities on Guam. This study, completed by Jeanine Stojkovich, U.O.G. graduate student, describes the most relatively untouched areas of representative marine communities such as barrier reefs, fringing reefs, mangrove flats, submarine terraces and cut benches. The areas are described in detail, mapped and photographed with lists of animal and plant species found in each area. The study will also be published separately as a U.O.G. Marine Lab Technical Report.

Marine studies often contain long lists of scientific names that can be difficult to associate with the actual plant or animal unless a person specializes in marine biology. It is often

easier for the layman to refer to a particular animal by its common English or Chamorro name. For this reason, a list of Chamorro and English names of fish, shellfish and crustaceans on Guam, cross-referenced with scientific names, was prepared by CZM planner Patrick McMakin from past anthropological fieldwork. Also included in Volume II and of cultural significance is A Guide to the Medicinal Plants of Guam which was prepared by local botanist Philip Moore and Patrick McMakin and donated to the Coastal Management Program as a report which can assist in the identification and protection of medicinal plant species. The protection of medicinal plants protects both environmental resources and cultural tradition. The Land-Use Plan and Community Design Plans both stress the importance of cultural sensitivity in land-use planning for a culturally plural society that values both its heritage and unique identity.

Federal CZM guidelines for local programs require planning to address shoreline erosion and beach access as two potential problem areas in coastal regions. Two in-house position papers were prepared to discuss these areas. The assessment of shoreline erosion found that it is not an area of particular concern on Guam. The rocky coastline, hardy mangroves and reef-protected beaches on Guam do not face major natural erosion problems. Presently, Talofofo Bay is the only area with significant shoreline erosion and Army Corps studies have shown that the cost of stabilization measures would far exceed the benefits to be derived. A study entitled Beach Access on Guam, by CZM planner Robert Gomez, however, points out definite management is needed to ensure that Guam's beaches are available for public use. This report maps and identifies Guam's beaches, recreational uses and problems of ocean shore availability, as well as recommendations for management.

One problem that threatens beach availability is sandmining. Residents often illegally remove sand from beaches for construction or fill purposes. The Guam Coastal Management Program contracted geologist David Doan to conduct a study of fine aggregates on Guam in order that alternative sources of sand would be mapped and projections of fine aggregate needs be provided. Mineral extraction is an area of particular concern in land-use planning and this study provides much needed background data. This and the above described studies in Volume II will be provided to agencies and developers with interests in responsible and balanced land and water resource use on Guam.

Coastal Management Section
Bureau of Planning
P.O. Box 2950
Agana, Guam 96910



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Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agana, Guam, 96910

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TERRITORIAL FISHERY RESOURCES

As an island, Guam is obviously linked with the surrounding sea. Just as land use can directly affect offshore marine waters, use of resources in marine waters can have a direct impact upon the economy and lifestyle of island residents. The interrelationship between man, the island and the sea must be carefully balanced (planned and managed) such that present and future generations can achieve the highest use of natural resources. The fish that abound in waters surrounding Guam are one such natural resource.

The Land-Use Plan has mapped and outlined areas of particular concern (APCs) or resource areas requiring special management attention. The Guam Coastal Management Plan, currently in preparation, will precisely outline the management programs for those APCs with the highest priority. Management programs will be within the capabilities of present enforcement agencies and mechanisms which will be strengthened by proposed legislation and funding from federal grants. The Land-Use Plan has addressed land and water resources within all types of land areas including the coral reef. The coastal zone of Guam, however, includes not only the land and reef, but deepwater areas beyond the reef to the 3-mile limit. Within deepwater areas, there are fishery resources of high value that must receive further study and be considered for future management programs such that their development and conservation can be balanced in the same logical approach as taken for areas already covered in the Land-Use Plan.

Currently, research, management and development of fishery resources is in a rather uncoordinated pioneer stage. An increasing interest in the development of marine fisheries suggests that this resource area be considered as a potential APC in the Guam Coastal Management Plan. As a potential APC, territorial fishery resources will be further researched by the Guam Coastal Management Program in order that a more concise data base on the subject be available. A consultant is being sought to study the various factors involved in managing the aquatic species of marine life that abound in the waters surrounding Guam, particularly those with high economic value.

A wise governmental policy pertaining to territorial fishery resources may be to conserve and ensure the wise use of existing stocks of important commercial and game (sport) fish and other aquatic species, develop new or poorly utilized ones and ensure that these stocks are fairly allocated among groups of

fishermen. Also the government can encourage and assist commercial fisheries research, actively enforce responsible performance standards for resource use and promote the development of on-shore facilities.

Plentiful stocks of fish abound in the territorial waters of Guam and in surrounding regional waters of the Pacific. Past fishing endeavors by Vietnamese fishermen, utilizing an extraordinarily minimal technology, proved that an abundance of fish exist within the 3-mile limit. Currently, local fishermen are providing the new Public Market with fresh fish and sport fish catches are reported weekly in news columns. Foreign fishing interests, particularly the Japanese, have long successfully exploited migratory tuna in regional waters. Japanese catch statistics are generally guarded and a lack of tuna storage facilities does not find foreign fleets utilizing Guam's port for tuna transshipment. Tuna catches within the 200-mile zone are still allowed for foreign vessels. Other types of fishing by foreign interests require permits under the provisions of the Fishery Conservation and Management Act of 1976. Although the 200-mile zone extends beyond the 3-mile coastal zone boundary, activities have a direct relationship to management of the near shore marine areas. A Western Pacific Regional Council provides management of the 200-mile zone with enforcement by the U.S. Coast Guard.

To research the potential for fisheries development in waters surrounding Guam and other Pacific Islands, the Pacific Tuna Development Foundation was established in 1974. The foundation's goals seek to expand the use and protection of skipjack tuna resources in the Western Pacific by American fishermen, in fulfillment of the objectives of the federal Central and Western Pacific Fisheries Act. Using Congressional funds and support from the National Marine Fisheries Service (NMFS), they have initiated fishing expeditions which test various techniques such as purse seining and trolling for tuna. Research pertaining to provision of bait fish, training programs, economic studies and fish location and attraction methods are among the foundation's associated interests.

On a federal level, the NMFS is the primary agency involved in fishery resource use. They carry out a variety of activities involving biological and economic research pertaining to fisheries operations. They also research the ecology of both economic and game species and coordinate agency interests on a federal level.

In addition to the ongoing functions of the Western Pacific Regional Council, Pacific Tuna Development Foundation and the NMFS, the proposed federal Marine Sanctuaries Program within the Ocean Management Section of the U.S. Dept. of Commerce may provide future management capability for fishery resources. There may one day be a merger of Ocean Mgt. and Coastal Zone Mgt. programs. Background information on the Marine Sanctuaries Program can be obtained at the Bureau's office. The Guam Science Teacher's Association has submitted Cocos Island and Lagoon as a potential candidate for the Marine Sanctuaries Program.

If a future management program is effectively developed for fishery resources, performance standards will undoubtedly resemble the following draft guidelines. The Guam Coastal Management Program welcomes comments concerning the development of fishery management guidelines and input at forthcoming public hearings.

Draft Guidelines for Fishery Resources

Federal development on lands excluded from the coastal zone shall be consistent with the fishery resources policy and not create adverse spillover impacts upon those resources. Developments which directly or indirectly affect fishery resources shall require a thorough environmental impact assessment.

Dredging activity such as offshore mineral extraction shall not adversely affect fishery resources and shall be timed so as to minimize impacts upon seasonal fish runs.

Ocean disposal shall not adversely affect fishery resources and shall adhere to appropriate sites (where currents do not cause a migratory pollution plume or where disposal will not cover valuable bottom-dwelling organisms.) Appropriate site selection shall involve current and marine biological analysis. Disposal shall only be allowed when on-land disposal is not economically or environmentally feasible. Transport vessels carrying waste materials shall not be overloaded and fishermen shall be notified of the time and place of dumping operations.

Dredging and dumping sites shall be approved by the Guam Environmental Protection Agency after relevant agency, council, foundation and cooperative review on both local and federal levels.

Maximum oil preventative measures shall be encouraged. Deballasting of tankers and bilge pumping shall be prohibited within the coastal zone. Accidental spills shall be immediately reported to the U.S. Coast Guard.

. Permanent or temporary structural development that could pose a navigational hazard in Guam's territorial waters shall follow Submerged Lands Permit approval from the Department of Land Mgt and the U.S. Army Corps of Engineers.

. Sport and commercial fishing shall adhere to size and bag limits or species restrictions if established. Both American and foreign fishing interests shall adhere to all fishing regulations. Billfish and tuna catches (number, weight and location) shall be recorded with appropriate agencies such that stocks can be monitored. Billfish include marlins, swordfish and sailfish. (It has been suggested that shark catches should also be monitored because of their economic value. Many foreign vessels place a high value on shark catches.)

Being a small island, much of Guam's potential economic resource base is marine in nature. Therefore, fishery management is more important than in some continental regions. As many states would rely most heavily on their forests and farmlands, Guam will increasingly look towards the sea for economic production. Advanced commercial fishing can support the development of port-related facilities and increase self-sufficiency, thus benefiting the entire island. Direct benefits to the tourist industry can be derived from enhancement of sport fishing. In short, fishery management can benefit Guam, the Pacific region and Guam's strategic economic location in the national interests of the United States.

Offshore fishery resources can not escape worldwide factors. There is an increasing international recognition of the importance of the world's seas and the need to deal with major ocean problems such as overfishing and pollution. International interaction in fishery resource management must begin with effective local management.

National Oceans Week

Washington D.C., the nation's capital will observe a National Oceans Week during April 16-23, 1978. The Washington area was chosen as the focal point for a National Oceans Week in recognition of its key role in the development of national policy, legislation and regulations that involve the development and preservation of ocean resources. There is a move to declare the event by a National Proclamation. Information can be obtained by writing National Oceans Week, 1000 Water St., S.W. Washington, D.C. 20024.

Coastal Management Section
Bureau of Planning
P.O. Box 2950
Agana, Guam 96910



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Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agana, Guam, 96910

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THE GUAM COASTAL MANAGEMENT PROGRAM

The Land-Use Plan and Community Design Plans as elements of the Comprehensive Development Plan have been completed. These plans have been printed and can be viewed at the Bureau of Planning. Awaiting final printing of maps for the Community Design Plans, they will be presented at public hearings in the near future. Responsible use of the island's resources must go beyond these printed documents. An action-oriented response is needed to address the many issues and problems which have been clearly identified. A means of providing support for such response is the second phase of the Guam Coastal Management Program for which the draft document has been completed. The Draft 306 Document, using the Land-Use Plan as a basis, further clarifies policies and problems, and outlines planning and management activities.

Depending upon a number of factors, funding for the 306 or implementation phase of the Guam Coastal Management Program could amount to \$500,000 in FY79. It is presently estimated that 75-80% of this amount will be distributed to other GovGuam agencies.

Certain program activities focus upon guiding development with areas of particular concern (APCs) which are not protected by existing law and/or rules and regulations, or which will be subject to increased development pressure in the future. For example, Guam's historic sites are already protected by law which outlines the standards for historic preservation. Guam's pristine ecological communities, however, have only recently been delineated as the most significant representatives of Guam's characteristic marine and terrestrial communities and need to be protected by up-to-date management capabilities. Cocos Lagoon and Tarzan Falls are examples of pristine areas.

Management of resources must also recognize major developments within areas such as Commercial Port as being both beneficial and desirable. Still other areas, such as seismic fault zones or scenic vistas require additional study before effective management can be realized.

In an identification of problems related to land and water use on Guam, it was evident that not all problems involved the actual use of resources. Certain governmental process problems concerning the administration of related laws exist. An activity of the Guam Coastal Management Program which seeks to alleviate governmental process problems is, for example, funding of needed personnel for enforcement agencies such as the Attorney General's Office, Department of Land Management, GEPA, Department of Agriculture and Department of Public Works. The program is presently developing memoranda of understanding to define the responsibilities of these personnel. The program can also enhance governmental processes by providing funding for training programs, seminars or workshops to develop the skills of key personnel within related agencies. Governmental updating of mapping and technical documents must also continuously be a part of effective resource management.

The Draft 306 Document will be presented at a public hearing to be held 7:30 p.m., Thursday, March 2, 1978. The public is invited to attend the hearing at the Office of the Bureau of Planning, Conference Room, 4th Floor, PDN Bldg. The document and maps can be seen in the Bureau's office prior to the hearing. The staff will be glad to answer questions or receive comments.

The implementation of the program awaits and relies heavily upon the passage of Bill No. 233 by the 14th Guam Legislature. The bill defines land-use districts, APCs and the functions of the Land-Use Commission. The Guam Coastal Management Program has found this to be the best method of delineating land and water areas that, due to particular characteristics, are suitable for specific uses or require special management attention. Public Law 12-200, Government Code of Guam also mandates the development of a comprehensive approach to planning, a task that has been met, from a land-use perspective, through the delineation of districts and APCs. Article IX of the Draft Guam Constitution further mandates, "A land use plan shall be adopted by law identifying urban, rural, agricultural, and conservation areas. The constitution's environmental policy reads, "The land, water, and other natural resources of Guam shall be conserved and managed to preserve scenic beauty, guarantee clean air and pure water, encourage agriculture, and provide for recreation."

PLANNING NOTES

Resort-Hotel Zone Regulations Drafted

During the past year, the 14th Guam Legislature passed a bill which established a resort-hotel zone. The bill, however, did not define the various zoning standards that outline such things as building height restrictions, lot sizes, setbacks, parking requirements, etc. An amendment to the bill required that these standards be developed. An interim set of rules and regulations has now been prepared and submitted to the Territorial Planning Commission (TPC). The TPC has held an initial public hearing and received valuable input from the American Institute of Architects, Guam Chapter. The TPC will now meet to vote on the rules. If adopted, the TPC will then have the authority to enforce the rules as with other zoning laws.

Seashore Park Bill in the Legislature

Bill No. 638 which proposes the establishment of the Territorial Seashore Park is being reviewed by the Committee on Youth and Senior Citizens, 14th Guam Legislature and will appear in a legislative hearing this month. The Bureau of Planning has thoroughly reviewed the bill and closely coordinated with the Department of Parks and Recreation throughout the planning process for the proposed park. The park concept is highly consistent with the objectives of the Land-Use Plan and Community Design Plans. A synopsis of the park's objectives will be outlined in the Comprehensive Development Plan's Recreation Element. The Bureau strongly supports passage of the bill. More information can be obtained by contacting the Office of the Department of Parks and Recreation, phone 477-9621.

Bureau of Planning Readies Disaster Plans

The Bureau's Disaster Preparedness Planning Program is actively engaged in completing the Territorial Emergency Plan. They have recently completed an interim plan which outlines a new concept of government operations, before, during and after hazard situations. The final draft has received favorable comments from numerous agencies. Upon finalization, the interim plan will be mandated through Executive Order and shall be used till the passage of the final plan. The DPP Program has also prepared a report entitled Information Interface of Individual Assistance Programs

which summarizes assistance programs provided during Typhoon Pamela to reduce duplication of efforts and benefits among major disaster assistance program. The Vulnerability Study Series, Reports I and II are concerned with hazard analysis or discuss the nature, cause and effects of various hazards to which the island is vulnerable. Current efforts of the program are directed towards completing studies on building codes and other plans, measures and procedures for strengthening the government's response capability.

Two Studies Completed by Economic Section

Two studies have recently been printed by the Economic Planning Division within the Bureau of Planning regarding agricultural and fisheries development. Both studies were prepared as supporting documents for the Five Year Economic Plan, which is being prepared as an element of the Comprehensive Development Plan. The Agricultural Development Plan, prepared by the College of Agriculture and Business, University of Guam, analyzes resource potentials and constraints facing Guam's agricultural sector today and identifies basic approaches that can be taken to stimulate agricultural development. Dr. Paul Callaghan, also of the College of Business and Agriculture, is the author of Some Factors Affecting Household Consumption of Seafood and Fish Products on Guam. This study used a sample survey of households to estimate the local consumption of different types of fish products and analyzed various socio-economic factors influencing this consumption.

GEPA Environmental Management Study in Progress

GEPA's 208 Program has contracted consultants to provide an in-depth analysis of governmental agency procedures which relate to environmental management. Recommendations will seek to eliminate overlaps, fill in management gaps and increase overall enforcement capability by clearly defining or revising agency responsibilities. The study has completed two initial discussion papers and is holding inter-agency workshops. The first discussion paper gave a preliminary overview of present authorities, procedures and problems. The second discussion paper addresses major problems and outlines the positive and negative impacts to be expected from various solutions. The entire study is highly consistent with the Coastal Management Program's objective of reducing governmental process problems and is developing into a valuable assessment of needs for greater efficiency in resource management.

Coastal Management Section
Bureau of Planning
P.O. Box 2950
Agana, Guam 96910



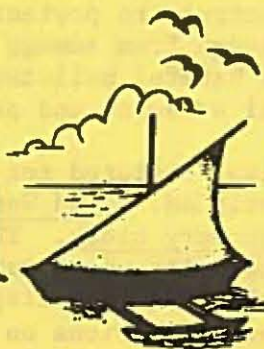
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Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agana, Guam, 96910

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THE PROPOSED TERRITORIAL SEASHORE PARK

Bill No. 638, proposing the establishment of a Territorial Seashore Park for Guam, has appeared in a legislative hearing before the Committee on Youth and Senior Citizens. The hearing will be continued in the near future, upon notification of area residents and landowners. The bill, submitted by the Department of Parks and Recreation, is supported by the Bureau of Planning as it provides for the balanced conservation and development of Southwestern Guam. The proposed park surrounds Merizo and Umatac and extends inland to the Fena Lake and Tarzan Falls area. The majority of the park area covers federal and GovGuam owned lands. Urban areas were excluded to allow for the expansion of existing community centers.

The establishment of a seashore park could ensure that an opportunity exists for those who choose to maintain a rural lifestyle associated with Southern Guam. With the inevitable urban growth on the island, the residents of Southern Guam should have the option of retaining a more traditional lifestyle.

Most of the proposed park area is undeveloped open space and extremely beautiful. The natural features of Southern Guam represent a unique blend of interior valleys and volcanic uplands, coastal lowlands, spectacular coastline and coral reefs. It is generally agreed that untouched areas, such as Cocos Lagoon, Sella Bay and Tarzan Falls, need to be protected due to their geologic, ecological and scenic value.

Numerous historical features found in the park area merit preservation as reminders of Guam's Spanish-Chamorro heritage. Thirty-four historic features, dating from prehistoric times through World War II, have been identified and it is probable that more will be found as the area is further researched.

The Seashore Park is not a no-growth concept. It is a flexible one, encouraging multiple, compatible uses and discouraging those which do not complement the natural environment. For example, the construction of buildings which block scenic views or developments which would involve large amounts of land-grading would be discouraged.

On the other hand, fishing, farming, outdoor recreation and other related enterprise would be encouraged. The park could provide a setting for the establishment of responsible and culturally sensitive park-related enterprise. More jobs could develop for area residents with activities such as tours of historic and scenic areas, fresh fruit and vegetable sales or local handi-craft shops in village centers. Another economic benefit would be in the form of federal grants to be used in the management of the park area.

The development of a park that maintains the integrity of village life, while adding to the recreational activities and physical environment to be enjoyed by all residents, can additionally enhance the tourist industry. Assured that the seashore park would be a worthwhile destination, visitors would be attracted to this part of Guam to enjoy its outstanding scenic beauty. The resulting economic impact, though not easily seen, could be increased revenues for area residents and the tourist industry.

PLANNING NOTES

The Guam Environmental Protection Agency has recently developed a Water Monitoring Strategy for the Territory of Guam. Various local and federal laws require the Territory to ensure that water quality standards are continuously met. To keep Guam's water safe for drinking, recreation, wildlife and other uses, numerous tests must continually be made at various places around the island. The water monitoring strategy is a plan which outlines exactly where, when, and what tests will be conducted.

Within GEPA, the 208 Program is planning to make all of Guam's water swimmable and fishable by 1985. The program has funded consultants to develop a strategy for control of nonpoint sources of pollution. A draft report is being circulated for comment by various agencies. Nonpoint sources are types of pollution which are not readily visible, such as toxic chemicals, solid waste leachates, bacteria, fertilizers, etc. The threat of nonpoint sources increases with residential, commercial, industrial and even agricultural

land-use, if harmful pesticides or other substances are used. The Nonpoint Source Pollution and Recommended Control Strategies report contains discussion and recommendations concerning runoff from urban streets, ponding and catch basin effectiveness and maintenance, land-use controls to protect water wells, disposal of sludge from sewage treatment plants and disposal of harmful pollutants such as used lubricating oil or swine and poultry wastes.

Also completed for GEPA is a consultant report entitled, Solid Waste Disposal and Resource Recovery Study. This study examines the existing solid waste management system (garbage collection and disposal) on Guam and makes recommendations on improving operations so that they efficiently utilize the space at the Ordot Dump and are environmentally clean. Solid waste disposal can be costly, damage water quality, pollute the air or breed disease if improperly managed. If efficiently developed, recovery of resources such as metals, organic mulch, or methane gas, could provide revenues to offset the cost of disposing of the trash which is generated on Guam. The study outlines the potential for various resource recovery methods which are possible on Guam.

WRRRC Studies Completed

Two technical reports have recently been completed by the University of Guam Water Resources Research Center. The WRRRC has completed five major studies to date and others are in progress. Copies of their studies can be obtained from their office located in the UOG Marine Lab complex. A report entitled Urban Runoff Quality in Northern Guam presents information pertaining to the amounts of pollutants contained in storm drains and ponding basins. It was found that bacteria counts in Agana Bay, due to storm drains, often exceed the Guam Water Quality Standards, as did the nitrogen levels within groundwater seepage and tap water sources. Excessive amounts of grease and oil were found in stormwater near the airport. The data indicates that the Water Monitoring Strategy mentioned earlier will be a timely and much needed operation.

Another report, The Analysis of Small Water Distribution Systems is a study outlining a method to determine the amount of water lost within pipes as a result of leaks or illegal connections. A mathematical method of determining water loss amounts is presented.

This is important, as it has been estimated that up to 30% of the water being distributed on Guam is being lost as a result of these two reasons. The method utilizes analysis of flow and pressure changes to measure loss.

Environmental Report on Tract I, Dededo

At the request of the Governor, the Bureau of Planning and GEPA have compiled a report discussing the environmental, economic and social considerations involved in the present development within a land area over the northern aquifer or underground water supply. Agricultural leases, administered by the Government of Guam, have led to a complexity of existing and potential problems. Many agricultural leases have been used for residential development and it is known that the potential for pollution increases with intensifying land use. Septic tanks, pesticide spraying, poultry farming and other activities could harm the water supply used by the entire island. Presently, the report which contains detailed discussion and alternatives for action is being reviewed by relevant agencies for comment. Upon completion, it will provide a basis for decision-making by the Office of the Governor, concerning the status of land use in Tract I.

306 Document and Bill 233 Status

The first public hearing on the 306 or implementation phase of the Guam Coastal Management Program was held this month. A representative of the U.S. Fish and Wildlife Service arrived on Guam to discuss the program and various local and federal agencies are preparing written comments. The program document, which outlines activities towards a more balanced use of Guam's resources, is being refined with the input received. Another public hearing will follow the current review process. Moving from the 305 planning phase to the 306 phase is dependent upon passage of important land-use legislation. Bill No. 233, which outlines the process for designating land-use districts and areas of particular concern is being revised based on discussion on the floor of the Legislature. Soon, it will receive further review by the Legislature's Committee on Resources, Manpower and Economic Development.

Coastal Management Section
Bureau of Planning
P.O. Box 2950
Agana, Guam 96910



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Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agana, Guam, 96910

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Floodplains

Historically, man has been attracted to the low-lying areas along rivers and streams. The availability of water and rich alluvial soils, the accessibility of coastal transportation, and the aesthetic beauty of the shoreline have encouraged the settlement of these areas. Many of the nation's major cities, productive farmlands and most attractive residential and recreational sites have been developed in floodplains.

Floodplains are the relatively flat areas adjoining inland and coastal waters that receive overflow during excessive rainfall. Floods are natural occurrences within these lowlands. Flood damages, however, are usually the result of man's encroachment of flood-prone areas without first providing adequate protection against rising waters.

Flood damages are not confined to coastal or riverine floodplains. Damages occur in a wide range of physical situations in which abnormally high waters can cause loss of life and property. Whenever a tract of land is graded, a highway constructed or a building erected, the natural flow of surface water is altered. A change in topography often increases runoff water that flows into improperly drained sites, destroying homes, undermining roadways and interfering with agriculture and other land uses.

In the past, floods were controlled primarily through the construction of channels, dams, levees and similar structures. In many instances, however, these projects may be inadequate or undesirable in reducing flood losses. The cost of land for building such structures may be prohibitively high. Flood control projects may also be incompatible with the locational advantages of a site. A levee, for example, might cut off recreational access to a river or destroy the aesthetic appeal of a beach. Structural controls may even contribute to flood problems. While the structures are engineered to protect flood-prone areas up to a certain limit, their construction could encourage a false sense of security that could lead to development of flood-prone areas beyond that limit of protection. Communities have learned through bitter experience that flood control systems alone are not the answer to recurring flood problems.

Flood management policies have been shifted from a primary emphasis on structural controls, to a balance between structural and regulatory controls.

The regulatory approach may involve the enforcement of various subdivision and building codes. Guidelines for flood hazard area management will be established. The purpose of these regulations is not to prohibit development of flood-prone lands, but rather to encourage the most appropriate use of these areas. For example, residential use may be discouraged in areas most susceptible to recurring floods while open-space or agricultural use may be encouraged. In these areas, parks, certain types of warehouses and parking lots may be permitted. The specific manner of use must also be considered. A concrete structure in a flood-prone area may suffer minor damage while a wooden building may be swept from its foundation. A home constructed below flood level may be destroyed; a similar structure elevated on piles may be left undamaged. A warehouse full of boxed foods or drugs may have its contents completely destroyed; cement blocks stored in a similar structure may suffer minor damage.

Without guidelines for floodplain use, owners of flood-prone areas may use lands in a manner incompatible with the general welfare. Landowners may not realistically consider flood threats and the possible costs to society as a result of developing these lands. The public interest requires that the benefits of uses located in flood-prone areas exceed the cost to the user and to society. Total costs include the economic loss to the user, to property owners whose lands are affected as a result of development nearby and public expenses for reconstructing roads, sewers and other utilities. The cost of protecting public health and safety must also be considered part of these total costs.

The National Flood Insurance Program

The National Flood Insurance Program was designed to reduce the severity of flood damages by reducing the amount of property exposed to hazards. The program offers flood insurance coverage for private and public landowners at rates made affordable through a federal subsidy. In return, affected communities are required to regulate new construction and development in flood hazard areas. The program is administered by the Federal Insurance Administration (FIA) of the Department of Housing and Urban Development. Guam's participation in the insurance program will be initially coordinated by the Coastal Management Program of the Bureau of Planning.

tered in two phases: The Emergency Program and the Regular Program. The function of the Emergency Program is to make flood insurance readily available to property owners. To qualify for this phase of the program, a Flood Hazard Boundary Map must be prepared by the Federal Insurance Administration. The map is a preliminary delineation of flood hazard areas of the island prepared from the best available data. After Guam is admitted into the Emergency Program, limited amounts of federally-subsidized insurance will become available to owners of flood-prone lands. The limits of coverage under this phase are up to \$35,000 for single-family homes and up to \$100,000 for other structures. Content coverage may be purchased up to \$100,000 for non-residential structures.

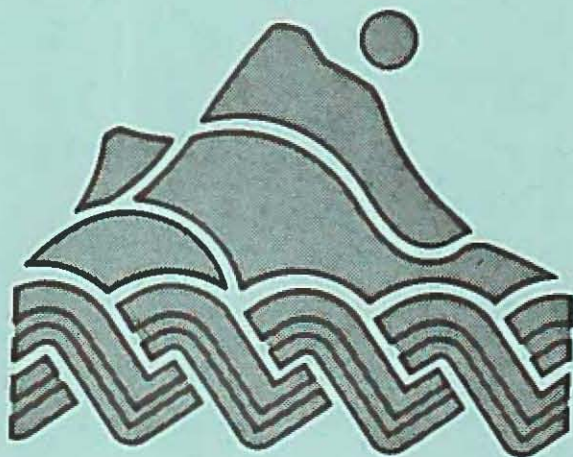
In preparation for entering the Regular Program, an extensive technical Flood Insurance Study will be conducted by an engineering contractor for the FIA. The study includes the development of a flood insurance rate map. The non-subsidized insurance rates for the community will be derived from this Flood Insurance Study and flood elevations from the Flood Hazard Boundary Map. Guam will have the opportunity to appeal the elevations to the FIA. After appeals are resolved, official base flood elevations will be reflected on the Flood Hazard Boundary Map. Once the flood elevations are finalized, the community will be required to adopt additional floodplain management regulations. Additional flood insurance coverage will then be available.

PLANNING NOTE

306 Program Status

The review draft of the Guam Coastal Management Program's 306 document has undergone an extensive review process by relevant local and federal agencies and is presently being revised prior to submittal of another draft for further review. The current revisions are rather extensive, not only as a result of agency and public input, but also due to changes in the status of related legislative proposals. In order to effectively manage Guam's land and water resources and gain approval of the program, there have to be sufficient regulatory mechanisms, or simply laws which facilitate the enforcement of responsible land-use practices. The Land-Use Plan and Community Design Plans, recently approved by the Central Planning Council and the Governor and transmitted to the Guam Legislature, update the 1966 Master Plan and delineate the land-use districts and areas of particular concern (APCs) which require special management attention. Guam's new Constitution also mandates the utilization of the land-use districting system. Now, all the 306 (implementation phase) of the program needs to

standards for balanced use of the land within the urban, rural, agricultural and conservation districts and those APCs which are not sufficiently managed by existing controls. For example, APCs such as freshwater resources are covered by GEPA's water quality standards or slopes in excess of 15% are managed through soil erosion and sediment control standards. Two APCs identified by the Guam Coastal Management Program as most lacking such regulatory controls are wetlands and flood hazard areas. Originally, the program envisioned passage of legislation in the form of Bill 233 which defined the land-use districting system and APC approach and Bill 234 which revised the Zoning Law. Due to legislative input and program developments, other mechanisms have been formulated to more effectively meet the needs of the program. The promulgation of rules and regulations for the Resort-Hotel Zone by the Territorial Planning Commission (TPC) and the usage of Community Design Plans as a guide for zoning decisions will substantially encourage more responsible zoning. The anticipated promulgation of rules and regulations (performance standards) for land-use districts, wetlands and flood hazard areas by the TPC will effectively fill in the present gaps in land-use management. As discussed in this newsletter, the enactment of rules and regulations for management of flood hazard areas will not only benefit the Guam Coastal Management Program's objectives, but is essential for participation in the National Flood Insurance Program. These performance standards and those for wetlands have been drafted and are presently being circulated for agency review prior to a TPC public hearing. The public hearing is scheduled for August 10, 1978, 9:30 A.M. in the Administration Building Conference Room, Agana.



Coastal Management Section
Bureau of Planning
P.O. Box 2950
Agana, Guam 96910



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the Sea



Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agana, Guam, 96910

Volume 3, No. 6

December, 1978

Program Update

The Guam Coastal Management Program is nearing completion of its program document which, once approved through a federal review process, will guide the program into its 306 or implementation phase. The lengthy document, having undergone review by local agencies, interest groups and the public, has been extensively revised at the Bureau of Planning since it was first drafted over a year ago. Major changes involve the legal mechanisms which will support a more balanced use of Guam's land and water resources. Proposed Bills 233 and 234 relative to land use and revised zoning were scrapped in favor of alternative approaches which have successfully filled in large gaps in regulatory authority. Executive Orders, Rules and Regulations for Land-Use Districts, Wetlands and Flood Hazard Areas and the Resort-Hotel Zone Regulations have significantly upgraded the Territory's capability to manage coastal resources. These specific controls are consistent with the intent of an executive order which mandates the island's adherence to Land-Use policies, as developed by the Guam Coastal Management Program. The policies provide a basis for the program's future direction and promote a consistent approach to resource management among all government agencies and interests. Within a month or two, it will be printed with an Environmental Impact Assessment of the program and distributed to relevant federal agencies and commissions for final review.

Seashore Reserve Plan Drafted

During the past two years, the Guam Coastal Management Program has been monitoring and analyzing the effectiveness of the Seashore Protection Act. The Act was originally conceived in 1974 with the intent of promoting responsible use of Guam's shoreline areas. The Territorial Seashore Protection Commission was established to review projects to be developed within the Seashore Reserve. The area was originally defined as the seaward area to a 10 fathom (60 ft.) depth and landward to a 100 meter boundary.

The shoreline of Guam requires a highly effective management approach because as the fragile land-sea interface, it must serve as the medium for marine recreation, wildlife protection, historical preservation, port development, resort hotels,

and specific shoreline-dependent uses such as wastewater disposal and power production. Despite the need to balance these conflicting demands, the Act's regulatory function was eroded by an amendment which reduced the landward boundary to 10 meters for the temporary need for post-Typhoon Pamela reconstruction of damaged homes within the seashore reserve.

Now that reconstruction has been completed and areas for urban growth as well as areas of particular concern, such as wetlands and flood hazard areas, have been officially designated, there is a need to amend the Act again to provide a definition of the Seashore Reserve which can responsibly meet the original intent of the Act.

The Guam Coastal Management Program has encouraged a proposed bill which amends the Seashore Reserve boundary to, not an arbitrary boundary, but to a distance delineated on an official Seashore Reserve Map. The draft Seashore Reserve Plan and maps prepared by the program denote the actual extent of shoreline-associated resources. This geographic-ecological approach will hopefully provide a more logical method of assessing impacts of proposed developments along Guam's unique shoreline areas. The plan's implementation is contingent upon agency review, public hearings and amendment and passage by the 15th Guam Legislature.

Land-Use Plan to be Revised

Just as the Guam Coastal Management Program 306 Document was drafted in light of proposed legislation which never received legislative approval, the Land-Use Plan was also conceived in the same dim light. The program has undertaken an effort to update the plan in reference to changes in legal authorities, as previously discussed, and refine the data regarding Guam's basic inventory of resources. The past year's utilization of the plan has brought forth a number of improvements which are needed to upgrade

ability of defining the capacity of Guam's land and water resources to accommodate the island's growth needs. Users of the plan will find two new chapters in the revised document. Discussions of land transportation and federal lands will be included. The Guam Comprehensive Highway Plan, prepared in 1976, was limited by the absence of a land classification system and knowledge of areas of particular concern in planning for highway improvements. The revised Land-Use Plan will address transportation issues related to land use and environmental protection and provide guidelines for transportation developments which are consistent with Land-Use Policies and the Land-Use Districting Map. The chapter on federal lands will seriously address the broad implications of federal land ownership on Guam and delineate specific federal properties which are not critical to national interests or military missions and which could be put to better use if acquired by the Government of Guam. Key areas discussed will be Cabras Island, Fena Valley, Ritidian Beach and Tarague Beach.

CZM-Funded Studies Completed

During the CZM Program's 305 planning phase, many studies have been completed so that an inventory of Guam's natural resources would be available as basic planning information. The last of the 305 studies have now been completed and are available for agency and public use. Further studies can be completed under 306 funding, however, these would only occur in specific cases with emphasis on development of management or restoration strategies rather than on the collection of baseline data.

Phase II of a Study of Guam's Reefs and Beaches has been completed by marine biologists as separate studies published as UOG Marine Lab Technical reports. Sedimentation Studies at Fouha Bay and Ylig Bay, Studies on the Biology of Reef Fishes of Guam and Transect Studies provide baseline data about the ecology of offshore marine communities on Guam. Also providing data regarding a segment of the island's marine fauna is a study completed by the Division of Aquatic and Wildlife Resources entitled Survey of Edible Marine Shellfish and Sea Urchins on the Reefs of Guam. Those persons engaged in harvesting clams and sea urchins for home consumption will find this study particularly informative. One of the most interesting studies for both the government and the general public is another CZM study, also completed by A&WR, which presents the Current Status and Distribution of the Marianas Fruit Bat on Guam. This study maps the critical habitats of the fanihi which is at a low population level. Population

counts indicate that fewer than 100 bats are left on Guam. Two major factors contributing to the decline are habitat loss and illegal hunting of the popular delicacy. It is evident that the palates of Guam's residents will have to yield to more effective protection of fruit bats if we are to continue to count them as part of the island's unique wildlife community.

CEIP Study Submitted

A previous newsletter issue described the intent of the Coastal Energy Impact Program, as a federally-funded program designed to promote responsible planning for energy facilities toward mitigation of adverse impacts which result from such intensive use of the land. The program, affiliated with the CZM program, has initially funded a study entitled Planning for the Impacts of Guam Energy Facility Expansion. This study provides a preliminary assessment of the environmental, economic and social impacts of proposed developments related to energy production. Expansion will be in the realm of construction of an additional steam plant at Cabras sometime after 1983, provision of additional fuel storage tanks and pipelines at various locations, probable expansion of GORCO's refining operations and the power hardening project which involves the replacement of wooden poles with concrete and steel. There is also the remote possibility that a Central Terminal Station (supertanker port and oil storage) will be considered once again. The voluminous study provides baseline data regarding present and projected energy facilities, discusses methods of alleviating adverse environmental impacts and denotes areas where the CEIP could provide future federal funding to alleviate these hazardous conditions.

Coastal Management Program
Bureau of Planning
P.O. Box 2950
Agana, Guam 96910



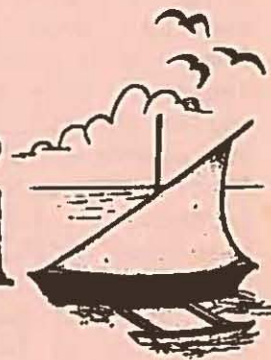
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the Sea



Bureau of Planning, Office of Coastal Zone Management

Box 2950, Agana, Guam, 96910

May, 1975
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THE BUREAU OF PLANNING

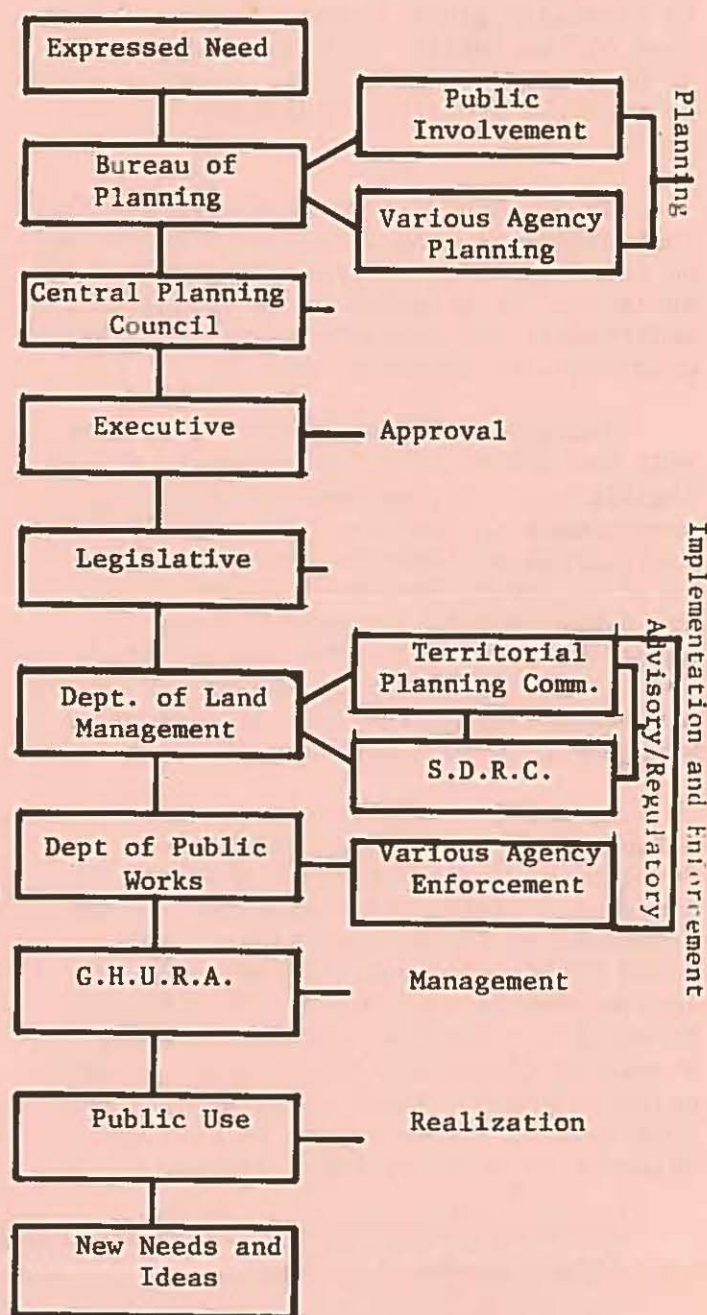
Effective planning for Guam's future is the challenging task facing the Bureau of Planning. The complexity of pressures affecting land and water resources, as well as lifestyle and the economy, necessitates an agency designed to monitor rapid change and present conceptual plans for needed development.

The Bureau of Planning, as mandated in Public Law 12-200 is responsible for the preparation of a Comprehensive Development Plan for Guam. In support of this objective, the Bureau has received federal matching funds from the Department of Housing and Urban Development, The Office of Coastal Zone Management and the Economic Development Administration. The expected completion date is July, 1978.

The main objective of the Comprehensive Development Plan will be to promote intelligent policy-making. It is designed as a reference guide for government and professionals who are concerned with development or resource use on Guam. It will provide conceptual guidelines to assist in a wide-range of special-interest planning and management. Also, it will be distributed to federal agencies so that they will be informed of plans affecting adjacent federal properties and so that land-uses will be compatible throughout the island. As a comprehensive plan, it is ultimately designed to protect the public interest.

THE PLANNING PROCESS

The planning process involves a major effort to coordinate the plans and activities of various GovGuam and federal agencies and formulate more comprehensive or all-encompassing plans. A wide range of pertinent information is incorporated into the various elements or sections of the Comprehensive Development Plan. Inherent in the planning process is the continual drafting of new legislation and revision of current legislation to meet changing needs. This issue of the newsletter seeks to explain the



An Example of a Land-Use Planning Process

current land-use legislation and discuss various agency's interests in land-use and planning. The different types of laws, permits, commissions and agencies are easily confused. In order to gain a logical perspective or a better understanding of the complexity of different interests, let us follow the basic process involved in planning for an urban-residential government subdivision (see process chart).

PLANNING TO MEET NEEDS

It is the nature of man to continually strive to meet felt needs and desires. Even if totally satisfied, humans will persistently develop new desires. This never ending quest is called the search for affluence. Without comprehensive planning, this satisfaction of needs becomes random and the interests of a few can damage the resource base upon which an entire society relies. For this reason, needs are often expressed by a group of residents to the government. A senator may learn that there is a demand for a residential subdivision to handle the expanding population growth within a community area. The legislature or executive office may then direct a government agency to formulate plans to meet this expressed need of the public. Various agencies, to be discussed later, will design a plan to meet the specific requirements of the area.

As the central planning agency within the government, the Bureau of Planning will be involved in the delineation of land-use areas for the proposed urban expansion and incorporate the specific plans into their comprehensive planning efforts.

Currently, the proposed Districting Bill No. 233 is being presented to the legislature. It outlines the Bureau's involvement in land-use planning. Four basic areas of land-use have been designated as having special interest. They are urban, rural, agricultural and conservation districts. The mapping of these areas assists planners in developing performance standards for land and water management in each district.

As man is an inevitable member of the island ecosystem, residential housing development is necessary to meet the demands of a rising population for the improvement of living conditions. A proposed residential subdivision would be located within an urban district so that it would not conflict with performance standards for other conservation and agricultural areas. Rural areas are primary locations for urban growth as they are adjacent to existing urban areas.

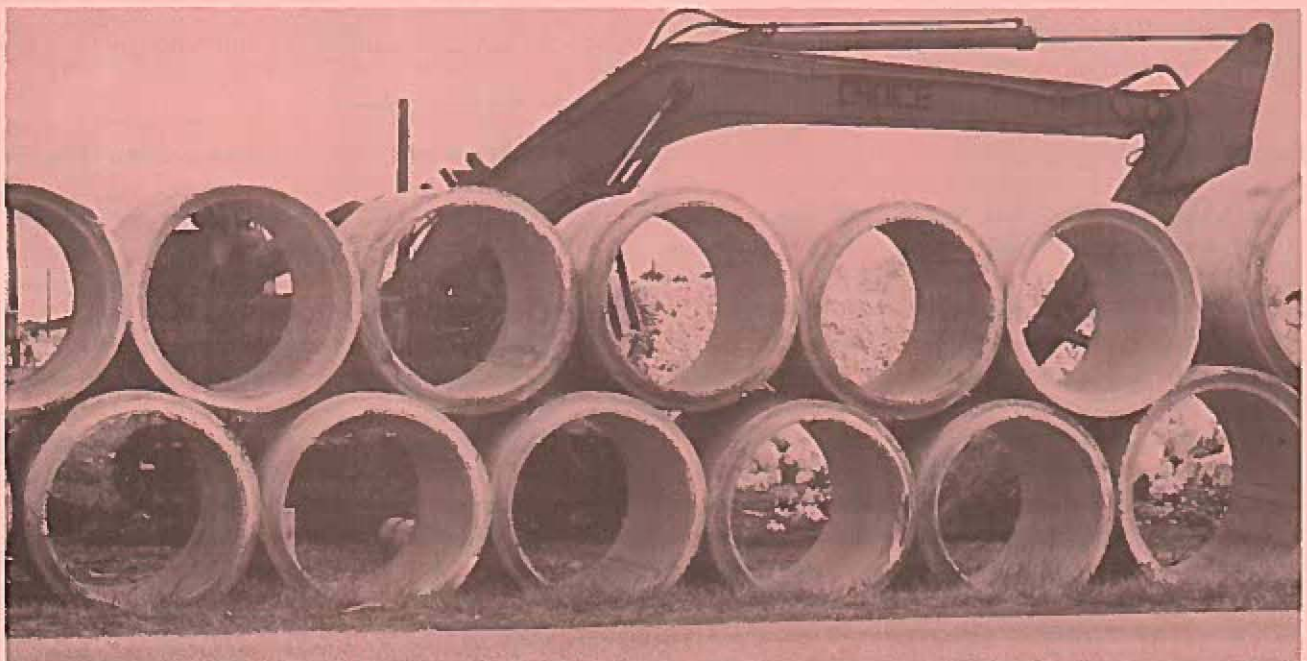
An urban subdivision would be located within a specific community area. Thus, it would be located on a community design map for inclusion in this more specific land-use element of the Comprehensive Development Plan. Community design planning utilizes a wide range of information in depicting the logical progression of compatible land-uses within a geographic area. Simply, the proposed residential subdivision would be outlined on a map so that its location could be compared to other land-uses within a village area.

PUBLIC INVOLVEMENT

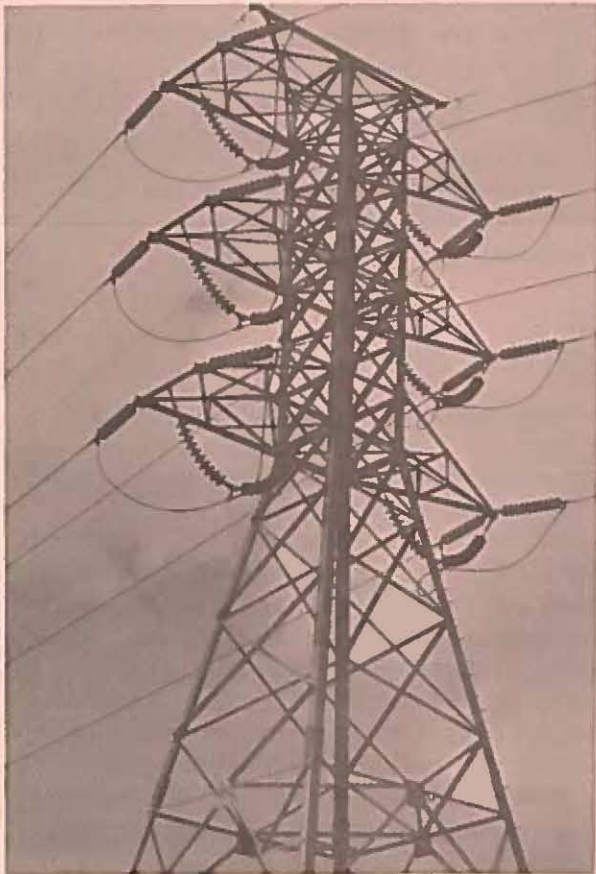
Planning for urban land-use, within a community, is only the development of an expressed need. The need is felt by the public and the actual implementation of the proposed plan will ultimately affect the residents in the area. Therefore, public participation in the planning process is essential. Planners often have difficulty in recognizing specific needs until the people themselves speak out. The plans are presented at public meetings so that area expertise is gained. Once initial plans are presented, they are taken back to the Bureau for modification. They are changed to meet the specific desires of the people who originally expressed a need for an urban subdivision.

THE CENTRAL PLANNING COUNCIL

Once developed, proposed elements of the Comprehensive Development Plan must meet further approval before being implemented. The elements are presented to the Central Planning Council. The CPC consists of eleven members. The Director of the Bureau of Planning is the Chairman of the CPC. The CPC acts as a coordinating and review council that specifically reviews elements in order to assess their applicability for implementation. This is necessary as the Bureau of Planning is not an enforcement agency and requires input from different agencies who will be implementing the plan. This enables a plan to move more easily from a planning stage to the implementation stage. It is envisioned in the Districting Bill that the CPC will



maintain a diversified program to meet this need. Included within their scope of services are youth centers, beach management, archaeological investigation, landscaping and park maintenance.



THE MANAGEMENT PHASE

So, our government subdivision has finally taken shape. The streets are paved, sidewalks are in place and street signs lead the way. All it needs are houses and people. Currently, three government subdivisions fall into this category. They are at Pagachao in Agat, Pigua in Merizo and the Umatac subdivision which is currently being completed by the Department of Public Works.

The Bureau of Planning has drafted legislation that would establish priorities for those people wishing to move into government subdivisions. Among the first priorities proposed are for those people currently living within the above subdivisions and those who are currently living within the seashore reserve--a conservation area. Related legislation proposes that the Guam Housing and Urban Renewal Authority manage the subdivisions. GHURA is involved with studying living and housing conditions and the determination of methods to deal with problem areas.

REALIZATION OF NEEDS

Once human settlement is established within a subdivision, the public will experience realization of an initial need. It is a long and painstaking process. However, it is designed to maximize the benefits to be derived from a development project and minimize adverse effects upon the surrounding environment. With proper planning and enforcement, a development project can become a worthwhile accomplishment. As island living continues, new needs are felt and the planning process begins anew. The preceding outline only discusses one endeavor. There are a multitude of other plans and objectives that are being developed by the Bureau of Planning and other agencies.

THE SEASHORE PROTECTION ACT

The Guam Territorial Seashore Protection Act of 1974, modeled after the California Coastal Zone Conservation Act of 1972, establishes a mechanism for review of all proposed development within the Seashore Reserve. Under this act, all types of development within ten meters inland of the high water mark and that area extending seaward to a depth of ten fathoms must receive approval from the Seashore Protection Commission. The Seashore Reserve area, reduced by the Thirteenth Guam Legislature in the aftermath of Typhoon Pamela from the original inland boundary of 100 meters to the current 10 meters, is currently being redefined by the Bureau of Planning to conform with the varying geographic features along the coastline.

THE SUBDIVISION LAW

Guam's Subdivision Law, Title XIX of the Government Code, establishes the mechanisms for the development, regulation and review of all types of subdivisions. The Territorial Planning Commission has jurisdiction over all subdivision matters, including the authority to develop rules and regulations and establish particular specifications and standards. Before acting on a proposed subdivision, the TPC submits the application to the Subdivision Development Review Committee, composed of various governmental agencies involved in land-use planning, for review and comment. The legislature has found such control and regulation necessary to provide for the "orderly growth and harmonious development of the Territory."

THE ZONING LAW

Guam's Zoning Law, Title XVII of the Government Code, sets out the permitted and conditional uses of land within the seven established zone classifications. As a result of the Master Plan, developed originally in 1966, the island's land areas

assume a more active role in the designation of areas of particular concern and the development of performance standards will address permissible and non-permissible land uses or simply rules and regulations pertaining to resource use in particular areas. The CPC will also review district designations developed in the Land-Use Element of the Comprehensive Development Plan.

GOVERNMENT APPROVAL

The next step, after approval by the CPC, is to present the plans to the Governor for executive approval. Legislative approval must follow and if approved, the plan has gone beyond an elaboration of needs and becomes the objective of various enforcement agencies such as the Department of Land Management.

THE DEPARTMENT OF LAND MANAGEMENT

In regard to urban subdivision delineation, the Dept. of Land Management would be the primary agency to initiate the implementation of the plan. This agency is specifically designed to monitor land-use and insure that violations of land-use regulations are not tolerated. They issue the necessary permits for land development so that personal interests in land-use do not abuse the environment or negate the purpose of comprehensive planning. The DLM is involved with two commissions in the enforcement of their objectives.

THE TERRITORIAL PLANNING COMMISSION

The Territorial Planning Commission, for which the DLM serves as staff, reviews all applications for subdivision development and issues zoning variances, zone changes, building permits, appeals and conditional uses depending upon the unique requirements of specific areas. Among their concerns are easements, setbacks, land ownership and compliance with comprehensive planning. As a regulatory body, they utilize the field inspections and analysis performed by the DLM. The TPC represents another mechanism for public input into the entire process.

Presently, the Seashore Protection Commission is composed of the same members as the TPC and acts in a similar capacity, except it specifically deals with land use within the Seashore Reserve. The SPC has become primarily concerned with preservation and the TPC tends to be development oriented. They are both designed as regulatory bodies rather than planning agencies. Thus, the Districting Bill proposes a consolidation of both into the Land-Use Commission in order that a more balanced perspective of land-uses will be in effect.

THE SUBDIVISION DEVELOPMENT REVIEW COMMITTEE

Assisting the TPC, SPC and DLM in implementation and regulation of land-use plans is an advisory body. The Subdivision Development Review Committee is primarily concerned with all types of subdivisions, zone changes, variances and development within the Seashore Reserve. They review the permit requests and submit recommendations to the TPC. The committee is comprised of various GovGuam agency representatives. It institutes another step to insure that, as in planning, there is a maximum coordination of different agencies' interests in the implementation of government plans and in the requests of private developers.

THE DEPARTMENT OF PUBLIC WORKS

Once approved, surveyed and mapped by the Department of Land Management and the regulatory commissions, the government subdivision can begin to take shape on the actual ground within a community area. The land grading, traffic circulation design and construction of stormwater drainage facilities are some of the functions of the DPW in developing a government subdivision. In the development of a specific area, special input from various agencies is provided to DPW in order that the subdivision be of maximum utility to the public. These various agencies are some of the same agencies that have provided input into the Bureau of Planning, the Central Planning Council and the Subdivision Development Review Committee.

MULTIPLE AGENCY INPUT AND ENFORCEMENT

The Department of Public Safety provides input concerning the fire regulations and traffic safety that will apply to the new residential area. The Guam Power Authority and Guam Telephone Authority are concerned with the availability of power and telephone service to the area. The Dept. of Public Health is concerned with planning for a healthy community and the maintenance of health codes and community health centers. The Public Utilities Agency of Guam provides operation and maintenance of water and sewer connections.

Besides infrastructure development, various environmental standards must be met to insure that development benefits are not outweighed by the affects of adverse pollutants. The Guam Environmental Protection Agency has the formidable task of planning for a cleaner environment. They monitor problem areas in the field and enforce regulations. For a subdivision, they will assess the environmental impact and issue necessary permits for sewage disposal, water quality and air quality.

In terms of an urban settlement's recreational needs, the Dept. of Parks and Recreation actively plans for playgrounds, public parks, historical sites and conservation areas. They plan, develop and

have been designated as either agricultural (rural), single-family residential, multiple dwelling residential, commercial, automobile parking, light industrial or heavy industrial. Requested variances from the allowable uses, as outlined in the law for the various zones, requests to change various zones and applications to engage in certain specified conditional uses within the zones are all handled by the Territorial Planning Commission. Under the Bureau's proposed Districting Bill, zoning will be limited to the urban and rural districts, with regulation of uses in agricultural and conservation districts being governed through performance standards.

U.S. ARMY CORPS OF ENGINEERS

Although the Bureau of Planning does not include federal lands in their planning efforts, a close liaison with the U.S. Army Corps of Engineers and other federal and military agencies is maintained. On an island, the size of Guam, adjacent land uses cannot afford to be incompatible despite federal and local ownership boundaries. For example, the grading of private property could facilitate erosion and introduce siltation into waters on federal property. Inversely, the noise levels from military jet take-offs affects developmental land-use of private property adjacent to air installations. Thus close cooperation between federal and local planning is essential.

In addition to many interrelated land uses, all of Guam is subject to federal legislation and the Corps of Engineers is the permitting agency for development of all offshore waters, ports and coastal wetland habitats. They are assisted in enforcement of federal regulations by the U.S. Attorney General.

The Corps also actively plans and supervises construction of harbors, reservoirs and flood control projects on locally-owned lands in addition to activities on federal properties.

In the planning and management of land areas such as wetlands, harbors and flood hazard zones, decisions by the Corps are primarily based upon the public interest. As with the Bureau of Planning, their decision reflects a concern for both the protection and utilization of resources. This is the maintenance of the difficult and often controversial balance between preservation and developmental needs. Various factors considered by the Corps are conservation, economics, aesthetics, historical preservation, flood control, land-use classification and lifestyle. Permit issuance or project developments are not initiated until it has been determined that a land or water use is in the public interest.

PLANNING NOTES

Marine Sanctuaries Program

Under the Marine Protection, Research and Sanctuaries Act of 1972, a new federally-funded program could be offered to Guam. The Marine Sanctuaries Program would be concerned with offshore waters and marine habitats. It is particularly concerned with offshore mining, energy development, fisheries, transportation and deepwater ports. An abstract of the program states:

"The cumulative impact resulting from these developments have made it imperative that the Nation formulate and implement a comprehensive ocean policy that adequately balances all the competing demands being placed upon the marine environment."

The key word in the above statement is "balance." The balancing of conservation and developmental needs is the main objective in the planning or management of resource use in any area. The first phase of the program's development involves the current data collection by the Center for Natural Areas in Washington, D.C. They have contacted Guam's Coastal Management Program for an initial exchange of information. If established, their program would overlap with Coastal Management's Seashore Reserve planning and development of performance standards for the coral reef as an area of particular concern. Their scope would extend further into deepwater areas. On the mainland, they would be concerned with the Outer Continental Shelf. Guam does not have an OCS. Therefore, many questions, as to the extent of Marine Sanctuaries, would have to be considered for the program's applicability on Guam. For example, would their scope of management include Santa Rosa Reefs or Galvez Banks.

Currently, budget problems, on a federal level, may prohibit the program's development beyond this initial stage of its formulation. Guam's Coastal Management Program looks forward to increased federal interest in both preservation of marine sanctuaries and responsible resource use and feels that the program could be a valuable compliment to our efforts.

Community Design Plans Presented

As described in last month's newsletter, the Community Design Element of the Comprehensive Development Plan seeks to delineate land-use areas within major geographic areas of human settlement. The design plans project existing and future land uses, based upon a wide range of pertinent data. The latest plans presented in public meetings were for Asan-Piti, Chalan Pago-Ordot-Mangilao, Agana-Agana Heights-Sinajana-Maina, Mongmong-Toto-Maite, and Barrigada. If you missed the presentation and discussion in your area, the maps can be viewed in our office, 4th Floor, PDN Bldg., Agana.

Commercial Port Development Program

The Commercial Port, managed by the Guam Port Authority, is located on 33 acres of Cabras Island. The facilities include 2700 feet of dock space, two warehouses, the Administration Building, storage buildings, a gantry crane and a nine-acre container yard. The container yard was designed to handle 600 containers. However, there are an average of 2,000 containers on hand each day. Expansion of the port area is vital to meet the demand of physical capacities, traffic circulation and safety regulations. The island's population growth has been accompanied by increased economic activity. As the primary link between Guam and the rest of the world, the pressures have built upon this vital facility. Increasing containerization is a worldwide trend in shipping and geographically, Guam has always been an excellent service area for transshipment on major trade routes in the Pacific.

During FY 1975, 31,000 tons of goods were transshipped through Guam. In FY 1976, the amount quadrupled to 128,000 tons. Transshipment only accounts for 25% of the Port's traffic.

A Development Program for the Commercial Port is based on the three main objectives:

1. Expansion of facilities to serve a rapidly growing population.
2. Provision for the growth of the transshipment industry as a viable income producer.
3. Reduction of the turnaround time of ships at port, relieving pressure on shipping rates, providing more effective service and cost reduction to local businessmen who utilize the Port's services.

Specific improvements, proposed to meet the above objectives involve a second gantry crane so that more than one containerized ship can be handled at a time. Additional equipment is needed for handling the containers in the yard is also proposed. A tuna transshipment and fish processing

facility would greatly enhance, local revenues. Last year, tuna transshipment provided \$250,000 in revenue to the Port. If more refrigeration facilities and a canning operation were developed, revenues would be much higher. Presently, the demand for tuna transshipment from ocean-going trawlers to container ships, destined for mainland ports, exceeds the present capabilities of the Port. Accompanying projected increases in transshipment activity is the need for dock expansion.

The various aspects of the Development Program for the Commercial Port rely on funding, but ultimately cannot become a reality without more land. Negotiations for release of adjacent Navy-owned land would only partially eliminate the problem. The U.S. Army Corps of Engineers has developed several proposals for the expansion of the Port. They involve dredging, filling and rechannelization of water within the inner harbor adjacent to existing facilities. A representative of the U.S. Fish and Wildlife Service, Hawaii Office, recently visited Guam to study the marine life in this area of the harbor to determine which alternate proposal would have the least environmental impact.

Due to the overwhelming economic need for port expansion and the responsible approach of the Development Program, the Coastal Management Program supports the proposed expansion and does not foresee the expansion as having any critical adverse effects upon the natural environment or adjacent land uses. The Development Program for the Commercial Port may be incorporated into the Overall Economic Development Plan being prepared by the Bureau of Planning.



Coastal Management Section
Bureau of Planning
P.O. Box 2950
Agana, Guam 96910