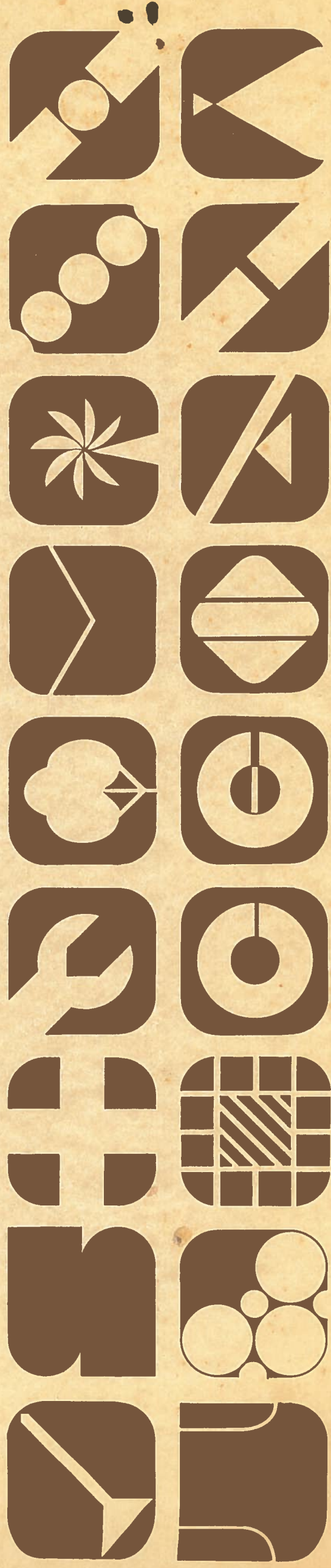


PUNA



Community Development Plan



PUNA COMMUNITY DEVELOPMENT PLAN
Puna, Hawaii

Prepared for:

PLANNING DEPARTMENT
County of Hawaii

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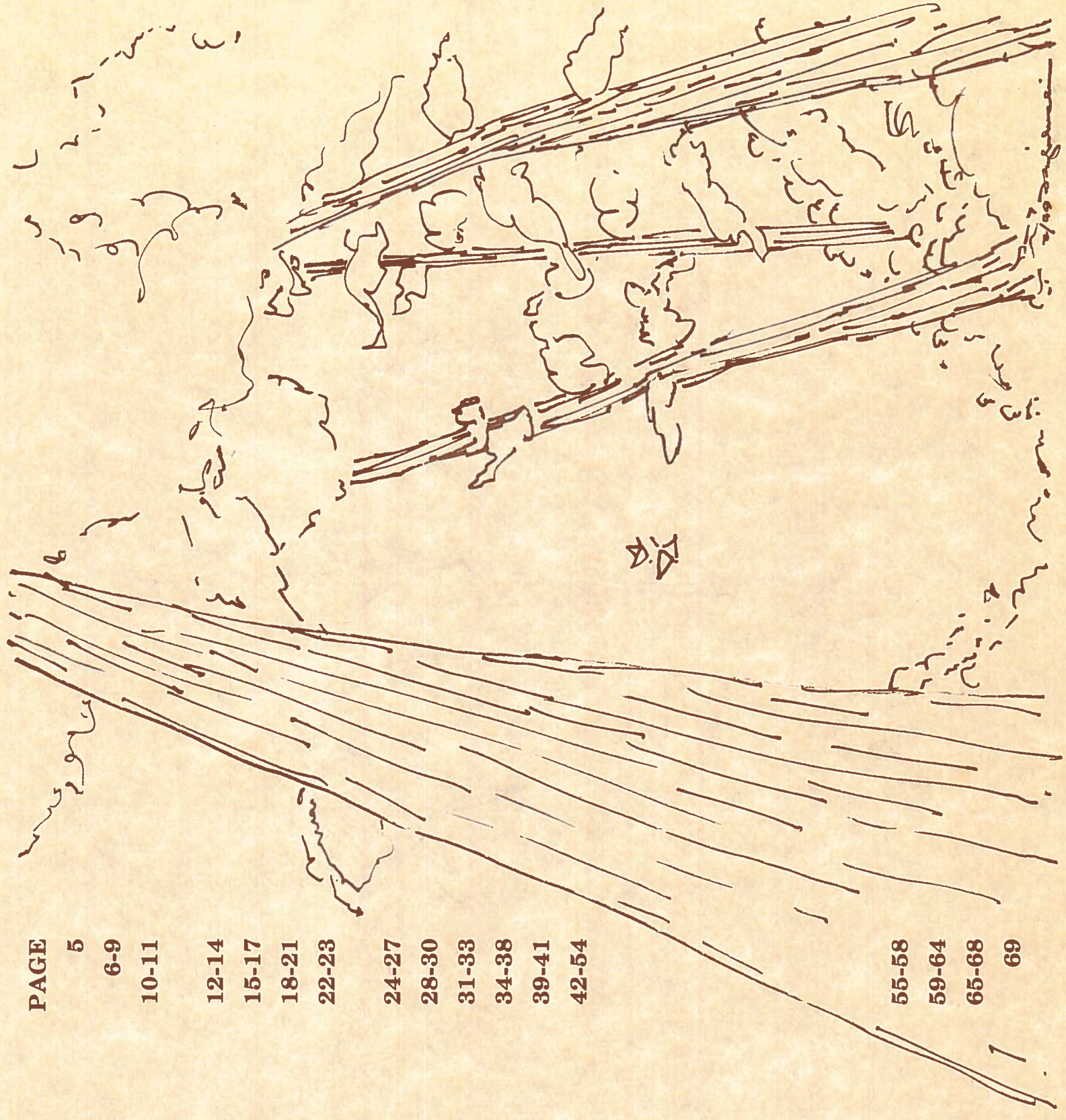
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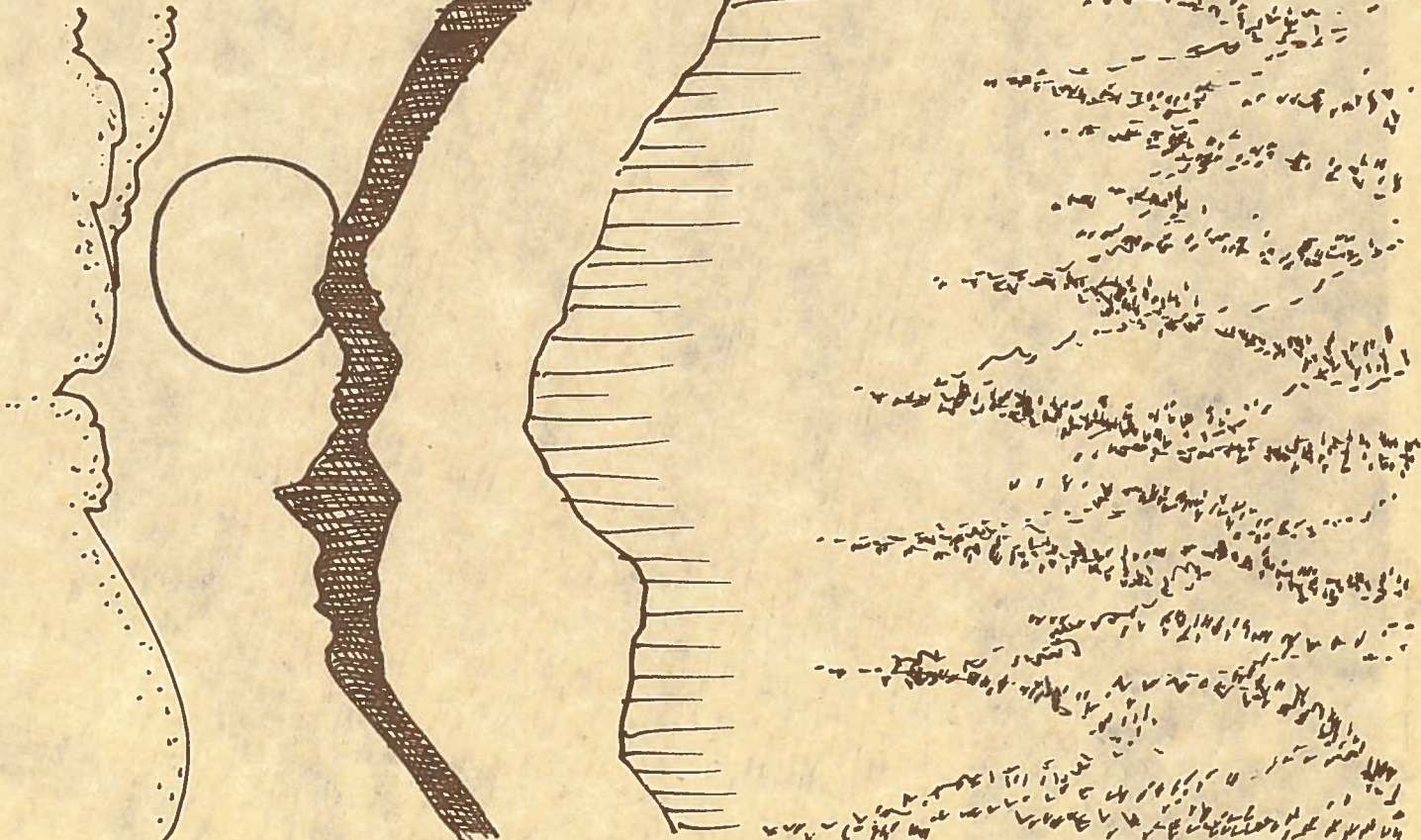
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INTRODUCTION

Chapter 1

The Puna Community Development Plan is intended to provide direction in the implementation of the Hawaii County General Plan, a document which contains policies to guide the overall development of the island of Hawaii.

Broken down into similar elements as the Hawaii County General Plan, the Puna Community Development Plan is designed to void the gap between the general plan policies and the specific concerns of the Puna community. It is intended to cover a fifteen year period.

The Plan reflects the combined efforts of many individuals - community residents, professional planners, government representatives, and experts in various fields ranging from economics to communication. As such, it is hoped that the Plan is representative of the concerns of diverse interests and needs.

The Development Plan begins with an economic overview in the line with the County General Plan format. This economic overview provides an analysis of the various factors crucial to the formulation of recommendations on housing and population, large-scale subdivisions, urban uses, and agriculture.

Because Puna is blessed with many natural features of scenic beauty and areas rich in cultural heritage and natural resources, the Plan focuses on the integration of man's development with the natural environment. With the emphasis on the natural setting subsequent chapters have much discussion on environmental quality, floods and natural hazards, historic sites, natural beauty, and natural resources and shorelines.

The report then provides background and specific courses of action relating to the man-made

infrastructures - housing programs, public facilities and utilities, transportation, and recreation.

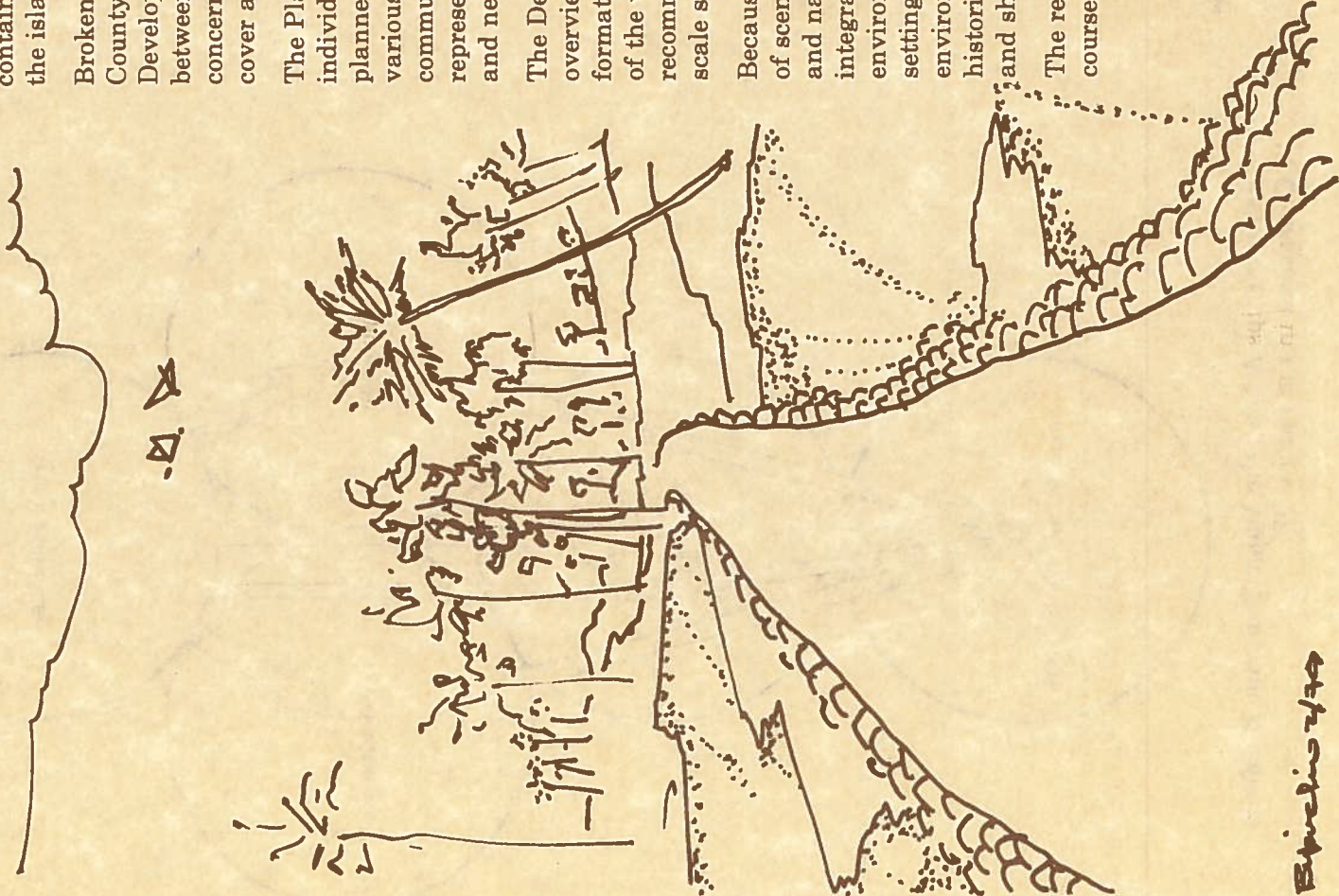
In Chapter 13, the Plan focuses on the various land use elements—agriculture, residential, commercial, industrial, resort, open space, public lands, and large-scale subdivisions. It gives direction on the various land use patterns, rationale for this direction, and a plan of action.

Environmental and historic preservation concerns are discussed in Chapter 14. No attempt was made to discuss specific details on the environmental concerns of each project; instead, a list of generalized impacts that the Plan would generate is included.

A vital part of the Plan is the implementation program. The program, as spelled out in Chapter 15, includes recommended changes in the County zone as shown in the Zone Guide Maps, a review and recommended changes in existing subdivision and zoning codes and in other County codes which would carry out the intent of the Puna Plan, and a list of recommended capital improvement projects together with a schedule of estimated cost and time of completion.

Of crucial importance in the formulation of the Plan was citizen participation. The entire final chapter is devoted to the significance of citizen participation - role of citizens in the planning process and their recommended role in the implementation of the Plan.

Finally, to augment the Puna Community Development Plan, urban design plans for Keaau Village and Pahoa Village were developed. These discuss in greater detail the goals, objectives, criteria, standards, elements, and effectuation measures for Pahoa Village and the Keaau urban and urbanizing area and have been prepared under separate cover.



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ECONOMIC ELEMENT AND POPULATION

Chapter 2

Hawaii County, referred to as the Big Island, covers an area of approximately 4,000 square miles. Partly because of the island's open space character and the large number of available lots, the population has been growing very rapidly in the last few years. The Big Island is becoming an attractive alternative to people leaving crowded areas on the mainland who find the rural life style on Hawaii very desirable. Puna, in particular, has grown in dramatic fashion as a result of this trend.

The major economic activities on the Big Island are agriculture and tourism. One-third of the State's agricultural production comes from Hawaii County. The major agricultural industries are sugar, macadamia, papaya, livestock, flowers, and diversified agriculture.

The tourist industry is the most rapidly growing economic sector in the County. The number of visitors grew by 87.6% from 1969 to 1975. Now, well over 900,000 visitors come to the County annually. Seventeen percent of the total, or approximately 160,000 are Eastbound visitors (from Asia). The remainder, roughly 770,000 are Westbound tourists (from the U.S. mainland and Canada).

These two major activities, tourism and agricultural, together provide a strong economic base for the Big Island. Sometimes, however, these activities compete for prime lands and relatively scarce labor and capital in various areas of the County. Both industries are necessary to maintain a diversified economic base. The desired relationship between these activities, however, may differ, at least in degree, from one district to another.

In Puna, agriculture is predominant as it has been for many years. Tourism activity is concentrated in the area of the Volcanoes National Park and at the Black Sand Beach. Tourism has not been significant in the Puna District but is expected to assume a more important role in the future, particularly when the Loop Road from the National Park to the Kalapana is completed.

This report will examine both these existing economic activities as well as potential activities in order to ascertain what future direction is most desirable for the residents. This is one of the major purposes of this report.

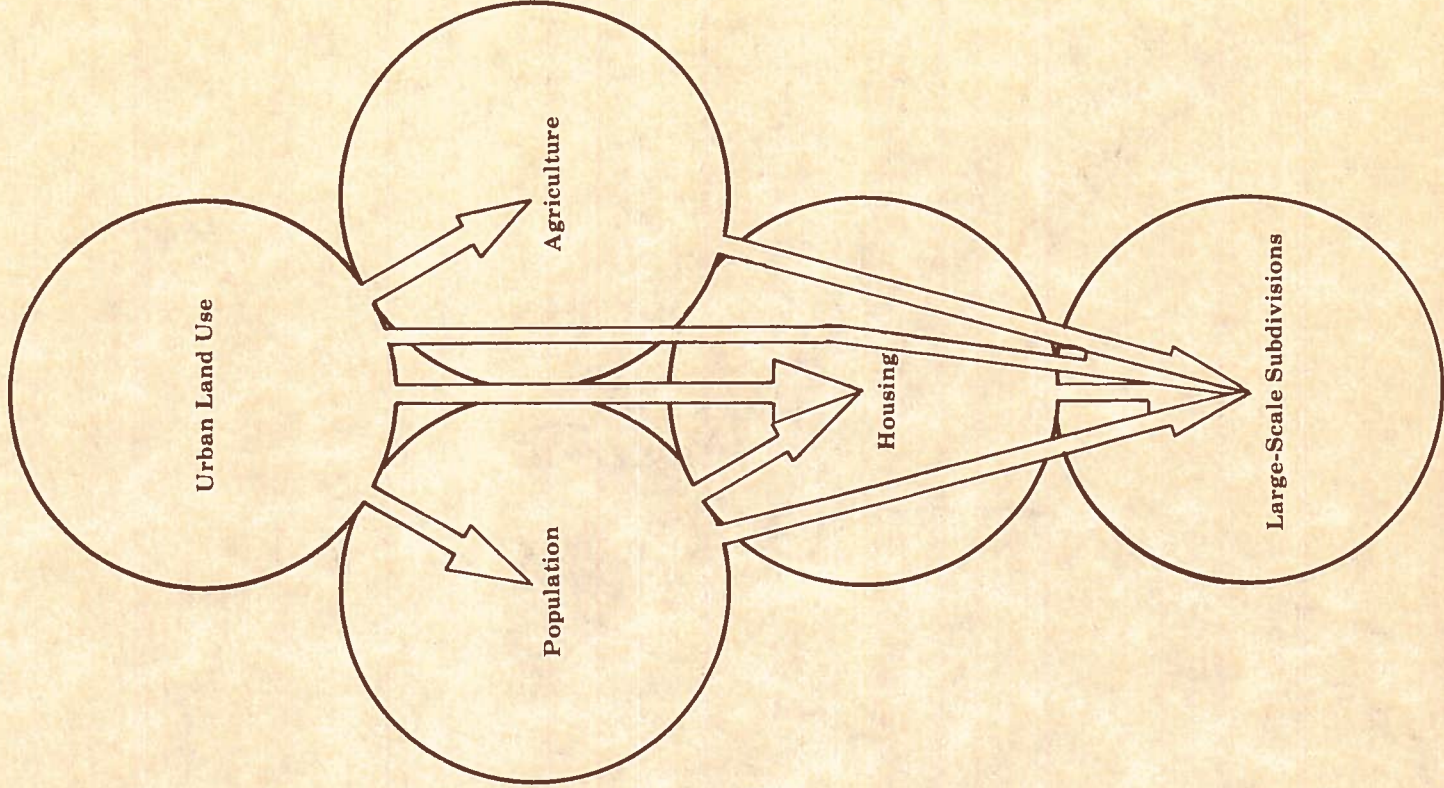
The major "economic elements" addressed in the Puna Community Development Plan (CDP) are:

1. Population and Housing
2. Urban Land Use (Retail/Commercial, Industrial and Resort uses)
3. Large-Scale Subdivisions
4. Agriculture

This categorization was selected in order to simplify the presentation. Actually, there are many more elements or factors, like employment for example, which are inherent in economic analysis and which are considered within the four major elements. This categorization was selected because it is pertinent to the area under consideration and is a logical way to approach the area's economic problems.

The diagram that follows illustrates the simple interrelationships among these elements. It is important to emphasize that the elements are not independent of each other. For example, in recent years the population within large-scale subdivisions in Puna has grown dramatically. This, in turn, causes competition (direct or indirect) with agricultural lands. At the same time, because there are so many empty lots in the large-scale subdivisions, the question of housing priorities must be addressed. This may have a direct effect upon subdivision activity in the future.

Thus, the actual relationships among the elements are much more complex than the figure indicates; it merely illustrates that planning decisions relating to any one of the elements will have an effect, to some degree, on all of the other elements. This, in turn, may set off secondary or tertiary changes. The General Plan of the County of Hawaii clearly recognizes the importance of these interrelationships. Planning decisions for any one element cannot be made without fully investigating the implications on each of the other elements.



Relationships Among the Major Economic Elements Considered in the Puna CDP.

ECONOMIC ELEMENT AND POPULATION

(cont.) Chapter 2

GENERAL PLAN GOALS, POLICIES, STANDARDS & COURSES OF ACTION

GOALS

- The economic system of the County should provide its residents with opportunities to improve their quality of life.
- Economic development and improvement should be accomplished in an orderly manner which is in balance with the physical and social environments of the island of Hawaii.
- The County of Hawaii should strive for stability in its economic system.

POLICIES

- It shall be the policy of the County of Hawaii to assist the expansion of the agricultural industry, especially diversified agriculture, through the protection of prime agricultural lands, capital improvements and other programs, and continued cooperation with appropriate State and Federal agencies.
- The County of Hawaii shall strive for an economic climate which provides its residents an opportunity for choice of occupation.
- The County of Hawaii shall encourage the expansion of the research and development industry by working with and supporting the university and other agencies' programs developed to aid the County of Hawaii.
- The County of Hawaii shall encourage the development of a visitor industry which is consistent with the social, physical, and economic goals of the residents of the County.
- The County shall require a study of the total social and physical impact of large developments prior to approval.
- The County of Hawaii shall strive for diversification of it's economy by strengthening existing industries and attracting new endeavors.

- The County shall encourage the expansion of the fishing industry, various forms of aquaculture, and other ocean-based activities.
- The expansion of higher and continuing educational services and institutions shall be supported by the County.
- The County of Hawaii shall study the feasibility of establishing a business development loan program.
- The County's capital improvements program should improve the quality of existing commercial and industrial areas.
- The County of Hawaii's land, water, air, sea, and people shall be considered as essential economic resources for present and future generations and should be protected and enhanced through the use of economic incentives.
- It shall be the County's policy to strive for full employment.
- The County shall conduct a re-evaluation of all economic goals and policies, particularly in the area of tourism, coincident with any County-initiated overall land use acreage allocation and General Plan review.

STANDARDS

- The island of Hawaii should be developed into a unique scientific and cultural model. The island should become a model of living where economic gains are in balance with social and physical amenities. Development should be reviewed on the basis of total impact on the residents of the County, not only in terms of immediate short run economic benefits.
- New industries which provide favorable benefit-cost relationships to the people of the County should be encouraged. Benefit-cost relationships as used here include more than fiscal considerations.

Courses Of Action

- The County shall assist the further development of the agricultural industry by providing support services, such as co-operation with other agencies in developing manpower training programs, protecting prime agricultural lands, and requesting and providing necessary capital improvements.
- The overseas capacity at Hilo's General Lyman Field is extremely important to the development of Puna's export crops. The County shall continue to encourage the further development of this facility.
- There is potential for limited visitor facilities in the form of small accommodations and support facilities, such as natural areas, botanical gardens, and limited commercial facilities. Resort growth should enhance and be in keeping with this area's rural character.

PROFILE

A basic General Plan goal is to provide balanced growth for all sections of the County. The goals set forth in the Plan assume that economic activity and population growth are interdependent. Thus, a diversified economic base is essential to a growing population.

Because population growth and economic activity are interdependent, the population analysis and projections and employment activity are presented in this section. Other major elements are discussed in other chapters of this Development Plan.

1. **Population Trends:** Puna's population has grown from 5,154 to 8,231 since 1970. In percentage terms, Puna has been one of the fastest growing areas in the State. The population level in Puna is closely related to changes in South Hilo's population. The increase in Puna's population is due in part to the overflow from South Hilo. Moreover, the in-migration of newcomers to Puna is not unexpected because Puna is very close to Hilo both in terms of distance and

ECONOMIC ELEMENT AND POPULATION

Chapter 2 (cont.)

commuting time, and because land is relatively cheap in Puna. it is anticipated that population growth in Puna will continue to be a function of Hilo's growth.

- 2. **Population Characteristics:** In analyzing the population profile of a fast growing district like Puna, it is important to see how this population has changed over time.

- **Ethnicity:** Japanese comprise 37% of Puna's population. Caucasians are second with 22.9%. Hawaiians and part-Hawaiians represent almost 19% of the population.

- **Age Distribution:** Recent growth in Puna has been comprised of young people and those over age 50. Almost two-thirds of the people in 1976 were under 45 years of age, as compared with 61% in 1970.

- **Residency:** Almost 29% of the residents of Puna have been in the State of Hawaii 5 years or less. Well over a third, 36% of the residents, have been in Hawaii County for less than 5 years. 31% of the residents did not live in the same house 5 years ago.

- **Conclusion:** Population increases in all the age groups have created the need for more educational facilities for the young, housing and health facilities for senior citizens, and a requirement of more jobs for people of working age. Population growth has also created pressure for an increase in the quality and the quantity of County and State services to the area.

- 3. **Income and Employment:**
 - **Income Distribution:** Well over 50% of the households in Puna currently have incomes below \$10,000; 80% are below \$15,000. However, incomes are

increasing, in part because of changes in Puna's occupational profile.

- **Occupational Profile:** There has been a decided shift in the occupational profile of Puna residents from 1970 to 1976. Professional, technical and managerial occupations now comprise 21% of the total, whereas in 1970 they represented only 12%. The number of craftsmen has also increased significantly from 16.8% in 1970 to 23.6% in 1976. At the same time, service workers have declined by almost two-thirds, relative to the total population in Puna.

- **Industrial Profile:** Agriculture is the main industry, employing over one-quarter of Puna's labor force. Other major employment categories are retail/wholesale trade (19%) and construction (17.4%).

- **Major Employers:** The major employers in the Puna District are the sugar industry, macadamia, papaya, anthurium farms, and various government agencies. Sugar employs 428 full-time workers. Approximately 260 full-time workers and 227 part-time workers are employed in the papaya industry. This is Puna's fastest growing agricultural activity.

- **Unemployment Trends:** During the past five years, Puna has consistently had higher unemployment rates than either South Hilo or Hawaii County. Puna's labor force has grown steadily since 1970. At the same time, however, the present of Puna's total labor force employed has been decreasing since 1973. The current unemployment rate in Puna is 7.3% according to recent OEO surveys.

- **Place of Residence/Work for Commuters:** A substantial part of Puna's labor force is comprised of

commuters who work in Hilo. There are also many agricultural workers (particularly papaya) who work in Puna but live in Hilo.

- **Conclusion:** Because Puna is so close to Hilo, the major population and employment center in Hawaii County, planning for Puna must involve some assessment of Hilo's influence on Puna. The preceding statements reflect Hilo's growing influence on Puna. This situation has occurred partly because of the increase in population in Puna and the expanding commercial and industrial activity in Hilo. Increasing population may bring with it the problems of labor absorption and unemployment.

- 4. **Population Projections:** It is estimated that the population for Puna will grow in the following manner:

Year	Population
1975	7,900
1976	8,200
1980	9,700
1985	11,400
1990	12,800

This assumes that Puna's economic base is expected to remain relatively stable until 1990, and that the projected increase in population will be due primarily to new arrivals from the mainland and the overflow of people from Hilo.

It should be noted, however, that new developments in geothermal energy and manganese nodule processing may cause the populations to grow faster than projected. A pilot program for tapping geothermal power near Pahoa has been approved to generate electricity for sale to Hilo Electric. It is conceivable that this project will be substantially expanded within the next decade. However, projections of the

ECONOMIC ELEMENT AND POPULATION

(cont.) Chapter 2

expansion rate and the growth implications are dependent upon future developments in the pilot system.

The feasibility and potential impact of manganese nodule processing has been assessed in preliminary fashion by the State of Hawaii Department of Planning and Economic Development (February 1978).

This indicates that the mining of deep sea manganese nodules could begin within a few years if initial tests prove successful. The DPED study assessed the impact of a hypothetical processing plant on the assumption that the port of Hilo would be used as a terminal and that nodules would be pumped in slurry form to a point near Keaau where processing would occur.* It was assumed that the processing plant would occupy approximately 200 acres of land and would employ about 500 workers. This would require a three-year construction period and would create over 6000 new jobs.

There would clearly be very significant economic, social and environmental impacts associated with this project, if it is found to be feasible and if Hawaii is selected as the preferred location for nodule processing. The processing plant would require significant amounts of energy, generated either by fossil fuels or by geothermal wells. Environmental problems are foreseen with regard to emissions and effluents from the plant as well as from the disposal of solid and liquid wastes from the processed slurry. At least as important, the processed facility would generate significant social impacts and would necessitate the importation of labor, the construction of many new facilities such as housing, schools and hospitals, all of which would have a very substantial effect on the lifestyle of those now living in Puna.

There are also substantial legal problems associated with the proposed mining venture. Law of the Sea Negotiations have been underway for several years but there has been no resolution of the critical questions relating to jurisdiction, the validity of existing mining claims, and marketing constraints.

Because there are so many major unresolved questions and because this industry faces a series of legal and environmental hurdles, it is probable that initial development, if it does occur, will not proceed for several years. Moreover, it is clear that there are many potential problems (aside from the economic advantages) with the proposed facilities. These must be very carefully studied before any reasonable impact assessment can be made to determine the effects such a plant would have on Puna.

*Other locations considered in Hawaii were East Maui and Kawaihae on the Big Island.

Implications: The rapid growth in population and the projected increase in population have important ramifications for those who are planning for the future, particularly in terms of County and State services. Among the immediate concerns for County services are road-upgrading, utilities, and fire and police protection. Long-run concerns for the County are municipal services, zoning, transportation, parks and recreation, housing, employment and unemployment. Other related factors are the future of agriculture (as competition for land increases), the need for diversification of the economic base, and future prospects for tourism.

COURSES OF ACTION

- The County should anticipate the growth of Puna to its projected population increase by 1990 by providing services such as road-upgrading, utilities, and fire and police protection.
- The County should continue to look for diversification of the economic base in Puna so as to provide the populace with more employment opportunities. This policy, however should be consistent with the following action related to agriculture.
- The County should continue to encourage agriculture as one of the main economic bases in Puna.
- The County should consider the influence of Hilo in planning for expansion of housing areas, industrial sites, and other types of uses in the Puna District.



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ENVIRONMENTAL QUALITY

Chapter 3

GENERAL PLAN, POLICIES AND STANDARDS.

POLICIES

- The County of Hawaii shall take positive action to further maintain the quality of the environment for residents both in the present and in the future.
- Minimum controls are established by the Federal and State governments; through its powers the County shall reinforce and strengthen established standards where it is necessary principally by initiating, recommending, and adopting ordinances pertaining to the control of pollutants which affect the environment.
- The County should keep apprised of and advise the public of environmental conditions and research undertaken about the island's environment.
- Encourage the concept of recycling agricultural and municipal waste material.

STANDARDS

Clean air, pure water, freedom from excessive and unnecessary noise, and the natural and aesthetic qualities of the environment shall be without abridgement the right of the people of the County. Pollutants shall be prevented, abated, and controlled at levels which will protect and preserve the public health and well-being, and for the prevention of irritation to the senses, interference with visibility, and damage to vegetation, animals and property. The existing environmental quality of the island shall be maintained and if feasible, improved.

PROFILE

Environmental quality, in its broadest sense, refers to all aspects of the environment - man-made or natural. The environmental quality section of this plan focuses on the improvement and conservation of the quality of air and water, the control of noise,

and methods of solid waste disposal, which constitute but a part of the overall environment. Subsequent sections of the plan elaborate on other aspects of the physical environment which need examination.

Comparatively, Puna, as a whole, is blessed with a physical environment which is not yet degraded by undesirable man-made pollutants. However, certain problems as presented below do exist.

AIR

Apparently, the greatest air pollutant in Puna is caused by volcanic activity along the flanks of Kilauea and Mauna Loa. Sulfur fumes, dust, and smoke which result from these eruptions contribute to the degradation of the air. No control of this natural occurrence is foreseen in the foreseeable future.

Other major sources of man-made air pollution are sugar cane burning, sugar mill operations, and automobile emissions. However, the staggered and infrequent burning of sugar cane fields, the controls on emission in mill operations and automobiles, and the existence of abundant open space collectively minimize the threat of man-made air pollution in Puna.

WATER

In the area of water pollution, there is contamination of ground water and shorelines from cesspools which are the principal means of sewage disposal in Puna. The County Olaa Water System which services Keaau to Glenwood has its source of water from 2 wells at the Puna Sugar Mill site in Keaau. In the vast watershed from which this ground water source is developed, there are many cesspools utilized for sewage disposal in the nearby camps and Keaau village. Invariably, some contaminants leak to the well site at the mill as shown in periodic tests conducted by the Department of Health. In addition, cesspools utilized by the cluster of homes around the tidal pools near Kapoho Beach Lots are responsible for contamination of the shore waters. This contamination of shore waters was verified by dye tests conducted by the Department of Health.

The unavoidable adverse effects can be minimized by: 1) stricter requirements on sewage disposal near well sites and along the shoreline; 2) adequate treatment of drinking water; 3) the natural filtering action of the ground; 4) the natural chemical reaction of bacteria and oxygen to break down sewage waste; and 5) use of recyclable methods of sewage disposal, such as ecological toilets, a term used to identify self-contained toilets which re-use the water with sewage solids being removed periodically. Additionally, periodic tests for pollution along the shorelines by the Department of Health would pin-point problem areas which, through existing regulations, can be rectified by the State.

NOISE

The sugar mill operations in Keaau and the use of aircraft for crop dusting are the major sources of man-made noise. Also mentioned as "noisy" by community residents are cane trucks and helicopters. However, noise generated by these sources is not excessively loud and can be considered minimal.

SOLID WASTE DISPOSAL

Solid waste consists of rubbish and garbage generated from passing motorist, households and businesses in Puna. It also includes junk cars, old household appliances, and other bulky scrap metal. The main concern relative to solid waste is the litter created along roads and in vacant lots, thereby causing unsanitary conditions and distracting from the natural and aesthetic qualities of the environment.

Presently, lacking a municipal home collection service, Puna residents haul their refuse to nearby private or County disposal areas. The County does, however, have a plan of solid waste disposal as related to refuse production, collection, transportation and ultimate disposal of refuse. The County has a series of container-compactor stations in Kalapana, Pahoa, with future stations to be located in Pohoiki and Glenwood. In addition, a County rubbish dump exists in Volcano where refuse is periodically buried by the County as a land fill site. The container-compactor stations, commonly

ENVIRONMENTAL QUALITY

(cont.) Chapter 3

called transfer stations, are areas where residents can dispose of rubbish into containers which can be compacted to increase capacity. These filled container-compactor units are then periodically hauled to land fill sites by the County.

Although the County is adequately handling the solid waste disposal problem in Puna, litter along highways and in vacant lots remains a problem.

The adverse effects of litter and solid waste disposal can be minimized by: 1) a continued solid waste disposal program by the County; 2) enforcement of litter laws and ordinances; 3) public anti-litter education; 4) creation of roadside refuse containers in strategic locations where motorists can stop to dump their rubbish.

COURSES OF ACTION

- The County should utilize all data gathered in the General Plan and the Puna Community Development Plan as a framework for environmental assessment on all public and private projects in Puna.
- Existing environmental problems should be controlled by applicable Federal, State, and County laws and ordinances. Where existing legislation is not adequate, the County should initiate new laws to correct inadequacies. Examples of possible legislation might include allowing sewage disposal by means other than cesspool, such as ecological toilets, and a study of a "bottle bill".
- The County, should encourage continued research for the maintenance of environmental quality of air solid waste disposal and noise.
- A strong anti-litter campaign should be initiated by the County, including strict enforcement of existing laws, public education, and providing refuse disposal containers at scenic strips and wayside parks along the main roads.



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FLOODS AND OTHER NATURAL HAZARDS

Chapter 4

GENERAL PLAN GOALS, POLICIES, STANDARDS, COURSE OF ACTION

GOALS

- To conserve scenic and natural resources.
- To protect human life.
- To prevent damage to man-made improvements.
- To control pollution.
- To prevent damage from inundation.
- To reduce surface water and sediment runoff through the employment of soil conservation measures.

POLICIES

- It shall be the responsibility of government agencies to properly guide through regulations the use of flood plains. The purpose of such regulations is to minimize the danger to life and property in areas subject ot recurrent flooding. It is intended that the establishment of flood plain regulations will reduce public cost for flood control, minimize relief and rescue efforts, and control development in flood plain areas so that lands will be utilized in the most suitable manner.

- Flood districts are to be established in consideration of the amount of flood data available. In analyzing the probability of flooding and the degree of potential development in the flood plain area, certain interrelated physical factors such as depth, frequency, velocity, type and duration of flooding must be considered. Where the severity of flood conditions due to these factors increases the possibility of loss of life and large property damage, restrictive regulations, to minimize loss must be enacted. In areas subject to less frequent flooding, the damage potential is lightened. Less restrictive regulations will there fore be enacted and additional land uses can be considered.

- After flood plain areas have been established, it shall be the responsibility of the County to provide the official Flood District Map for incorporation as a part of the rules and regulations for the flood plain areas. Periodic updating and review of the established district maps will be required, particularly for areas where hydrologic data are scarce. It is suggested that this review be conducted every five years.
- Permitted uses within the flood plain areas shall be established district maps will be
- After flood plain areas have been established, it shall be the responsibility of the County to provide the official Flood District Map for incorporation as a part of the rules and regulations for the flood plain areas. Periodic updating and review of the established district maps will be required, particularly for areas where hydrologic data are scarce. It is suggested that this review be conducted every five years.
- Permitted uses within the flood plain areas shall be established in accordance with the regulations of the flood plain district. Adopted district soil conservation practices shall determine the use of agricultural and conservation lands.
- Within the flood districts, flood way and flood way fringe zones are to be established, uses strictly controlled, and the boundaries of these zones are to be included in the official zoning map.
- Inundation safety areas shall be incorporated as part of the rules and regulations of the flood plain areas.
- Potential tsunami inundation areas and areas subject to high seas damage shall be established and identified for public safety. These areas should be evacuated in the event of tsunami warning. Tsunami inundation as

- referred to in this text is intended to mean flooding or overflowing and not to necessarily imply great tsunami force, depth, or damage. It is recognized that all segments of the designated inundation area will not be exposed to the same risk or degree of damage.
- In areas vulnerable to severe damage due to the impact of wave action, restrictive land use and building structure regulations must be enacted relative to the potential for loss of life and property. Only uses which cannot be located elsewhere due to public necessity and character, such as maritime activities and the necessary public facilities and utilities, would be allowed in these areas.
- In areas subject to less tsunami or high seas impact damage, land uses other than recreation and "open" and those stated in the preceding paragraph may be considered provided they meet criteria set forth within applicable ordinances and regulations.
- In those areas where conditions are such that large-scale, usually vertical, earth movements may generate devastating tsunamis immediately offshore which permit little or no warning for evacuation, further evaluation must be eventually made in these areas for the consideration of public safety.
- It is the responsibility of governmental agencies to maintain drainage systems as well as to assist in developing comprehensive flood damage prevention programs and in the construction of flood control features.
- In addition to the above, subdivision, regulations, building codes, health regulations, **grading** ordinances, and other types of regulations, as well as preventive measures, shall be used in carrying out the goals of the flood control and drainage element.

FLOODS AND OTHER NATURAL HAZARDS

(cont.) Chapter 4

STANDARDS

- Potential Tsunami Inundation Zones: Shall be classified into two categories.
 - I. On northwest, northeast, and southeast coastlines for tsunamis of distant origin from any direction; and on designated southwest coastlines for tsunamis from the south or west:
 - A. All areas between the shoreline and the intersection with the ground of a surface declining inland with a slope of one percent from a height of 50 feet above mean sea level.
 - 1. At the 10-foot contour below mean lower low water; or
 - 2. Where the submarine slopes seaward of the minus 10-foot contour is slight, lines drawn seaward from the minus 10-foot contour at a distance from it equal to half of the excess of the local distance from the minus 10- to the minus 20-foot contour over 1,000 feet.
 - B. All additional areas less than four feet above mean sea level and within 400 feet of the shore of the ocean or tidal bodies such as bays, harbors, estuaries, or canals.
 - II. On designated southwest coastlines for tsunamis of distant origin from the south or west.
 - A. Areas defined as in Section I. A. but using a 30-foot instead of 50-foot height offshore.
 - B. Areas defined as in I. B.
- Storm Drainage Standards* shall consist of calculated:
 - 1. Recurrence interval
 - 2. Runoff quantity
 - 3. Rational method
 - 4. Closed conduits
 - 5. Open channels
- Flood Plain Maps

Course of Action

- As urbanization increases within the district, the drainage systems designed for the existing village areas shall be implemented. These systems are designed to collect and transport surface runoff through the communities.

PUNA PROFILE

Puna is susceptible to damage from four principal types of natural hazards: flooding from storm runoff, lava flows from volcanic eruptions, earthquakes and land subsidence, and tsunami/storm wave inundation.

A brief discussion of each of these hazards follows:

Storm Runoff

Towns and communities throughout the district are affected adversely by storm runoff during the rainy season every year. Flooding is attributed to the absence of clearly-defined natural drainage ways and to inadequate outlet channels on some of the existing drainage culverts.

The upper Puna region receives about 200 inches of rainfall annually, of which nearly one-half is recorded between February and May. This intense rainfall, combined with ill-defined natural drainage ways, makes upper Puna highly prone to storm flooding.

The **Mountain View Drainage Study and Master Plan**, by Austin, Smith, and Associates, is one of two engineering drainage study plans developed for Puna. This study identifies Pszyk Road, Kulani Road, and Kukui Camp as specific flood areas in upper Puna and proposes a drainage plan to control the storm runoff by directing the storm waters to a safe location. An interim plan, which will provide for immediate flood protection from storms of low intensity, will be implemented. A total of \$400,000 has so far been appropriated for this plan, and \$4.5 million more is planned for the next five years.

The other hydrological study is for the urban and urbanizing areas of Puna under the County General Plan.

A comprehensive hydrological study to determine the flood plain area within Hawaiian Acres and Orchid Land Estates subdivisions is needed as the Mountain View flood waters are channeled into these subdivisions over existing lots, roadways, and underground channels.

In the lower Puna area, a portion of the commercial district and school junction site in Pahoa encounter flooding each year. The County have constructed one dry well to alleviate some flooding near the community center. Storm runoff is also known to enter the ponds in Harry K. Brown Park due to the configuration of the roadside swales and general topography of the area.

Lava Flows

Inasmuch as most Hawaiian eruptions are non-explosive, generally with slow-moving lava, the risk to human life is minimal. No life has been lost during the 19th or 20th century because of lava flows. Additionally, in the event of threat from natural hazards, the Hawaii County Code authorizes County officials to legally order the evacuation of areas so threatened. Risks to property, however, remain high during these emergencies.

Volcanologists at the Hawaiian Volcano Observatory (U.S. Geological Survey) have prepared a report indicating the various hazard zones for the island of Hawaii (D.R. Mullineaux and D.W. Peterson, 1974, Open-file report 74-239, 61 pp.). The report defines the hazard zones according to the frequency of eruptive outbreaks and inundation by lava flows in historic times and with respect to certain structural and topographic features.

Both Kilauea Volcano's east rift zone and faults of the Hilina fault system lie in Puna. The rift zone is the locus of magma injection characterized by surface fissures, pit craters, volcanic shields and cones, marking the past and future eruption sites. On the other hand, fault zones are not regions of magma injection, and, therefore, are unlikely eruption sites. Most of the land in Puna classified in excess of 20 per cent slope are found in the fault zone

FLOODS AND OTHER NATURAL HAZARDS

Chapter 4 (cont.)

on the south flank of Kilauea. Lands situated downslope of the rift zone are subjected to lava flows.

The United States Department of Interior/Geological Survey has published a report that includes of map of the island of Hawaii indicating zones of different relative risk to property from volcanic and related natural hazards rated on a scale from "A" to "F"... from least to highest relative risk. The hazard zones are defined according to the frequency of eruptive outbreaks and flooding by lava flows during recent times and in consideration of certain structural and topographic features.

MAP 3 shows the hazard zones as they apply to the Puna district.

Earthquakes and Land Subsidence

The Puna coastal zone lies within the Hilina fault zone. Geologic studies have shown that Kilauea's south flank is unstable and moves seaward and downward relative to the volcano's summit. Large earthquakes have usually caused sudden land movements. For example, the earthquake on November 29, 1975, which registered 7.2 on the Richter scale, caused the Halape area to sink about 11.5 feet and to move seaward about 20 feet. The Kalapana-Kaimu area subsided nearly three feet, and virtually instantaneously the roadway fronting Harry K. Brown Park was underwater during normal "high" tide until it was raised.

Even excluding such catastrophic events, however, long-term tide-gage studies indicate that the entire island of Hawaii, including the Puna coast, is sinking at an average rate of about 4mm per year. This sinking is expected to continue as long as Hawaii volcanoes remain active.

Tsunamis and Storm Waves

Severe earthquakes, coupled with abrupt land movements offshore or near shore, can trigger a locally-generated tsunami. The November 29th earthquake generated a tsunami with waves ranging between 48 and 26 feet above sea level along the Puna coast.

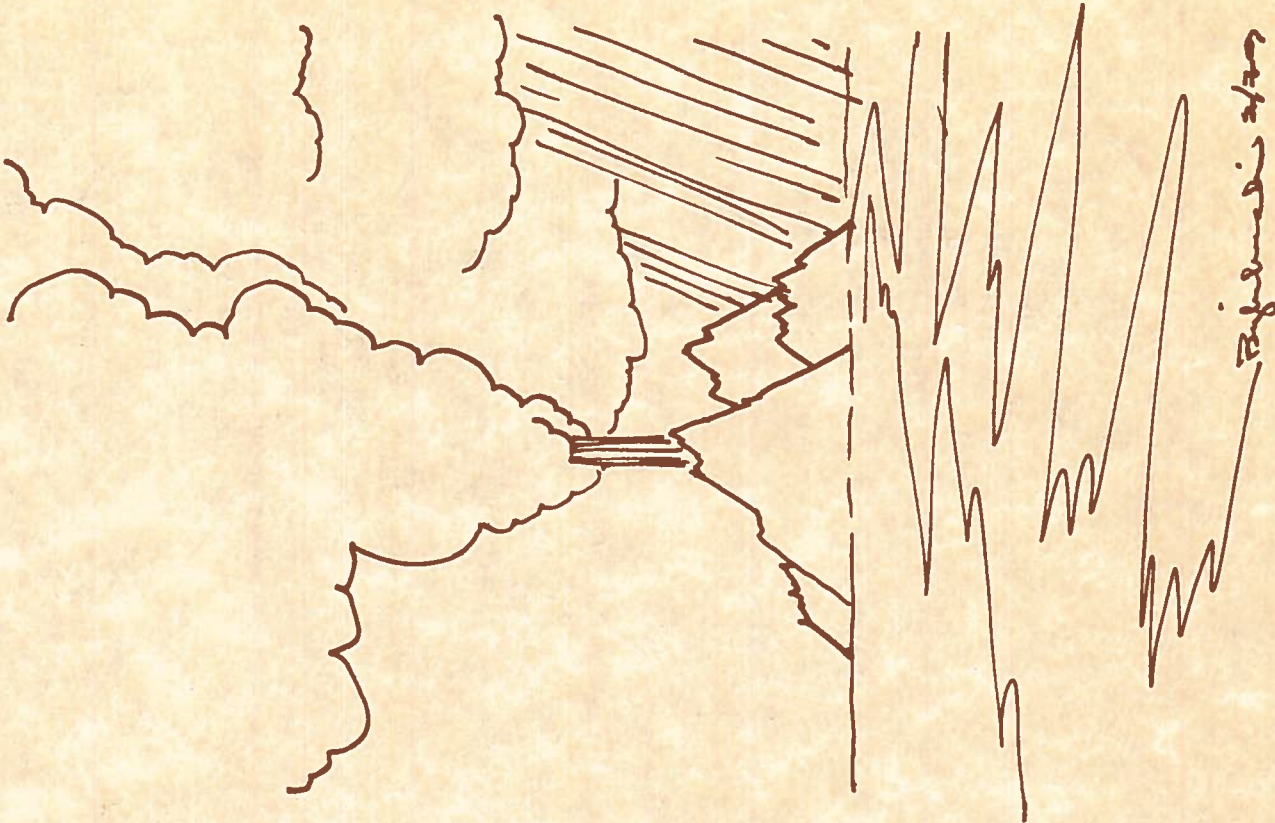
Tsunamis from distant areas, such as from the Aleutian Islands, Japan, or South America, have thus far caused very negligible damage to the coastline of Puna, mainly because of the relatively undeveloped nature of the coast area. The fact that much of the Puna coastline is characterized by sea cliffs also minimized tsunami damage. Storm waves, especially during the winter season, inundate low-lying land along the Honolulu Landing to Kalapana route. The pounding surf, in addition to depositing debris, damages portions of the roadway.

COURSES OF ACTION

- Restrict land uses to low density uses or Open space in the "F" volcanic hazard zones along Kilauea's east-rift zone along the coast (See Map 3) and makai of the rift zone in the "E" zone.
- Realign the Kapoho-Kalapana Beach Road inland at Honolulu Landing, Opihikao, and Kalapana to prevent storm waves from inundating these low-lying areas.
- Construct the Kaimu breakwater only if long-term monitoring and comprehensive beach-shore regime studies show that the proposed breakwater will, in fact, retard erosion of the beach. With the major subsidence in November 1975, results of previous studies may not be applicable. (Further discussed in Natural Beauty and Natural Resources and Shorelines sections).
- The Federal Government in coordination with the County should complete field analysis and flood-plain maps of Hawaiian Acres and Orchid Land Estates subdivisions. Moreover, to minimize the overall costs of repairs and other temporary measures, the improvement of the Mt. View drainage system should be given a high priority for completion.
- Encourage the County Civil Defense Agency to continue its educational program for evacuation procedures and to develop alternate escape routes in coordination with the County Public Works and State Highways Division to cope

with tsunami, lava flows, or other natural hazards. (The residents of Puna are currently limited to only one escape route, the Keaau-Pahoa Road.)

- Discourage the construction of structures along the volcanic east rift zone by designating this strip of land into safety zones.



HISTORIC SITES

Chapter 5

GENERAL PLAN GOALS, POLICIES, STANDARDS

GOALS

- Protect and enhance the sites, buildings and objects of historical and cultural importance to Hawaii.
- Agencies, either public or private, pursuing knowledge about historic sites should keep the public apprised of projects.
- Access to significant historic sites, buildings and objects of public interest should be made available.

POLICIES

- It is recognized that historic sites need to be evaluated and protected. The County of Hawaii shall incorporate sections on historic sites, buildings and objects into appropriate ordinances.
- It shall be the policy of the County of Hawaii to require developers of land either public or private to provide a historical survey prior to the clearing or development of land when there are indications that the land under consideration has historical significance.
- Public access to significant historic sites and objects shall be acquired.
- In the evaluation and protection of historic sites, it shall be the policy of the County to give preference to sites with a preponderance of original materials in context and to complexes rather than single isolated sites unless they are of great significance.
- The County of Hawaii shall embark on a program of restoring significant historic sites on County lands. Through a joint effort with the State, the County can insure the protection and restoration of sites on other public lands.
- On private lands, the County of Hawaii shall encourage the restoration of significant sites.

- It is recognized that the information derived from historic sites is of interest to the residents of the island of Hawaii. It shall hereby be the policy of the County of Hawaii to collect and distribute historic sites information for public interest and to keep a current inventory of sites. The County shall also aid in the development of a program of public education concerning historic sites.
- Signs explaining historic sites, buildings and objects shall be in keeping with the character of the area or the cultural aspects of the feature.
- The process of evaluating the significance of historic sites shall be a continuing program of the County of Hawaii.

STANDARDS

The evaluation of the importance of specific historic sites is necessary for future action. The following standards establish a framework for evaluating sites.

- Importance in the life or activities of a major historic person.
- Associated with a major group or organization in the history of the island or community.
- Associated with a major historic event (cultural, economic, military, social, or political).
- Associated with a major recurring event in the history of the community (such as annual celebrations).
- Associated with a past or continuing institution which has contributed substantially to the life of the community.
- Unique example of a particular style or period.
- One of the few of its age remaining.
- Original materials and/or workmanship which can be valued in themselves.

Our historic and cultural resources face the constant threat of destruction from development pressures in the form of residential, commercial, and highway construction and from the preparation of land for agriculture. The Historic Sites element is concerned with the preservation of sites, buildings, structures, districts and objects of significance to the history and culture of Hawaii.

Governmental responsibility for historic preservation is shared by federal, state and county agencies.

Under Chapter Six of the Revised Statutes, amended by Act 104 of the 1976 Legislature, the State Department of Land and Natural Resources and the Hawaii Foundation for History and Humanities are charged with identifying, evaluating and interpreting all known historic areas, sites and places and preparing a Statewide Comprehensive Historic Preservation Plan.

To implement this law, the State's Hawaii Register Program initiated a statewide survey of archaeological sites in 1970. Field work for Hawaii County started in 1971 and was completed in 1975 with the Puna and Kau districts being the last. Because of the volume of work involved and a limited staff, review and evaluation of many sites in Puna remain incomplete as this Puna Community Development Plan is being prepared.

Once a site is placed on the Hawaii Register, any development on that land requires review and approval of the Department of Land and Natural Resources. Existing statutes also provide for the review of public works projects to determine the need for survey and salvage of archaeological and historic sites.

On the County's side, a general plan policy requires a historical survey prior to clearing or developing land when there are indications that the land under consideration has historical significance. Also under the Grading Ordinance, the applicant must furnish a plot plan showing locations of designated historical or archaeological sites. The Rules and Regulations

HISTORIC SITES

Chapter 5 (cont.)

Relating to Environmental Shoreline Protection require assessment of a proposed development which may significantly effect the Special Management Area. Criteria used to determine "significant effect" include project which involves irrevocable commitment to loss or destruction of any cultural resource...including historic sites...outlined in the County General Plan.

Even with these controls, there is danger of non-registered historic sites being damaged or destroyed

when bulldozing takes place for a use that is permitted or exempted by law such as setting of survey lines, construction of residences or starting a small farm operation.

PROFILE

The Puna Community Development Plan attempts to provide a means of integrating the preservation of historical resources with the processes of growth and change by indicating how and where new

development can take place in a manner that will be compatible with the historic character of the district. The listing of sites in the General Plan consists primarily of the better-known ancient Hawaiian places at the time the Plan was prepared. Subsequently, many more sites have been discovered, identified and evaluated. The uncovering of new sites is a continuing process which should be carried on by private and public interests.

General Plan Listings:

The following Ancient Hawaii sites should be assured of protection and should be restored or reconstructed:

Waha'ula Heiau
Punaluu Spring*
Stones in Park
Canoe Landing
Waiakolea Pond*
Kehena Beach Trail
King's Highway
Old Coffee Mill
Mahina'akaka Heiau,
Keahialaka Spring
Petroglyphs
Kahuwai Village

1-1-01:6
1-1-01:17
1-2-03:6
1-2-03:12
1-2-03:5,6
1-2-09:22
1-3-07:26
1-3-08:5

1-3-08:15
1-4-02:31
1-4-03:13

Poupou
Kahaulea
Kalapana
Kalapana
Kalapana
Keekee
Malama-ki
Pohoiki

The following sites need further research to ascertain their value:

Makaiwa Heiau
Platform
Kikoa Heiau
Aukelenuiahiki Heiau
Waiaka Heiau
Kanikapahu Heiau
Niukukahi Heiau
Housesites, petroglyphs

1-1-01:1
1-1-01:17
1-2-03:22
1-2-02:6
1-2-28:26
1-2-03:26
1-2-06:1
1-3-07:27

Kahaulea
Kahaulea
Kalapana
Kalapana
Kapahu
Kalapana
Kalapana
Malama-ki

*These sites were recommended for protection because of their natural beauty.

The following is a listing of additional sites in the Puna district cateorized according to the standards set forth in the General Plan:

Ancient Hawaiian sites:

Hawaii
Register Number
Name
Enclosure
Lava Bubble Enclosure
Honolulu Landing
Habitation Complex

Makuu Petroglyphs
Kukii Heiau
Ahalanui
Ahalanui Complex 2
Laepaoo Enclosure
Pohoiki North Complex
Pohoiki Enclosure
Hale Park Complex
Complex
MacKenzie Petroglyphs
King's Pillars
Kumukahi Grave Site
House Sites
House Sites/Complex
Pualaa Village, Makai
Pualaa Village, Mauka
Keokea Petroglyphs

4222
2500
2503
2505
2506
2507
2512
2515
2524
2529
4250
4251
4254
4255
4294
4295
2544



Tax Map Key
1-6-118:37
1-6-118:37

1-4-03:19

1-5-10:11,15,16
1-4-02:2
1-4-02:49,73
1-4-02:7
1-4-02:7
1-3-08:16
1-3-08:4
1-3-08:4
1-3-08:1
1-3-07 and 08
1-4-02:1
1-4-02:1
1-4-27:24
1-4-27:14
1-4-02:4,15,26
1-4-02:37
1-2-07:1

Location
Keeau Ranch
Keeau Ranch

Honolulu
Landing
Makuu
Kapoho
Kapoho
Kapoho
Kapoho
Pohoiki
Pohoiki
Pohoiki
Malama
Malama
Kapoho
Kapoho
Kapoho
Kapoho
Kapoho
Kehena

Evaluation
M
R

R
V
BP
R
R
R
R
M
M
R
V
V
BP
R
BP
BP
BP
BP
BP
M

2544-2544

HISTORIC SITES

(cont.) Chapter 5

The following reports also make an important contribution to information on Ancient Hawaiian sites in the Puna district:

Barrera, William. Archaeological Survey of a Portion of the Ahupuaa of Kupahua, District of Puna, Island of Hawaii, 1975. (1-2-02:29 and 30)			
Barrere, Dorothy B. and Crozier, Neal. Archaeological Survey of the Ahupuaa of Pualaa, Puna District, Island of Hawaii, 1975. (1-4-02:4,15,26)			
Bevacqua, Robert F. and Dye, Thomas S. Archaeological Reconnaissance of Proposed Kapoho-Kalapana Highway, District of Puna, Island of Hawaii, 1972. (1-02, 03 and 04)			
Ching, Francis, et al. Surface Survey Kalapana-Kaimu Beach Park for County Parks and Recreation Department, 1974. (1-2-03 and 04)			
Eward, Ned D. and Luscomb, Margaret L. K. Archaeological Reconnaissance of Proposed Kapoho-Keaukaha Highway, District of Puna, Island of Hawaii, 1974. (1-05 and 06)			
Sites of importance in the life or activities of a major historic person:			
7492	Lyman Marker	1-4-02:16	Kapoho
7382	Damien Church	1-2-29:33	Kapaahu
Sites associated with a major group or organization in the history of the community:			
7375	Kamauloa Oka Malama-malama Hoomana-Naauao O Hawaii	1-7-06:12	Kurtistown
7376	First Hawaiian Church	1-7-07:24	Kurtistown
7378	Kurtistown Jodo Mission	1-7-17:60	Kurtistown
7380	Star of the Sea Catholic Church	1-2-03:16	Kalapana
7381	Kalapana Mauna Kea Congregational	1-2-03:15	Kalapana
7387	Puula Congregational Church	1-4-51:115	Nanawale Est.
7383	Opihikao Congregational Church	1-3-04:4	Opihikao
Sites associated with a major historic event:			
(None)			Sites associated with a recurring event in the history of the community: (None)

COURSES OF ACTION

- Encourage more community involvement in recommending sites and buildings for preservation.
- Establish, through County initiative, a continuing program of preservation, stabilization, restoration, interpretation, and acquisition of sites and buildings and securing of access there to when evaluated "Valuable" by Hawaii Register.
- Nominate significant sites to the National Register of Historic Places to gain recognition, protection and benefits. (No National Register sites in Puna now.)
- Require development taking place on previously undeveloped land within five miles of the Puna

Sites associated with a past or continuing institution which has contributed substantially to the life of the community:

7374	Mt. View Village	1-8-01 and 02	Mountain View	BP
7379	Iwasaki Camp	1-7-17:15	Kurtistown	BP
7386	Old Coffee Mill	1-3-08:4	Pohoiki	BP
7388	Pahoa Town	1-5-07,11,12,13,14	Pahoa	BP
7389	Keaau Town	1-6-02-03,143	Keaau	BP
7453	Glenwood	1-8-09,10	Glenwood	BP
7385	Old Kudo Camp	1-3-05:12,13,19	Kaueleau	BP
Sites representing unique examples of a particular period or style:				
7377	Yamashita Residence (former home of Assistant Manager, Puna Sugar Company)	1-7-16:33	Kurtistown	M
Manager's Residence, Puna Sugar Company				
	Manager's Residence, Puna Sugar Company	1-6-03:10	Keaau	
in 7389	Puna Hongwanji Temple	1-6-02:28	Keaau	
in 7388	Pahoa YBA Hall	1-6-02:28	Pahoa	
in 7388	Sacred Heart Catholic Church	1-6-02:25	Pahoa	
in 7389	Holy Rosary Catholic Church	1-5-06:1	Keaau	
One of the few sites of its age remaining:				
7384	Kahalooa House	1-3-04:18	Opihikao	BP
7373	Kunio Takaku House	1-8-08:1	Glenwood	M
in 7388	Tao House	1-5-114:24	Pahoa	BP
7476	Kamahele House	1-5-10:9	Makuu	BP
	Hale House	1-3-08:4	Pohoiki	
Sites with original materials and/or workmanship which can be valued in themselves:				
(None)				
Evaluation Key:				
	no report (blank)			
	M arginal			
	R eserve			
	V aluable			
	B eing P rocessed			

coastline to provide at the developers' expense a preliminary historic site survey before bulldozing takes place. More detailed research and study may be required later if significant sites are found.

- Recommend enactment of ordinance to establish a Hawaii County Historic Preservation Commission to carry on local preservation plan and program.
- County undertake an educational program among schools, organizations and groups involved in land development to make them aware that common and legal practices such as bulldozing of land for setting survey lines, construction of a home, or farming, can damage or destroy valuable sites.

- Recommend the adoption of a state statute providing for:

Tax incentive to owners of significant historic sites for costs of clearing, restoring and maintaining sites for public use and enjoyment or for donating a historic site to a State or County agency, and exemption from public liability where the public is allowed use of the site; or

Allowing public funds to be expended with the consent of the owner to restore, maintain and pay for public liability when a significant historic site is locate on private property.

HOUSING

Chapter 6

GENERAL PLAN GOALS, POLICIES STANDARDS, COURSES OF ACTION

GOALS

- Encourage safe, sanitary, and livable housing.
- To attain diversity of socio-economic housing mix throughout the different parts of the County.
- Formulate program for housing.
- Maintain a housing supply which allows a variety of choice.

POLICIES

- It shall be the policy of the County of Hawaii to assure that safe, sanitary, and livable housing is available to persons of all ages, income and ethnic groups and to provide a variety of choice as to location and types.
- A volume of constuction and rehabilitation of housing sufficient to meet growth needs and correct existing deficiencies shall be promoted.
- The construction of specially designed facilities for elderly persons needing institutional care and for active elderly persons shall be encouraged.
- The use of new housing design and construction shall be encouraged to keep housing costs at a minimum and to increase the volume of production through the further use of technological innovations.
- Corporations and non-profit organizations shall be encouraged to participate in Federal programs to provide new and rehabilitated housing for low and moderate income households and the elderly.
- The County shall make maximum utilization of all Federal and State programs and disseminate information on these available assistance programs to the public, financial institutions, supply houses, and developers.

- Improvements in financing practices that will help to make housing more readily available to all persons shall be actively sought by the County.
- Public and private programs intended to increase the supply of housing and to create a variety of choice shall be encouraged.
- The County shall promote and support the use of Turnkey developments and encourage the use of cluster and planned unit developments.
- The County shall review its codes and ordinances to see if there are overly stringent restrictions which may impose unnecessary hardship.
- It shall be the policy of the County to study measures for curbing speculation practices and for reducing housing costs.
- The County shall encourage the State to construct homes for lease. The lease on the house and lot should be on a long-term basis and should be at a reasonable lease rate. In this way, the people's natural resource of land can still be perpetuated through public ownership and at the same time housing can be provided without heavy initial investment.
- The County realizes that the investment in home ownership constitutes the largest single investment for most of its residents. It is therefore the policy of the County to protect residential property values from depreciating influences.
- There shall be a systematic code enforcement schedule to upgrade the quality of the existing housing inventory. The County shall also seek means of assuring the maintenance of all housing in livable condition through programs of renewal, rehabilitation or redevelopment.
- Large industries which create a demand for housing shall provide employee housing based

upon a ratio to be determined by an analysis of the locality's needs.

STANDARDS

Housing standards shall consist of and comply with:

- Housing Code.
- Building Code.
- Electrical Code.
- Plumbing Code.
- Zoning Ordinance.
- Subdivision Ordinance.
- Uniformity of housing information system.
- The standards for housing shall not be limited to the above, but shall also include the standards listed for single-family and multiple residential land use elements.

Courses of Action

- Aid and encourage the development of a wide variety of housing choice for this area.
- Encourage the sugar company to continue assistance in providing employees with suitable housing or house sites before phasing out of the rental housing market.
- Since the sugar company has lands zoned for residential use within existing urban centers, they should be encouraged to make these lands available on the private market.

PROFILE

The economic overflow portion of housing in the Puna Community Development Plan reveals the following pertinent facts in relation to Puna housing:

1. **Growth in Housing Supply:** Housing in the Puna district has shown the fastest growth in the State at the annual rate of 8.2 per cent since 1970. Housing increased from 1, 777 units in 1970 to approximately 3,000

units in 1975. Factors such as availability of vacant lots, availability of Farmers' Home Loans, and cheaper houses as compared to those in Hilo resulted in this increase.

2. **Current Housing Inventory:**

Age of Housing: About 50 per cent of the homes were constructed after 1960, with over 30 per cent built since 1970.

Condition of Housing: Most housing units in Puna is in good condition; only 10 to 12 per cent can be labeled poor or dilapidated. Most of those in poor repair are located in Keaau and Pahoa.

Demand Factors: Demand for housing in Puna will depend on the projected population and the accompanying characteristics of income, age distribution, housing tenure, and ethnicity.

3. **Household Size:** The number of people per occupied housing unit decreased from 3.39 in 1970 to 2.87 in 1976. The number of persons per housing unit is projected to stabilize at 2.9 persons during the planning period until 1990.

4. **Housing Tenure and Costs:**

Tenure: In 1970, approximately 75 per cent of the occupied homes in Puna were owner-occupied. This ratio increased to 84 per cent in 1976.

Monthly Housing Costs: Average housing cost for homeowners was \$122 per month in 1973, with about 75 per cent of the homeowners paying less than \$200 per month. A recent housing survey in the area (1978) found that average monthly housing costs have now increased to over \$200.

Value of Owner-Occupied Housing: In 1970, the average value of owner-occupied housing was less than \$20,000. By 1976, the

average sale price of homes in the district was \$34,000.

Rent Distribution: Two-thirds of the rental units are rented for less than \$150 per month, with 40 per cent of these renting less than \$100 per month. Only one of 6 homes rents for \$200 or more.

5. **Projected Forecast of Housing Demand:** It is estimated that by 1990 there will be a demand for approximately 1,600 additional housing units or a total of about 4,670 dwelling units.

PROFILE (BY PLANNING AREAS AS SHOWN IN MAP 18) LOWER PUNA

Planning Area #1 (Lower Portion and Planning Area #2 - Royal Hawaiian Estates and Kalapana

The area is in hazard-prone zones E and F, (See explanation in Floods, Volcanoes, and Other Natural Hazards section) and the shorelines are subject to tsunami and land subsidence. Rainfall ranges from 40 inches along the shoreline to 150 inches in the upper regions. The major subdivision in the planning area is the Royal Hawaiian Estates. A County water line is available along Kalapana Road to Wahaula National Park Visitor Center. There are approximately 1,600 vacant lots available for housing for persons who wish to live in this planning area. Housing is limited in the mauka areas off the highway as water lines and electricity are unavailable.

Planning Area #3 - Opihikao - Pohoiki

The area is in hazard-prone zones E and F, with shorelines subject to subsidence and tsunami. Rainfall averages from 75 inches along the shoreline to 125 inches in the upper portion. Electricity is available along the coastal road, but no County water line exists. However, some 2,360 half-acre to one-acre size lots do exist in scattered sites. Housing types are anticipated to be restricted to vacation

houses or single-family. Employee housing for the papaya industry can be located in the area should the need arise.

Planning Area #4 - Kapoho-Nanawale

The majority of land is in zones E and F of the Volcanic Hazard Map. Land has been designated Urban by the State Land Use in Kapoho Beach Lots and Kapoho Vacation Lands along the shoreline and in portions of Nanawale Estates at the upper regions of this planning area. There is an existing County water system serving Kapoho area and Nanawale. Electricity and telephone are also available.

Planning Area #5 Portion - Pahoa-Hawaiian Beaches

The area is in zone E of the Volcanic Hazard Map. Existing amenities include electricity, telephone, and a County water system in Pahoa village. Major subdivisions in the area are Hawaiian Beaches and Parks and Hawaiian Shores Subdivisions where the most growth in Puna thus far has taken place.

Anticipated demands for elderly housing, apartments, single-family dwellings, and employee housing can be satisfied in the Pahoa village.

Growth in the Hawaiian Beaches area is restricted because the private water system is inadequate and because of stricter Federal Farmers' Home Loan requirements. However, it is anticipated that the subdivisions can grow substantially within the planning period as the problems are corrected or other avenues found.

UPPER PUNA

Planning area #5 (portion) - Hawaiian Paradise Park Area

This area includes the entire Hawaiian Paradise Park Subdivision. Electricity and telephone lines exist along selected roads, and a water line is earmarked for completion along Pahoa Road within the next ten years.

The area is predominantly single-family residential on a density of one house per acre. Vacation homes can be located there. The area is in zone D of the

HOUSING

Chapter 6 (cont.)

Volcanic Hazard Map and is relatively safe from volcanic lava flows. The shoreline is characterized by steep cliffs which deter tsunami from coming inland.

Existing one-acre lots can meet the housing needs of this planning area as only 2 per cent of the 10,995 lots are now occupied by homes.

Planning Area #6 - Keaau-Hawaiian Acres
The area is in zones D and E of the Volcanic Hazard Map. Keaau village is located in this planning area. Other major subdivided areas include Hawaiian Acres and Orchid Land Estates Subdivisions where there are 6,330 lots ranging from 10,000 square feet to three acres.

Existing amenities of electricity, telephone, and a County water line are readily available in Keaau village. The County water line is planned to be extended along Pahoa Road within the planning period. Electricity and telephone are already available along Pahoa Road and along select roads within the Hawaiian Acres and Orchid Land Estates Subdivisions.

Flood-prone areas exist in Hawaiian Acres and Orchid Land Estates.

Existing subdivisions within the planning area have many available vacant lots for those who wish to live there.

The majority of the Puna houses considered to be in poor or dilapidated condition are located in Keaau village. Replacement of all or some of these homes is necessary within the planning period. There are adequate residential zoned lands in Keaau around Keaau School or on the southwest side of Keaau village to handle this replacement program.

Elderly housing, farm-labor housing, apartments, and single-family residences can be located in Keaau village.

Planning Area #7 - Kurtistown
The area is situated in zones D and E of the Volcanic Hazard Map. County water, electricity, and telephone

are available throughout the planning area.

Because of the availability of water, electricity, telephone, and other amenities such as being near Keaau, the area is conducive to future expansion as a bedroom community. Should low or moderate income housing be located there through mortgage assistance from the federal or state governments, lands now zoned RS-20 (20,000 sq. ft. minimum) or Ag. lac. (1 acre minimum) need to be rezoned to smaller allowable lot sized.

Planning Area #8 - Mt. View/Glenwood
This area lies within the D and E zones of the Volcanic Hazard Map. Rainfall averages from 180 inches to 230 inches, the highest range in the Puna district. An existing County water system services houses along Volcano Highway and Peck Road. Electricity and telephone are available in the built-up areas along the highway and in the subdivisions.

The housing study reveals that there are vacant residential-size lots available in the Glenwood area. Some 4,900 dwelling units can be built on existing lots and/or on lands zoned residential; presently, only 450 dwelling units are situated there.

Since existing amenities are readily available in Mt. View, any future urban expansion for subsidized housing, elderly, or employee housing within this planning area should be located in Mt. View. Existing A 1ac (1 acre minimum) and other agricultural land nearby should be rezoned to residential as the need arises.

Glenwood subdivisions should be able to accommodate the housing needs of persons who like rural-type living. No rezoning or urban expansion for housing seems necessary for the area except to zone the subdivisions which already have urban size lots and are still in the agricultural district of the State Land Use regulations.

Planning Area #9 - Volcano
The area is in zones D and E of the Volcanic Hazard Map. Rainfall Ranges from 60 inches to 120 inches, resulting in problems of rain catchment as a method

of water supply as compared to the rainier portions of Puna. One reason is that there is no minimum size standards for the storage tanks.

A main problem relative to urban expansion is the rain catchment method of water supply. This method has not been acceptable to the County in meeting water supply requirements when subdividing into residential lots. Drilling test wells at the higher elevations to see if there is adequate ground water to service the Volcano area are now being conducted by the State.

Electricity and telephone are readily available in and near the older sections of this planning area.

Historically, the area has been a community of recreational homes and homes for retirees, farmers, and employees of the National Park and Kilauea Military Camp. This trend should continue in the planning period. Additionally, if the water problem is solved, the existing urban area can accommodate other types of housing, such as moderate-income housing and housing for the elderly. Projections show that the existing dwelling unit count of 320 will increase to 480 dwelling units within the planning period. However, improvements such as a centralized water system can markedly increase the growth.

Planning Area #1 (Portion) Lower Volcano
This area is in zone E of the Volcanic Hazard Map, with the National Park area in this planning area in zone F. The area does not have a County water system and electrical and telephone distribution systems are only located near the Volcano Highway. The annual rainfall of 80 to 180 inches is adequate to provide individual rain catchment systems for isolated homes in the area. Many paved roadways lead into the major subdivisions in the area. There are adequate vacant subdivided lots to meet the demand for future housing in the area. The areas which are more distant from the main highways are most suitable for, and perhaps limited to, small-scale farmers and other self sufficient individuals who prefer relatively isolated settings.

COURSES OF ACTION

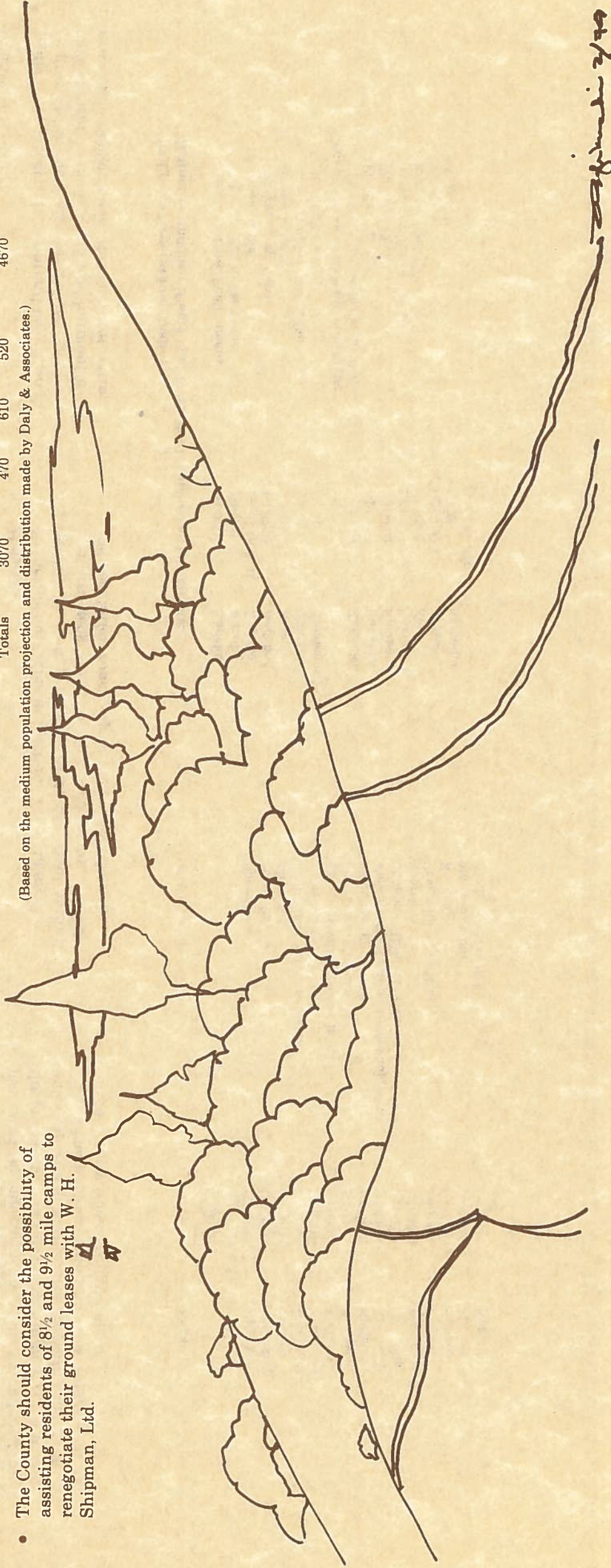
- The County and/or private developers should provide adequate areas for additional dwelling units to supplant existing vacant subdivided lots. (See Table 1 on the following page. The numbers indicated are not absolute; they should be used only as a guide in granting rezoning or in planning services to any given area.)
- New housing should reflect the current pattern in Puna which is approximately 95% single-family dwellings and only 5% multi-family dwellings.
- Housing for the elderly has already been developed in Keaau. If additional housing is warranted by market demand, it should be located close to the center of Pahoa town.
- The County should consider the possibility of assisting residents of 8½ and 9½ mile camps to renegotiate their ground leases with W. H. Shipman, Ltd.

TABLE 1 HOUSING DEMAND BY PLANNING AREAS

Tax Key Section	Planning Area	Existing 1976	Additional 1976- 1980	Required D.U.'s		Total
				1981 1985	1985 1990	
Lower Puna						
1 (por.)	Royal Hawaiian Estate	1	4	9	4	18
2	Kalapana	80	11	15	14	120
3	Opihikao-Pohoiki	90	11	19	15	135
4	Pohoiki-Kapoho-Nanawale	240	42	49	40	371
5 (por.)	Pahoa-Hawaiian Beaches	768	113	152	128	1161
Upper Puna						
5 (por.)	Hawaiian Paradise Park	212	42	43	38	335
6	Keaau-Hawaiian Acres	530	84	105	90	809
7	Kurtistown	450	69	89	76	684
8	Mt. View-Glenwood	300	45	59	51	455
9	Volcano	320	42	62	53	477
1 (por.)	Lower Volcano-Glenwood	79	7	8	11	105

Totals 3070 470 610 520 4670

(Based on the medium population projection and distribution made by Daly & Associates.)



NATURAL BEAUTY

Chapter 7

GENERAL PLAN GOALS, POLICIES, STANDARDS

GOALS

- Protect and enhance the integrity of areas endowed with natural beauty.
- Protect scenic vistas from becoming obstructed.
- Maximize opportunities for present and future generations to experience natural beauty.

POLICIES

- The County of Hawaii shall establish view plane regulations to preserve views of scenic or prominent landscapes from specific locations.
- The identification and development of viewing sites shall be a continuing program of the County of Hawaii.
- Criteria for safeguards of natural beauty shall be provided in the design review of developments so as to blend and harmonize man-made elements with their natural setting.

STANDARDS

The following standards provide guidelines for designating sites and vistas of extraordinary natural beauty which shall be protected.

- Distinctive and identifiable landforms distinguished as landmarks, e.g., Mauna Kea, Waipio Valley.
- Coastline areas of striking contrast e.g., Laupahoehoe Point.
- "Frontyard" vistas of distinctive features.
- Natural or native vegetation which makes a particular area attractive.
- Areas which are harmoniously developed and enhanced by man so as to appear natural.

Profile

Natural beauty sites in the Puna districts are the result of the interaction of a wide variety of natural elements-geography, geology, topography, climate and vegetation zones. Up to the present time the

existing land forms and vegetation within the district have been relatively unaltered by man except where sugar cane, macadamia and diversified crops and villages that support these industries were developed.

The list of sites in the Puna Community Development Plan includes attractive natural settings with varied and interesting land forms, shoreline configurations, scenic vistas and vegetation. Many sites are individual areas of scenic splendor, unique or limited in number and irreplaceable. Most are in their natural condition, but a few has been enhanced by man’s harmonious use of the environment. Site areas vary from a few acres to large tracts of land.

Natural beauty sites should be protected and preserved for enjoyment by residents and visitors at the present and in future generations. A list of sites and examples of natural beauty within the Puna district compiled according to the standards set forth in the County General Plan follows:

(*Indicates General Plan Listings) Distinctive and identifiable land forms distinguished as landmarks:

*1960 Lava Flow/Puu Laimana	1-4-02:1	Kapoho
*Kukii and Puu Kukae Cones	1-4-02:2	Kapoho
*Kapoho Cone	1-4-02:16 & 31	Kapoho
Halekamahina Cone	1-4-02:32	Kapoho
Honuaula Cone	1-4-01:19	Kapoho
1955 Lava Flow/Iilewa Cone	1-2-10:1	Kamaili
Holei Pali Fault	1-1-01	Kalapana
Coastal areas of striking contrasts:		
*Tidal Ponds & Fishing area (above cliff)	1-1-01:17	Kahaulea
*Punaluu Spring	1-1-01:17	Kahaulea
*Waiaholea Pond	1-2-03:5,6	Kalapana
*Viewpoint (Ka Lae Ahole)	1-2-03:12	Kalapana
*Kehena Black Sand Beach	1-2-09:21	Kehena
*Viewpoint	1-2-09:22	Keekee
*Waiaka Pond	1-2-28	Kapaahu
	(Lots 94-108)	

*Waikupanaha Pond

*Shoreline	
*Warm Springs	
*Shoreline	
*Keahialaka Spring & Ponds	
*Shoreline	
*Kapela Bay(Black Sand Beach)	
*Shoreline (Hilo Side)	
*Shoreline (Puna side)	
*Viewpoint & Tidal pool (Makauiu Pt.)	
*Shoreline (Honolulu Landing)	
*Shoreline	
*Cove with Stone Beach	
Kauaea	
MacKenzie Park	
Ahalanui (Mauna Kea) Pond	

1-2-28	Kapaahu
(Lot 109)	
1-2-29	
(Lots 110 & 111)	
1-3-04:71	Opihikao
1-3-08:5	Pohoiki
1-3-08:5	Pohoiki
1-3-08:15	Keahialaka
1-3-08:15	Keahialaka
1-4-03:13	Kahuwai
1-4-03:13	Kahuwai
1-4-03:13	Kahuwai
1-4-03:13	Kahuwai
1-4-03:19	Honolulu
1-5-63:1-4	Waiakahuila
1-6-140:4,5	Keaau
1-3-03:5	Kauaea
1-3-07:26	Malama Ki
1-4-02:5	Kapoho

NATURAL BEAUTY

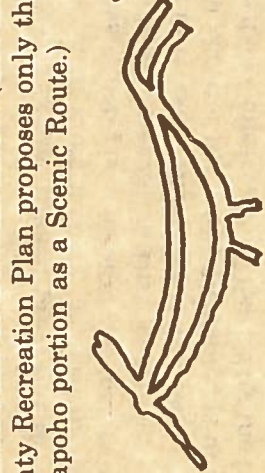
(cont.) Chapter 7

Areas which are harmoniously developed and enhanced by man so as to appear natural:

- Volcano Road (Highway 11)
- Pohoiki Road and Kapoho-Honolulu Landing Road through mango groves
- Pahoa-Kapoho Road near Lava Tree Park through albizzia groves

COURSES OF ACTION

- Continue the indentification, acquisition, and development of viewing sites for areas of scenic beauty.
- Designate the entire Puna Coastal Highway (FAS 137) from Hilo to the Hawaii Volcanoes National Park as a Scenic Route. (The Hawaii County Recreation Plan proposes only the Hilo to Kapoho portion as a Scenic Route.)



Frontyard vistas of distinctive features:

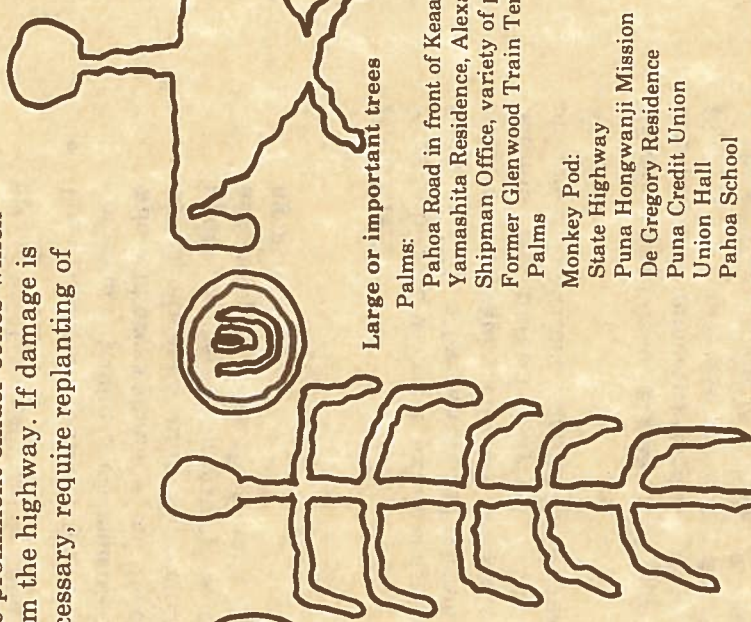
- Views of Mauna Kea and Mauna Loa from Keaau and Pahoa; various subdivisions; Volcano, Pahoa, Kapoho and Kalapana Roads.
- Views of cinder cones listed under distinguished landmarks.
- Views of ocean from various locations (near and distant).

Natural or native vegetation which makes a particular area attractive:

Groves

- Ohia, eucalyptus, bamboo, waiwi, hapuu and ginger along Volcano Highway
- Mango groves along Pohoiki Road (1-3-08:5)* and Kapoho-Honolulu Landing Road at Kahuwai (1-4-03).
- Kamani groves along Kalapana-Kapoho Beach Road at Keekee (1-2-09:22), Opihikao (1-3-02:36), Malama Ki (1-3-07:1 and 6) and Isaac Hale Park, Pohoiki (1-3-08:14)
- Milo grove on Kapoho-Kalapana Beach Road at Pohoiki (1-4-02:8)
- Ironwood groves at Kauaea shoreline (1-3-03:5), MacKenzie Park (1-3-07:76) and Nanawale Park (1-4-03:18)
- Albizzia groves along Pahoa-Kapoho Road near Lava Tree Park (1-4-01:4)
- Coconut groves at Harry K. Brown Park (1-2-03:5 and 6), Kaimu Park (1-2-04:30 to 36 and 38), Opihikao Coastline (1-3-03 and 04) and at Keahialaka Shoreline (1-3-08:15).

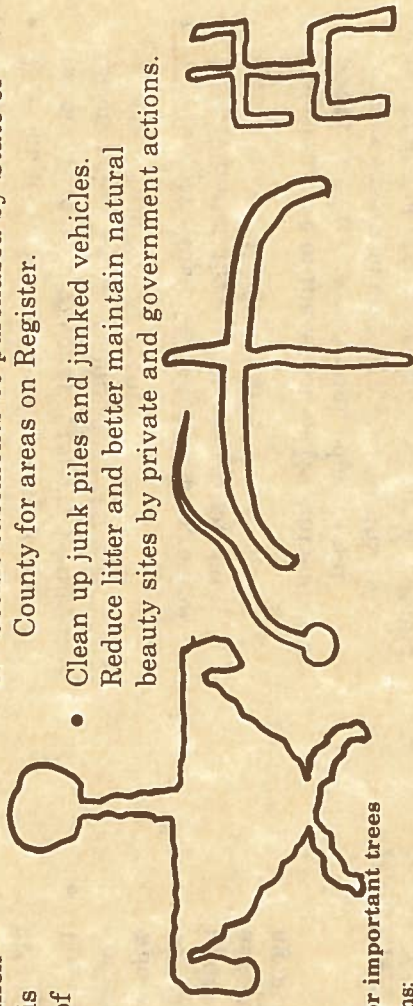
- Nominate the more important natural beauty sites in Puna for inclusion in the National Natural Landmark Registry for their recognition, protection and other benefits.
- Ensure during review that developments provide view corridors to ocean, mountain, or other areas of natural beauty, wherever feasible.
- Implement Arbor Bill (Act 105, Session Laws of Hawaii 1975) which enables county to enact regulations safeguarding "exceptional trees" from destruction.
- Prevent motorcycle riding, removal of cinder or scarring of the prominent cinder cones which are visible from the highway. If damage is absolutely necessary, require replanting of scarred areas.



Large or important trees

- Palms:
 - Pahoa Road in front of Keaau School, Royal Palms1-6-02
 - Yamashita Residence, Alexandra Palms 1-7-16:33
 - Shipman Office, variety of palms 1-6-02:99
 - Former Glenwood Train Terminal, Alexandra Palms 1-8-09:
 - Monkey Pod: near1-6-03:8
 - State Highway 1-6-02:23
 - Puna Hongwanji Mission 1-6-03:76
 - De Gregory Residence 1-6-143-12
 - Puna Credit Union 1-6-143:19
 - Union Hall 1-5-114:25
 - Pahoa School
 - Albizzia, Banyan, Mango, Royal Palm: 1-6-03:10
 - Manager's Residence
- Keaau
- Kurtistown
- Keaau
- Glenwood
- Keaau
- Keaau
- Keaau
- Keaau
- Pahoa
- Keaau

- Require buffer landscaping or retain natural plants for all new subdivisions bordering on federal aid primary and secondary highways. Also eliminate clutter caused by numerous mail and newspaper boxes on these highways by their centralization and concealment.
- Recommendation adoption of a Natural Beauty Register enabling statute:
 - Sites placed on county register be granted tax concessions as long as they are so retained similar to a dedication to agricultural use under the Land Use Law, or
 - Scenic easements be purchased by State or County for areas on Register.
- Clean up junk piles and junked vehicles. Reduce litter and better maintain natural beauty sites by private and government actions.



Finished 2/79

NATURAL RESOURCES AND SHORELINE

Chapter 8

GENERAL PLAN GOALS, POLICIES, STANDARDS.

The following goals, policies, and standards set forth to insure the protection of our natural resources and shoreline for present and future generations.

GOALS

- Protect and conserve the natural resources of the County of Hawaii from undue exploitation, encroachment and damage.
- Provide opportunities for the public to fulfill recreational and educational needs without despoiling or endangering natural resources.

POLICIES

- The County of Hawaii should require users of natural resources to conduct their activities in a manner that avoids or minimizes adverse effects on the environment.
- The County should encourage a program of collection and dissemination of basic data concerning natural resources.

- The shoreline of the island of Hawaii should be maintained for recreational, educational, and/or scientific uses in a manner that is protective of resources and is of the maximum benefit to the general public.

- The shoreline shall be protected from the encroachment of man-made improvements and structures.
- The County shall coordinate programs to protect natural resources with other government agencies.
- Investigate methods of beach replenishment sand erosion control.

STANDARDS

The following shall be considered for the protection and conservation of natural resources.

- Areas necessary for the protection and propagation of specified endangered native

wildlife, and conservation for natural ecosystems of endemic plants, fish and wildlife.

- Lands necessary for the preservation of forests, park lands, wilderness and beach areas.
- Lands with a general slope of 20% or more which provide open space amenities or possess unusual scenic qualities.
- Lands with topographic, locational, soils, climate or other environmental factors that may not be normally adaptable or required for urban, rural, agricultural or public use.
- The installation of utility facilities, highways and related public improvements in natural and wildland areas should avoid the contamination or despoilment of natural resources by design review, conservation principles, and by mutual agreement between the County and affected agencies.

PROFILE

Puna is blessed with a dynamic ecosystem of flora, fauna, and other terrestrial and marine life in a wide range of topography, climate, and geological features. This natural ecosystem is fragile and unique; thus, actions to protect and preserve them are vital.

Research on endemic plants and wildlife has been conducted by numerous scientists in the National Park, in the forest reserves, along the shorelines and at the geothermal site in Pohoiki. Some of the studies are elaborated in the following sections.

Plants

Hawaii is blessed with a wide range of plant life. Studies show that at least 2,500 kinds of plants grow in the islands. There are many introduced (exotic) species brought by different waves of migration of people beginning with the early Hawaiians.

However, many native and/or endemic plants abound throughout the islands. Puna enjoys this wide range of plant life.

Plant life in Puna closely coincides with the climatic and topographic factors of the area. Vegetative zones include the rain forests of ohia, fern, and other dominant native plants at the upper reaches of Puna; the cultivated lands interspersed with rough broken lava land of ohia, pili, and introduced plants in the midlands; and the highly vegetated shorelines of native plants of coconut, kukui, hala, kamani, as well as guava and other introduced plants.

Because Puna is richly endowed with natural forests, the federal, state, county governments constantly strive to preserve this valuable resource.

Examples of existing government programs to preserve indigenous biota include the existing State Land Use laws which place most of the forests and shorelines in the Conservation District for the preservation of forests, wilderness, and beach areas. Some 137,200 acres of the total 313,600 acres in Puna are designated as Conservation District by the State Land Use laws.

Within this Conservation District, the State is further insuring the preservation of existing natural forests and shorelines by creating a Natural Area Reserves System. Basically, this law is intended to protect and preserve unique natural assets, both for the enjoyment of future generations and for providing a baseline against which changes being made in the environment of Hawaii can be measured. The Natural Area Reserves System Commission at present is making an assessment to place about 6,400 acres of the Conservation designated lands into Natural Area Reserve. Areas being considered are the Malama-Ki Forest Reserve, the Keaauhana Forest Reserve, and portions of Olaa Forest Reserve.

Another government program geared towards preservation of natural plants is the Endangered Species Preservation Act under which the federal

NATURAL RESOURCES AND SHORELINE

(cont.) Chapter 8

ENDANGERED PLANTS IN HAWAII VOLCANOES NATIONAL PARK AN INTERIM LIST

The plants in this list are those which now grow in Hawaii Volcanoes National Park, or which have been collected in the past from sites now included within HAVO, and which were listed in the Federal Register of June 16, 1976, pp. 24524-24572 as among those proposed for determination as endangered taxa pursuant to section 4 of the Endangered Species Act of 1973. The Federal Register list includes only taxa proposed for endangered status, it does not include any proposed for threatened status, so all plants listed below are to be considered endangered.

	Family	Scientific Name	Common Name
FERNS:	Ophioglossaceae	<i>Ophioglossum concinnum</i> Brack.	pololoi
	Polypodiaceae	<i>Adenophorus periens</i> L. E. Bish.	
	Liliaceae	<i>Dracaena hawaiiensis</i> (Deg.) Fosh.	halapepe
MONOCOTYLEDONS:	Poaceae	<i>Ischaemum byrone</i> (Trin.) Hitch.	hōlei
	Apocynaceae	<i>Ochrosia compta</i> K. Schum.	hao
	Araliaceae	<i>Rauwolfia remotiflora</i> Deg. & Sherff.	'ohe maka'i
	Asteraceae	<i>Reynoldsia hillebrandii</i> Sherff	āhinahina; Ka'u silversword
DICOTYLEDONS:		* <i>Argyroxiphium kauense</i> (Rock & Neal) Deg. & Deg.	āhinahina; Haleakala silversword
		* <i>A. sandwicense</i> DC.	silversword; Mauna Kea silversword
		<i>Bidens skottsbergii</i> Sherff var. <i>skottsbergii</i>	koko'olau
		<i>B. skottsbergii</i> var. <i>conglutinata</i> (Deg. & Sherff) Sherff	koko'olau
	Campanulaceae	<i>Clermontia hawaiiensis</i> (Hbd.) Rock var. <i>hawaiiensis</i>	'Ōhā-kēpau
		<i>C. peleana</i> Rock	
	Fabaceae	<i>Canavalia kauensis</i> St. John	'Ōhai
		<i>Sesbania tomentosa</i> H. & A.	naupaka'; huahekili-uka
	Goodeniaceae	<i>Scaevola kilaueae</i> Deg. var <i>kilaueae</i>	kāmakahala
	Longaniaceae	<i>Labordia baillonii</i> St. John	kāmakahala
DICOTYLEDONS:	Longaniaceae	<i>Labordia baillonii</i> St. John	kāmakahala
		<i>L. hedyosmifolia</i> Baill var. <i>kilaueana</i> Sherff	kāmakahala
		<i>L. hedyosmifolia</i> var. <i>magnifolia</i> Deg. & Sherff	kāmakahala
		<i>Hibiscadelphus giffardianus</i> Rock	hau-kuahiwi
	Malvaceae	* <i>H. hualalaiensis</i> Rock	hau-kuahiwi
		* <i>Kokia drynarioides</i> (Seem.) Lewt.	hau-hele'ula; koki'o
	Pittosporaceae	* <i>Pittosporum hosmeri</i> Rock var. <i>saint-johnii</i> Sherff	'a'awa hua kukui
	Portulacaceae	<i>Portulaca sclerocarpa</i> Gray	'ihi-mākole; po'e
	Rhamnaceae	<i>Alphitonia ponderosa</i> Hbd.	kaula
	Rubiaceae	<i>Bohea timonioides</i> (Hook. E.) Hbd.	'aka-kea
DICOTYLEDONS:	Rutaceae	<i>Pelea zahlbruckneri</i> Rock	kāwa'u
		<i>Zanthoxylum dipetalum</i> Mann var. <i>gemicarpum</i> Rock	
	Sapindaceae	<i>Dodonaea eriocarpa</i> Smith var. <i>skottsbergii</i> Sherff	'a'li'i
		<i>Nothocestrum breuiflorum</i> Gray	'aiea
	Solanaceae	<i>N. longifolium</i> Gray var. <i>rufipilosum</i> Stone	'aiea
		<i>rufipilosum</i> Stone	'aiea
	Urticaceae	<i>Neraudia ovata</i> Gaud.	

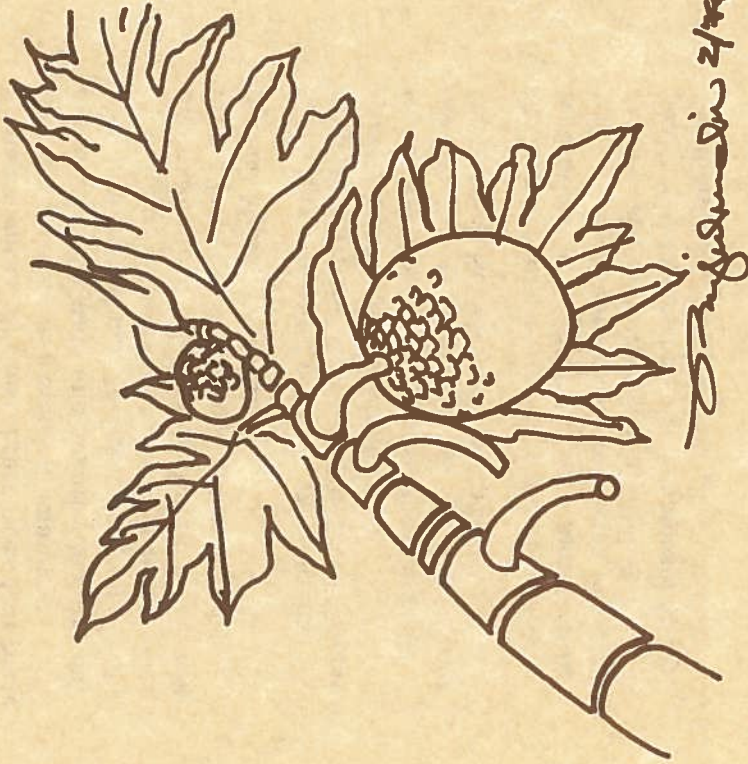
*There is no evidence that these taxa occurred naturally in HAVO and present populations are those planted by man.

C. H. Lamoureux
20 August 1976

government is seeking to protect native fish and wildlife that are threatened with extinction by preserving, wherever practical, the habitats of such threatened species. This act specifically relates to lands under the federal government, such as the Hawaii Volcanoes National Park.

Still other programs include an investigation of the causes of ohia die-back and the continued surveillance and destruction of introduced pests, such as the faya tree which threatens to crowd out native plants in the forests.

Through existing laws and through public concern, giant steps have been taken towards protection of native plants over the past few years. Certain plants, (shown in Table 2), as presented by Dr. C. H. Lamoureux at a recent Natural Science Conference, have been identified as endangered native plants in Hawaii Volcanoes National Park.



NATURAL RESOURCES AND SHORELINE

Chapter 8 (cont.)

Birds

Since 1939, the Hawaii Audubon Society has been the State's leading advocate for the conservation of native birds and their native habitats in the State. According to the Society, there are 30 different kinds of endemic Hawaiian birds that occurred on the island of Hawaii. Twelve of them are believed to be extinct, and eleven more are currently on the U. S. List of Endangered Species.

Man has not been the sole destructor of this unique resource. The introductions by man of foreign animals, plants, insects, birds, and diseases also contribute to the continuing degradation of the birds

TABLE 3 STATUS OF ENDEMIC HAWAIIAN BIRDS WITH RANGE IN OR AROUND THE PUNA DISTRICT IN HISTORIC TIMES

	Hawaiian or Common Name	Status
1.	'Ua 'u Hawaiian Petrel	E
2.	Nene, Hawaiian Goose	E
3.	Koloa, Hawaiian Duck	E
4.	'Io, Hawaiian Hawk	E B
5.	Moho, Hawaiian Rail	X B
6.	'Alae 'ula, Hawaiian Gallinule	X*
7.	'Alae ke'oke'o, Hawaiian Coot	E
8.	'Ae'o, Hawaiian Stilt	E
9.	Pueo, Hawaiian Owl	
10.	'Alala, Hawaiian Crow	E B
11.	'Oma'o, Hawaii Thrush	B
12.	Hawaii 'Elepaio	B
13.	Hawaii 'O'o	X B
14.	Kioea	X B
15.	Hawaii 'Amakihi	B
16.	Greater 'Amakihi	X B
17.	Hawaii Creeper	E B
18.	Hawaii 'Akepa	E B
19.	Hawaii 'Akailoa	X B
20.	'Akiapola'au	B
21.	'O'u	E
22.	'Apapane	
23.	Ula 'ai hawane	X B
24.	'Iiwi	
25.	Mamo	X B

Legend: E = on the U.S. List of endangered Species
X = considered extinct

B = found only on the Big Island

*Big Island population extinct; endangered elsewhere

Reference for table: **Hawaii's Birds**, Hawaii Audobon Society, 1975.

and their essential habitats. A possible solution to reverse the trend in the future may be through increased protection of forest ecosystems and wetland habitats, through more environmental education, through research on native ecosystems, and through control of harmful foreign organisms.

Table 3 lists a total of 25 of the 30 endemic birds with habitats in the Puna district on the island of Hawaii. Of these birds, eleven are endangered species and eight more are considered extinct. This leaves only six species out of the 25 that are neither endangered nor extinct.

Mammals

Because of Hawaii's distant location from other land masses, few mammals arrived through natural dispersal. The hoary bat and Hawaiian seal are the only land-based mammals native to Hawaii. The Hawaiian hoary bat is found throughout the island, including Puna, and is considered an endangered specie by the United States Department of Interior. The Hawaiian monk seal is endemic to Hawaii and is found only within the Hawaiian Islands National Wildlife Refuge, north of Kauai.

Geothermal Resources

Geothermal energy is a natural heat resource available in the Puna district, which can be harnessed for direct thermal use and for electrical power generation.

Geothermal drilling was tried in the Puna district in the early 1960's with initial wells found either unsuccessful or were not further developed after initial drilling.

A successful well was drilled along the Pohoiki-Kapoho Road below the east rift zone of Kilauea. The project is now entering into the next phase of installing a research power plant to demonstrate that geothermal energy is an economical means of obtaining alternate natural energy for the Big Island.

Marine Resources and Shoreline

The 58 miles of shoreline in Puna, characterized mostly by their craggy and undeveloped state, rank among Puna's important natural assets.

Like the other native resources and habitats, some of Puna's shoreline has been subject to man's development and degradation. Man has wrought havoc on the fragile ecological balance of the shoreline and its marine life by the use of cesspools as the primary means of sewage disposal, by directing storm runoff to the shorelines, and by using the sea life, such as fish, limu, opihi, and other marine invertebrates as food sources at an accelerating rate.

To preserve the shoreline from futher environmental degradation and to preserve the coastal water quality, several governmental actions have occurred. An overview of the actions follows:

1. A Coastal Zone Management (CZM) Act, passed by Congress in 1972, sets the guidelines from which individual states enact their individual programs to provide guidance in the management of all coastal resources. Our State Legislature enacted a series of enabling statutes for the state and counties to carry out Hawaii's coastal management program. In the Puna district, the shoreline management rules and regulations call for a minimum of 300 feet inland from the shore to be placed under a Special Management Area.
2. Other governmental controls for shoreline protection are the existing State Land Use laws which can zone coastal lands into Conservation and shore waters into special marine conservation districts. (An example of the latter is Kealahakua Bay in Kona.)
3. Still other controls are the existing fishing regulations of the State, under which certain fish and invertebrates are restricted to seasonal catches, size, and methods, and by existing health regulations on sewage disposal along the shorelines.

NATURAL RESOURCES AND SHORELINE (cont.) Chapter 8

4. Another regulation to control development is the shoreline setback rules and regulations under State laws which requires all construction to be at least 100 feet back from the shoreline on large lots and 20 to 40 feet in urban size lots.

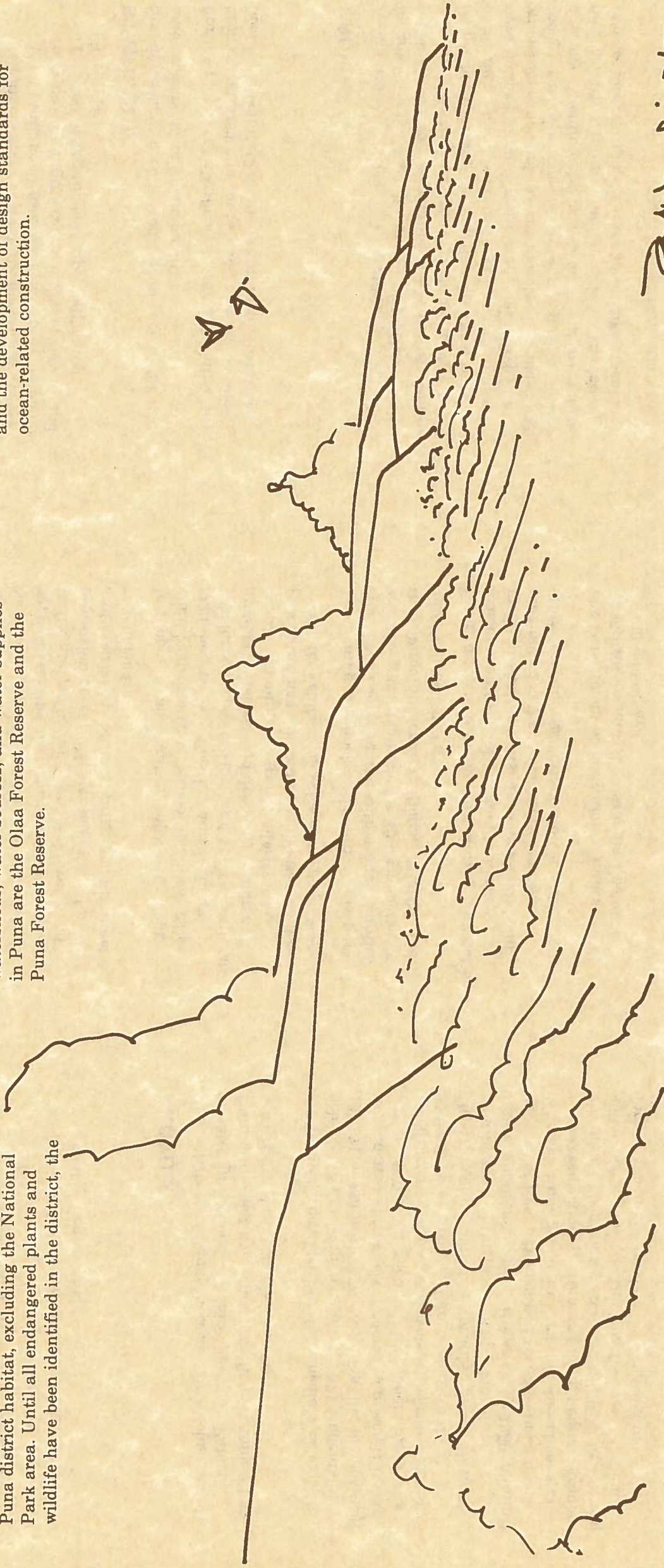
COURSES OF ACTION

- Educational programs initiated by government and concerned citizens to inform the public about rare and endangered plants, birds, and marine resources.
- The County should encourage the identification of endangered plants and wildlife within the Puna district habitat, excluding the National Park area. Until all endangered plants and wildlife have been identified in the district, the

County should encourage evaluation of the impact of each public or private development on the wildlife and ecosystems in the district. Evaluation may be in the form of an environmental assessment.

- The State, with encouragement from the County, should continue to investigate and identify lands necessary for the preservation of natural forests and wildlife. These should be added to the Natural Area Reserves System of the State.
- Lands necessary for the protection of watersheds, water sources, and water supplies in Puna are the Olaa Forest Reserve and the Puna Forest Reserve.

- Installation of highway improvements, such as the Puna Coastal Road, the Chain of Craters Road, and related public improvements in the natural and wildland areas, should avoid despoilment of natural resources by keeping the improvements to a minimum, thus keeping the areas as natural as possible.
- The County should encourage developmental controls along the shoreline, encouraging studies of the physical characteristics of the shore area to determine wind, wave, current, and sand transport patterns to evaluate new developments and correct existing problems; and the development of design standards for ocean-related construction.



2/7/77

PUBLIC FACILITIES

Chapter 9

GENERAL PLAN GOAL, POLICY, AND STANDARDS

GOAL

- It is the goal of the County to provide public facilities that effectively service community needs and to continue to seek ways of improving public service through better and more functional facilities which are in keeping with environmental and aesthetic concerns of the community.

POLICY

- In order to provide the necessary facilities to effectively serve community needs, the County shall continue to seek ways of improving public service through the coordination of service and by maximizing the use of personnel and facilities.

STANDARDS

Standards have been established in each of the four major groupings of public facilities.

For the purpose of clarification, public facilities have been categorized into education, protective services, health and sanitation, and government operations.

PROFILE

As defined in the County General Plan, "public facilities are those service systems which are provided, staffed, and maintained by government to directly serve the individual citizen in his desire to realize his full self-potential, to enjoy the protection of his rights and his property, to be secure in his need for medical and health care, and to live in a wholesome and sanitary community." Included are the systems of schools, libraires, fire stations, police stations, detention and correctional facilities, refuse disposal areas, harbors, and airfields. (The latter two are discussed in the transportation element.)

PUBLIC FACILITIES: EDUCATION, GENERAL PLAN STANDARDS, COURSES OF ACTION

STANDARDS

Educational standards here relate to the provision of facilities rather than programs, which are the province of the State. It is nevertheless recognized that the facilities and programs are the tools necessary to improve total educational service.

- Joint pre-planning of schools with the Department of Education and the University of Hawaii shall take place continuously to ensure coordination with roads, water, and other support facilities and considerations such as traffic and safety, and vehicle, bicycle, and pedestrian access. Master planning of present and proposed public and private institutions is recommended.
- In proposed communities, sufficient acreage shall be dedicated for school facilities. Sites shall be free from flooding and drainage problems, excessive slope and shall incorporate appropriate street and driveway design and location to minimize traffic interference, pedestrian hazard, and to enable safe and easy access for vehicles, bicycles and pedestrians.
- The joining of school yards with county parks shall be encouraged and with school facilities shall be made available for afterschool use by the community for recreational, cultural, and other compatible uses.
- Where a separate community library may not be feasible, joint school-community library facilities shall be considered and shall be in proximity to other community facilities, affording both pedestrian and vehicular access.
- The Department of Education's 'Educational Specifications and Standards for Facilities' should be followed.'

The following is an examination and analysis of educational facilities by districts. Courses of action are to be supportive of and consistent with the overall element.

Courses of Action

- Existing complexes shall be up-graded to meet the standards established by the Department of Education.
- School facilities shall be made available for afterschool use by the community for recreation and other compatible uses.
- Pedestrian access between the village of Pahoa and the school and library facilities shall be improved.
- A Keaau School-community library complex should be considered.

PROFILE

In the district of Puna, there are three school plants situated in Keaau, Mountain View, and Pahoa. During the past five years, significant changes have occurred in these schools.

At Keaau Elementary and Intermediate School, the school enrollment increased from 371 students in 1970-71 to 485 in 1977-78. Additionally, the physical area increased from six (6) acres to fifteen (15) acres, and in 1975, a joint community-school library was constructed on the school grounds near the existing Shipman gymnasium. Future plans of the Department of Education for this school call for the continuation of the plant as an elementary-intermediate institution. However, by 1980, all ninth graders of Keaau School will become students at Waiakea High School in Hilo, and the school will then service kindergarteners through eighth graders. Enrollment is anticipated to be stabilized at between 460 to 500 pupils over the next five years with an increase to approximately 700 students in 1990.

PUBLIC FACILITIES

(cont.) Chapter 9

At Mountain View School, a major change occurred in 1974 with the merger of the school with Keakealani School at Volcano. As a result of this merger and an increase in population, school enrollment increased from 182 pupils in 1970-71 to 283 pupils in 1977-78. Added improvements to the school include a recently-completed community-school library.

By 1980, it is expected that ninth graders of Mountain View School will also become a part of the new Waiakea High School. At that time, the school enrollment at Mountain View is anticipated to be about 320 students. The increase in population, as shown by the economic study, would also increase school enrollment over the next ten years. Probably, a high of an 11% per annum increase would result, based on a straight line projection of population. Therefore, should this projection be realized, by 1990, the school enrollment can conceivably be about 435 students. According to Department of Education standards, the existing physical site of twelve (12) acres to handle this projected student enrollment in 1990 is inadequate. About 23 acres would be desirable and required for the school site.

In the last six years, Pahoa High and Elementary School has witnessed the most significant change within the Puna district. An unprecedented growth in population in the area, mainly in the Hawaiian Beaches Subdivision, caused the school enrollment to increase to 1018 students in 1977-78 as compared to 332 in 1970-71. Within this span, the land area for the school and playground also increased from ten (10) acres to 19,478 acres, including 2,522 acres of County park area. Long-range plans of the Department of Education for this school include maintaining the present K-12 program, with the expansion of the physical facilities to accommodate an enrollment of 1,330 students, the projection for 1990. With this growth in enrollment, by Department of Education standards, about 30 acres of land would be required to house this student population in 1990.

Other educational facilities in the area include one church-operated pre-school nursery and a proposed

Henry Opukahaia School.

COURSES OF ACTION

- The State should expand the Pahoa School site to about 30 acres to accommodate the anticipated increase in school enrollment.
- The State should review the master plans for Keaau School and Mt. View School jointly inasmuch as both existing school plants are inadequate to accommodate the projected student population to 1990. A possible solution is the shifting of intermediate students from Mt. View to Keaau School.

PUBLIC FACILITIES: PROTECTIVE SERVICES

GENERAL PLAN STANDARDS AND COURSES OF ACTION

STANDARDS

- Development of police and fire facilities should entail joint use structures whenever feasible.
- The minimum area for establishing a fire/police facility shall be one acre and in locations which permit quick and efficient vehicular access.
- Police headquarters shall be near the geographic center of the service area and near concentrations of commercial and industrial use.
- Stations in outlying districts shall be based on the population to be served rather than on geographic district.
- Additional rehabilitation and counselling centers shall be established as needed.
- The Fire Department, in cooperation with other related governmental agencies and the involved land owners, shall prepare a fire protection and prevention plan for forest reserves and other

natural areas, and such plan shall be approved by the County Council.

Course of Action

- A review of the possibility of 24-hour fire and police service for the entire district should be conducted and expansion of the civic center facilities should be considered in accord with district needs.

PROFILE

Protective services in Puna consist of fire, police, and National Guard facilities.

Fire stations are located in Pahoa and Keaau, with the Keaau facility being the only 24-hour facility in the district.

Police are headquartered in Keaau to service the Puna district. Anticipated improvements in the next five years include the expansion of the existing station.

COURSES OF ACTION

- The County should creat a 24-hour fire station in Pahoa to provide fire-fighting, rescue, and emergency medical services.
- The County should increase police protection in Puna by (1) providing more manpower; (2) establishing a monitoring CB unit for all police and rescue units to handle emergency situations; (3) providing protection for those subdivisions which are serviced by private roads by enactment of new County ordinances to allow patrolling over private roads.
- The County should create volunteer fire-fighting units in the large subdivisions which are susceptible to periodic forest fires.
- For fire-fighting purposes, the County should provide standby outlets along Pahoa Road upon the installation of a trunk line, or install pumps into the existing wells and standby water tanks.

PUBLIC FACILITIES

Chapter 9 (cont.)

PUBLIC FACILITIES: HEALTH AND SANITATION

GENERAL PLAN STANDARDS AND COURSES OF ACTION

STANDARDS

- Sanitary landfill sites for refuse disposal shall be established in accordance with the needs of communities and shall be landscaped. Appropriately designed transfer station sites shall be located in areas of convenience and easy access to the public.
- Hospitals should be on sites capable of handling moderate expansion of facilities. Quiet surroundings, convenient and adequate access, and compatibility with adjoining uses shall be required.
- Hospitals shall be served by a public sewerage system or have self-contained sewerage systems. Hospital solid waste disposal methods shall be by incineration.
- Private and public cemeteries shall be compatible with surrounding land uses and shall be provided with adequate access and drainage systems.
- Cemeteries should be encouraged, wherever possible, to use plaques installed flush with the ground.
- Cemetery services and rates should be standardized.

Courses of Action

- Maintenance of cemetery sites shall be improved.
- Implementation of the landfill method of solid waste disposal should begin.

PROFILE

The Puna Sugar Company operates a dispensary in Keaau which provides health services for its employees and their families. Pahoa has one full-time doctor and a clinic, and an examination room has been set aside in the Pahoa Neighborhood Center for use by the Health Department and the Hilo Counseling Center.

Since the adoption of the General Plan, the County has made significant progress in implementing a solid waste management program for Puna as well as for the entire county. In compliance with federal environmental protection regulations, the County has converted open dumping areas to sanitary landfill sites.

There were two open dumps located at Kapoho and on Kulani Road in Mountain View. The Kapoho dump site closed recently since the Pahoa transfer station on Cemetery Road has been completed. The Kulani Road open dump site is scheduled for conversion to a transfer station site in the near future. (Transfer stations are contained trailers into which rubbish is disposed and then transported for final disposal in landfill sites.)

A combination landfill-transfer station will be constructed in Glenwood, near the 19-mile marker.

Transfer stations currently in operation are located at Kalapana, Pahoa, Keaau, and Volcano.

Solid waste disposal systems for Puna should be adequate for the planning period after the Glenwood and Kulani Road transfer sites are completed.

Public cemeteries in the district of Puna are located in Kaimu, Kehena, and Malama. The cemetery at Kaimu, which covers 16.63 acres, has burials scattered throughout the area. The Kehena cemetery is not in use since it was covered by the 1955 lava flow. The Malama cemetery site is also no longer in use.

COURSES OF ACTION

- All transfer and landfill sites for solid waste

disposal shall be properly landscaped, buffered from view from public highways and adjoining residential areas, with periodic maintenance to keep the areas clean and free of litter.

- Maintenance of cemetery sites should be provided by the County and by private owners.

PUBLIC FACILITIES: GOVERNMENT OPERATIONS

GENERAL PLAN STANDARDS

STANDARDS

- Civic center sites shall satisfy modern and reasonable requirements of accessibility and compatibility with the surrounding neighborhood.
- The multipurpose concept of flexibility to satisfy changing requirements should be part of the design for these public buildings.
- Architectural and landscaping shall reflect as much as possible the community's attributes.

PROFILE

The Keaau civic center complex serves the entire Puna district. It houses the police and fire stations, the district court, and the post office. Other post offices are located in Kurtistown, Mountain View, Pahoa, and Volcano.

Over the next five years, among scheduled improvements is the relocation of the County's road maintenance baseyard to Keaau near the transfer/landfill site.

COURSES OF ACTION

- The County should relocate the Kurtistown road maintenance baseyard to Keaau to centralize road maintenance operations in Puna.
- The community should request the Postmaster to create new Federal post offices in Kalapana and Hawaiian Beaches area.

PUBLIC UTILITIES

Chapter 10

Public utility services are regulated by government and include water, electricity, telephone, and gas. Water, electricity, and telephone services are basically confined to the older, developed areas of Keaau, Pahoa, and Kapoho, and along the Volcano Highway from Keaau to Mountain View. Water and telephone service also extends to the Kalapana area. To extend services to homes which are beyond a service area, new customers can utilize “line extension policies” where first users of the line are required to pay for initial cost of installing the extension.

Line extension policies for electricity and telephone services are regulated by the State Public Utilities Commission. The County Department of Water Supply administers the County water system throughout the island, and electricity and telephone services are administered by separate utility companies. Costs for these extensions are also influenced and adjusted by factors such as projected revenue, the additional revenue to be gained by the extension, and the number of customers who eventually utilize the new extension. In many instances, the customer who pays for the extension is later refunded a part of the money.

Maps 11-13 show the current water, electrical, and telephone service areas in Puna.

Gas and sewer systems are non-existent in Puna. However, gas is provided to individual homes by means of tanked liquefied propane by Gasco Inc. at the request of the homeowner. Sewage disposal is usually by means of individual cesspools throughout the Puna area.

GENERAL PLAN GOALS, POLICIES, AND STANDARDS, COURSES OF ACTION

The following goals and policies of public utilities are set forth through the careful examination and analysis of past and present situations. Their primary purpose is to make provisions for the needs of the residents of the County of Hawaii.

GOALS

- To ensure that adequate, efficient and dependable public utility services will be available to users.
- To maximize efficiency and economy in the provision of public utility services.
- To improve the physical appearance of public utility facilities and/or to conceal them from public view.

POLICIES

- Public utility facilities shall be designed so as to complement adjacent land uses and shall be operated so as to avoid pollution or disturbance.
- Use of properties or easements owned by public or private utility companies or agencies as supplemental open space and recreational areas should be pursued whenever practical and within the limits of safety and operating requirements of the utilities concerned.
- Provide utilities and service facilities which minimize total cost to the public and effectively service the needs of the community.
- Utility facilities shall be designed to minimize conflict with the natural environment and natural resources.
- Improvement of existing utility services shall be encouraged to meet the needs of users.

Utility services are treated individually in this section to clarify the factors which make up the public utilities element.

UTILITIES: WATER

POLICIES

- All water systems shall be designed and built to Department of Water Supply standards.
- Improve and replace inadequate systems.
- Water sources shall be adequately protected

to prevent depletion and contamination from natural and man-made occurrences or events.

- New public water systems should be first installed in urban areas which have established needs and characteristics, such as occupied dwellings and other uses, or in areas adjacent to them if there is need for urban expansion, or to further the expansion of the agricultural industry.
- Sources of additional water supplies shall be sought in order to ensure sufficient quantities of water for future needs.
- The fire prevention distribution system shall be coordinated with water distribution systems in order to ensure water supplies for fire-fighting purposes.

STANDARDS

- Water systems shall meet the requirements of the Department of Water Supply and the Subdivision Ordinance.

The following is an analysis by district with courses of action to undertake for water systems. The brief analysis of each district is intended to bring into focus the relationship of the district to the County as a whole. The courses of action shall be consistent with and supportive of the goals, policies, and standards set forth in the overall water section.

Courses of Action

- Replace the deteriorated galvanized iron pipes of the Olaa Water System.
- Extend the Kalapana system from the Painted Church to the Wahaula Visitors’ Center within the National Park.
- Water source exploration should be continued in order to provide service to the Volcano and Glenwood areas.

PUBLIC UTILITIES

Chapter 10 (cont.)

UTILITIES: POWER

POLICIES

- Power distribution facilities shall be placed underground when and where it is economically feasible. The County shall encourage developers of new urban areas to place utilities underground.
- The County shall encourage the continuation of studies concerning the development of power which can be distributed at lower costs to consumers.
- The effects of discharging heated water directly into the ocean should be studied.
- Safety standards for power systems shall conform to safety standards as established by appropriate regulatory authority.

STANDARDS

- There shall be a minimization of obstruction of scenic views and vistas by electrical facilities.
- New power plants shall incorporate devices which minimize pollution.
- Facilities such as substations shall be aesthetically pleasing.

UTILITIES: TELEPHONE

POLICIES

- The County shall encourage underground telephone lines where they are economically and technically feasible.
- The County shall work closely with the telephone company to provide all users with efficient service.

STANDARD

- Telephone facilities, such as lines, poles and substations, shall enhance rather than detract from scenic vistas and views.

UTILITIES: GAS

POLICY

- Gas storage facilities shall be located so as to minimize danger to commercial and residential areas.

STANDARD

- The County's ordinances shall reflect appropriate safety standards for gas facilities.

UTILITIES: SEWER

POLICIES

- The "Sewerage Study For All Urban and Urbanizing Areas of the County of Hawaii, State of Hawaii," December 1970, shall be used as a guide for the general planning of sewerage disposal systems.
- Municipal systems and/or sewerage systems developed with private interests shall be provided or expanded at Hilo, Kailua-Keauhou, Kealakekua, and at Waimea. Where major resort complexes and other developments along shorelines are contemplated, private systems shall be installed by land developers, except where connection to nearby treatment facilities is feasible and compatible with the County's long range plans.

- The County shall take immediate steps to designate treatment plant sites, sewage pump station sites, and sewer easements to facilitate their acquisition.

- Health Department approved individual cesspool disposal systems shall be considered in higher inland areas which are sparsely populated and where there is little danger of contaminating the ground water supply.

- Disposal of raw sewage directly into waterways and the ocean is in violation of State Water Quality Standards and shall be discontinued as soon as possible.

- The County shall seek State and Federal funds

to assist in financing the construction of proposed sewer systems.

- Schemes for wastewater reclamation and reuse for irrigation shall be utilized where feasible and needed.

STANDARDS

- Incorporate sewage works standards proposed in the "Sewerage Study for All Urban and Urbanizing Areas of the County of Hawaii."
- Sewerage systems shall be designed for the particular area, depending on topography, geology, density of population, costs, and other considerations of the specific area.
- Adopt State Water Quality Standards as minimums and explore the possibilities of imposing higher standards.
- There shall be a minimum of visual and odor pollution emanating from sewerage treatment facilities.

Courses of Action

- The use of cesspools shall be discontinued in the coastal areas where cesspools do not function satisfactorily to meet water quality standards. Individual household aerobic treatment units approved by the State Health Department and the County of Hawaii could be utilized in these areas. Future sewerage systems for the Puna area would then naturally commence with service to the lower coastal areas.
- Isolated developments shall provide their own sewage collection and treatment facilities in conformance with County and State Health Department requirements.

PROFILE

WATER

The County Department of Water Supply currently operates four water systems in Puna. These systems are located at Kalapana, Kapoho, Keaaau-Mt. View, and Pahoa.

PUBLIC UTILITIES

(cont.) Chapter 10

The Kalapana system extends from the Keauohana Forest Reserve to Kaimu Beach and the Wahaula Visitor Center. The Kapoho system is used primarily for servicing farm lots in the area. The Olaa-Mt. View water system extends along Volcano Highway and services only portions of those subdivisions closest to the highway and on which homes have been built. The Pahoa water system extends from Keonepoko Homesteads to Lava Tree Park. There is also a private system servicing the Hawaiian Beaches/Park Subdivision.

All families living in areas without centralized water systems rely on the roof catchment method for their water supply. During periods of drought, such as in 1973 when Puna was declared a disaster area, the County assists families who rely on the rain catchments in replenishing their water supply. At such times, the County pays two-thirds of the cost of water.

The Department of Water Supply plans to build a 12-inch water trunk line from Keaau to Pahoa along the Pahoa Road. Upon its completion, this water line will not only provide another source of water for fire-fighting but will also make it possible for homeowners living along the highway to tap into the County system. However, line extensions to these homes are private expenses or made possible by improvement district funds.

Major water problems in the Puna area are three-fold: 1) the excessive costs incurred in operating the County's Olaa-Mt. View water system (pumping water from the source at Puna Sugar Mill to Mt. View means an expenditure of funds over and beyond the revenues obtained from users along the line); 2) the continued over-expansion of service lines to vast areas where there are few users, thus raising costs; and 3) rain catchment tanks that are inadequate to sustain households through drought periods.

ELECTRICITY

Hawaii Electric Light Company (HELCO) furnishes electricity generated through oil, diesel, and

hydroelectric power for the entire county. In addition, HELCO buys electric power, generated by burning bagasse, from Puna Sugar Company and Hilo Coast Processing. Puna Sugar Company supplies HELCO with 6,000 kilowatts of electricity.

Most of the older communities along the main roads of Puna and portions of newer subdivisions near them have electrical service. Exceptions are the Pohiki and Kalapana areas.

Alternate sources of energy for generating electricity in Puna, such as hydroelectric power, wind or wave action, and nuclear plants were investigated and found questionable because of physical and funding constraints. Although the district is blessed with abundant rainfall, hydroelectric power in Puna is not feasible because there are no well-defined streams where dams can be constructed to impound water for electrical energy. Wind energy is impractical because of the lack of a steady wind of adequate velocity in the district. More studies are required to research wave action along the Puna Coast which can be converted into energy. A nuclear plant for the production of electrical energy is uneconomical inasmuch as the maximum peak load for the entire county was about 71,000 kilowatts in 1976 and whereas the smallest nuclear generator on the market has a 500,000 kilowatt capacity.

At the time this Plan was being prepared, an exploratory well to tap geothermal energy in Puna was drilled and found successful. The project is now entering into the next phase of installing a research power plant to demonstrate that geothermal energy in Puna is an economical means of obtaining natural energy for the Big Island.

TELEPHONE

The telephone service area coincides with that of electricity, except for the Kaimu-Kalapana area where only telephones are available. Also the scattered residents along Kaimu and Pohiki have extended the telephone service along the Puna Coast Road where electricity is not available. A few years

ago, the County requested that Hawaiian Telephone Company determine the cost of an island-wide emergency telephone system. Factors such as the projected initial capital expense, costs for maintenance, and the possibility of vandalism made implementation unfeasible at that time.

COURSES OF ACTION

- The County should encourage the use of rain catchment tanks as an alternate water source rather than over-extending existing water lines to lower cost of hauling water during drought periods. Catchment tanks should be large enough to handle drought periods of 2 to 3 months. Capacity should be determined on the basis of locality, rainfall, number of users, roof area, and good water conservation practices.
- Alternate sources of water for the Olaa-Mt. View system should be investigated by the State. Perched water within the State's Olaa Forest Reserve in upper Puna is a possible source because of limited usage in forest reserves, abundant rainfall, and large drainage basins.
- The County should request the Hawaii Electric Light Company, Hawaiian Telephone Company, and the Department of Water Supply to conduct public education programs on their respective line extension policies. Better public understanding of these policies may enable more families to tap into these existing systems.
- The County should pursue the development of a public emergency telephone network throughout the Puna district. Telephones could be non-dailing and linked to fire and/or police stations.

RECREATION

Chapter 11

GENERAL PLAN GOALS, POLICIES, STANDARDS, COURSES OF ACTION

GOALS

- Provide a wide variety of recreational opportunities for the residents of the County.
- Maintain the natural beauty of recreation areas.
- Provide a diversity of environments for active and passive pursuits.

POLICIES

- The County of Hawaii shall improve existing public facilities for optimum usage. Facilities shall incorporate features for the convenience of all age groups and for the handicapped and the elderly.
- Recreational facilities in the County shall reflect the natural, historic, and cultural character of the area. The use of land adjoining recreation areas shall be compatible.
- Facilities for compatible multiple uses shall be provided. Innovative ideas for improving recreational facilities should be implemented. Neighborhood parks should be considered for the development of nursery schools.

- The County shall provide a broad recreational program for all age groups, with special considerations for the handicapped, the elderly, and young children.
- With other agencies, both governmental and private, the County shall coordinate both recreational programs and facilities. Such a combined effort would offer a wider range of recreational opportunities than are now available. Innovative ideas for improving existing opportunities should be implemented. Local citizen leadership and participation in recreation planning, maintenance and programming should be encouraged.
- Personnel requirements for County recreational

programs shall be flexible so as to enrich programs by utilizing persons of special skills and talents.

- The County of Hawaii shall adopt an on-going program of identification, designation, and acquisition of areas of recreational importance, such as land with sandy beaches and other prime areas for shoreline recreation.
- Public access to the shoreline shall be provided in accordance with the adopted program of the County of Hawaii.
- A system of trails to places of scenic, historic, natural or recreational interest should be established.
- Marine and terrestrial natural areas for the preservation of unique Hawaiian wildlife, especially rare or endangered species, should be identified and evaluated.
- Conduct an on-going educational program to gain the cooperation of all people in maintaining the quality of recreation areas.
- Establish and maintain a recreation information dissemination system for the public's use.
- In accordance with Act 140, Session Laws of Hawaii 1970, the County shall adopt an ordinance requiring subdivisions to provide land area for park and recreational use or pay a fee in lieu thereof.

STANDARDS

Neighborhood Parks:

Provides open space in urbanizing areas for the general aesthetic enjoyment of the outdoors, play areas for young children, and a social gathering place for the neighborhood.

Up to 4 acres, within the center of the neighborhood and preferably adjacent to a school.

Minimum facilities include: restrooms; drinking



Papa Aiea

RECREATION

(cont.) Chapter 11

water; sheltered area for crafts and other passive activities; office; parkkeeper's storage; walking paths (bike and skating paths); play area and equipment for young children; and an adequate and defined parking area.

Larger neighborhood centers between 4 and 8 acres provide additional facilities for active team sports: courts for basketball, volleyball, and tennis; softball and football fields; night lights; and adequate parking.

Community Centers:

Major center for spectator sport and for cultural and social activities.

Size depends on facilities proposed and accessory uses.

Facilities include: multipurpose building; auditorium; gym; facilities for spectator sports; swimming facility; and adequate and defined parking.

Parks For General Use:

Centered around a major natural asset, such as a sandy beach, a prime forest, or a volcanic feature.

Designed to accommodate users from throughout the County.

Beach parks provide opportunities for swimming, fishing, boating, nature study, and other pastimes. Every section of the island should be adequately served. Facilities depend on size and intensity of use but should include: restrooms with showers and changing area; picnic area with tables and cooking facilities; a defined tent camping area when allowed; drinking water; defined and adequate parking; pavilions of various sizes; and storage for groundskeeper and lifeguard equipment.

Wilderness area are remote from population centers and have limited access by jeep, hiking, biking, or horseback. Facilities include: trails

and unimproved roads; designated hunting and and fishing areas; designated conservation areas for nature study and other passive activities; wilderness camp sites with simple shelters where needed; outhouse facilities; and drinking water.

Historic sites should be included in parks whenever feasible.

Courses of Action

- A multipurpose community center and park should be established in Pahoa.
- A swimming pool should be provided in Pahoa in cooperation with the Department of Education, the plantation, and local community groups.
- As population increases and need arises, neighborhood parks in large subdivisions between Keaau and Pahoa shall be provided and improved.
- Punaluu Springs (Queen's Bath) should be developed as a park to include Waiaka and Waikupha Ponds.
- Implement the County of Hawaii Park Development Plan for the Kalapana-Kaimu area. Preserve and restore Kaimu Black Sand Beach. In cooperation with the U.S. Corps of Engineers implement the construction of a submerged breakwater and beach replenishment to preserve and restore Kaimu Black Sand Beach.
- Recommend establishing a wilderness camp and park reserve on State-owned land east of Kaimu.
- Recommend the establishment of beach reserves at Kehena Beach and Opihikao (west of Opihikao junction).
- Recommend that the State increase the area of MacKenzie Park.
- Develop the Pohoiki recreation area and

improve its launching ramp. Improve Isaac Hale Park. Provide trail access to Keahialaka Spring and Pond and Mahinaakaka Heiau.

- Develop the Kapoho Tidepools as a marine park.
- Establish a small scenic park overlooking Kapoho and provide minimum facilities.
- Recreation along the coastal area between Hilo and Kapoho should be developed and include areas at Papai, Haena (Keaau), Kaloli Point, Keonepoko Nui, Honolulu Landing, and Nanawale.
- Small scenic parks should be established along the Puna Road to provide viewpoints of the rift zone and Kauleau, Keekee and the 1955 flows.

INTRODUCTION

The increase in available leisure time, the growing county population and visitor count, and a greater number of retirees will continue to place heavy demands on the County's goal to provide diverse recreational facilities and programs for all people.

The General Plan establishes the goals, policies, and standards to guide the development of recreational facilities in Hawaii County. The County of Hawaii Recreation Plan, prepared by Edward R. Aotani & Associates in 1974, is a functional component of the General Plan in which the recreation element is refined and made more definitive. It recommends a park distribution pattern for each district, whereby development of new parks is coordinated with population growth and demand.

The Recreation Plan classified parks into three groups, as follows:

- Group 1: Active recreation parks under county jurisdiction
- Group 2: Primarily passive recreation or general use parks under county and/or state jurisdiction

RECREATION

Chapter 11 (cont.)

Group 3: Areas under state and federal jurisdiction

The acreage standards recommended as guidelines for Hawaii County for Group 1 parks is 5 acres per 1,000 population and 10 acres per 1,000 population for Group 2 parks.

PROFILE

The Puna district is characterized by a rural environment with population widely dispersed along the roadways which serve many agricultural towns and shoreline villages in upper and lower Puna.

Between 1960 and 1970, the population growth was only 2.5 per cent. From 1970 to 1975, however, the total population grew approximately 50 per cent to 7,900 persons.

Because of this rapid growth in population, the Puna district achieved in 1976 the projection anticipated by the Recreation Plan for 1990. This unexpectedly large increase in population and the use of many Puna parks by residents of other districts indicate the need for an accelerated implementation program for developing parks in the district. (Records at the Parks and Recreation office show that reservations for Harry K. Brown and Isaac Hale Parks are made preponderantly by visitors and non-Puna residents.)

The Recreation element of the Puna Community Development Plan is basically an updating and refinement of the information contained in the County General Plan and Recreation Plan.

TABLE 4
LIST AND DESCRIPTION OF NEIGHBORHOOD AND COMMUNITY PARKS, GROUP 1
(County Jurisdiction, Active Recreation)

By Tax Map Key Sections

Section 1: Queen's Bath area, Lower Puna, and subdivisions from Crescent Acres to Hale Aloha Tract, Upper Puna.

Section 2: Kalapana-Keheua

Proposed Kalapana Community Park (P-1)
4.8 acres
Site not selected
No parks existing or proposed

Section 3: Kamaili-Pohoiki and Leilani Estates
Proposed Opihikao Playground (P-2)
Former Opihikao School site
3.566 acres

Private community center in Leilani Estates
Special Permit granted in 1975
Community center building, recreation building and storage; community center building completed
5.0+ - acres

Section 4: Kapoho-Honolulu Landing and Nanawale Estates
Proposed Puua Neighborhood Park (P-3)
Nanawale Estates Subdivision
4 + - acres

When increase in population justifies development
Note: Existence of a private swimming pool and community building; 3.2 acres in Nanawale Estates Subdivision
4 other areas reserved for parks within subdivision plat.

Section 5: Pahoa-Hawaiian Beaches-Hawaiian Paradise Park
Pahoa School Park, portion of Pahoa School (E-2)
2.522 acres
Baseball field lighting completed in June, 1977
Pahoa Neighborhood Facility and Playground (E-3)
8,930 acres
Multi-purpose meeting room, recreation room, clinic room, examination room, 3 offices, and parking stalls at Neighborhood Facility
Proposed: ballfields, outdoor courts, tot lot at Playfield
Hawaiian Beaches Park (E-4)
11.0 acres; 5 acres developed
Pavilion/restroom, tot lot, little league/football field, paved court, landscaping and parking completed in September, 1976
Proposed: additional ballfield, picnic area, restroom, tennis courts, additional parking
Hawaiian Paradise Park Neighborhood Park (P-4)
4 + - acres
When increase in population justifies development
Note: 6 20-acre lots set aside as future public sites, including park use, under original subdivision plat.

Section 6: Keaau-Hawaiian Acres/Orchid Land/Ainaloa Subdivisions
Keeau School Playground (E-5)
Gymnasium, tennis court, paved courts, parking
2.00 + - acres
Herbert C. Shipman Park (E-6)
11.0 acres (6.0 acres originally)
Ballfield, restroom pavilion, parking
Phase 1: Little League ballfield, grading, drainage (completed)
Phase 2: Football field, tennis courts, tot lot, basketball/volleyball courts, parking, lighting
Realign and improve existing ballfield

Section 7: Kurtistown
Kurtistown Park (E-7)
6.84 acres
Pavilion/restroom, softball/Little League field, basketball, tennis court under construction
Proposed: additional tennis court

Section 8: Mt. View-Glenwood
A. J. Watt Park (E-8)
5.5 acres
Gymnasium, Little League ballfield, parking
Proposed: tennis court
Mt. View School (E-9)
1.5 acres
Covered paved courts, playfield
Glenwood Park (E-10)
1.116 acres
Restroom/pavilion, picnic area

Section 9: Volcano
Volcano Playground, TMK: 1-9-03: portion of 11 (P-3)
10.0 acres
Proposed: pavilion, softball/Little League field, volleyball/basketball court, tennis courts, tot lot and parking.
Another proposal is to purchase land formerly owned by the YMCA and now owned by Wm. F. Dicks and wife Virginia, TMK: 1-9-04:6.



Figia indica

TABLE 5
NEIGHBORHOOD AND COMMUNITY PARK (GROUP 1)
RECREATION NEEDS, 1976

Tax Map Key Section	Population 1976	Acreage Required 5 Ac./1,000 Pop.	Existing Acreage	Acreage Needed
1	217	1.1	0	1.1
2	211	1.1	0	1.1
3	237	1.2	0	1.2
4	655	3.3	0	3.3
5	2,637	13.2	13.0	(0.2)
6	1,426	7.1	8.0	(0.9)*
7	1,206	6.0	6.8	(0.8)*
8	801	4.0	8.1	(4.1)
9	<u>841</u>	<u>4.2</u>	<u>0</u>	<u>4.2</u>
	8,231	41.2	36.9	10.9

DISTRICT POPULATION PROJECTIONS

Year	Population	Acreage Required*
1980	9,728	47.6
1985	11,401	57.0
1990	12,841	64.2

() Surplus acreage

* 5 ac./1,000 Population

(Source: Recommended for County of Hawaii in the
Recreation Plan, E.R. Aotani & Assoc., 1974)

Table 5 shows the neighborhood and community park (Group 1) needs based on an acreage of 5 acres per 1,000 population. Sections 1, 2, 3, 4, and 9 (Queen's Bath, Kalapana-Kehena, Kamaili-Pohoiki, Kapoho-Nanawale Estates and Volcano areas) with low population have no parks at present. Sections 5, 6, 7, and 8, the more populous areas of Puna (Pahoa, Keaau, Kurtistown, and Mt. View-Glenwood) appear to have adequate park acreages or a slight surplus.

In the Volcano area, where the population count justifies a neighborhood park, community meetings held in 1976 revealed that the opinions were divided on whether to develop an active recreation complex on ten acres of undeveloped state land or to purchase a developed property with an existing building for a meeting place type of use. No action has been taken by the Council since then.

TABLE 6

BEACH AND GENERAL USE PARKS, COUNTY AND STATE
(GROUPS 2 AND 3)

Park	Total Acreage	Approx. Acreage Dev
County:		
Harry K. Brown Park (C-1)	22.88 ac.	17.0 ac.
Kalapana Beach Regional Park (C-2)	17.33	0
Kaimu Beach Park (C-3)	11.18	8.0
Isaac Hale Park (C-4)	<u>1.80</u>	<u>1.5</u>
	53.19 ac.	26.5 ac.
State:		
MacKenzie Park (S-1)	13.1	6.8
Lava Tree Park (S-2)	17.0	17.0
Kalapana Canoe Landing Park (S-3)	12.97	0
Keakealani Outdoor Recreation Center (S-4)	<u>1.7</u>	<u>1.7</u>
	44.77	25.5

TABLE 7

RESERVES FOR FUTURE PARK DEVELOPMENT

Beach and Shoreline:	
Kahena Black Sand (B-1)	
Opihikao (B-2)	
Kaloli Point (B-9)	
Papai Bay (B-10)	
Haena (Keaau) (B-11)	
Keonepoko Nui (B-3)	
Honolulu Landing (B-4)	
Nanawale (B-5)	
Waiakehiula (B-6)	
Kapoho Tidepools (B-7)	
Kalapana-Waipuku Pt. (B-8)	
Scenic, Historic, Natural	
Queen's Bath (N-1)	
Green Lake (N-2)	
Kahuwai (N-3)	
General Use:	
Kapoho Scenic Stops (G-1)	
Puna Road Scenic Stops (G-2)	
East Kaimu Wilderness Camping Area (G-3)	

An important consideration to keep in mind is that, on the basis of the recommended standards, a minimum-sized neighborhood park (4± acres) is warranted for every 800 persons. The population projection for the entire district reveals that Group 1 park acreage demands will average 7-8 acres every five years.

Group 2 and 3 parks (beach and general use) are shown in Table 6.

Existing county parks include the Harry K. Brown, Kaimu Beach, and Kalapana Beach Regional Park in Kalapana and the Isaac Hale Park in Pohoiki . The Harry K. Brown and Isaac Hale Parks have been in use for many years and are in a developed stage, in contrast to the Kaimu and Kalapana Beach Regional Parks which are both relatively undeveloped at present. Historic site surveys were

completed for both, and a development plan for Kalapana Park is presently underway. Kaimu Beach Park is used for surfing, fishing, picnicking, and sightseeing. State parks in this group are the MacKenzie and Lava Tree Parks, both partly developed and in use.

On the basis of a ten acres per 1,000 population standard as recommended for Group 2 and 3 parks in the County Recreation Plan, the Puna district should have 82 acres in 1976. Approximately 52 acres are developed and in use now. Development of Harry K. Brown, Kaimu Beach and Kalapana Beach Regional Parks by the County in the near future should alleviate the deficiency. Table 7, derived from the County Recreation Plan, contains a list of areas that can be considered for acquisition and development by the state or county when the recreation need arises.

RECREATION

Chapter 11 (cont.)

A source of recreation that is not listed in the table but is available and in use is the vast lands in the Conservation District which include Forest Reserves, Fish and Game Management Areas, and Natural Area Reserves. These are utilized for hunting, hiking, bird watching, picnicking, nature study, and similar pursuits. Additionally, approximately 60,000 acres of the Hawaii Volcanoes National Park lie within the Puna district and are available for camping, fishing/hunting, picnicking, hiking, sightseeing, and other forms of passive recreation.

COURSES OF ACTION

(Priorities for Courses of Action are listed as high, medium, and low according to levels of demand determined under the General Plan, the Recreation Plan, growth projections and community input. The schedule, however, is only a guideline and should be flexible enough to allow a project in lower priority to proceed if funds become available for it sooner than expected.)

County:

High Priority

Herbert C. Shipman Park

Football field, tennis courts, tot lot, basketball and volleyball courts, comfort station, parking and lighting.

Realign existing ballfield

Isaac Hale Park

Replacement of pavilion/restrooms, picnic area, parking

Pahoa Playground

Ballfields, outdoor courts, tot lot, parking

Volcano Playground

Pavilion, Little League field, volleyball and basketball courts, tennis courts, tot lot, parking

Kalapana Regional Beach Park

Incremental development involving relocation of existing shoreline road, picnic area, restrooms, parking

Medium Priority

Harry K. Brown Park

Expand existing pavilion/restroom building

A.J. Watt Park

Tennis courts

Hawaiian Beaches Park, Phase 2

Additional ballfield, picnic area, tennis courts, restroom, and additional parking

Kaimu Beach Park

Restrooms

Nanawale Regional Beach Park, E.O. 1665

Planning and incremental development

Low Priority

Community Hall for Kalapana Village

Additional tennis court at Kurtistown Park

Swimming pool in Pahoa either at school or playground

When offered, County should accept parcels reserved for public use within subdivisions served by private roads with understanding that it has no obligation to develop the park or make improvements to private roads serving the parcels.

However, when demand criteria are met to develop the parks, the County shall work with lot owners within the subdivision to bring roadways serving the parks to dedicable standards.

Public or private golf course in Lower Puna (one course justified for each 10,000 population)

STATE:

Kapoho Tidepools Marine Park

Acquire lands and develop incrementally

Kalapana Canoe Landing Park

Develop historic and natural park

Punaluu Springs (Queen's Bath), Waiaka and

Waikupaha Pond

Acquire lands, develop scenic, historic and natural park

Isaac Hale Park

Obtain access to Keahialaka Spring and Pond and Mahinaakaka Heiau; bay improvements

Beach Reserves along Puna Coastline Scenic Route - Hilo to Kalapana

Planning and reserve or land acquisition

Viewpoints of eruptions along Puna Road and Kapoho Road

Green Lake Scenic Park

Acquire and develop

Wilderness Camp in Puna Forest Reserve

Plan and develop



Ajimaia

TRANSPORTATION

Chapter 12

GENERAL PLAN GOALS, POLICIES AND STANDARDS

GOALS

- Provide a transportation system whereby people and goods can move efficiently, safely, comfortably and economically.
- Make available a variety of modes of transportation which best meets the needs of the County.

POLICIES

- A framework of transportation facilities which will promote and influence desired land use shall be established by concerned agencies.
- The agencies concerned with transportation systems should provide for present traffic and future demands.
- The improvement of transportation service shall be encouraged.

STANDARD

- Transportation systems shall meet the requirements of the State Department of Transportation and the County of Hawaii.

The following sections on Highways and Streets and Transportation Terminals are sub-elements of the overall transportation element. The goals, policies, and standards set forth in these sections shall complement those established in the overall element.

TRANSPORTATION: THOROUGHFARES AND STREETS

In planning for vehicular transportation for Puna, a basic consideration is that land use activities will generate traffic, i.e., the types of land use planned for Puna will directly influence the physical design of the district's road system.

Also, because of limited federal programs for highways and the fiscal constraints of the County, there is a need to carefully examine the various road improvement programs that the County can undertake.

GENERAL PLAN GOALS, POLICIES, STANDARDS, COURSES OF ACTION

GOALS

- Provide a system of thoroughfares and streets for the safe, efficient and comfortable movement of people and goods between and within the various sections of the County.
- Provide an integrated State and County system so that new major routes will complement and encourage proposed land uses.

POLICIES

- The programmed improvement of existing thoroughfares and streets shall be encouraged.
- There shall be coordinated planning of Federal, State and County street systems to meet program goals of the other elements such as historic, recreational, environmental quality.
- Private and public parking requirements and needs shall be incorporated as part of the street system.

- The County shall encourage the State Department of Transportation to establish special scenic routes within and between communities.
- Transportation and drainage systems shall be integrated in all medium and high density urban areas.
- Support development of an efficient transit route between east and west Hawaii.

STANDARDS

- **Primary route:** Includes major highways and primary arterials which move vehicles in large volumes and at higher speeds from one geographic area to another; highest traffic volume corridor.
Major highways:
Minimum right-of-way: 300 feet
Primary arterial:
Minimum right-of-way: 120 feet.

- **Minor Arterial:** A street of considerable continuity which is primarily a traffic artery for intercommunication between or through large areas; interconnect with and augment primary system.
Minimum right-of-way: 80 feet.

- **Collector Street:** Any street supplementary to the arterial street system which is a means of intercommunication between this system and smaller areas; used to some extent for through traffic and to some extent for access to abutting properties; collect and distribute traffic between neighborhood and arterial system.
Minimum right-of-way: 60 feet

- **Local minor streets:** The principal purpose of a local street is to provide access to property abutting the public right-of-way; lowest level of mobility.

Minimum right-of-way: 50 feet.

Courses Of Action

- Primary arterial rights-of-way providing access to the district should be increased to 120 feet where they pass through relatively undeveloped lands.
- The present Puna Coast Road, eventually to connect with the Chain of Craters Road, should have a 300-foot right-of-way and be developed as a scenic parkway along the coast.
Alignment should basically follow the existing road from the Kalapana end of the Chain of Craters Road to the proposed extension of the Saddle Road in the vicinity of the Hilo Airport.
- A new 120-foot road alignment to connect the junction of the Kapoho-Pohoiki Roads with the Pohoiki area should be constructed. This alignment will eliminate a series of bad curves in the present road.
- Major collector roads with 80-foot rights-of-way should run from:

Opihikao to the Puna Road.

TRANSPORTATION

Chapter 12 (cont.)

Volcano Road to the coast parkway along the Puna-South Hilo boundary.

Volcano Road to the Saddle Road above Hilo along the existing Kulani Road.

Upper portion of the National Park to a point approximately 2 miles west of Kalapana.

PROFILE

The Volcano Road (Highway 11), which has been improved substantially from Hilo to Hawaii National Park in the past six years, is the primary Hilo-Puna—Kau route. The only proposed improvement for this highway within the next five years is an extension of the four lanes from Panaewa Forest to Keaau village.

The primary routes connecting lower Puna to Keaau and Hilo are the Pahoa Road (Hawaii 13) between Pahoa and Keaau; the Kalapana-Kaimu Road (Hawaii 13 continuation) between Pahoa and Kalapana; the Kapoho Road (Hawaii 132) connecting Kapoho and Pahoa; and the Puna Coast Road (Hawaii 137) linking Kapoho and Kaimu.

In the past five years, improvements on these routes included straightening of curves along the Puna Coast Road and widening and improving Kapoho Road near Lava Tree Park to Pahoa.

Among future County-planned improvements to these roadways are the continued improvement of Kapoho Road, the relocation of the existing road from Kalapana to Kaimu and Puna Coast Road further inland along the shoreline, as well as planning for a new alignment of the Puna Coast Road from Kalapana to King's Landing at an estimated cost of approximately thirty million dollars at today's prices. The State Department of Transportation is presently investigating the possibility of creating a new Pahoa by-pass road and a Kalapana by-pass road. All of these planned improvements are earmarked for either construction or alignment study within the next ten years.

A 1990 projection of estimated traffic flow based on projected dwelling units and exiting traffic counts in the Puna district shows the need for the proposed improvement of expanding the existing Volcano Road to four-lanes from Keaau to Panaewa Forest.

The proposed traffic volume (passenger vehicles per day) for 1990 exceeds the maximum allowable service volumes for a two-lane highway.

Additionally, the estimated traffic volume for 1990 on selected roadways of the Puna district reveals that a high volume of traffic would be generated along Pahoa Road from Hawaiian Paradise Park Subdivision to Keaau village. Alternatives to lessen traffic congestion within this area, would be to disperse vehicular traffic around or through another route such as the Puna Coastal Road.

Another high volume area (approximatedly 6,800 vehicles per day in 1990) is anticipated along Kahakai Boulevard leading into Hawaiian Beaches Subdivision.

(Private roadways in large subdivisions are discussed in the Large-Scale Subdivisions section of this plan.)

Other public streets and roadways within the district are all under County jurisdiction and are periodically maintained and improved by the County.

Besides automobiles, there is an existing bus system which connects Puna to Hilo from Volcano as well as from Pahoa. No other form of mass transportation is in existence in Puna, although there was an existing rail system for hauling cane and passengers prior to World War II.

Designated bikeways are non-existent in the Puna district. However, the State Department of Transportation in 1976 began preparation of a statewide Bikeway Plan developed by private consultants. Preliminary plans presented to the public indicated bicycle routes, lanes, and paths utilizing Highways 11, 130, 132, and 137 within Puna. The gentle topography and numerous scenic

points along the Puna coast should make this a very popular route.

In addition, the County has recently published a draft of a Bikeway Plan for the County of Hawaii with goals, objectives, criteria, and design standards and presented it for public review.

COURSES OF ACTION

- The County should encourage bicycling and walking as alternate forms of transportation by promoting the development of bikeways and walkways.

Bikeways along Volcano Road, Pahoa Road, Kapoho Road, the Kalapana Road, and the Puna Coastal Road.

Walkways within Keaau and Pahoa as shown in the Village Design Plans, and along the coast following the old Hawaiian trail.

- The County should continue to provide a bus system to service the Puna district.
- The natural environment of the Puna district should be considered when building new roadways. Specifically, the following roadways should be constructed in a manner that will enhance the scenic character of the area:
 - 1) A scenic route along the Puna coast
 - 2) The Kalapana by-pass road
 - 3) The Pahoa by-pass road
 - 4) The Keaau village by-pass road
- Inasmuch as the Puna district is characterized by many private sub-division roads, some of these should be built to County standards and connected to disperse traffic, to serve as escape routes from natural hazards, and to provide access to presently inaccessible subdivisions.

A main thoroughfare with a 60-foot wide right-of-way through Hawaiian Acres, Orchid Land Estates, and Hawaiian Paradise Park

TRANSPORTATION

(cont.) Chapter 12

from Volcano Road to the proposed Puna Coastal Road should be built.

(Other road improvements are elaborated in the Large-Scale Subdivisions section.)

TRANSPORTATION TERMINALS: AIRPORTS AND HARBORS

GENERAL PLAN GOAL , POLICIES, STANDARD , COURSES OF ACTION

GOAL

- Provide transportation terminals and related facilities for the safe, efficient and comfortable movement of people and goods.

POLICIES

- The County shall encourage the programmed improvement of existing terminals, including adequate provisions for control of pollution.
- The State Department of Transportation should establish a framework of transportation terminals and related facilities which will promote and influence desired land use.
- Transportation terminals should be developed in conjunction with the different elements of the overall transportation system.

STANDARD

- Requirements of the State Department of Transportation

The following is an analysis by district with courses of action to undertake with reference to transportation terminals. The brief analysis of each district is intended to bring into focus the relationship of the district to the County as a whole. The courses of action shall be consistent with and supportive of all the goal, policies, and standard set forth for this element.

Course of Action

- Provide for general aviation and small boat harbor facilities as the need arises.

PUNA PROFILE

Transportation terminals in the County of Hawaii consist basically of harbors and airports. None of these terminals exist in the Puna district. However, private aircraft landing strips used primarily for crop-dusting cane and papaya fields are located in Mountain View, Kurtistown, Keaau, Pahoa, and Kapoho. These airfields can accommodate only single-engine aircraft and helicopters.

There are no developed harbor sites in the district, although Pohoiki has been mentioned as a potential small boat harbor by the State.

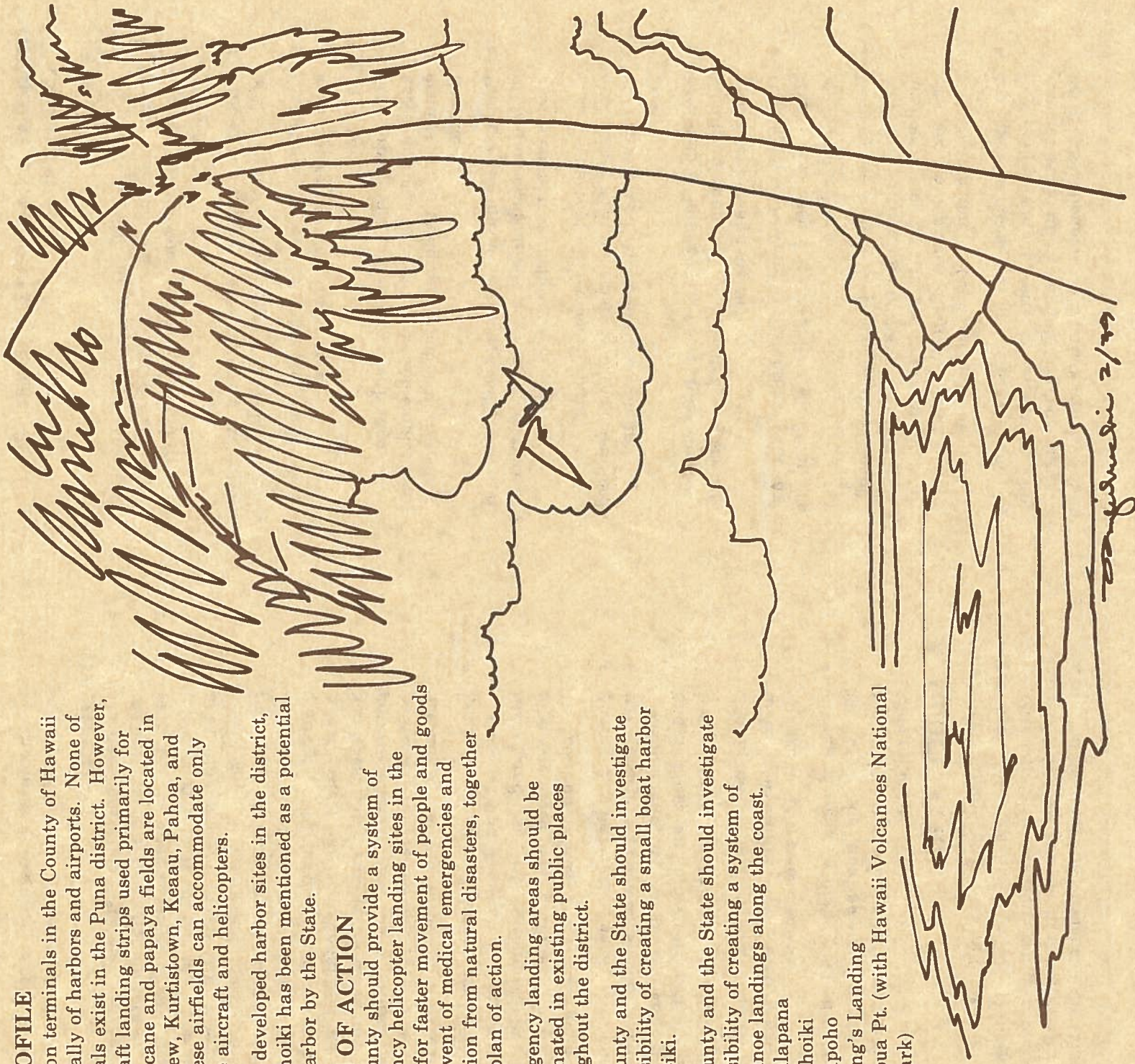
COURSES OF ACTION

- The County should provide a system of emergency helicopter landing sites in the district for faster movement of people and goods in the event of medical emergencies and evacuation from natural disasters, together with a plan of action.

Emergency landing areas should be designated in existing public places throughout the district.

- The County and the State should investigate the feasibility of creating a small boat harbor in Pohoiki.
- The County and the State should investigate the feasibility of creating a system of boat/canoe landings along the coast.

- 1) Kalapana
- 2) Pohoiki
- 3) Kapoho
- 4) King's Landing
- 5) Apua Pt. (with Hawaii Volcanoes National Park)



LAND USE

Chapter 13

GENERAL PLAN GOALS, POLICIES, STANDARDS

GOALS

- Designate and allocate land uses in appropriate proportions and in keeping with the social, cultural, and physical environments of the County.
- Protect and encourage the intensive utilization of the County's limited prime agricultural lands.
- Protect and preserve forest, water, natural and scientific reserves and open areas.

POLICIES

- Zone urban-type uses in areas with ease of access to community services and employment centers and with adequate public utilities and facilities.
- Promote and encourage the rehabilitation and utilization of urban areas which are serviced by basic community facilities and utilities.
- Allocate appropriate requested zoning in accordance with the existing or projected needs of neighborhood, community, region and County.
- Establish a "land zoning bank" from which land use zoning may be allocated to specified urban centers and districts.
- Conduct a review and re-evaluation of the tax structure to assure compatibility with land use goals and policies.
- Incorporate innovations such as the "zone of mix" into the Zoning Ordinance in order to achieve a housing mix and to permit the more efficient development of lands which have topographic and/or drainage problems.
- Incorporate the concept of a "floating zone" for future industrial and retreat resort areas. This concept would allow flexibility in locating future needed developments in districts which cannot

be pinpointed at this time, especially in the more rural and/or remote areas.

STANDARDS

- The designated land uses will be delineated on the General Plan Land Use Pattern Allocation Map. The boundaries indicated are long-range guides to general location and will be subject to: a) existing zoning; b) State Land Use District; and c) zone guide map and interpretation. Similarly, the acreages allocated represent alternatives for the various levels of economic activity and supporting functions, such as resort, residential, commercial and industrial activities. Land required for community and governmental services and programs as well as new towns and resort centers may be accommodated within the allocated acreages.
- Zoning requests shall be reviewed with respect to General Plan designation, district goals, State Land Use District, compatibility with adjacent zoned uses, availability of public services and utilities, access, and public need.
- Zoning may be recommended on a incremental basis depending upon construction schedule, development of supporting services and and facilities, and other pertinent factors bearing upon the performance of the petitioner.
- Zoning may be reallocated as to location within districts according to need with or without change in total zoned acreage.
- Zoning of areas for industrial and retreat resort uses under the "floating zone" concept shall be required to meet all pertinent elements of the General Plan.

A. AGRICULTURE

The principal industry in Hawaii County is agriculture. The Big Island produces more than one-third of the State's total agricultural output and agricultural industries account for approximately one-third of the total employment in the County.

Implicit in the County General Plan is an obligation to ensure that future generations are allowed a diverse range of choices in terms of land uses on the Big Island. Underlying this statement is the conviction that all of the land, particularly that which is in agricultural uses, do not have to be put into "structural" uses immediately. Parts of the land can remain as open space for the benefit of present and future generations.

GENERAL PLAN GOAL, POLICIES, COURSES OF ACTION

GOAL

- Protect and maintain agriculture lands on the island of Hawaii.

POLICIES

- Agricultural lands shall continue to receive preferential treatment. Zoning shall protect and maintain prime agricultural lands from urban encroachment. New approaches to preserve prime agricultural land shall be studied with the appropriate State agencies, such as the Land Use Commission and the Department of Taxation.
 - Through the County's Capital Improvement Program basic resources and amenities, such as water and roads, shall be developed in order to assist agricultural endeavors.
 - The County shall assist other State agencies, such as the University of Hawaii, College of Tropical Agriculture, Department of Planning and Economic Development, and Department of Agriculture, on programs which aid agriculture.
- #### Courses of Action
- The County shall work closely with the State and private interests in identifying additional lands suitable for growing papaya and other commodities.
 - Water shall be provided in agricultural areas.

PROFILE

Existing Land Use: Based on a 1975 land use survey by the County and various data obtained from the State and each agricultural industry, a total of approximately 27,600 acres is found to be in actual agricultural use in Puna.

Table 8 Agricultural Land Uses in Puna - 1975

Use	Acreage	% of Total
Sugar	15,300	55.4
Papaya	1,840	6.7
Macadamia	2,450	8.9
Anthuriums	247	0.9
Orchids and Other Flowers	168	0.6
Guava	75	0.3
Truck Farming	170	0.6
Orange/Tangerine	58	0.2
Others (pasturing, etc.)	7,290	26.4
Total	27,600	100.0

State Land Use: Existing agricultural district under the State Land Use regulations covers about 172,620 acres.

County General Plan: The Land Use Allocation Map of the County General Plan shows that approximate agricultural designations are as follows: 22,000 acres for intensive agriculture, 7,000 acres for orchards and 83,000 acres in extensive agriculture. These designations amount approximately 112,000 acres for agricultural use. Within these agricultural uses, the General Plan has allocated some areas for alternate urban expansion should the need arise.

County Zoning:			
District	Min. Lot Size	Acreage	% of Total
A-1 ac.	1 acre	33,180	17.3
A-3 ac.	3 acres	40,830	21.3
A-5 ac.	5 acres	35,627	18.6
A-10 ac.	10 acres	8,700	4.5
A-20 ac.	20 acres	73,453	38.3
Total		191,790 acs.	100.0

Economic Considerations: Agriculture is the economic mainstay of the Puna district, and as such, lands used for agriculture must be preserved for the economic well-being of Puna. The diversity of agricultural uses is apparent in Puna; uses range from large corporation- run sugar and macadamia nut operations to back-lot farming. In determining

the future role of agriculture in Puna, the following trends should be considered:

- Puna will continue to enjoy a comparative advantage in economic growth over other districts on the Big Island because of its proximity to the airport and harbor in Hilo.
- There have been dramatic changes in Puna since 1970 in agricultural activities. These include an increase in papaya acreage and employment; a shift by independent sugar growers to other crops; stabilization of employment in the sugar industry; an increase in macadamia employment; and the use of vacant subdivided lands in agricultural uses, basically in anthuriums, nurseries, and other like uses. All of these activities were encouraged by government in the form of preferential tax treatment by the agricultural dedication laws, the local agri-business expanding further in the world-wide market, and the availability of a wide range of land types and climate in the Puna district.

- The continued emphasis on agricultural activities by the current leaders of government as reflected in the County General Plan goals and policies; in the State goals toward more self-sufficiency; in the continued support from the various State agencies through their agricultural programs; and in legislation.
- Emergence of the independent entrepreneur-type farmers in Puna in the flower and foliage industries, in guava, and in other small-farm operations.

COURSES OF ACTION

- Recommended changes in the Zoning Guide Map for Agriculture:
 1. Change A-lac. designation to SA-3ac. and SA-5ac. (Agriculture - Safety District) within the hazard zone F in Pohoiki along the Kilauea rift zone.

2. Preserve the existing sugar lands in large lot sizes of 20-acre minimums and over, except for those lands necessary for urban expansion in Keaaau, Pahoa, Mt. View, and Kurtistown. These sugar lands should be designated AI-20a (Intensive Agriculture).
3. County should recommend changing existing privately-owned Conservation-zoned lands in Kalapana and Hawaiian Paradise Park to Agriculture.
- The County and State should encourage the development of agricultural parks, either by having private developers provide the land and basic improvements and selling subdivided lots to bonafide farmers or having government acquire and develop parks as directed by Act 110-1972.
- The County or State should continue to provide the coordination services and to expand wherever necessary to meet the needs of the community in the education, marketing, and other aspects of the agri-business by providing loans, research, etc.
- The County should amend existing subdivision practices of requiring large agricultural lots to hook up to the County water system. Studies have shown that it is uneconomical for the County to overexpand its system in Puna and that there are other means such as impounding rain water to obtain potable and agricultural water in isolated areas.

B. COMMERCIAL DEVELOPMENT

GENERAL PLAN GOAL, POLICIES, STANDARDS, & COURSES OF ACTION

GOAL

- To provide for commercial developments that maximize convenience to users.

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POLICIES

- In an effort to assist existing commercial developments, urban renewal, rehabilitation and/or redevelopment programs shall be undertaken in cooperation with communities, businesses and governmental agencies. The key to the success of these kinds of programs is active and sustained participation from communities and businesses.
- Commercial facilities shall be developed in areas adequately served by necessary services, such as water, utilities, sewers, and transportation systems.
- Distribution of commercial areas shall be such as to best meet the demands of neighborhood, community and regional needs.
- Existing strip development shall be converted to more appropriate uses when and where it is feasible.

STANDARDS

There are three basic types of shopping centers:

- 1) Neighborhood Centers
Provide: Convenience goods, e.g., foods, drugs, and personal services.
Major Shops: Supermarket and/or drug store.
Number of Shops: 5 to 15.
Acreage: 5 to 10 acres.
Approximate Market: 3,000 people.
- 2) Community Centers
Provide: Convenience goods, plus "soft line" items, such as clothing, and "hard line" items, such as hardware and small appliances.
Major Shops: Variety or junior department store.
Number of shops: 20 to 40.
Acreage: 10 to 30
Approximate Market: 15,000 people.
- 3) Regional Centers

Provide: Full range of merchandise and services.
Major Shops: Full size department store.
Number of Shops: 40
Approximate Market: 50,000 people.

Courses Of Action

- Centralization of commercial activities in Keaau and Pahoa shall be encouraged.
- Rehabilitation of existing commercial development in appropriate locations shall be encouraged.
- Appropriately zoned lands shall be allocated as the need arises.

PROFILE

Existing Land Use:

Commercial activities are located in Keaau, Pahoa, Kurtistown, Mt. View, Glenwood, Volcano, and Kalapana. The majority of these activities are family-operated businesses which serve the adjoining communities. A recent survey revealed the following commercial uses:

	Land Area in Acres	Floor Area in Sq. Ft.
Retail	28.8	138,643
Services*	124.1	201,440
* Includes government services		

A large portion of the land use in services is in service stations which occupy a floor area of 95,440 square feet.

In comparing the private commercial/retail land area with that in Hilo, it is found that 0.0035 acres of land area are available for Puna residents; in Hilo, the ratio is 0.00456 acres of commercial land per Hilo resident. The ratio is greater for Hilo because the Hilo area provides services for the entire County.

County General Plan:

Commercial activity is expected to continue in the medium density urban areas of Pahoa and in the resort area of Kalapana in lower Puna and in the

medium density urban area of Keaau, Kurtistown, Mt. View, and Volcano in upper Puna.

Other means of expanding commercial developments in the outlying areas not covered under the medium density urban or resort areas, but still meeting the requirements of the General Plan are:

- 1) Through the Special Permit route under the State Land Use regulations as an accessory to an agricultural business;
- 2) Meeting the zoning allocation requirements either through the district allocation or through the Land Zoning Bank. The acreage for commercial uses in Puna is approximately 190 acres with about 510 acres in the overall Land Zoning Bank.

Existing County Zoning:

County zoning recognizes the bulk of the existing commercial uses of Puna as reflected in the following table. Some could not be recognized by County zoning because they fall in the State Land Use Agricultural district.

TABLE 13

Tax Key Sec. & Planning Area	Existing Commercial Use (acres)	Existing Commercial Zone (acres)
1 Upper Puna - Volcano	3.0	--
2 Lower Puna	4.	--
3 Lower Puna - Kalapana	1.0	--
4 Lower Puna	--	--
5 Lower Puna - Pahoa	9.6*	21.0
5 Upper Puna	--	--
6 Upper Puna - Keaau	14.0	28.0
7 Upper Puna - Kurtistown	3.1	1.0
8 Upper Puna - Mt. View	Glenwood2.8	5.0
9 Upper Puna - Volcano	1.0	6.0
	34.5	61.0

*Area recently approved by Special Permit and conditional zoning but not developed such as in Hawaiian Beaches and in Pahoa Village.

Future Retail Land Requirements:

Based on the population and economic projections, it appears that the retail/commercial zone should be adequate to serve almost all of Puna. An exception has been found in the Pahoa area where approximately five additional acres need to be

incorporated into the commercial zone to meet the needs of the expanding Pahoa community.

Future Office Land Requirements:

Existing County-zoned lands for commercial and other uses should satisfy the needs for office spaces in Puna. Therefore, no expansion of commercial zones based on office use seems necessary for the planning period.

COURSE OF ACTION

- Expand commercial areas by five acres in Pahoa within the medium density area to meet future retail commercial requirements.

C. INDUSTRIAL

GENERAL PLAN GOALS, POLICIES, STANDARDS, AND COURSE OF ACTION

GOALS

- Designate and allocate industrial areas in appropriate proportions and in keeping with the social, cultural, and physical environments of the County.
- Promote and encourage the rehabilitation of industrial areas which are serviced by basic community facilities and utilities.

POLICIES

- The County shall support the creation of industrial parks in appropriate locations as an alternative to strip development.
- It shall be the policy of the County to achieve a broader diversification of local industries by providing opportunities for new industries and strengthening existing industries.
- Through its zoning powers, the County shall locate industrial areas convenient to transportation facilities, and provide a variety of sizes of industrial sites, depending on the needs of the community.

- The County shall attempt to improve the aesthetic quality of industrial sites and protect amenities of adjacent areas by requiring landscaping, open spaces, and buffer zones.
- The concept of a “floating zone” to allow for the future development of industrial areas shall be incorporated.

STANDARDS

- Industrial development shall be located in areas adequately served by transportation, utilities, and other amenities.
- Offstreet parking and loading facilities shall be provided.
- Performance standards shall be used to determine qualification of industries in various industrial zones.
- Industrial development shall maintain or improve the quality of the present environment.
- Industrial activities may be located close to raw materials.
- Topography of industrial land shall be reasonably level.
- Industrial development shall be conveniently located to its labor resource.
- Buffer zones shall be established between industrial and adjacent noncompatible uses of land.
- The direction of wind patterns and the absence of tradewinds shall be considered in locating industrial designations.

Course of Action

- The County shall identify sites suitable for future industrial activities.

PUNA PROFILE
Existing Land Use:

Within the Puna district, there are 153,928 square feet of floor space and 41.8 acres of land in industrial

uses. Major activities are sugar, macadamia nuts, and papaya processing. Puna Sugar Company has 100,358 square feet of industrial space.

State Land Use:

State Land Use regulations allow the County to permit industrial uses within the urban district.

County General Plan:

The urban land use pattern acreage calls for approximately 310 acres in Industrial in the Puna district. These areas are located in Keaau and Pahoa. The Land Zoning Bank, which is to be implemented by zoning within the County General Plan, calls for about 120 acres for industrial zoning, and under the “floating zone” concept an additional allocation from the overall 20 per cent Land Zoning Bank of 550 acres can be made.

County Zoning:

There are 15 acres of land zoned for industrial uses in Puna. A discrepancy of more industrial uses than zoned lands arises from the fact that most industrial activities in Puna are accessory uses in agricultural-zoned land. Examples are the sugar mill in Keaau, the macadamia nut factory, and various flower processing plants.

Future Outlook:

Major employment basis shall continue to be those industrial uses that are accessory to the agricultural industries. The geothermal activity may have an economic impact in increasing industrial activity in Puna if proved successful. Industrial parks are proposed by W. H. Shipman’s Master Plan in three possible locations.

COURSES OF ACTION

- Locate industrial parks by utilizing the floating zone concept between Keaau and Hilo, preferably close to the Puna-South Hilo boundary.
- Eliminate industrial zoning in Keaau Village.

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D. MULTIPLE RESIDENTIAL

GENERAL PLAN GOAL, POLICIES, STANDARD, COURSE OF ACTION

GOALS

- To provide for multiple residential developments that maximize convenience for its occupants.

POLICIES

- Appropriately zoned lands shall be allocated as the demand for multiple residential dwellings increases. These areas shall be allocated with respect to places of employment, shopping facilities, educational, recreational and cultural facilities, and public facilities and utilities.
- The County shall incorporate reasonable flexibility in applicable codes and ordinances to achieve a diversity of socio-economic housing mix.
- The rehabilitation and/or utilization of multiple residential areas shall be encouraged.

- To assure the use of multiple residential zoned areas and to curb speculation and resale of undeveloped lots only, the County shall impose incremental and conditional zoning which shall be based on performance requirements.

STANDARDS

- Height:
 - Three stories—variance on an additional story may be allowed.
 - Seven stories.
 - Ten stories.
- Densities
 - 1,000 square feet of land area per unit:
 - Ground cover ratio
 - 20% of total land area.
 - Parking
 - 35% of total land area.
 - Open space
 - 45% of total land area.
 - 1,250 square feet of land area per unit:
 - Ground cover ratio
 - 24% of total land area.
 - Parking
 - 28% of total land area.

- Open space
 - 48% of total land area.
- 1,500 square feet of land area per unit:
 - Ground cover ratio
 - 20% of total land area.
 - Parking
 - 30% of total land area.
- Open space
 - 50% of total land area.

- Areas shall be located in such a manner that traffic generated by high density development will not be required to travel through areas of lesser density en route to principal community facilities.
- Areas shall be protected from incompatible uses by transition zones.
- Provide adequate access to arterial streets, shopping facilities, schools, employment centers, and other services.
- Development shall not be permitted in natural hazard areas unless proper on-site improvements are provided.
- Located in areas where public utilities can be economically provided at a level of adequate to meet the demand for the concentrated service.
- Recreational area and/or facilities shall be considered in multiple residential development.

Course of Action

- Appropriately zoned lands shall be allocated as the need for multiple residential development increases.

PROFILE

Existing Land Use:

Based on a recent land use survey, there are approximately 41 units in multi-family use, including duplexes. The majority of these units (31 units) are situated in the farm-labor housing in Pahoa.

County General Plan:

There are several medium density urban areas in Puna where multi-family uses can be located as long as they conform to other pertinent elements of the General Plan. These are in Keaau, Pahoa, Kurtistown, Mt. View, and Volcano.

Existing County Zoning:

The existing County zoning designates only four acres in Pahoa in Multi-Family Residential (RM-2). Zoning also allows multi-family units to be built in any commercial-zoned areas.

COURSES OF ACTION

- It is anticipated that most of the multi-family demands can be absorbed in the commercial-zoned areas and in the single-family zones where institutional and elderly housing are conditionally permitted. One main criteria to locate an institutional or elderly housing in a single-family residential zone is that it be on a minimum 1-acre site.
- Multi-family housing needs, such as for farm labor, the elderly, low-income groups, and recreation, can readily be met in the designated medium urban density areas of Puna.
- The Planned Unit Development approach will aid in optimum adaptation of the development of land by diversifying the relationships of various uses in planned building groups while keeping needed open spaces, serving existing lifestyles, and maintaining the same overall density in the area.
- Based on the assumption that about 5 per cent of the total housing needs of Puna are in multi-family uses, only about 10 additional acres are required. These land area requirements can be absorbed in existing commercial zones in Pahoa and Keaau and in single-family residential zones for elderly housing.

TABLE 12 LAND AREA REQUIREMENTS FOR MULTI-FAMILY IN PUNA

Period	Total Projected Pop. Increase(1)	Additional Multi-Family Units(2)	Land Required in Acres(3)
1975-1980	1,500	26	3.0
1980-1985	1,670	29	3.5
1985-1990	<u>1,440</u>	<u>25</u>	<u>3.0</u>
TOTAL	4,610	80	9.5acres

(1) Daly & Associates projection

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- (2) Projected population divided by 2.9 and assuming 5% multi-family dwelling units
- (3) Density of 10 units/acre plus 20% for open space and parking.

E. OPEN SPACE

GENERAL PLAN GOALS, POLICIES, AND STANDARDS

GOALS

- Provide and protect open space for the social, environmental, and economic well-being of the County of Hawaii and its residents.
- Protect natural areas.

POLICIES

- Open space in the County of Hawaii shall reflect and be in keeping with the goals, policies, and standards set forth in the other elements of the General Plan.
- Open space in urban areas shall be established and provided through zoning and subdivision regulations.
- Identify, evaluate and designate natural areas.
- Scientific research in natural areas and the protection of such areas, especially those suggested by the Governor’s Committee on Preservation of Scientific Areas and the Federal Bureau of Sport Fisheries and Wildlife, shall be encouraged.
- Zoning, subdivision and other applicable ordinances of the County of Hawaii shall provide for and protect open space areas.

STANDARD

- Open Space designations shall include:
 - Forest Reserves
 - Watershed areas
 - Potential natural hazard areas
 - Natural areas and reserves
 - Open space recreation areas

Scenic vistas and viewplanes
General Use Conservation zones with compatible uses
Scientific areas, including habitats of endemic species

PROFILE

Existing Land Use:

Those areas which are considered open space include watersheds, forest reserves, potential natural hazard areas, open recreational-type areas, conservation-zoned areas, scenic vistas and view planes; steep land; developable vacant land; and scientific areas, including habitats of endemic species.

Using these categories, a recent land use survey shows that 232,000 acres of 316,975 acres or 73% of Puna District are in open space. Also, there are 51,000 acres in open-type recreational use.

State Land Use:

Open space areas are permitted within all categories of the State Land Use regulations. A vast number of open space areas is located in the State Land Use conservation district which contains 137,215 acres or 44 per cent of the land area, and in the agricultural District which contains 172,620 acres or 55 per cent of the land area in Puna.

County General Plan:

Specific open space uses other than the vast vacant land in agricultural and conservation districts that the County General Plan calls for are the preservation of scenic vistas and areas of scenic beauty; the preservation of watershed and forest reserves through the conservation district designation; the preservation of open recreational areas; and the discouragement of development on steep land over 20 per cent slope and in natural hazard areas.

County Zoning:

Open zone contains some 6,630 acres in Puna. In general, the County open zone covers the conservation district of the State Land Use outside the National Park and forest reserve boundaries.

Recreation areas are also zoned as open by the County.

Future Outlook:

Since preservation of the natural environment is a major concern in the Puna district, open space will continue to play an integral part in preserving the existing lifestyle of the people in the area.

COURSES OF ACTION

Open Space recommendations by categories are as follows:

- Forest Reserves: Continue to preserve the existing forest reserves.
- Watershed Areas: Protect the watershed areas in upper Puna where the main source of the Keaau-Glenwood water system originates.
- Potential Natural Hazard Areas: The Kilauea east rift line should continue to be protected as open space due to the danger of lava eruptions. Shoreline areas from Kalapana to Kapoho should continue to be protected as open space in areas highly susceptible to tsunami inundation and land subsidence. Flood plain areas should be designated as open space or by restrictive structural considerations once the area is established by the Federal Corps of Engineers.
- Natural Areas and Reserves: Areas along the Puna Coast, especially where the proposed Puna Coastal Road will traverse, should be protected for their attractive natural features.
- Open Space Recreation Areas: Discussed at length in the Recreation portion of this plan.
- Scenic Vistas and Viewplanes: Discussed in the Natural Beauty, Natural Resources and Shorelines and Transportation elements of this plan. Basically, shoreline areas, from whence natural scenic vistas can be appreciated from the proposed Coastal Road should be preserved.
- General Use Conservation Zones: Continue all G. U. conservation zones except for those

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agricultural subdivided lots which were zoned Conservation along the shorelines within Hawaiian Paradise Park and privately owned lands near Pohoiki where areas were zoned Ag. lac by County. Also, revert privately owned lands in Kalapana where existing lot owners wish to homestead and provide lands to their offsprings.

- Scientific Areas, including Habitats of Endemic Species: Discussed in the Natural Resources and Shoreline element of this plan. Areas to preserve endemic plants and wildlife should be the Puu Makaala areas of the Olaa Forest Reserve; the Kipuka and rift zones in the Puna Forest Reserve and the Malama-Ki Forest Reserve.

- Landscaping Buffer Zones Along Major Highways: Discussed in the Transportation element of this plan. Landscaping of buffer strips should be continued along the Volcano Highway. In addition, buffer strips along the proposed Puna Coastal Road from Kalapana to Kapoho should be created.

F. PUBLIC LANDS

GENERAL PLAN GOALS, POLICIES, AND STANDARDS

GOALS

- To utilize publicly owned lands in the best public interest.
- To acquire necessary lands for public use to implement policies and programs contained in the General Plan.

POLICIES

- It shall be the policy of the County of Hawaii to create a position of public land agent to keep the County abreast of intended actions on government lands and to coordinate the County's land acquisition program.

- Encourage uses of public lands which will satisfy specific public needs, such as housing, recreation, open space and education.
- Encourage the creation of State programs for State lands consistent with the County General Plan.
- State and County Capital Improvement Programs should be coordinated.
- A sub-classification, University use, may be designated permitting the primary institutional and numerous supportive and accessory uses required for establishing and/or expanding a public university. Its designation shall be shown on the Allocation map.

STANDARDS

- Public lands shall be used to obtain maximum benefit to the greatest number of people.
- Public lands with unique recreational and natural resources shall be maintained for public use.

PUNA PROFILE

The State owns about 77,800 acres of the total 313,600 acres in Puna. This constitutes about 25 per cent of the total acreage in Puna. In comparison, the State owns 42 per cent of the total land on the Big Island.

The County owns about 50 acres in Puna. The Federal government which owns the Hawaii Volcanoes National Park and lighthouse sites along the shoreline, controls over 61,550 acres in Puna.

Therefore, in total, public lands constitute about 44 per cent of the land area in Puna.

The State is currently conducting a master plan study for the lands in the Conservation district which comprise basically of State-owned land.

Hawaiian Homes has 2,000 acres of the State-owned land. A master plan for these lands has been completed and plans for these lands are basically for agricultural uses.

The County-owned lands are basically for recreational and government-service facilities. An expanded program of land acquisition for recreational purposes, especially in the Kalapana-Kaimu area, took place between 1970 to 1976.

The Federal government continues its program of preserving the hazard areas and surrounding areas in their natural state for the enjoyment of residents and visitors.

COURSES OF ACTION

- The State should be encouraged to continue its program of providing lands for agricultural and housing purposes, as well as to provide open spaces, watershed areas and recreational uses, and to preserve the natural environment in its vast land holdings in Puna.

- The County should continue to acquire land for future parks, open spaces, and roadways based on availability of funds and needs of the community.

- The Federal government should be encouraged to continue the Hawaii Volcanoes Park as an integral part of the open space program of Puna and of the County.

G. RESORT

GENERAL PLAN GOALS, POLICIES, STANDARDS, AND COURSES OF ACTION

GOALS

- To guide the orderly development of the visitor industry.
- To provide for resort development that maximizes conveniences to its users.
- To ensure that resort developments maintain the social, economic, and physical environments of Hawaii and its people.

POLICIES

- To assure the orderly use of resort zoned areas and to curb speculation and resale of undeveloped lots, the County shall impose incremental and conditional zoning which would be based on performance requirements. This is to assure that a certain percentage of buildings will be constructed.
- Promote and encourage the rehabilitation and utilization of resort areas which are serviced by basic facilities and utilities.
- Zoning of resort areas shall be granted when proposed development is consistent with and incorporates the stated goals, policies, and standards of the General Plan.
- The County shall encourage the establishment of a system within the State Capital Improvement Program to help develop visitor destination areas in better relationship to the total County and the State.
- The County shall designate and allocate resort areas in appropriate proportions and in keeping with the social, economic, and physical environments of the County.
- The County shall encourage the visitor industry to provide resort facilities which provide an educational experience of Hawaii as well as recreational activities.
- The County shall re-evaluate existing undeveloped resort zoned areas and reallocate zoned lands in appropriate locations.
- The concept of a "floating zone" shall be adopted to allow for the future development of retreat resort areas.

STANDARDS

The following established standards shall guide the development of resort areas.

Courses Of Action

- Primary emphasis on resort development should

be in the Kalapana-Kaimu area. The area will be serviced with a water system. The sewer system should be provided by the developer until such time as a public sewer system is available.

- Other isolated developments may be allowed at Pohoiki and Kapoho when said area is serviced with adequate basic facilities.
- Resort development shall complement the character of the area and be consistent with the General Plan.

PROFILE

Existing Land Use:

There are 6,095 hotel and condominium units in Hawaii County, with some 2,930 units built since 1970. However, none of these is in the Puna district.

State Land Use:

State Land Use regulations allow the County to permit hotels and condominiums to be within Urban-zoned lands. In Conservation districts, resort uses can be approved by the Board of Land and Natural Resources within the GU (General Use) subzone.

County General Plan:

The County General Plan designates resort development in the Kalapana-Kaimu area. The Plan also recommends isolated resort development at Pohoiki, Kapoho, and Papai Bay, when these areas are serviced with adequate basic facilities.

County Zoning:

Only one acre of land in Kalapana is zoned Resort in the entire Puna district. However it is now used for commercial purposes and not for resort use.

Future Outlook:

In forecasting the demand for transient accommodations in Puna, the following assumptions are made:

1. The number of visitors to Hawaii County in 1975 was 927,000, an increase of 63 per cent since 1970. Although the increase in the number of visitors has been high, the

number of new tourist facilities has increased even faster; this is a principal factor in the decline in occupancy rates.

2. Length of stay in hotels vary from 1.2 days in Hilo to 2.0 days in Kona hotels, and from 5.0 days for local visitors to 7.5 days for Westbound visitors in condominiums. Eastbound visitors only stayed an average of 0.4 days.
3. Employment in hotel services doubled from 1970 to 1976 with the annual average wages in 1976 being \$7,074.
4. Based existing economic trends hotel developments in the Kalapana-Kaimu area do not seem likely in the near future in view of the existing supply of tourist facilities and because of difficulty in obtaining financing for such developments.
5. Low-density type hotels such as cabins or bungalows may be possible within the planning period along the Kalapana to Kapoho area if the following prevail: 1) reopening of the Chain of Craters Road as planned; 2) a clientele made up of tourists and local visitors; 3) willingness of developers to build within this hazard-prone area; and 4) the obtaining of financing.

COURSES OF ACTION

- Provide for resort development in Kalapana-Kaimu area with the following standards:
 1. Retreat Resort density of 6 units/acre with the total number of resort units not to exceed the number of existing residences in Kalapana area to keep a balance between residents and tourists.
 2. Design criteria should be 1 or 2 stories of bungalow or cabin type development with open space, landscaping, and Hawaiian motif.
- Allow for individual resort retreats in Pohoiki-Kapoho and Papai Bay areas.

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H. SINGLE-FAMILY RESIDENTIAL

GENERAL PLAN GOALS, POLICIES, STANDARDS & COURSES OF ACTION:

GOALS

- To maximize choices of single-family residential lots and/or housing for residents of the County.
- To ensure compatible uses within and adjacent to single-family residential zoned areas.
- To rehabilitate and/or rebuild deteriorating single/family residential areas.

POLICIES

- To assure the orderly use of single-family residential zoned areas and to curb speculation and resale of undeveloped lots, the County shall impose incremental and conditional zoning which would be based on performance requirements. This is to assure that a certain percentage of buildings will be constructed.
- The County shall encourage more innovative uses of land with respect to geologic and topographic conditions through the use of residential cluster and planned unit developments. The clustering of residential units in sloping areas is a means of minimizing grading and drainage problems, preserving the natural appearance of the topography, preventing strip development, and making optimum uses of the terrain for buildings and open spaces.
- The County shall aid and encourage the State in providing fee simple and leasehold single-family residential lots to the residents through the State Housing Program.
- The County shall incorporate reasonable flexibility in codes and ordinances to achieve a diversity of socio-economic housing mix and to permit aesthetic balance between single-family residential structures and open spaces.

- The County shall re-evaluate existing undeveloped single-family residential zoned areas and reallocate zoned lands in appropriate locations.
- The County shall designate and allocate single-family residential zoned lands at varying densities for future use in accordance with the stated goals, policies, and standards.

STANDARDS

- Density of 2-5 units per acre.
- There shall be a transitional area between single-family residential areas and incompatible uses.

- A properly zoned single-family residential area shall be conveniently located with reference to shopping and other public and private services and shall be provided within easy and convenient access to employment centers.
- Major traffic routes shall not be located through single-family residential areas.
- Areas shall have a basic improvements and amenities necessary for immediate use.
- Areas shall be limited to low-density and medium density residential uses.

Courses of Action

- The County shall encourage the sugar company to make available on the private market its undeveloped residential zoned lands in Keaau and Pahoa.
- Encourage and aid the agricultural industry in continuing to provide employee housing.

PROFILE

Single family residences form the bulk of the available housing in Puna as well as in the entire County. The County General Plan Urban Land Use Pattern calls for 4,860 acres of residentially-zoned areas in Puna with additional allocations made from the 20 per cent County "Land Zoning Bank".

The bulk of this 4,860 acres should be allocated to Single-Family Residential Zone.

Existing Single-Family Dwellings in Puna:
No. of Units: 3,030 (1976) Acreage: 1,180+ acres (1976)

State Land Use:

The State Land Use regulations require single-family residential zones to fall under urban-zoned lands pof

State Land Use:

The State Land Use regulations require single-family residential zones to fall under urban-zoned lands of the State. Some 3,630 acres are zoned Urban by the State in the district of Puna.

County General Plan:

The Plan calls for the bulk of the single-family residential use be within areas designated as: Medium Density Urban - @ — 5.8 units/acre Low Density Urban - @ — 4 or less units/acre Future Urban Expansion -

Existing County Zoning:

Existing zoning (1976) shows single-family residential in the categories and amounts indicated in the following TABLE 9:

TABLE 9 CAPACITY OF EXISTING SINGLE-FAMILY RESIDENTIAL-ZONED LANDS IN PUNA

Category	Gross Area in Acres	Potential No. of Units (1)
RS-7.5	(7,500 sq. ft. minimum)	25
RS-10	(10,000 sq. ft. minimum)	1,809
RS-15	(15,000 sq. ft. minimum)	154
RS-20	(20,000 sq. ft. minimum)	<u>1,207</u>
TOTAL SINGLE-FAMILY	3,195acres	8,880 dwelling units

- (1) Based on net vacant land(gross area minus 20%
- (1) Based on net vacant land (gross area minus 20% for roadways, open space, and other uses)

The following TABLE 10 gives and indication of the number of single-family dwellings that can be situated in these agriculturally-zoned lots:

TABLE 10 NUMBER OF EXISTING AGRICULTURE-
ZONED LOTS IN PUNA THAT CAN BE
USED FOR SINGLE-FAMILY UNITS

Size	No. of Lots
3-Acre or More	6,990
1½-Acre to 2-Acre	20,680
Residential-Size	<u>17,580</u>
TOTAL	45,250 lots

Based on the foregoing tables, the potential allowable number of single-family residential units in Puna amounts to 54,130 units.

Future Requirements:

Based on the economic profile, existing governmental regulations and the housing study conducted, the additional single-family requirements are as follows:

TABLE 11 LAND AREA REQUIREMENTS FOR SINGLE-FAMILY DWELLINGS BASED ON POPULATION PROJECTION

Period	Projected Pop. Increase(1)	Additional New S. F. Units(2)	Land Required in Acres(3)
1976-1980	1,500	473	190
1980-1985	1,670	566	226
1985-1990	<u>1,440</u>	<u>486</u>	<u>194</u>
TOTALS	4,610	1,525	610

- (1) By Daly & Associates' projection
- (2) Based on housing study by Daly & Associates and assuming 95% single-family dwellings
- (3) Based on density of 3 units/acre plus 20% for roads and open space.

Projected land requirements show that the existing vacant lands in residential-zoned lands are adequate to handle the anticipated population increase (2,400 net acres vacant versus 610 gross acres required). However, the distribution among the planning areas must be evaluated. Additionally, the County General Plan residential allocation of 4,860 acres can be accommodated by 1) rezoning some existing residential-size subdivisions to Urban under the State and Residential under the County and 2) expanding into areas adjoining existing communities.

The considerations for determining logical expansion areas are:

- 1) For each planning area, designate at least 50% more land for residential development than required so that there is a broad choice available to developers and home purchasers. This would be one means of curtailing the rising cost of housing.
- 2) Recognize existing subdivisions as Urban areas when they are substantially developed into residential communities such as when any subdivision with residential size lots are more than 50% developed with houses.
- 3) Locate residential areas at sites where there are readily available infrastructures such as adequate County water, electricity, telephone, and roads.
- 4) Locate residential areas near, but not necessarily next to, employment bases such as commercial or industrial-zoned areas.
- 5) Locate near older communities where there is a concentration of urban amenities, such as shops, playgrounds, schools, churches, etc.
- 6) Integrate with the natural environment of Puna with respect to slope, soil condition, historic sites, drainage, volcanic hazards, etc.

COURSES OF ACTION

LOWER PUNA

Planning Area #1 - Royal Hawaiian Subdivision

Planning Area #2 - Kalapana

- Because the Kalapana shoreline area is an area prone to natural hazards such as tsunami inundation, land subsidence, and lava flows, concentrated urban development should not be encouraged beyond what the area is zoned for.

The existing urban designation should remain as such to facilitate processing of building permits or subdividing. Planned Unit Developments and Cluster Plan Developments are made possible by keeping this shoreline area in Urban.

Planning Area #3 - Opihikao-Pohoiki

- No urban zoning is foreseen in this planning area. The housing study shows that the existing 90 dwelling units could increase to about 135 dwelling units within the planning period.

The existing subdivided lots can accommodate any foreseeable housing need for people wishing to locate in this planning area.

Planning Area #4 - Pohoiki-Kapoho-Waawaa

The old Kapoho village was located in this area until the 1960 lava flow which covered the bulk of it. Historically, the area is blessed with good fishing areas, warm climate, and less rain than can be found in the upper regions of Puna.

The County has provided a water system along the existing road; it is used basically for farming as the urban areas are not yet tapped into this line.

- Possible expansion areas are the existing Vacationland area at the foot of Kapoho Cinder Cone and the location of the old Kapoho village. However, due to volcanic, tsunami, and land subsidence hazards, expansion should be of a low density type.

The expansion area can remain as Ag-la zone and serve as the link to providing amenities to the Beach Lots. Among these would be linkage to the County water system and a centralized sewer system with a sewer treatment plant either through improvement district programs or federal assistance as population increases enough to make a centralized sewer system justifiable and in order to preserve the Kapoho shoreline from further pollution.

LAND USE

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- No other urban expansion or allocation is foreseen. The majority of other large areas such as Nanawale Estates are already zoned as residential.

Planning Area #5 - Pahoia Village and Hawaiian Beaches Area

Since Pahoia is the hub of the Lower Puna area, it is the logical area for the bulk of urban allocation. There is much vacant land zoned for residential uses, but these are scattered throughout the village.

- In order to have a more orderly development, approaches such as P. U. D. 's (Planned Unit Development) and Cluster Plans are encouraged in large vacant areas, and some expansion should also take place in the outskirts in the agricultural-zoned areas within the General-planned urban expansion and low density urban areas.
- The Hawaiian Beaches area shold be rezoned to Urban and Residential uses within the planning period as it is substantially developed into a residential community.

UPPER PUNA

Planning Area #5 (Portion) - Hawaiian Paradise Park

- The majority of lots within this planning area are 1-acre lots. No residential allocation is foreseen for this area.

Planning Area #6 - Keaau-Hawaiian Acres

- Presently-zoned and vacant residential acres (28± acres in vacant land) should be utilized for immediate development.
- The Volcano side of the village now under low density urban development in the General Plan should be developed as an intermediate plan, including reverting the industrial zone (19 acres) to residential.
- In the long-range plan, the areas between the mill and Keaau Loop (56 acres) now under the

urban expansion areas in the General Plan should be developed.

Planning Area #7 - Kurtistown

The housing study reveals that there will be approximately 684 single-family units in this area by 1990, an increase of about 234 units between the 1976 to 1990 period. The vacant land study shows that there is a capacity of about 276 more units which can be built on existing residential-zoned lands and on subdivided lots. About 30 more acres of land is required for single-family development to provide for a broader choice of home sites.

- Some of the existing expansion area should be rezoned to residential (RS-15) and some of the existing RS-20 area near the commercial and playground area and near the Japanese Judo Mission Church should be changed to a higher density as the need dictates.

Planning Area #8 - Mt. View-Glenwood

- Single-family residential allocation within the General Plan expansion and low density urban area should be in and around the Mt. View urban area as individual property owners wish to convert their lands into urban.
- Other residential-zoned areas should be in the Glenwood area as the existing subdivisions such as the Pacific Paradise Garden, Mt. View Manor and others became substantially developed with houses.

Planning Area #9 - Volcano

- Only the existing urban areas of Volcano should be recognized. The residential-zoned area is substantially vacant (411 acres of 562 acres) and can meet all future demands for single-family use within the planning period.

I. LARGE-SCALE SUBDIVISIONS

This section of the Puna Community Development Plan is unique to this plan. It has been included as a separate section because of the unusually large number of subdivided lots that were created in Puna during the late 1950's to the late 1960's. Since specific goals, policies, and standards were not listed in the General Plan for Large—Scale Subdivisions, applicable goals, policies, and standards listed for other elements of the General Plan were studied to arrive at the courses of action.

PROFILE

There are forty-four large-scale subdivisions (25 or more lots) in the district of Puna, according to the County Planning Department. These contain a total of 49,171 lots. (See Table 14.)

Most of the lots in these subdivisions are designated as Agricultural under the State Land Use laws and County Zoning. The lot sizes range from about 8,000 square feet to three acres.

The subdivisions were created prior to the adoption of the County's present Subdivision Control Code which requires a developer to complete specific site improvements when land is subdivided. Because most of these subdivisions lack basic improvements commonly found in present-day subdivisions - improved roads, water distribution systems, and adequate drainage systems to handle surface runoff - they are considered substandard by present standards.

Less than three per cent of the owners of lots in these subdivisions have built homes on their lots. State tax records show that about 53 per cent of the lot owners live in the continental United States and abroad. This factor, coupled with the existing substandard conditions of the subdivisions, drastically reduces the possibility that the subdivisions will be eventually improved to County standards by improvement district programs.

Although residents have, in the past, attempted to improve their subdivisions by requesting that

LAND USE

(cont.) Chapter 13

absentee owners either participate in improvement district programs or join their associations and contribute their share of dues, they have been unsuccessful because many absentee owners do not wish to expend money for improvements.

The County has had serious discussions on ways of coping with the problems of these subdivisions. Demands for servicing of these subdivisions with adequate police and fire protection as well as extending existing utility lines and County roadways into these areas are already surfacing before the County.

Some of the positive factors relative to these subdivisions include:

1. Presently, tax revenue generated from these lots in Puna amount to about 14% of the total real property revenue received by the County. About 2.4 million dollars in revenue were received from these subdivisions in 1977.
2. A majority of the subdivisions are located in the 100 to 150-inch annual rainfall area. This factor makes individual rain catchment a feasible method of obtaining potable water, thus possibly eliminating the need for over-extension of the County water system.
3. A majority of the subdivisions are located on marginal agricultural land characterized by shallow soil with pahoehoe subsurfaces. Cultivation of such products as anthuriums, papayas, ornamental plants, and guavas is possible on these lands. Within the planning period, it is anticipated that part-time farmers will continue to utilize these subdivided lands for these pursuits as land is relatively inexpensive to acquire as compared to regular subdivided lots with full improvements such as paved roads and piped water. (Tax records show that the price of land is approximately four times higher for lots with full

improvements.) It is also possible to obtain lands by leasing and the existing agricultural dedication tax incentive is still another encouraging factor.

4. The subdivisions are attracting new retirees from out-of-state and other islands. Although most of these residents belong to a relatively fixed income bracket, they, nevertheless, contribute to the economy of the island.

COURSES OF ACTION

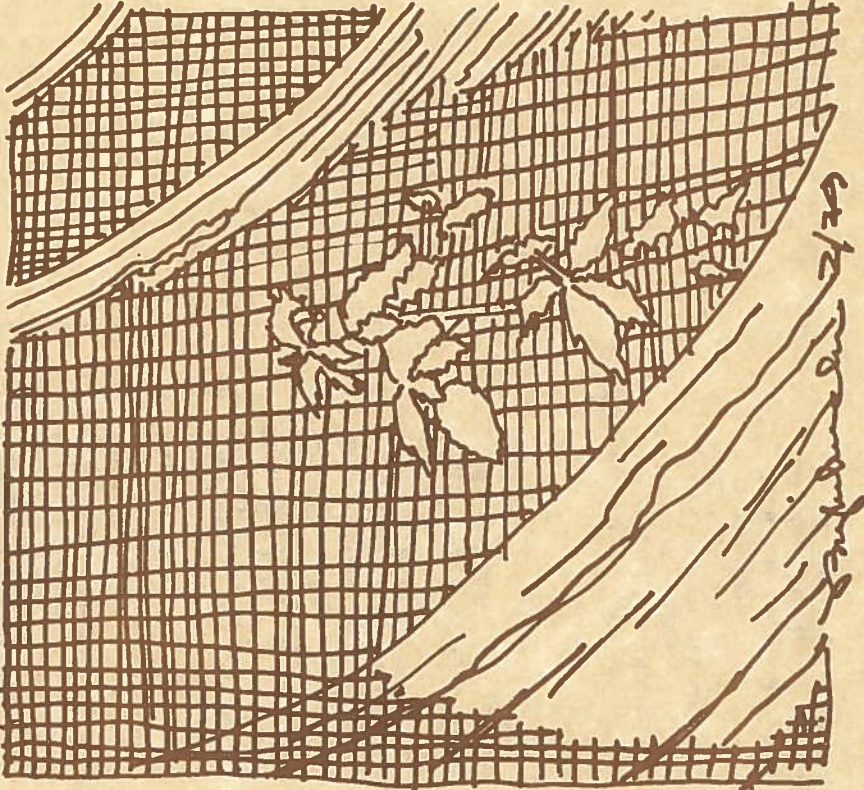
- The County, so as to curb speculation, should discourage additional subdivisions of these magnitudes without incremental and performance conditions.
 - The County should participate in improvement district programs with willing property owners or other means of funding to build at least one major roadway in each of the large subdivisions to comply with County standards.
1. A loop road from Volcano Road, through Hawaiian Acres, Orchid Land or Ainaloa, Hawaiian Paradise Park, to the proposed Puna Coastal Road should be considered to provide a continuous road as access to the subdivisions, an escape route from natural hazards, and a more efficient transportation system for Upper Puna as the area becomes more populated.
 2. There should be at least two access roads leading out of the subdivisions below the rift line when more homes are constructed to serve as escape routes. Escape routes via only one main paved road exist in Royal Gardens, Kapoho Beach Lots, Puna Seaview Subdivision, Black Sand Beach Subdivision, and other major subdivisions below the rift line.
 3. Construct the Puna Coastal Road incrementally, with the first priority given to the inaccessible Hawaiian Beaches to

Hilo segment.

- The County should accept any park area of adequate size (3 or more acres) which developers has set aside for such purposes to meet subdivision approval. The land may be left open until the need arises or leased out to bona-fide farmers during the interim. (Hawaiian Paradise Park presently has six 20-acre parcels available to the County.)

TABLE 15
1976-77 ESTIMATED REAL PROPERTY REVENUE
PUNA DISTRICT AND COUNTY OF HAWAII

	Real Property Revenue (1)	% of Revenue (2)
Large-Scale Subdivisions	\$2,370,000	14.4%
Other Puna Area	1,115,000	6.8%
Total Puna Area	3,485,000	21.2%
County of Hawaii	16,400,000(2)	100.0%
(1) From State Tax Office		
(2) Based on \$916,700,000 Assessed Valuation		



LAND USE
Chapter 13 (cont.)

TABLE 14 LARGE SCALE SUBDIVISIONS IN PUNA

ZN	SEC	SUBDIVISION	SLU	LOT		TOTAL HOMES		ROADS	WATER	ELEC.	76-77	
				SIZE	LOTS	(3/75)	VACANT				ASSES.	
1	1	Royal Hawaiian Estates	A	R,RA	926	2	924	Public	Catchment	Portion	\$4,088,915	
1	1	Mauna Loa Estates	U	R	893	22	871	Private	Catchment	Portion	3,760,162	
1	1	Fern Forest Vacation Est.	A	A	2,593	34	2,559	Private	Catchment	Portion	5,794,548	
1	1	Crescent Acres	A	RA	2,021	10	2,011	Public	Catchment	Portion	4,353,149	
1	1	Ohia Estates	U	R	756	1	755	Private	Catchment	Portion	1,357,489	
1	1	Royal Gardens	A	RA	1,617	1	1,616	Private	Catchment	None	4,714,787	
1	1	Hawaii's Eden Roc Est.	A	RA	1,992	0	1,992	Private	Catchment	None	3,299,838	
1	2	Kalapana Vacation Lots	A	R	738	0	738	Private	Catchment	None	1,829,164	
1	2	Kalapana Shores	U	R	44	3	41	Private	Catchment	None	302,688	
1	2	Black Sand Beach	A	R	918	4	914	Private	Catchment	Portion	1,131,373	
1	2	Pacific Paradise Ocean Front Estates	C	R	141	0	141	Public	Catchment	None	694,798	
1	2	Kehena Beach Estates	A	R	199	5	194	Public	Catchment	None	1,176,181	
1	2	Hwn. Land Investment	A	R	26	0	26	Public	Catchment	None	622,801	
1	2	Puna Sea View Lots	A	R	693	0	693	Public	Catchment	None	2,567,853	
1	3	Leilani Estates	A	RA	2,266	18	2,248	Private	Catchment	All	7,691,268	
1	3	Lanipuna Gardens	U	RA	110	0	110	Public	Catchment	Portion	408,660	
1	4	Kapoho Beach Lots	U	R	185	47	138	Private	Catchment	Portion	1,474,051	
1	4	Waawaa	A	RA	177	2	175	Private	Catchment	None	705,926	
1	4	Nanawale Estates	U,A	R	4,289	109	4,180	Portion Public	Private	Portion	11,179,438	
1	4	Kaniahiku Village Site	U	R	36	19	17	Public	County	All	91,690	
1	4	Hwn. Holidays Estates	U,A	R,RA	88	2	86	Private	Catchment	Portion	702,802	
1	4	Kapoho Vacation Land	U,A	RA	397	38	359	Private	Portions County	Portion	2,052,688	
1	4	Kapoho Papaya Farm Lots	A	A	40	0	40	Private	Catchment	None	101,232	
1	5	Kaaohe Homesteads	A	A	96	14	82	Private	Catchment	None	462,420	
1	5	Hawaiian Paradise Park	A	RA	8,843	212	8,631	Private	Catchment	Portion	24,330,649	
1	5	Hawaiian Parks	A,C	R	973	231	742	Public	Private	All	5,283,432	
1	5	Hawaiian Beaches	A	R	1,017	186	831	Public	Private	All	5,315,216	
1	5	Hwn. Shores Recreational Estates	A,C	R	1,532	82	1,450	Public	Private	Portion	8,257,961	
1	5	Tangerine Acres	A	R	44	21	23	Private	Catchment	All	287,496	
1	6	Orchid Land Estates	A	RA	2,491	66	2,425	Private	Catchment	Portion	8,714,565	
1	6	Hawaiian Acres	A	A	3,944	41	3,903	Private	Catchment	Portion	7,482,754	
1	6	Ainaloa	A	R	3,637	63	3,574	Private	Catchment	Portion	5,665,562	
1	6	Tiki Gardens	A	R	481	0	481	Private	Catchment	Portion	889,657	
1	7	Hilo Acres	A	R,RA	48	0	48	Private	Catchment	Portion	37,728	
1	7	Maunalani Lots	A	R	98	0	98	Private	Catchment	Portion	106,205	
1	8	Hawaii Island Paradise Acres	A	R	449	2	447	Private	Catchment	Portion	438,376	
1	8	Orchid Isle Estates	A	R	905	5	900	Private	Catchment	None	1,301,629	
1	8	Aloha Estates	A	R	1,846	21	1,825	Private	Catchment	Portion	1,307,546	
1	8	Pacific Paradise Development	A	R	209	1	208	Public	Catchment	All	217,348	
1	8	Pacific Paradise Garden	A	R	423	4	419	Private	County	Portion	1,264,002	
1	8	Glenwood	A	R	152	1	151	Private	Catchment	Portion	299,514	
1	8	Pacific Paradise Mt. View Manor	A	R	606	4	602	Private	Catchment	Portion	1,001,439	
1	9	Cymbidium Acres	A	R	180	10	170	Private	Catchment	Portion	956,037	
1	9	Hoonanea	A	R	52	2	50	Private	Catchment	Portion	130,374	
TOTALS =					49,171	1,283	47,888	TOTAL = \$131,796,111				

76-77 ASSES.
1976-77 Assesed Valuation as obtained from State Tax Office

- LEGEND: SLU - State Land Use
A - Agricultural District
U - Urban District
C - Conservation District
R - Rural District
LOT SIZE:
R - Residential Size Lots (7,500 sq. ft. - 15,000 sq. ft.)
RA - Rural Size Lots (1/4ac. - 2 acs.)
A - Agricultural Size Lots (3 acs. & Over)

ENVIRONMENTAL AND HISTORIC PRESERVATION CONCERNS

Chapter 14

The effects of existing and future development within the Puna district on environmental quality and historic sites are discussed in detail in earlier chapters of this community development plan.

Any use of land by the community affects the environment to some degree. Therefore, the adoption and subsequent implementation of this plan will have a major impact on the quality of the environment and the economic and social welfare of the community. The basic question to be addressed is whether the plan adversely affects the quality of the environment and whether the commitment of natural or cultural resources is intended to promote long-term productivity as opposed to a short-term gain.

Our courses of action and recommendations recognize the necessity of accommodating change and/or growth which are inevitable in any community. This plan is also mindful that such changes and/or growth, when they do occur, shall be compatible with, beneficial to, and preservative of the environment and historic sites.

As part of the planning process, alternate solutions were considered and analyzed. To give an idea of the various alternatives reviewed and the considerations given to the environment and historic preservation, a listing of alternate courses of action is included in this section.

THE ENVIRONMENTAL AND HISTORIC PRESERVATION IMPACTS (BENEFICIAL AS WELL AS ADVERSE) OF THE PROPOSED PLAN, IF THE PLAN IS CARRIED OUT

The proposed actions of providing needed government capital improvements and direction in private developments would have the following generalized impacts. At this stage, no attempt is made to go into details as such details can be made later on individual projects. Applicable impacts can be used as a base to analyze future developments in Puna.

Beneficial effects are as follows:

1. Creation of "oases" of open space for scenic view and aesthetics generated by the landscaping and open play fields;
2. Encouragement of growth of an area brought about by added amenities of improved roadways, new playgrounds, and other infrastructures;
3. Enhancement of the existing lifestyles of residents through increased police and fire protection, postal services, new playgrounds, housing developments;
4. Protection of valuable marine resources through developmental controls along the shoreline, such as placing the shoreline under the Special Management Area;
5. Protection of life and property through developmental controls along the volcanic east rift zone;
6. Preservation of areas of natural beauty by designation of certain highways as scenic routes and designation of certain sites for inclusion in the National Natural Landmark Registry;
7. Protection of low-lying areas from inundation by storm waves through realignment of designated roadways such as the Kapoho-Kalapana Beach Road;
8. Conservation of energy resources brought about by the development of bikeways, walkways, and continuation of a bus system to service Puna;
9. Creation of employment opportunities through diversification of the economic base and the encouragement of agriculture as the main economic base in Puna;
10. Protection of agricultural lands through zoning changes;

11. Optimum adaptation of the development of land through the Planned Unit Development approach.

The adverse effects are as follows:

1. Removal of some bird and wildlife habitats by the elimination of trees and other natural growth;
2. Increase in traffic, noise, and air pollution brought about by development of new roadways.
3. Increase in traffic brought about by new housing developments;
4. Pollution of existing ground water sources and shorelines through increased human wastes and other chemicals into the ground;
5. Increased overland storm waters and redirection of some drainage flows through land clearing and other improvements.
6. Creation of noise and air pollutants through research projects such as the geothermal project in Pohoiki;
7. Obliteration of historic sites in the process of construction of homes and other developments;
8. Increase in solid waste brought about by population increases;
9. Removal of some natural vegetation in the process of construction and roadway development;
10. Added utilization of natural resources for construction materials;
11. Creation of noise and dust and disruption of traffic during the construction phases.

ENVIRONMENTAL AND HISTORIC PRESERVATION CONCERNS

Chapter 14 (cont.)

ANY UNAVOIDABLE ADVERSE ENVIRONMENTAL AND HISTORIC PRESERVATION EFFECTS SHOULD THE PLAN BE IMPLEMENTED

The proposals in the Puna Community Development Plan, if implemented, will create a few adverse environmental effects which cannot be avoided. However, all of these adverse effects can be minimized by enforcing existing health, building, subdivision, zoning and other regulations. These regulations are geared toward providing adequate protection of the environmental and historic sites.

Adverse environmental effects can also be avoided by thoughtful design of projects and good work practices such as keeping dust down, work only during set times, keeping machinery at good working order, etc. during construction phases.

Still another way is by providing alternate methods of coping with the adverse environmental effects. The use of re-cycled water in toilets and returning sewage solids as humus to the soil in lieu of cesspools, or centralizing human waste collection and proper treatment before releasing wastes into the environment are examples. Some of the proposals in the plan itself are the most feasible methods of coping with unavoidable adverse environmental and historic preservation effects. However, it should be noted that future technology and know-how may render some of the proposals obsolete.

ALTERNATIVES TO THE PROPOSED PLAN

NO PLAN

The alternative of no plan in the area carries social, economic, and political implications. It means that the County will not be able to budget future needs of Puna in a rational and orderly fashion. Additionally, the residents of Puna will not have a voice in their future destinies inasmuch as no plan may result in a chaotic, haphazard development of the area without regard to neighbors, the natural environment, and its relationship with other districts such as Hilo.

NO FURTHER DEVELOPMENT:

This alternative would be contrary to the objectives of the County General Plan which calls for orderly growth. Keeping the area in "status quo" would mean no growth in employment, government services, taxes, and improvements on the infrastructures of the physical environment.

OTHER ALTERNATIVES TO RECOMMENDED COURSES OF ACTION:

Many other alternatives to the recommended courses of action contained in the Puna Community Development Plan were analyzed for each element. However, these alternatives either do not meet the goals and objectives of the County General Plan or are economically unfeasible and were therefore omitted.

Among the alternatives to the recommended courses of action are the following:

Natural Resources and Shorelines

1. Encourage the proliferation of exotic species of wildlife and plant life to take over the natural environment.
2. Discourage the geothermal project in Pohoiki.
3. Grant special rights to the shoreline and the land for native Hawaiians.

Environmental Quality

1. Control all pollutants in Puna by stricter codes and preventative measures.

Natural Beauty

1. Stop commercial harvesting of hapuu and ohia.

Floods, Volcanic, and Other Hazards

1. Develop Kalapana-Pohoiki coastline into high density uses such as industrial, commercial, and residential uses regardless of the possible hazards of volcanic eruptions and lava flows.

2. Disregard flooding problems in the Puna district inasmuch as these and other natural hazards either existed or were anticipated before development took place.

Historic Sites

1. Permit the destruction of historic sites on private property inasmuch as there is an unavailability of adequate government funds to acquire or to reconstruct all sites.

Public Facilities

1. Split Pahoa School into two or three locations rather than expand the existing school area to accommodate the elementary, intermediate, and high school facilities.
2. Expand Mt. View School land area to Department of Education standards.
3. Expand Keaau School land area to Department of Education standards.
4. Reverse the trend of centralizing schools and re-establish schools in various rural communities as the need arises. (Example: Keakealani School in Volcano)
5. Establish a high school in Keaau rather than in Pahoa as the centralized high school of the district for all Puna students.
6. Provide citizen police as an alternative to police protection if County funding is inadequate to provide this essential service.

Public Utilities

1. Provide County water at a lower rate to farmers to encourage agricultural development.
2. Explore possibility of hydroelectric power which is cleaner and less expensive than geothermal energy.
3. County to purchase HELCO and develop a cooperative.

ENVIRONMENTAL AND HISTORIC PRESERVATION CONCERNS

(cont.) Chapter 14

- County to assist in extending electrical services with funds set aside based on the prorated share of taxes generated from the people.
- HELCO to apply for Rural Electrification Administration funds to extend its sytem.

Transportation

- Plan various alternate routes through Pahoa town or none at all.
- Concentrate funds on improving the existing road network rather than building the scenic highway along the coast from Kalapana to King’s Landing.
- Consider old railroad beds as an alternative route for bicycle paths.
- Consider railroads as an alternate transportation mode in Puna. (Note: requires a comprehensive island-wide study.)

Recreation

Note: All of the recreation sites suggested by the community are listed in the development plan.

Large-Scale Subdivisions

- Concentrate new subdivision developments closer to Hilo.
- Tax absentee property owners at a higher rate than| residents.
- County to assist in upgrading the telephone and electrical systems in the subdivisions by applying for funds under the Rural Electrification Act.
- County to place a moratorium on large-scale subdivisions until all of the existing subdivisions are developed.
- County to buy back areas not yet developed in these subdivisions or place building moratorium to keep down the cost of providing services.

- Exempt agricultural subdivisions from meeting subdivision code of providing water and County dedicable roads.

Housing and Population

- Implement “no growth” controls.
- Subject all buildings planned for Pahoa to an urban design review before construction commences.
- Adjust building codes such as process time for variance; exempt native Hawaiians from compliance; and relax codes for low-income families.

Agriculture

- County to explore the possibility of converting rubbish and sewer to fertilizer.
- Use foreign immigrants as farm laborers.
- Develop plan for a system of windbreaks for papaya farmers.
- Prevent subdivision of existing large lots into smaller parcels by zoning these areas to higher minimum lot sizes such as A-100ac.

Urban Land Use

- Consider retreat-type hotels near Volcano.
- Consider neighborhood shopping centers in subdivisions such as Hawaiian Paradise Park.

THE RELATIONSHIP BETWEEN LOCAL SHORT–TERM USES OF MAN’S ENVIRONMET AND THE MAIN–TENANCE AND ENHANCEMENT OF LONG–TERM PRODUCTIVITY

The proposed courses of action in the Puna Community Development Plan involved trade-offs between long-term environmental productivity (gains) at the expense of short-term environmental losses.

Some of the most significant trade-offs are listed as follows:

Long-term Productivity:

- New roads and highways will reduce existing and future traffic congestion and thereby lessen the number of potential accidents.
- New by-pass roads will remove heavy concentration of through traffic from the Keaau, Kalapana, and Pahoa villages.
- Parks retard the encroachment of residential developments into the site and enhance the area by providing open space.
- Encouragement of the retention of existing large-scale subdivisions would discourage the development of houselots on prime agricultural land.
- Proposed actions provide for long-term productivity of resources of land, energy, and capital in concert with governmental agencies and the community.
- Short-term Environmental Losses:**
 - Highway projects may induce change in land use patterns which will, in turn, result in homes being built faster.
 - Agricultural lands in existing large-scale subdivisions would tend to remain idle due to the high cost and small size of individual lots.
 - Some agricultural lands would be removed from production with the construction of new roads and highways.
 - Some removal of existing homes may be necessary with the widening of existing roads or the construction of new parking lots or by-pass roads.
 - Some bird and wildlife habitats will be eliminated with the creation of new developments by virtue of the removal of brushess and trees.

ENVIRONMENTAL AND HISTORIC PRESERVATION CONCERNS

Chapter 14 (cont.)

ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES THAT WOULD BE INVOLVED IF THE PROPOSED PLAN SHOULD BE IMPLEMENTED

The commitments for improvements as specified in this plan include construction materials such as soil, rocks, select materials, asphalt materials, and concrete materials which are abundant in this County.

Some depletion of natural resources is foreseen by the actions recommended.

THE IMPACT OF THE PROPOSED PLAN ON THE LONG-TERM MAINTENANCE AND ENHANCEMENT OF NATIONAL REGISTER PROPERTIES

Presently, no sites in Puna are included in the National Register. The Puna Community Development Plan recommends that important sites be included. The Statewide Comprehensive Historic Preservation Plan can be used as a basis for registering significant sites in the National Register.

The Historic Sites element of this plan includes a detailed analysis of the impact of such a proposal and a listing of known historic sites in Puna.

A STATEMENT SETTING FORTH APPLICABLE FEDERAL, STATE, AND LOCAL CONTROLS FOR THE PROTECTING OF THE ENVIRONMENT AND FOR CONSERVING AND ENHANCING HISTORICAL PROPERTIES

Federal:

- Hawaii Volcanoes National Park
- Federal Register on Endangered Species of Wildlife and Plants
- National Register on Historical Sites
- Coastal Zone Management (CZM) Act

State:

- State General Plan

- Special Management Area under CZM
- Natural Area Reserves System
- Statewide Comprehensive Historic Preservation Plan
- State Land Use Laws
- State Forest Reserve System
- Environmental Impact Statement Regulations

County

- County General Plan
- County Zoning and Subdivision Codes
- Hawaii County Historic Preservation Commission
- County Grading Ordinance



IMPLEMENTATION PROGRAM

Chapter 15

ZONE GUIDE MAPS

Based on the review, analysis, and recommendations included in the elements of the General Plan and detailed in the land use chapter of this Puna Plan, the following changes to the existing zone maps are summarized:

Agriculture:

- Change A-lac. designation to SA-3ac. and SA-5ac. (Agriculture-Safety Districts with 3-acre and 5-acre minimum size lots) within the hazard zone F in Pohoiki to apprise land owners of the lands being situated on the Kilauea rift zone.
- Change existing A-20ac. lands now in sugar cane production to AI-20ac. (Intensive Agriculture with 20-acre minimum size lots).
- Change privately-owned Conservation lands in Kalapana and Hawaiian Paradise Park to A-lac. to recognize privately-owned lands suitable for subdividing to Agricultural subsistence lots.
- Designate all Agriculture and Open districts within the hazard zone F along the volcanic rift line as safety districts.

Single-Family Residential:

- Change existing agricultural-zoned lands around Pahoa village within the General-planned urban expansion and low density urban areas to RS-10 and RS-15 as the need arises.
- Change Hawaiian Beaches to Urban and RS-10 as it is substantially developed as a residential community.
- Change existing agricultural-zoned lands and existing industrial-zoned lands on the Volcano side of Keaau village to Residential RS-10 and RS-15 as an intermediate range plan (approximately ten years hence).
- Change the existing 20-ac. zone between Puna Sugar Mill and existing residential area along

Keaau Loop to RS-10 and RS-15 as a long-range plan (beyond 1985).

- Change existing urban expansion area to RS-15 Kurtistown as the need arises.
- Change existing RS-20 area in Kurtistown to higher density as the need arises.
- Change existing urban expansion and low density urban areas in and around Mt. View urban area to RS-10 or RS-15 to accommodate needs of the individual property owners.

Multi-Family Residential:

- Provide for multi-family uses in Planned Unit Developments in Pahoa and Keaau for sites 10 acres or larger.

Commercial:

- Expand commercial areas by five acres in Pahoa Village within the medium density area.

Industrial:

- Create industrial park between Hilo and Keaau.
- Eliminate industrial zoning in Keaau Village.

Resort:

- Create retreat resorts in Kalapana-Kaimu area in Pohoiki-Kapoho area and at Paipai Bay.

Open Space:

- Designate flood plain areas as Open Space once the area is established by the Federal Corps of Engineers.
- Create landscaping buffer zones along the Puna Coastal Road from Kalapana to Kapoho.

IMPLEMENTATION THROUGH EXISTING ZONING, SUBDIVISION, HOUSING, AND BUILDING CODES, AND OTHER APPLICABLE CODES

The Puna Community Development Plan is

conceived to function within the framework of all existing codes and standards. No deviation from these codes is required except for a few amendments which are detailed as follows:

Recommended Amendments

Zoning and Subdivision Codes:

- Relax water standards for agricultural lots. Subsequent to the recommendation, the Board of Water Supply amended its regulations to allow agricultural subdivisions of 6 lots or less, to use catchment water as an alternative in meeting water requirements.
- Designation of Keaau and Pahoa villages as ‘older communities’. Follow the historic district boundaries.
- Designation of the Iwasaki Camp and 9½ Mile Camp as “older communities” to maintain the plantation camp character of these areas.
- Utilize the “older community” concept to allow deviation from existing road and parking standards as determined by the Planning Director and Chief Engineer of the County to maintain the character of the area.
- Amendments to the zone maps as detailed under Zone Guide Maps.

Building, Health Codes:

- Permit “ecological toilets” as an alternate means of sewage disposal. These ecological toilets are a means of recycling toilet water and utilizing solid sewage for soil conditioners.
- Discourage building on the volcanic east rift zone by strict safety requirements.
- **Other Codes and Standards:**
 - Utilize minimum standards in building the Puna Coastal Road to minimize cost and to meet the demands of the public. Economy standards such as minimum right-of-way

IMPLEMENTATION PROGRAM

Chapter 15 (cont.)

acquisition, use of scenic easements in lieu of land acquisition, and minimum pavement and shoulder widths should be investigated.

RECOMMENDED SCHEDULE OF CAPITAL IMPROVEMENTS PROGRAM (CIP) 1976-1990

Inasmuch as the County Charter requires all capital expenditures to meet County General Plan proposals, the recommended schedule of capital improvements is an integral part for the effectuation of the Puna Development Plan. Since the inception of the Charter in 1968, the County has developed a annual capital improvements program. In the past, the capital improvements budget has called for about one million to seven million dollars of County funds annually.

In the Puna district, in considering the needed County projects, it is estimated that some 8.1 million dollars of County funds, together with 17.5 million dollars of State grants, Federal grants, and private funds, are required for the next fifteen years. This is approximately \$539,000 of County funds annually, a rather reasonable amount for the County to expend for the Puna district in light of existing revenues received. (3.5 million dollars of real property revenue was received from the Puna district in 1976 - 21% of the total County revenue received from real property.)

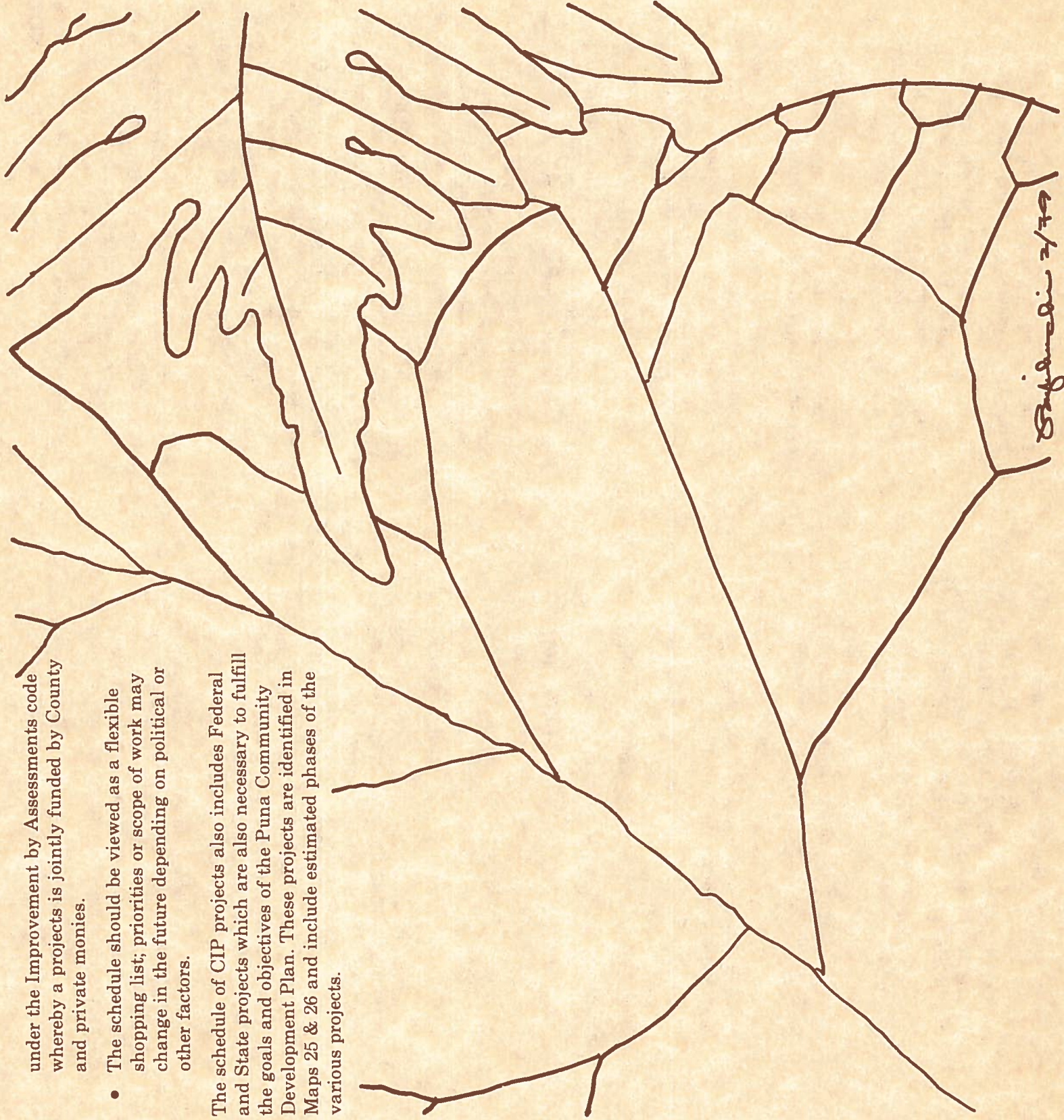
Together with the schedule, the following courses of action involving a coordinated effort among the County, other governmental agencies, and private property owners are necessary:

- County to actively seek Federal grants in meeting some of the monetary requirements. The County must assume the key role of "grantsmanship" in order to effectuate the Puna Plan.
- County to actively seek monetary assistance from private property owners who will benefit from any improvements. For example, many roads that need to be constructed can come

under the Improvement by Assessments code whereby a projects is jointly funded by County and private monies.

- The schedule should be viewed as a flexible shopping list; priorities or scope of work may change in the future depending on political or other factors.

The schedule of CIP projects also includes Federal and State projects which are also necessary to fulfill the goals and objectives of the Puna Community Development Plan. These projects are identified in Maps 25 & 26 and include estimated phases of the various projects.



IMPLEMENTATION PROGRAM
(cont.) Chapter 15

PUNA COMMUNITY DEVELOPMENT PLAN
IMPLEMENTATION PROGRAM
PROPOSED CAPITAL IMPROVEMENT PROGRAM 1979-1993
LOWER PUNA

I.D. NO.	PROJECT DESCRIPTION	TOTAL EST. COST	PHASE I	PHASE II	PHASE III	BEYOND 1993	SOURCE OF FUNDS*
			1979-83	1984-88	1989-93		
in thousands of dollars							
LOWER PUNA							
Federal Projects**							
F-1	Chain of Craters Road (under construction)		x				(F)
F-2	Post Office in Hawaiian Beaches			x			(F,P)
F-3	Post Office in Kalapana				x		(F,P)
State Projects**							
S-1	Pahoa School (Land acquisition, swimming pool, new classrooms, administration building)		x	x	x		(S)
S-2	MacKenzie Park (Expansion and camping sites)				x		(S)
S-3	Lava Tree Park (Expansion)				x		(S)
S-4	Kalapana Canoe Landing (Site improvements)		x				(S)
S-5	Kapoho Scenic Stops (2 sites along Kapoho-Pahoa Road)		x	x			(S)
S-6	Puna Scenic Stops (2 sites along Kalapana-Pahoa Road)		x	x			(S)
S-7	East Kaimu Wilderness Park (Site development)				x	x	(S)
S-8	Kehena Black Sand (Access acquisition and improvements)			x			(S)
S-9	Opihikao Beach (Reserve only)					x	(S)
S-10	Keonepoko Nui (Reserve only)					x	(S)
S-11	Honolulu Landing (Reserve only)					x	(S)
S-12	Waiahihula (Reserve only)					x	(S)

PUNA COMMUNITY DEVELOPMENT PLAN
IMPLEMENTATION PROGRAM
PROPOSED CAPITAL IMPROVEMENT PROGRAM 1979-1993
LOWER PUNA

I.D. NO.	PROJECT DESCRIPTION	TOTAL EST. COST	PHASE I	PHASE II	PHASE III	BEYOND 1993	SOURCE OF FUNDS*
			1979-83	1984-88	1989-93		
in thousands of dollars							
S-13	Kapohō Tidepools (Land acquisition & reserve)			x			(S)
S-14	Kalapana-Waipuku (Reserve only)				x		(S)
S-15	Green Lake (Land acquisition & reserve)			x			(S)
S-16	Kahuwai (Reserve only)			x			(S)
S-17	Bicycle Patha along State Highways below Pahoa Village (Route designation only)		x				(S)
S-18	Kalapana By-Pass Road (Construction)		x				(S,F)
S-19	Pahoa By-Pass Road (Construction)		x	x			(S,F)
County Projects							
Public Works							
CP-1	Pahoa Fire Station (Expansion for 24-hour service, including medical services)	50	50				(C)
CP-3	Kapoho Centralized Sewer System 1. Preliminary planning 2. Construction of sewer plant & feeder system, including improvement districts for Kapoho Beach Lots and Kapoho Vacationland	2,525	25	1,250	1,250		(C) (C,S,F,P)
CP-5	Kalapana By-Pass Road (Relocation of existing roadway to mauka side of Harry K. Brown Park)	500	500				(C,S)
CP-6	Puna Coastal Road (Kalapana-Koae Section) 1. Advance planning 2. Land acquisition & construction	6,500			800	5,700	(C,S,F)
CP-7	Bicycle Paths, Sidewalks within within Pahoa Village	170	170				(C,S)
CP-8	Pahoa Village Parking Lots (Land acquisition & improvements)	184		92	92		(C)

** - No estimated cost given for Fed. & State projects - X indicates only recommended priority and completion time.
* SOURCE OF FUNDS - (C) = COUNTY, (S) = STATE, (F) = FEDERAL, (P) = PRIVATE

IMPLEMENTATION PROGRAM

Chapter 15 (cont.)

PUNA COMMUNITY DEVELOPMENT PLAN
IMPLEMENTATION PROGRAM
PROPOSED CAPITAL IMPROVEMENT PROGRAM 1979-1993
LOWER PUNA

I.D. NO.	PROJECT DESCRIPTION	TOTAL EST. COST	PHASE I 1979-83	PHASE II 1984-86	PHASE III 1988-93	BEYOND 1993	SOURCE OF FUNDS*
Parks & Recreation							
CR-1	Leilani Estates Community Center (Privately-Run)						(P)
CR-2	Pahoa School Park (Continued Use)						(C)
CR-3	Pahoa Neighborhood Playground (Ballfields, Outdoor Courts, Tot Lot)	350	200	150			(C,S)
CR-4	Hawaiian Beaches Park (Additional ballfield, picnic area, restrooms, tennis courts, parking)	300		300			(C,S)
CR-5	Kalapana Community Park (Land acquisition, community center)	600			600		(C,S)
CR-6	Opihikao Playground (Reserve only - former school site)						(C,S)
CR-7	Puna Neighborhood Park (Nanawale Estates Subdivision) (Reserve only)						(C,S,P)
CR-8	Harry K. Brown Park (Expansion of existing facilities)	50		50			(C,S)
CR-9	Kalapana Beach Regional Park (Picnic areas, restrooms, parking)	1,300		650	650		(C,S,F)
CR-10	Kaimu Beach Park (Restrooms)	75		75			(C)
CR-11	Isaac Hale Park (New restrooms, pavilion, picnic area)	300	300				(C,S,F)
C-12	Queen's Bath (Land acquisition, historical park)	300	300				(C,S)
CR-13	Golf Course in Lower Puna (Planning, site selection, construction)	400			20	380	(C,S,F)
Department of Water Supply							
CW-1	Keaau-Pahoa Water Line (Lower Puna Section)	400		400			(S)
Improvement Districts							
ID-1	Pahoa Village Roadways (Improving existing roads in village)	158		90	68		(C,S,P)

*SOURCE OF FUNDS - (C) = COUNTY, (S) = STATE, (F) = FEDERAL, (P) = PRIVATE

PUNA COMMUNITY DEVELOPMENT PLAN
IMPLEMENTATION PROGRAM
PROPOSED CAPITAL IMPROVEMENT PROGRAM 1979-1993
UPPER PUNA

I.D. NO.	PROJECT DESCRIPTION	TOTAL EST. COST	PHASE I 1979-83	PHASE II 1984-86	PHASE III 1989-93	BEYOND 1993	SOURCE OF FUNDS*
in thousands of dollars							
UPPER PUNA							
State Projects							
S-20	Keauu School (New classrooms, administration building, parking)		x	x	x		(S)
S-21	Mt. View School			x	x		(S)
S-22	Keakealani Outdoor Recreation Center						(S)
S-23	Bicycle Paths (Along Volcano Rd. & Pahoa Rd.)		x	x	x		(S,F)
S-24	Kaloli Pt. (Reserve only)						
S-25	Papai Bay (Reserve only)						
S-26	Haena Bay (Reserve only)						
S-27	Keauu Village By-Pass Road			x	x		(S,F)
County Projects							
Public Works							
CP-6	Puna Coastal Road (Kaoe to King's Landing section) - 15 miles Advance planning	7,900	300				(C,S,F)
	Construction, land acquisition			3,800	3,800		
CP-10	Keauu Civic Center Expansion (Land acquisition to expand area to 1 ac.)	40	40				(C,S)
CP-11	Keauu Base Yard	175	175				(C,S)
CP-12	Kulani-Paradise Park Loop Road (County/Improvement District** project)			584			(C,S,P)
	1. Land acquisition	584			1,200	3,600	(C,S,P)
	2. Road improvements	4,800					
CP-13	Glenwood Land Fill	30	30				
CP-14	Glenwood Transfer Station	30	30				
CP-15	Kulani Transfer Station	30	30				
CP-16	Wright Road Drainage Study	30	30				(C)
CP-17	Hawaiian Acres/Orchid Land Est. Drainage Study	50	50				(C,S)
CP-18	Bicycle Paths/Pedestrian Walkways/ Sidewalks in Keauu Village	90	55	35			(C,S)
CP-19	Keauu Village Parking Lots (Land acquisition of two 1/2-acre parcels and improvements)	184			184		(C)
CP-20	Mt. View Drainage	4,475	2,250	2,225			(C,S)
**1/3	County and 2/3 property owner participation						

*SOURCE OF FUNDS - (C) = COUNTY, (S) = STATE, (F) = FEDERAL, (P) = PRIVATE

IMPLEMENTATION PROGRAM
(cont.) Chapter 15

PUNA COMMUNITY DEVELOPMENT PLAN
IMPLEMENTATION PROGRAM
PROPOSED CAPITAL IMPROVEMENT PROGRAM 1979-1993
UPPER PUNA

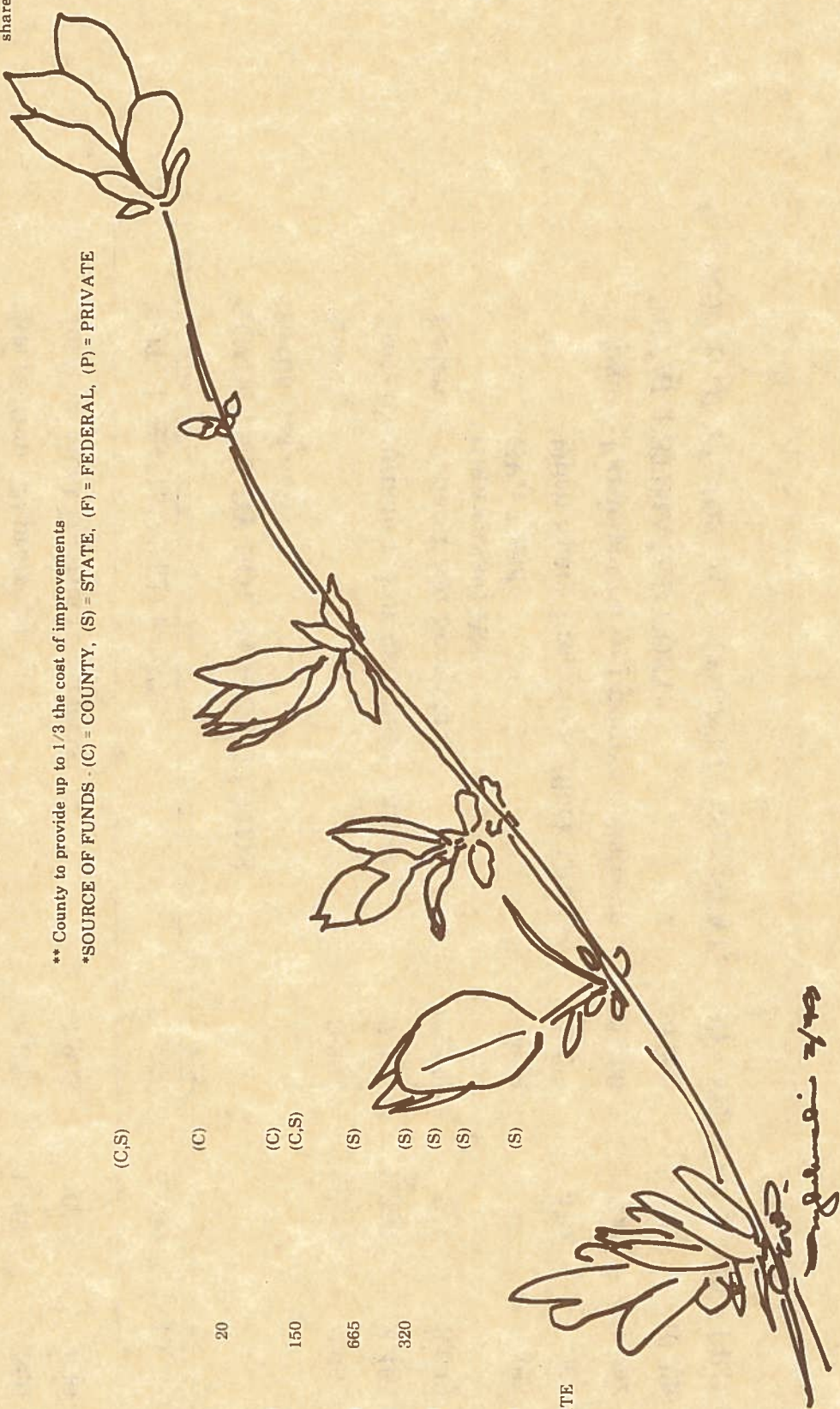
I.D. NO.	PROJECT DESCRIPTION	TOTAL EST. COST	PHASE I 1979-83	PHASE II 1984-88	PHASE III 1988-93	BEYOND 1993	SOURCE OF FUNDS*
in thousands of dollars							
Parks & Recreation							
CR-15	Keaau School Playground (Continued use of gymnasium, tennis court, and parking)						
CR-16	H.C. Shipman Park (formerly Keaau Park) (Tennis, volleyball, basketball courts; new softball field, jogging paths, tot lot, renovation of baseball field, & parking lots)	500	265	235			(C,S,F)
CR-17	Kurtistown Park (Additional tennis court)	20			20		(C)
CR-18	Ed Watt Park (Tennis courts)	40		40			(C)
CR-19	Mt. View School Park (Continued use of basketball court and playfield)						
CR-20	Glenwood Park (Continued use of pavilion, restrooms, and small field)						
CR-21	Volcano Playground (Proposed park w/ pavilion, athletic field, tot lot, parking)	500	500				(C,S)
CR-22	Hawaiian Paradise Neighborhood Park (Site selection, advance planning)	20			20		(C)
CR-23	Keaau Village - Passive Park for Elderly Land acquisition Improvements	50 150		50	150		(C) (C,S)
Department of Water Supply							
CW-1	Keaau to Pahoa Water Line (Upper Puna Section)	1,330		665	665		(S)
CW-2	Huina Road Water Line Improvements	320			320		(S)
CW-3	Kukui Camp Water Line Improvements	200		200			(S)
CW-4	Up-dating Pumps in Olaa-Mt. View System	460	460				(S)
CW-5	New Source Study & Development Upper Puna Area	600	300	300			(S)

*SOURCE OF FUNDS - (C) = COUNTY (S) = STATE (F) = FEDERAL (P) = PRIVATE

PUNA COMMUNITY DEVELOPMENT PLAN
IMPLEMENTATION PROGRAM
PROPOSED CAPITAL IMPROVEMENT PROGRAM 1979-1993
UPPER PUNA

I.D. NO.	PROJECT DESCRIPTION	TOTAL EST. COST	in thousands of dollars				SOURCE OF FUNDS*
			PHASE I 1979-83	PHASE II 1984-88	PHASE III 1989-93	BEYOND 1993	
Improvement Districts							
ID-2	Various Roads in Large-Scale Subdivisions**	900	100	100	100		(C,P) (County's share)
	Revolving Fund		200	200	200		(Property owners' share)
ID-3	Improvement to Existing Camps**	900	100	100	100		(C,P) (County's share)
	Revolving Fund		200	200	200		(Property owners' share)

** County to provide up to 1/3 the cost of improvements
*SOURCE OF FUNDS - (C) = COUNTY, (S) = STATE, (F) = FEDERAL, (P) = PRIVATE



IMPLEMENTATION PROGRAM
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PUNA COMMUNITY DEVELOPMENT PLAN
IMPLEMENTATION PROGRAM
PROPOSED CAPITAL IMPROVEMENT PROGRAM 1979-1993

SUMMARY COUNTY PROJECTS (LESS WATER PROJECTS)

I.D. NO.	PROJECT DESCRIPTION	TOTAL EST. COST	PHASE I 1979-83	PHASE II 1984-88	PHASE III 1989-93	BEYOND 1993	SOURCE OF FUNDS*
in thousands of dollars							
(in 1977 dollars)							
SUMMARY BY USES: (Estimates only)							
	Public Works (27 projects)	28,347	3,735	7,986	7,326	9,300	(C,S,F,P)
	Recreation (20 projects)	4,955	1,565	1,550	1,460	380	(C,S,F,P)
	Improvement District (2 projects)	1,958	600	690	668		(C,P)
TOTAL ESTIMATED COST:		35,260	5,900	10,226	9,454	9,680	

SUMMARY BY SOURCE OF FUNDS:
(Estimates only)

County	9,333	2,735	2,952	2,401	1,245
State (Grants-in-aid or matching funds)	7,892	2,350	2,457	1,840	1,245
Federal - Federal Aid Secondary Highways (FAS)	10,680	-0-	3,040	3,040	4,600
- EPA Funds	950		625	325	
- Open Space Programs, Block Grants	1,205	415	300	300	190
Private - Participation in Improved Districts	5,200	400	852	1,548	2,400
TOTAL ESTIMATED COST:	35,260	5,900	10,226	9,454	9,680

* SOURCE OF FUNDS - (C) = COUNTY, (S) = STATE, (F) = FEDERAL, (P) = PRIVATE

CITIZEN PARTICIPATION

Chapter 16

CITIZEN PARTICIPATION IN THE PUNA COMMUNITY DEVELOPMENT PLAN

Citizen participation in planning is essential under our democratic system. It is consistent with specific programs emerging from Washington, and with the Hawaii State and County efforts to insure that public input is sought in the planning process¹ Indeed, the communicative process in human interaction is not only necessary, it is a human need and right that must be provided for, and maintained on local, national, and international levels.² Although the human Right to Communicate is being sought on a global basis, the soundness of this right must begin with effective interpersonal interaction taking place on the local level, regarding planning and other types of decisions that will affect the environment of a community, and consequently, the fabric of the lives of those living in that community.

The Puna Community Development was developed with this notion as one of its primary foci, in arriving at its recommendations for the development of the district of Puna.

PURPOSE OF CITIZEN PARTICIPATION

Although planning theory has always advocated active citizen participation, 'no city has yet measured up to its responsibilities in achieving overall citizen participation.'³ In fact, in many past cases, unfavorable public reactions to government proposals are not heard or discovered until the public hearing stage, which indicates that public input is being considered at the end of the planning process rather than at the beginning where it should be. It follows then, that it is not uncommon to sense that feelings of mutual mistrust between the governed and the local governments, in general, exist.

One of the objectives of the planners for the Puna Community Development Plan was to establish effective communication between the planners, the elected and appointed officials of the Hawaii County, and the residents of the district of Puna. It was felt that through effective citizen participation, sufficient community input could be made in the early stages

of the planning process, and an understanding of the government's role of making decisions could be gained.

PRINCIPLES FOR EFFECTIVE CITIZEN PARTICIPATION

In developing the format for citizen participation in Puna, a number of communication principles had to be taken into account. Some of these principles pertained to the needs and goals of the citizens, planners, and county officials; others, to the levels of interaction that would be experienced, and the nature of those types of interaction. In short, there was a need to "organize" the meetings in the Puna district to gain as much input, from as many socio-economic and ethnic groups of the Puna District, as possible.

The principles taken into account in formulating the citizen participation format are briefly described below:

- **Needs and Goals:** The general concept of human needs has been the subject of recent inquiry and advocacy here in Hawaii and elsewhere in the world.⁴ Although there are many interpretations from a field of disciplines on this concept, perhaps the work of psychologist Maslow constitutes an often cited number of human needs. He identifies and orders basic needs as: 1) physiological needs such as air, water, food, shelter, sleep; 2) safety and security needs; 3) social needs; and 4) prestige/esteem needs.⁵ These needs as well as the need to communicate to exchange insights and perceptions are basic in planning for, and in understanding the planning of, a district.
- **Levels of Interaction:** It is always useful to examine the levels of communication that are to be predominantly utilized in any planning process. These levels include: 1) interpersonal communication (one-to-one communication); 2) small group communication (one-to-several communication); 3) organizational communication (institutional communication); 4) public communication (one-to-many

communication); and 5) mass communication (communication via the media).⁶

- **Nature of Interaction:** The nature of interpersonal communication is often described as dyadic or one-to-one interaction. Often this type of interaction will function according to basic roleset (one-to-one) patterns to accomplish goals in the "task dimension" and/or in the "social dimension."⁷ For example, in a situation where there is one-to-one communication to accomplish a given task, we have traditional ways that we communicate with our colleagues (balanced dyad) and ways in which we communicate with a person more stylized or expert in a task than we are, such as our communication with our doctors or our bosses (unbalanced dyad). Both modes of behavior are behavioral norms developed on an interpersonal basis to facilitate accomplishing the tasks with those who are in our individual occupations (balanced dyad), or behavioral norms that prepare us to interact with those who are not familiar with the concepts of our occupation (unbalanced dyad). However, both the balanced and unbalanced dyads or interaction patterns originally utilized to accomplish a task can soon become unique. As we function in our traditional task dimensions, we begin to relate to others on a social level, causing the dyad or interaction pattern to change from a task orientation to one which now includes the "social dimension." In planning, it is important that the task gets accomplished, but not in a way that would give the citizens a feeling that they do not have enough stylization or expertise to accomplish the planning task; especially since, in reality, there is a mutual exchange of community perspectives and technical ones. Also important, is the notion that obtaining the social dimension is important to keep the '**esprit de corps**' of the planning groups, but not in lieu of accomplishing the task. Both these dimensions,

CITIZEN PARTICIPATION

Chapter 16 (cont.)

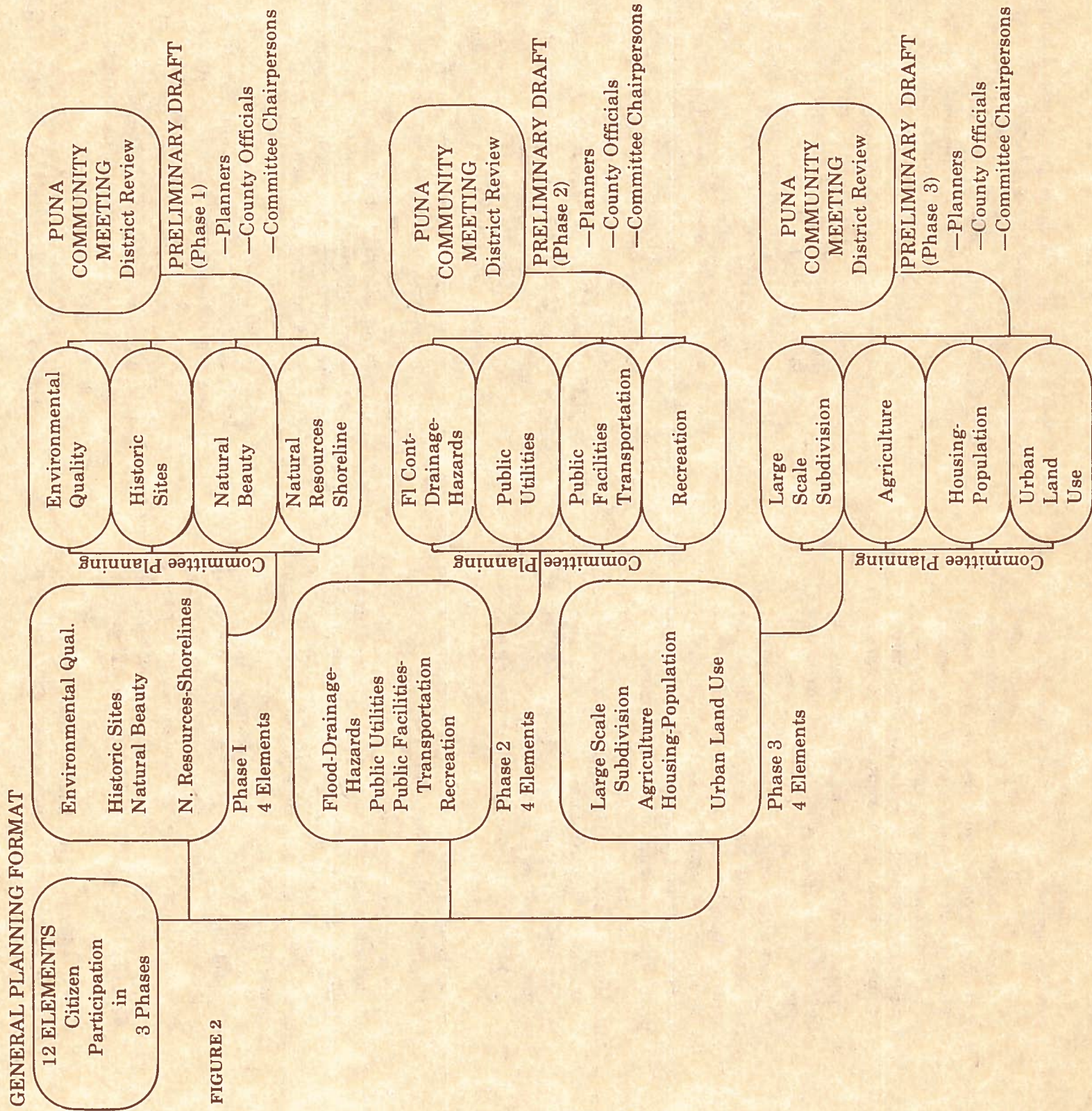
therefore, should be obtained and maintained in the interpersonal interaction among planners, citizens, and County officials.

Small group communication strives to accomplish tasks that cannot be accomplished by individuals alone. However, in order to function effectively, a group must resolve the following problems: 1) accomplishing its task, 2) maintaining its social environment, and 3) stabilizing the groups by a suitable means of identifying group leaders and the roles of its participants. In planning for citizen participation, then, the format must be structured in a manner that would help to create both the task and social dimensions; a type of interaction that would encourage the shy or withdrawn and limit the possibility of having persistent or outspoken individuals or organized cliques dominate the meetings.

These were the basic principles that were identified and discussed before arriving at the planning format that was to be used in the Puna planning meetings.

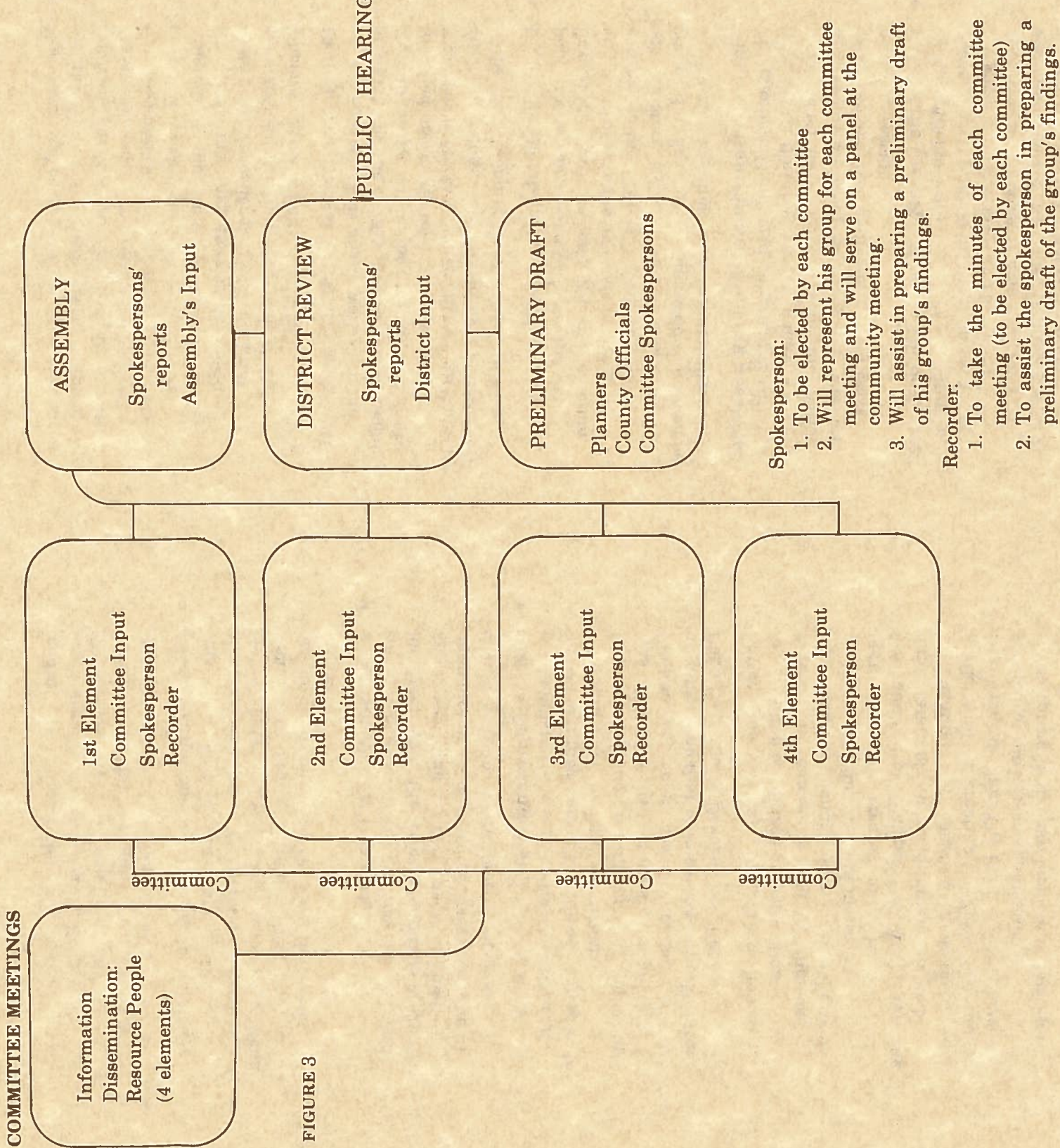
A SYSTEM FOR CITIZEN PARTICIPATION IN PUNA

- **District Divided for Maximum Planning:** Puna, it was decided, should be divided into at least two major areas for greater efficiency in planning. Therefore, the Puna District was divided into Upper and Lower Puna, using the school districts as a general dividing line. The Pahoia Civic Center was used as the planning center for Lower Puna, and Mt. View School was used as the planning center for Upper Puna.
- **General Planning Format:** The chart designated figure 2 depicts the general planning format for citizen participation that was designed to gain citizens' input from Upper and Lower Puna.



CITIZEN PARTICIPATION

(cont.) Chapter 16



- **General Plan Divided:** As indicated on the chart, the twelve major elements of the General Plan were divided into three major groupings of four elements. This meant that the residents of Puna would be able to evaluate and make recommendations on at least four elements per month.
 - **Procedure:** The procedure used to inform the residents of Puna about each of the elements they would evaluate; was as follows: 1) handouts that provided background information found in both the General Plan and the General Plan Implementation Manual were mailed to each participant; 2) whenever possible, participants were provided with specific information they desired; and 3) resource people that could provide more information on each of the elements discussed were invited to attend the planning sessions.
- Each participant was then asked to select a committee that he⁸ was interested in to discuss, evaluate, and make recommendations regarding a particular element. Each group was asked to select 1) a spokesperson who would report to all participants at the end of every planning session what their specific group had discussed, and 2) a recorder who would record the pertinent points brought out by his group.
- **Assembly:** Since the assignment to a specific committee meant that a participant may miss discussing and making recommendations regarding three other elements, the requirement for an "assembly" became evident. The assembly would be called after each planning session. At these assemblies, the spokesperson of each committee would report on the deliberations of his group. After each group report, an individual in the assembly could include his recommendations regarding any of the four elements discussed (see figure 3 for committee meeting format).

CITIZEN PARTICIPATION

Chapter 16 (cont.)

- **Community Meetings:** At the end of each month, the four spokespersons from Upper Puna and the four spokespersons from Lower Puna represented their respective areas at the General Puna Community Meeting that was held at Keaau School, a central point for residents of Upper and Lower Puna. At these community meetings, the residents of Puna could gain a broader perspective on the recommendations that were made by both Upper and Lower Puna residents,
- **Preliminary Drafts:** The final responsibility of each spokesperson was to work with the planners and the county members in developing a preliminary draft on the four elements that they had previously reported on at the Community Meeting. Three of these preliminary drafts, therefore, would constitute the first draft of the Puna Community Development Plan.
- **Round Table Discussion Groups:** At each planning session, round table groups were formed to: 1) provide better group interaction, and 2) encourage the opinions of shy or withdrawn individuals. This design was selected since group network studies have shown that the greatest interaction and member satisfaction is gained from the circle network.⁹
- **Planner's Roles in the Planning Sessions:** The planners 1) provided participants with the information that they needed to make their recommendations; 2) recorded the information provided by the group that they were working with; and 3) served as facilitators for each planning session.
- **Role of the County Officials:** The designated County officials were present at all planning sessions to: 1) provide information needed by the participants; 2) keep abreast of all developments in order to help with the writing and circulation of the Puna Newsletter; and 3) support the citizen participation program in general.

- **Media:** The Tribune-Herald newspaper and the local radio stations (KHLO, KIPA and KPUA) supported the Puna Community Development Plan through their reports and announcements of the Puna meetings.
- **Written Input Sought:** In order to provide an opportunity for those not attending the planning sessions or the community meetings, a periodic letter and work sheet were sent to Puna residents so they could mail in their input on any or all of the twelve elements that were discussed.
- **Puna Newsletter:** This mode of communication was the primary channel used for: 1) reporting the recommendations of Upper and Lower Puna to the residents of Puna; 2) announcements of scheduled meetings; and 3) communication among the participants.
- **Citizen Representation:** Upper Puna: A personal letter was sent by the County to all known organizations of the Upper Puna area to inform them of the Puna Community Development Plan. An interpersonal follow-up was made after the first meeting with Upper Puna to generate names of individuals or organizations that were willing to work on the Puna Community Development Plan.

Lower Puna: The Puna Council which is an organization comprised of many other associations representing ethnic, religious, regional, professional, and educational groups was contacted initially and invited to participate in the creation of the Puna Community Development Plan. At this meeting, other names of interested individuals and organizations were sought to invite their participation in creating the Puna Community Development Plan. The Puna Council, however, was one of the larger organizations participating in the development of this Plan.

EVALUATION OF THE CITIZEN PARTICIPATION IN PUNA

- **Necessity For Community Participation:**

As indicated earlier in the chapter, specific programs on the national, state, and local levels have provided for community participation. The necessity and right of every citizen to participate in the planning of his community should be one of the primary objectives of each County planning venture.

Certainly, in the case of Puna, over two hundred residents participated in helping to develop the Puna Community Development Plan. Of this group, there were more than twenty-four spokespersons and recorders, respectively.
- **Benefits of Community Participation:**

When community participation becomes an essential part of the planning process, there are many apparent advantages. The following are some of the advantages experienced: 1) the County officials and planners, having participated with the residents of Puna in their deliberations, are more cognizant of the rationale behind the conclusions reached by the community participants; 2) the County officials and planners were able to obtain direct and invaluable insights into the beliefs, attitudes, and values of the Puna residents; 3) the Puna residents were able to gain better authentication with County officials and planners through an interpersonal exchange rather than through impersonal means. Consequently, better rapport and understanding developed; 4) The participants, having experienced opposing arguments became more sensitive to the difficult decisions elected officials are required to make; and 5) greater understanding took place among the County officials, the planners, and the county members.

FOOTNOTES

¹William Goodman and Eric C. Freund, eds., **Principles and Practice of Urban Planning**. (Washington D. C.: International City Managers' Association, 1968) pp. 565-582.
See also: **The Citizen and the Planning Process: Understanding the System** (Honolulu, Hawaii: League of Women Voters of Honolulu, 1974) pp. 1-13
The contract between the Hawaii County and planning consultants also includes the following requirement: 'Organize a planning citizen group, with the assistance of the Planning Department, to work closely and directly with the consultants on a sustained basis. Alternative methods for increasing the level of citizen participation shall be sought.'

²L.S. Harms. **Human Communication: The New Fundamentals**. (New York: Harper and Row Publishers, 1974), 384 pages.

Richard J. Barber, et. al. **Issues in Communication Planning for Hawaii** (An occasional paper of the Hawaii Research Center for Futures Study, Honolulu, Hawaii, 1975), 50 pages.

³Goodman, **op cit.**, p. 567
⁴Barber, et. al. p. 5
⁵Abraham Maslow. **Motivation and Personality** (New York: Harber and Row, 1970).

⁶Franklin H. Knower. 'What Do You Mean - Communication?'" **Central States Speech Journal**, XXI, No. 1 (1970)/

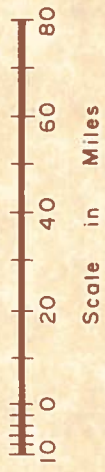
⁷George A. Borden, et. al. **Speech Behavior and Human Interaction**. (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1969) pp. 103-126.

⁸The pronoun 'he' used throughout this report also includes the feminine counterpart, and should be interpreted as such.

⁹Barry E. Collins and Harold Guetzkow. **A Social Psychology of Group Processes for Decision-Making** (New York: John Wiley and Sons, Inc., 1964), p. 205.

PUNA

PLATE 1 LOCATION MAP

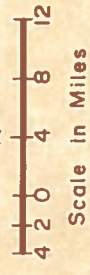


STATE OF HAWAII



KAHOOLAWE

HAWAII



ISLAND OF HAWAII

PLATE 2 TOPOGRAPHY

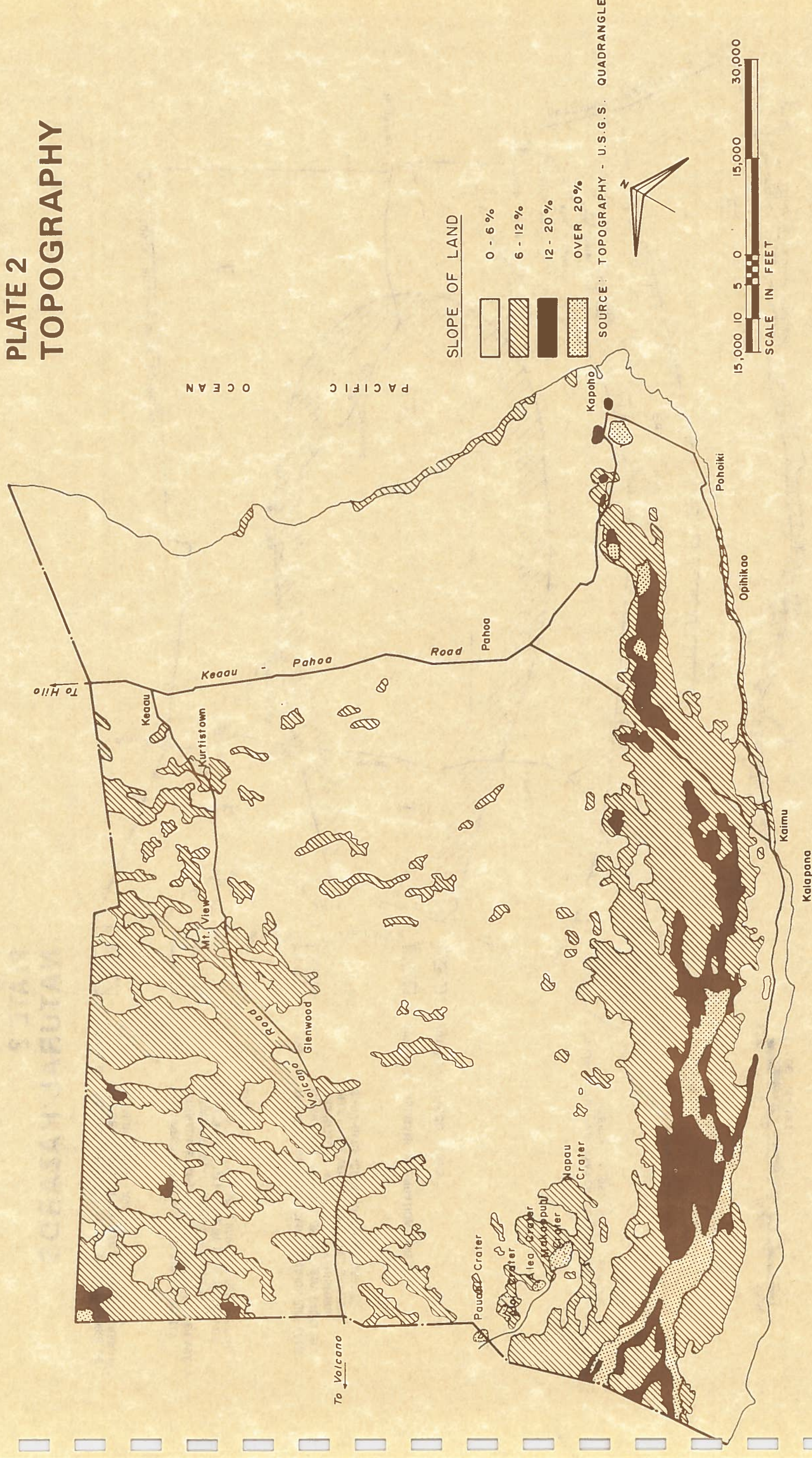


PLATE 3 NATURAL HAZARDS

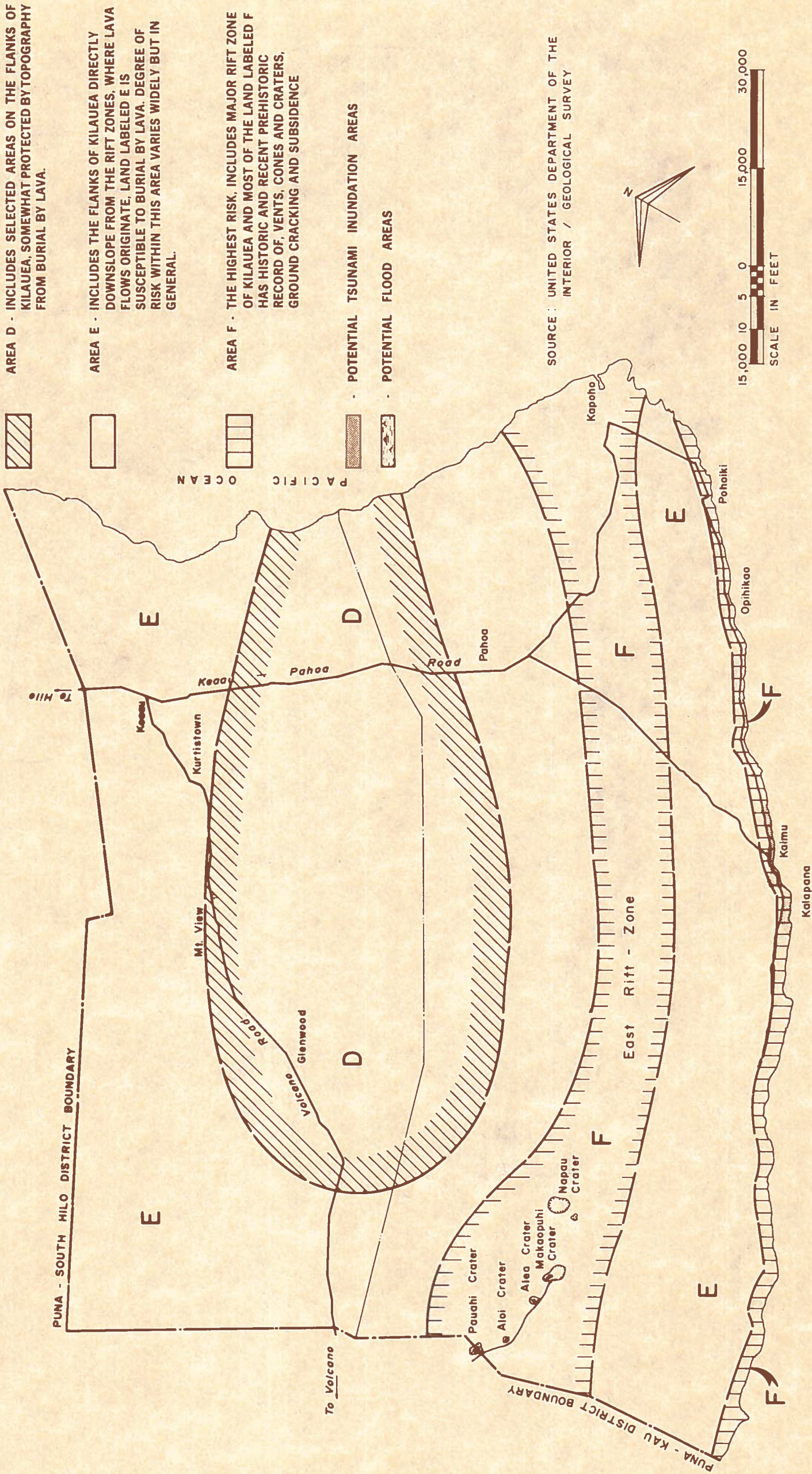


PLATE 4 GENERAL SOIL MAP

- 1

LAVA FLOWS ASSOCIATION: GENTLY SLOPING TO STEEP, EXCESSIVELY DRAINED, NEARLY BARREN LAVA FLOW; ON UPLANDS
- 2

KEKAKE-KEEI-KILOA ASSOCIATION: VERY SHALLOW, GENTLY SLOPING TO STEEP, WELL-DRAINED ORGANIC SOILS OVER Aa OR PAHOEHOE LAVA; ON UPLANDS
- 3

HANIPOE-MAILE-PUU Oo ASSOCIATION: DEEP GENTLY SLOPING TO STEEP, WELL-DRAINED SOILS THAT HAVE A MEDIUM-TEXTURED TO MODERATELY FINE TEXTURED SUBSOIL; ON UPLANDS
- 4

AKAKA-HONOKAA-KAIWIKI ASSOCIATION: DEEP, GENTLY SLOPE TO STEEP, MODERATELY WELL DRAINED AND WELL DRAINED SOILS THAT HAVE A MODERATELY FINE TEXTURED SUBSOIL; ON UPLANDS



75"



PLATE 6 LAND OWNERSHIP

- PRIVATE - 172,234 + Acs.
- PUBLIC LANDS -
- FEDERAL - 61,550 + Acs.
- STATE - 77,800 + Acs.
- COUNTY - 50 + Acs.
- HAWAIIAN HOMES - 1966 + Acs.

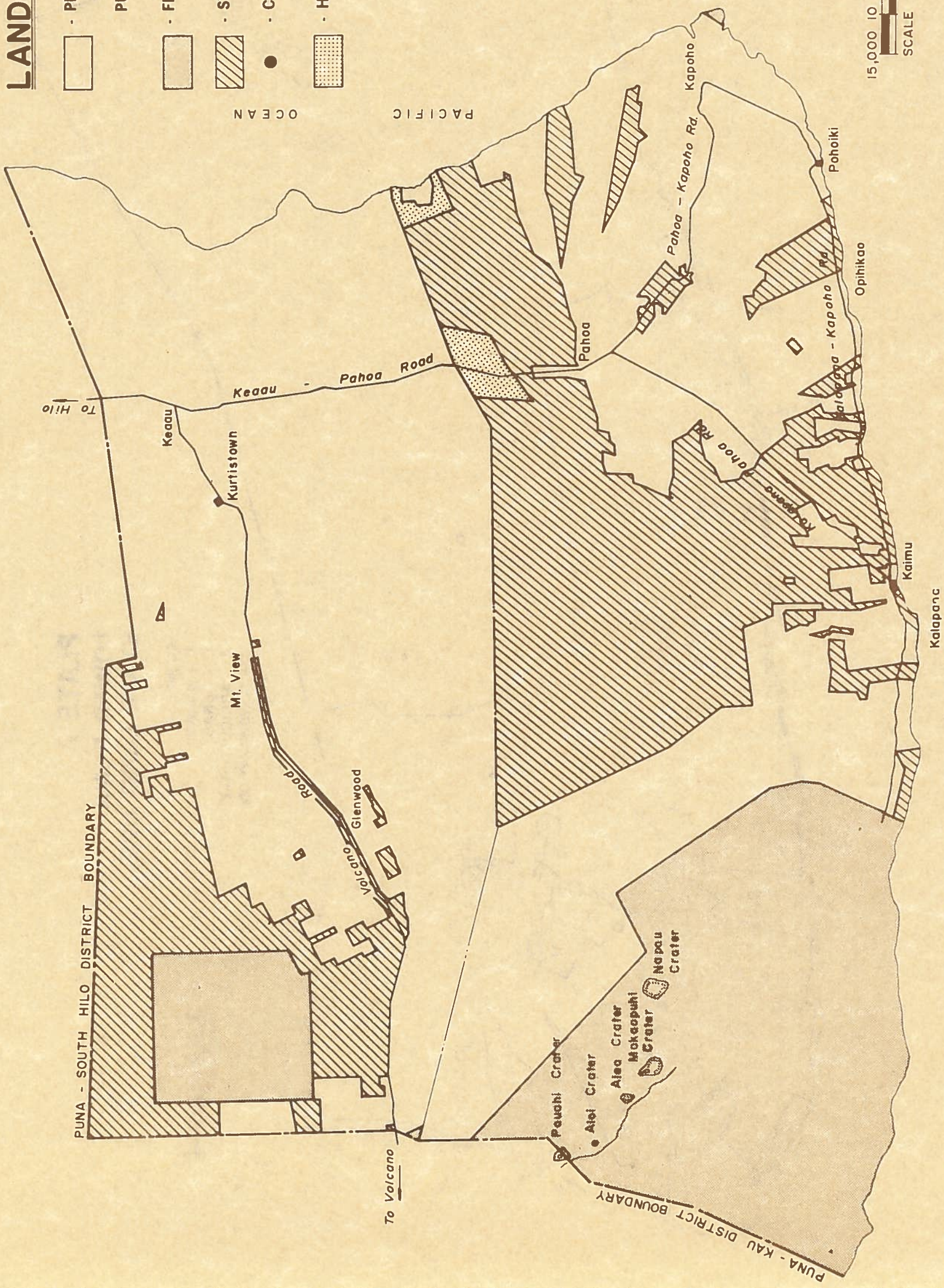
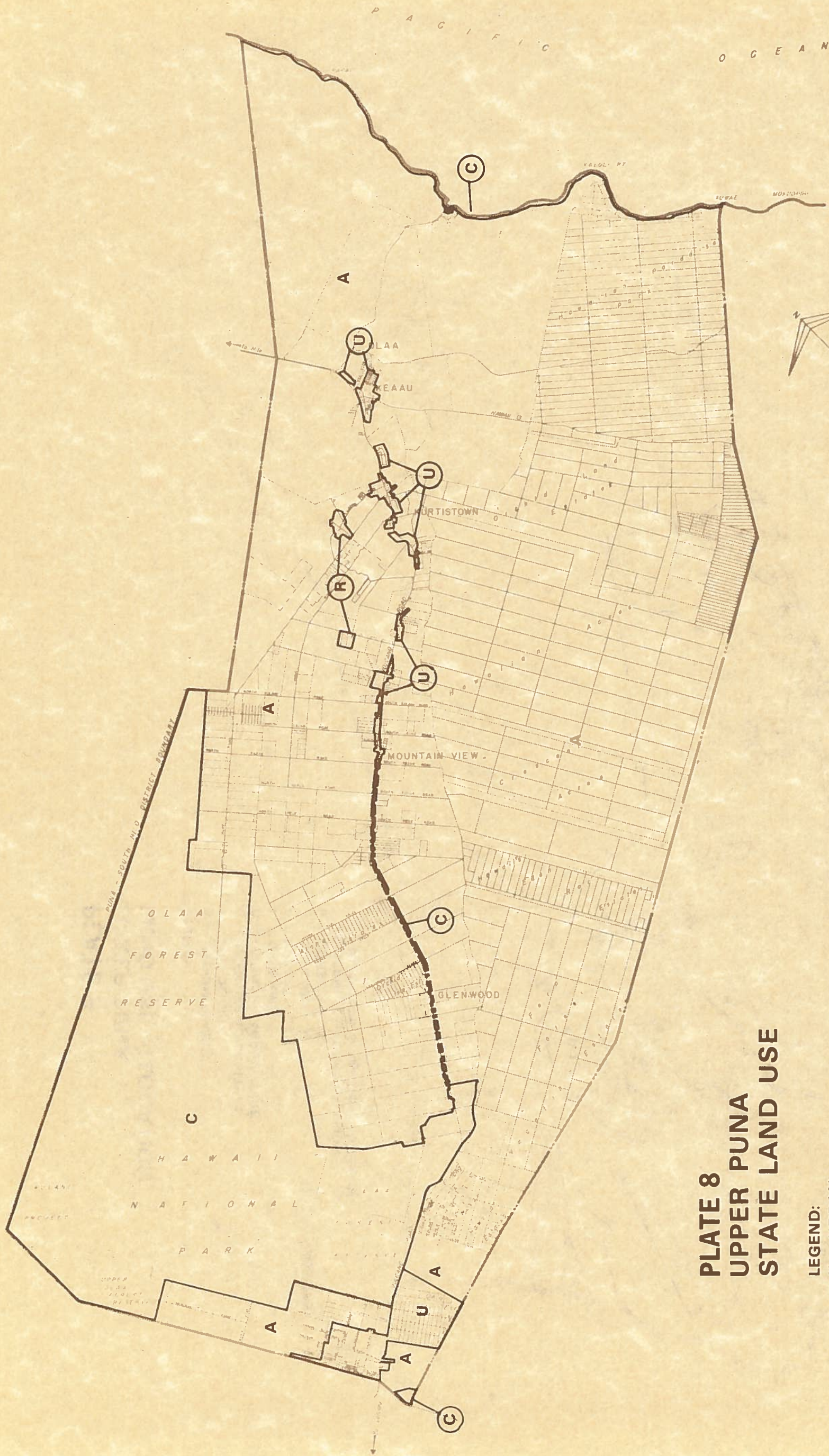


PLATE 7 **LOWER PUNA** **STATE LAND USE**

- LEGEND:**
 U — URBAN
 R — RURAL
 A — AGRICULTURAL
 C — CONSERVATION





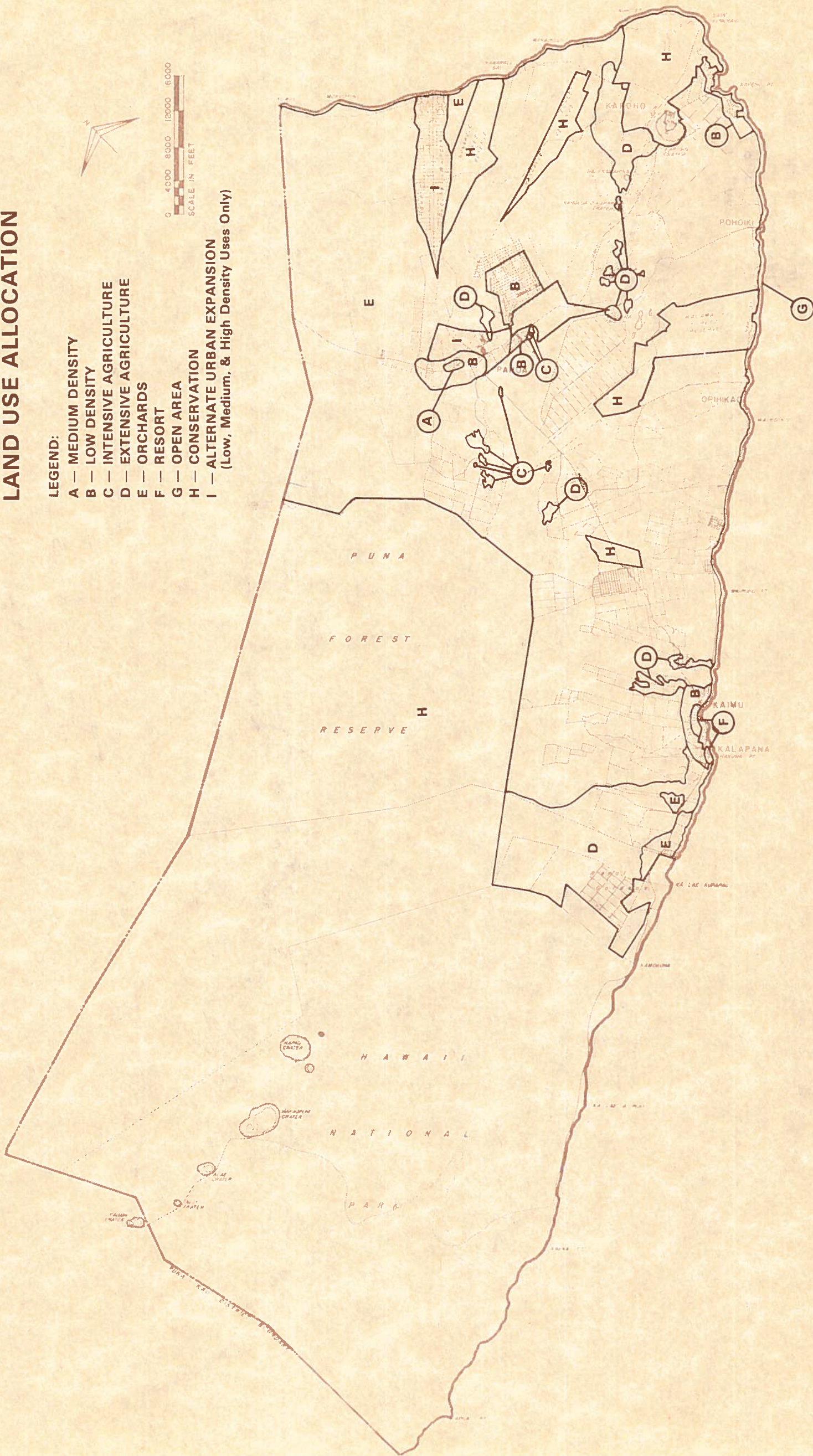
**PLATE 8
UPPER PUNA
STATE LAND USE**

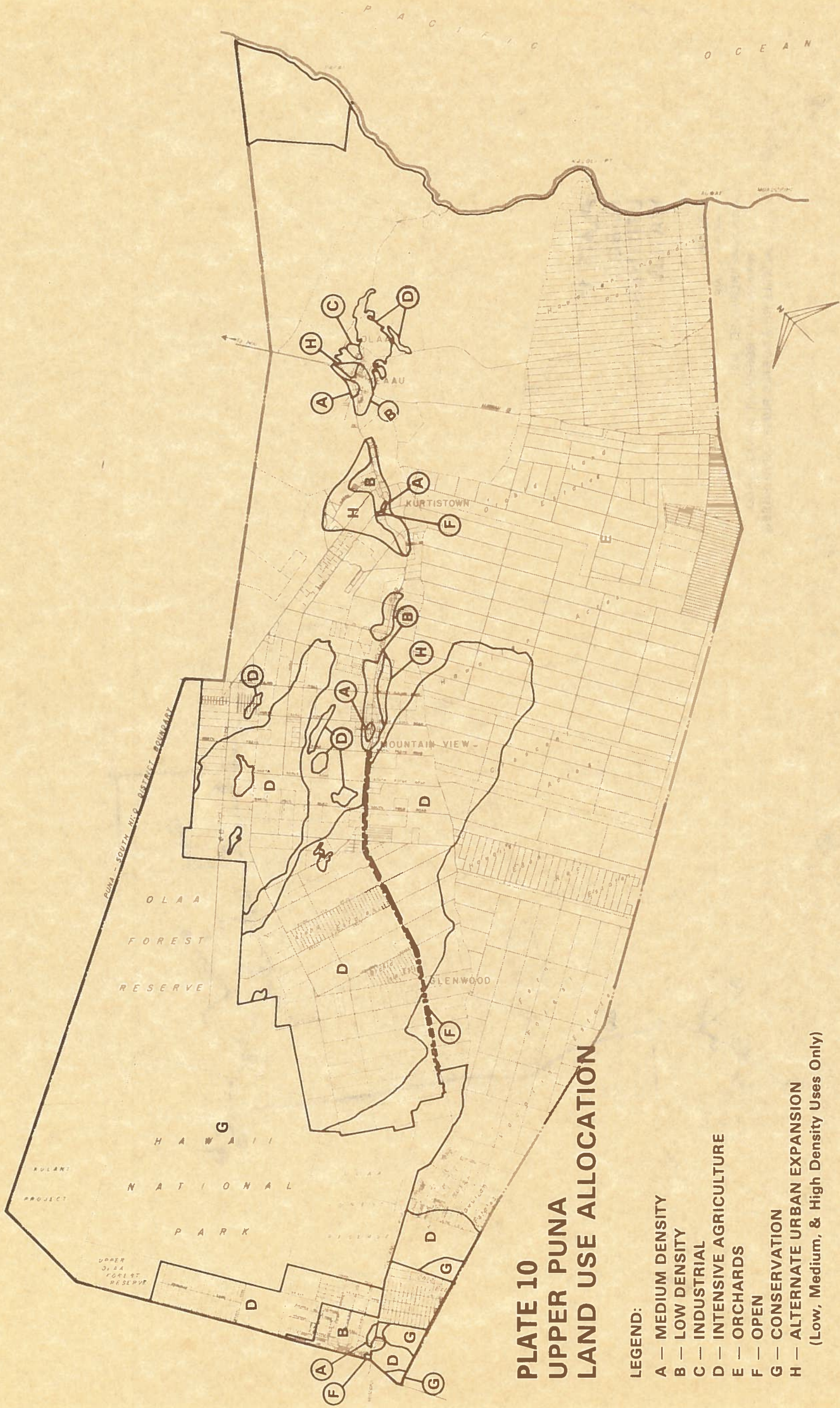
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U — URBAN
R — RURAL
A — AGRICULTURAL
C — CONSERVATION

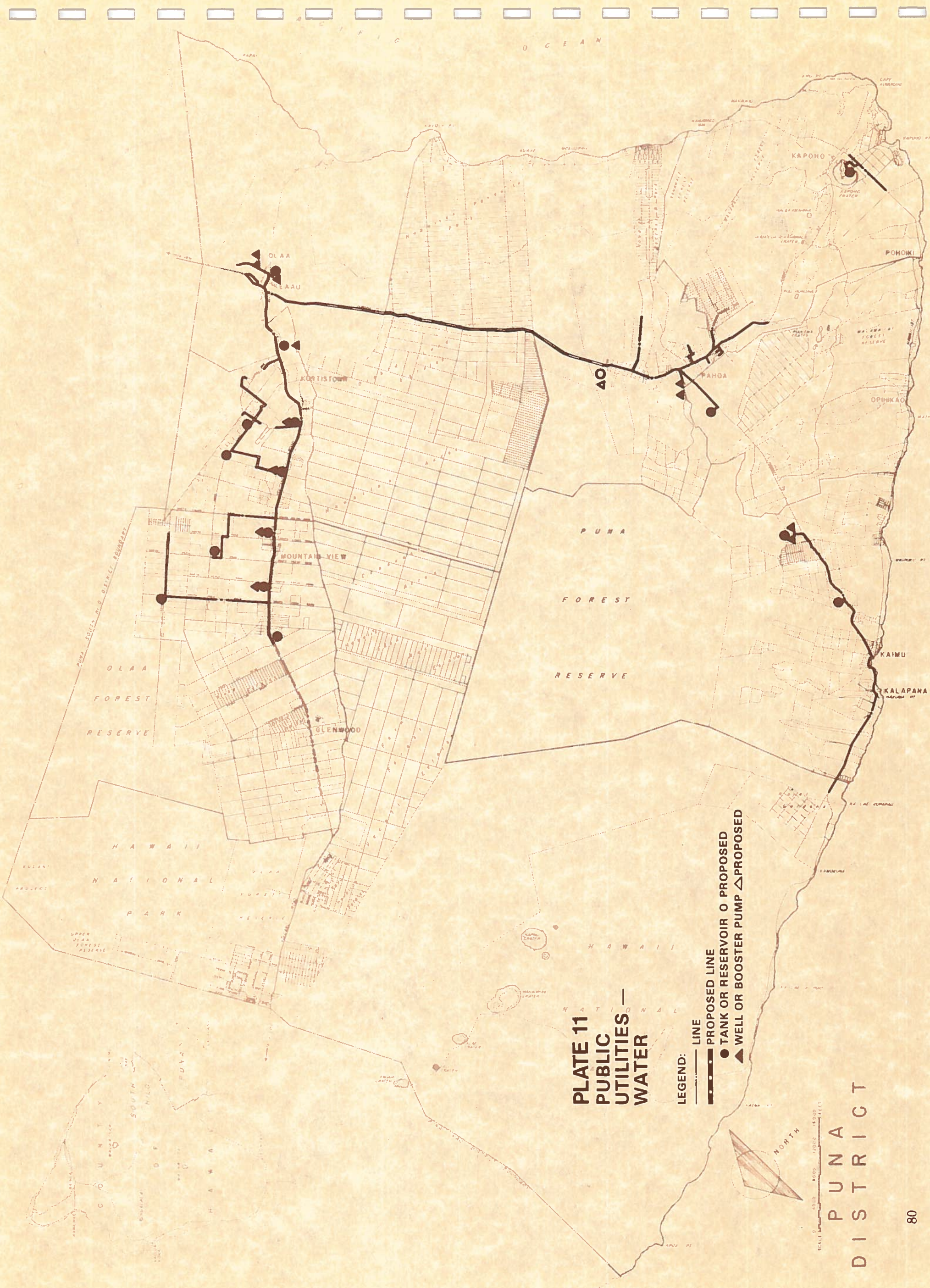
PLATE 9 **LOWER PUNA** **LAND USE ALLOCATION**

LEGEND:

- A — MEDIUM DENSITY
- B — LOW DENSITY
- C — INTENSIVE AGRICULTURE
- D — EXTENSIVE AGRICULTURE
- E — ORCHARDS
- F — RESORT
- G — OPEN AREA
- H — CONSERVATION
- I — ALTERNATE URBAN EXPANSION
 (Low, Medium, & High Density Uses Only)







**PLATE 11
PUBLIC
UTILITIES—
WATER**

- LEGEND:**
- LINE
 - PROPOSED LINE
 - TANK OR RESERVOIR
 - PROPOSED
 - ▲ WELL OR BOOSTER PUMP
 - △ PROPOSED

SCALE 0 400 800 1200 1600 FEET

**PUNA
DISTRICT**

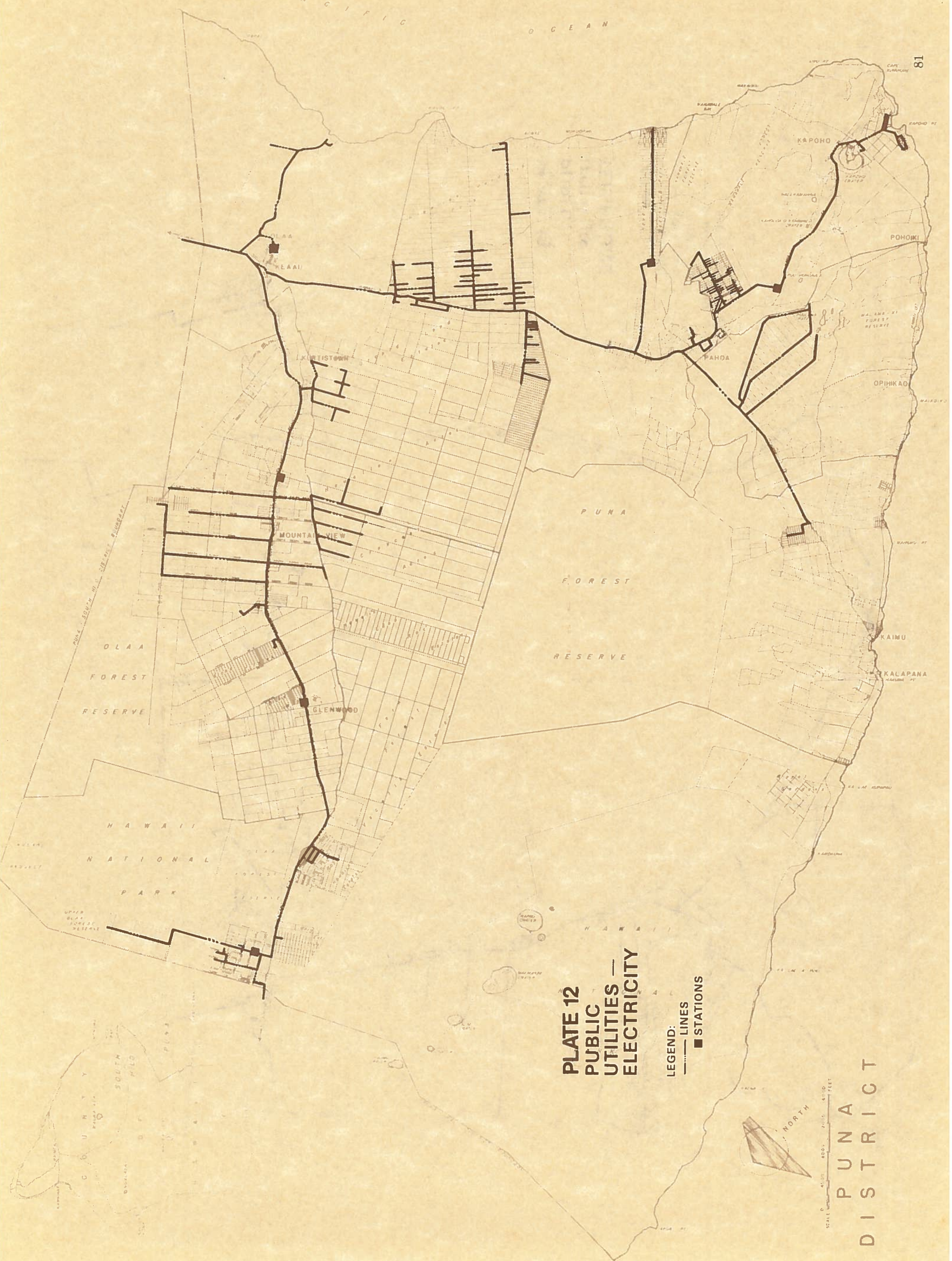


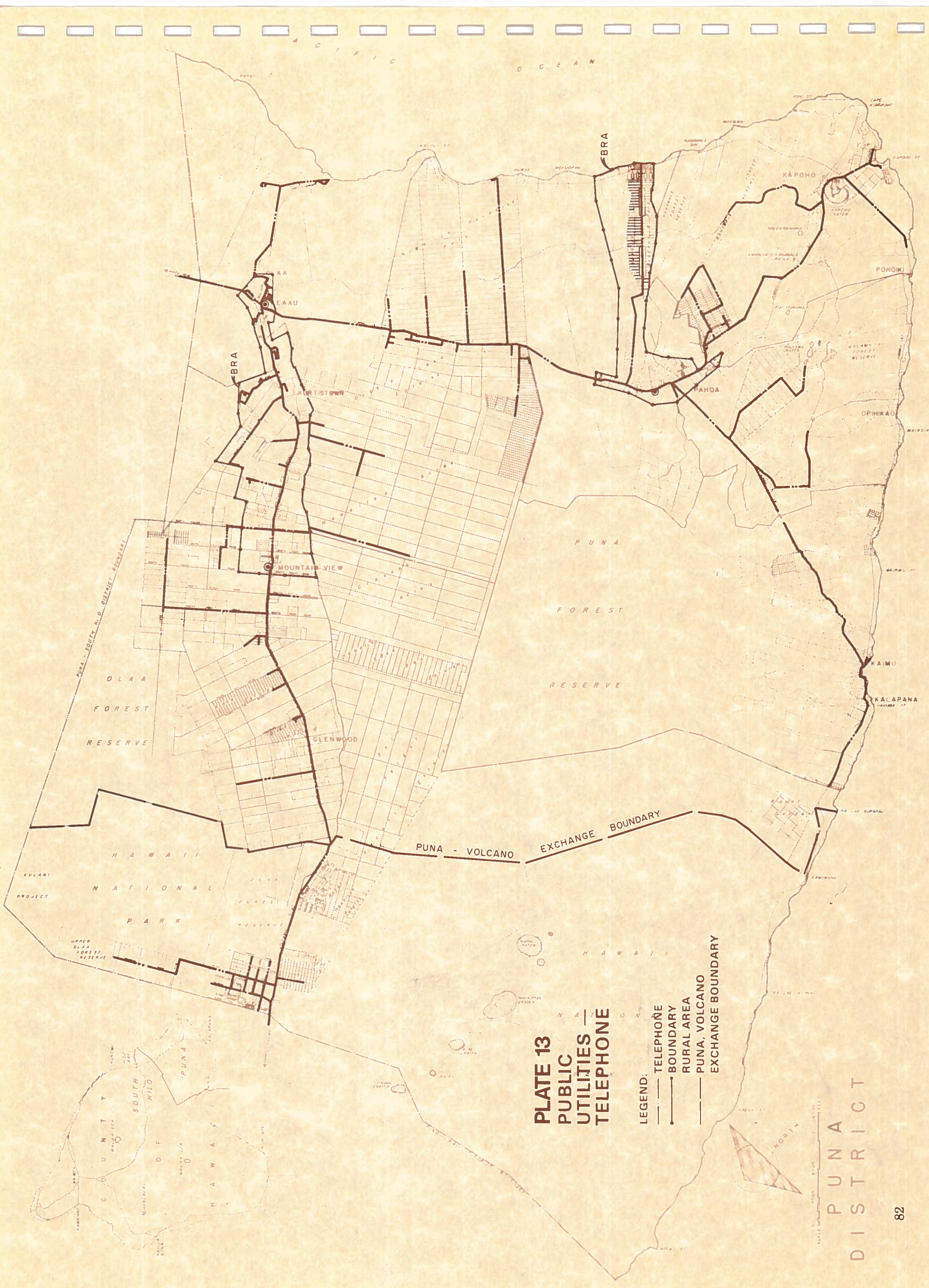
PLATE 12
PUBLIC UTILITIES —
ELECTRICITY

LEGEND:
—— LINES
■ STATIONS

PUNA
DISTRICT

SCALE 0 4000 8000 12000 FEET





**PLATE 13
PUBLIC UTILITIES —
TELEPHONE**

- LEGEND:**
- TELEPHONE
 - - - BOUNDARY
 - ... RURAL AREA
 - PUNA, VOLCANO EXCHANGE BOUNDARY

SCALE 1:50,000

PUNA DISTRICT

PLATE 14 1990 ESTIMATED TRAFFIC FLOW W/PUNA COASTAL ROAD



PLATE 15 **1990 ESTIMATED TRAFFIC** **FLOW W/O PUNA COASTAL** **ROAD**

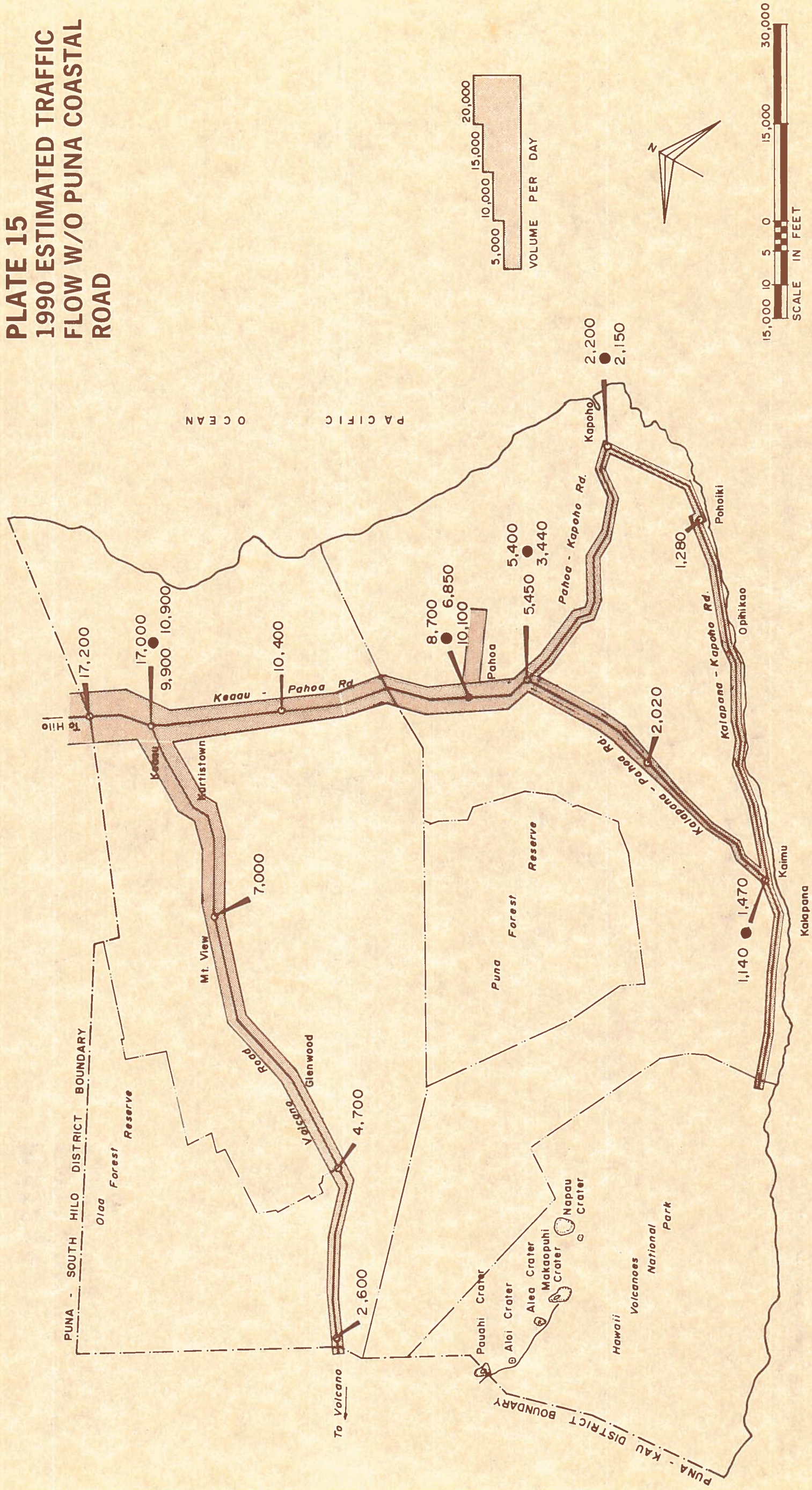


PLATE 16
LOWER PUNA
LARGE-SCALE SUBDIVISIONS

LEGEND



- (R) - RESIDENTIAL SIZE LOTS (7,500 sq. ft. - 15,000 sq. ft.)
- (RA) - RURAL SIZE LOTS (1 1/2 ac. - 2 acs.)
- (A) - AGRICULTURAL SIZE LOTS (3 acs. & OVER)

LD. NO. SUBDIVISION NAME NO. OF LOTS

- 24 ROYAL GARDENS - 1,617 LOTS
- 25 PACIFIC PARADISE OCEAN FRONT ESTATES - 141 LOTS
- 26 KALAPANA VACATION LOTS - 738 LOTS
- 27 KALAPANA SHORES - 44 LOTS
- 28 BLACK SAND BEACH - 918 LOTS
- 29 KEHENA BEACH ESTATES - 199 LOTS
- 30 HAWAIIAN LAND INVESTMENT - 26 LOTS
- 31 PUNA SEA VIEW LOTS - 693 LOTS
- 32 KAOHE HOMESTEADS - 96 LOTS
- 33 LEILANI ESTATE - 2,266 LOTS
- 34 LANIPUNA GARDENS - 110 LOTS
- 35 TANGERINE ACRES - 44 LOTS
- 36 KANIAHIKU VILLAGE SITE - 30 LOTS
- 37 NANAWALE ESTATES - 4,289 LOTS
- 38 HAWAIIAN HOLIDAYS ESTATES - 88 LOTS
- 39 HAWAIIAN BEACHES - 1,017
- 40 HAWAIIAN PARKS - 973 LOTS
- 41 HAWAIIAN SHORES RECREATIONAL ESTATES - 1,532 LOTS
- 42 WAAWAA - 177 LOTS
- 43 KAPOHO PAPAYA FARM LOTS - 40 LOTS
- 44 KAPOHO VACATION LAND - 397 LOTS
- 45 KAPOHO BEACH LOTS - 185 LOTS

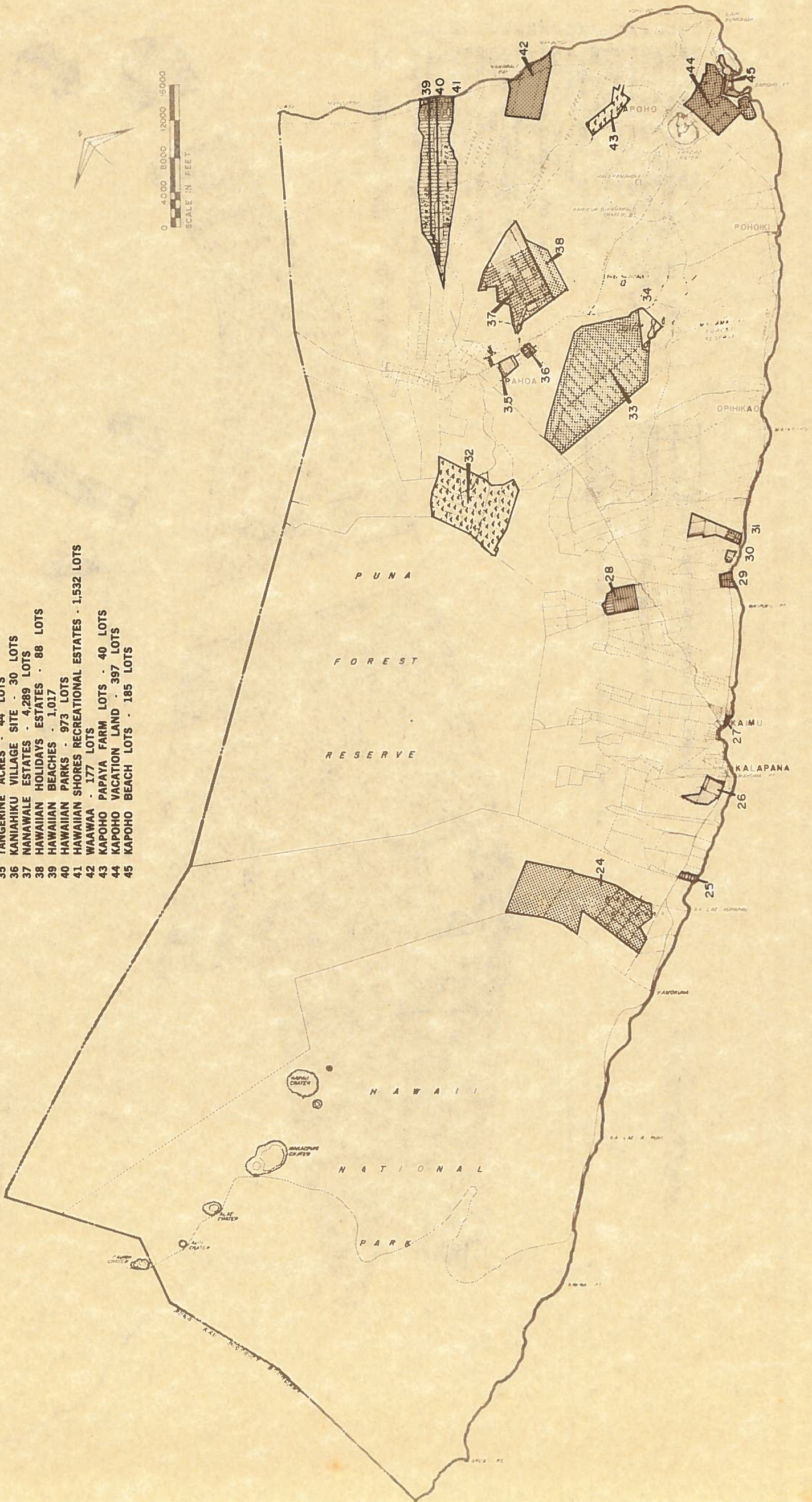


PLATE 17
 UPPER PUNA
 LARGE-SCALE SUBDIVISIONS

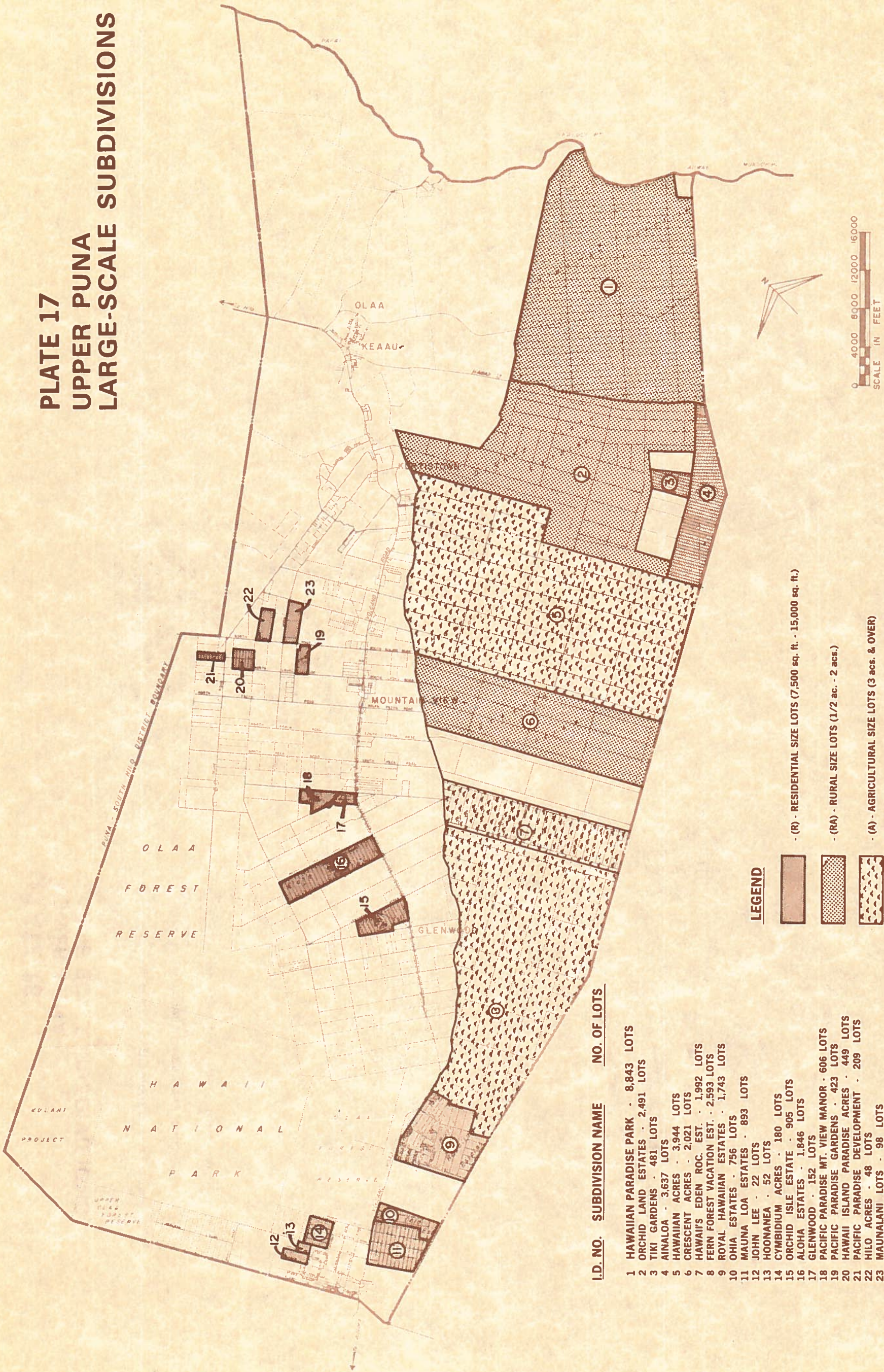
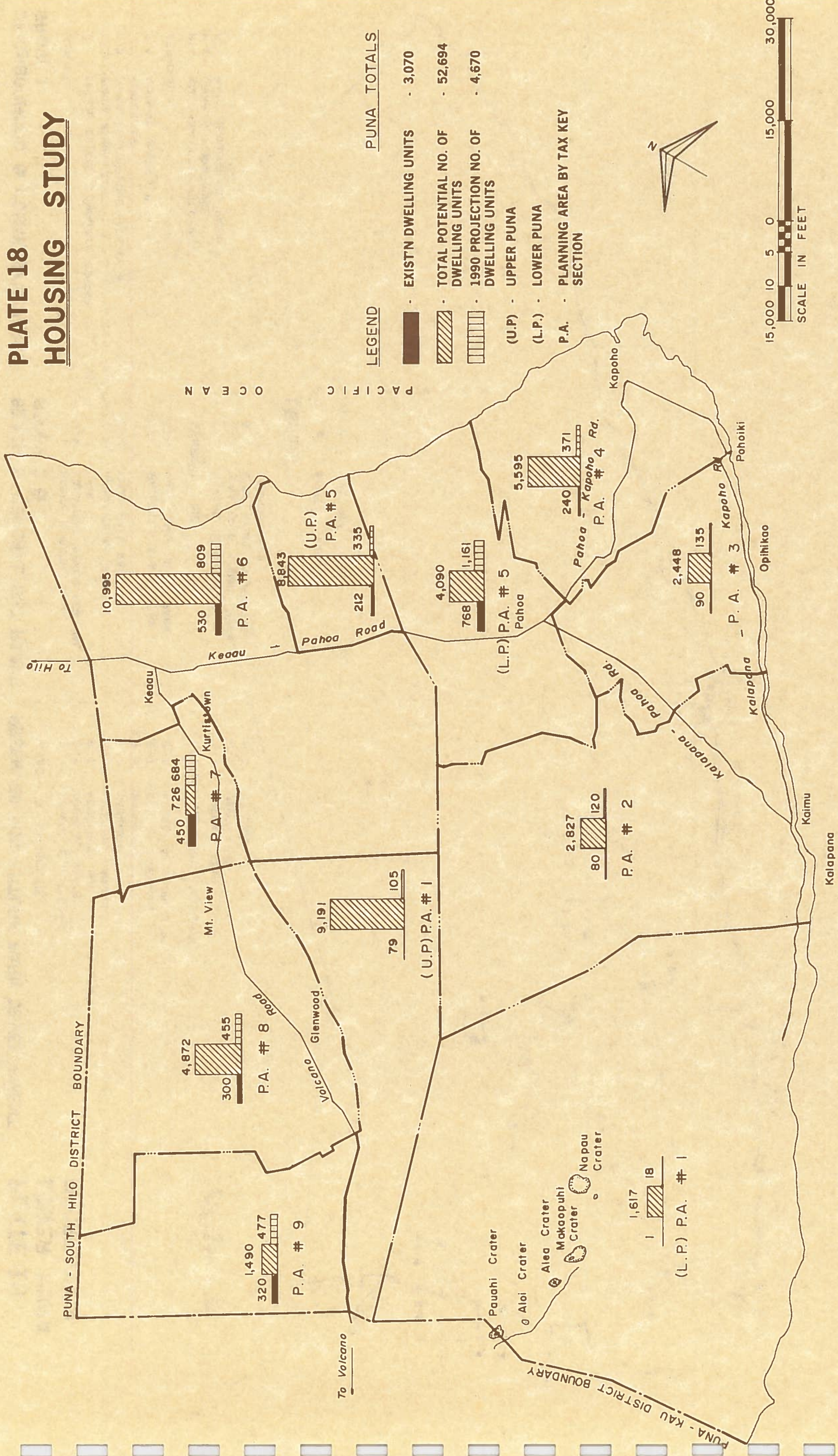


PLATE 18
HOUSING STUDY



NEIGHBORHOOD & COMMUNITY PARKS
GROUP 1

EXISTING:

- E-1 LEILANI ESTATES COMMUNITY CENTER
- E-2 PAHOA SCHOOL PARK
- E-3 PAHOA NEIGHBORHOOD FACILITY
- E-4 HAWAIIAN BEACHES PARK PLAYGROUND

PROPOSED:

- P-1 KALAPANA COMMUNITY PARK
- P-2 OPIHIKAO PLAYGROUND
- P-3 PUUA NEIGHBORHOOD PARK

BEACH & GENERAL USE PARKS
GROUP 2 & 3

- C-1 HARRY K. BROWN PARK
- C-2 KALAPANA BEACH REGIONAL PARK
- C-3 KAIMU BEACH PARK
- C-4 ISAAC HALE PARK

- S-1 MACKENZIE STATE PARK
- S-2 LAVA TREE STATE PARK

GENERAL USE

- G-1 KAPOHO SCENIC STOP
- G-2 PUNA ROAD SCENIC STOP
- G-3 EAST KAIMU WILDERNESS CAMPING AREA

RESERVES FOR FUTURE PARK DEVELOPMENT

BEACH & SHORELINE

- B-1 KEHENA BLACK SAND
- B-2 OPIHIKAO BEACH
- B-3 KEONEPOKO NUI
- B-4 HONOLULU LANDING
- B-5 NANAWALE
- B-6 WAIAKAHIULA
- B-7 KAPOHO TIDEPOOLS
- B-8 KALAPANA - WAIPIKU PT.

SCENIC HISTORIC, NATURAL

- N-1 QUEEN'S BATH
- N-2 GREEN LAKE
- N-3 KAHUWAI

PLATE 19
LOWER PUNA
RECREATION



LEGEND

- EXISTING FACILITY
- ⊙ PROPOSED FACILITY

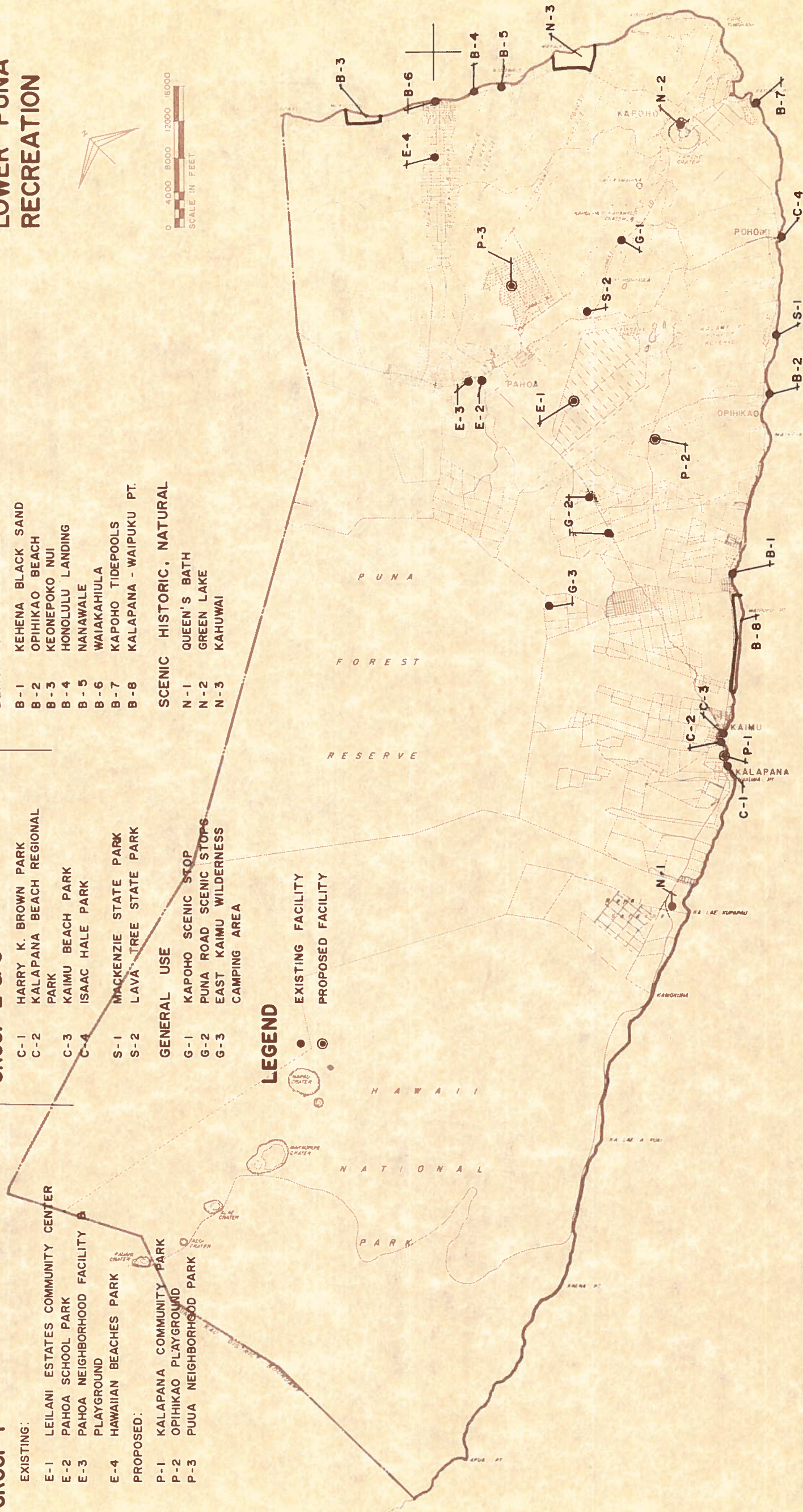


PLATE 20
 UPPER PUNA
 RECREATION

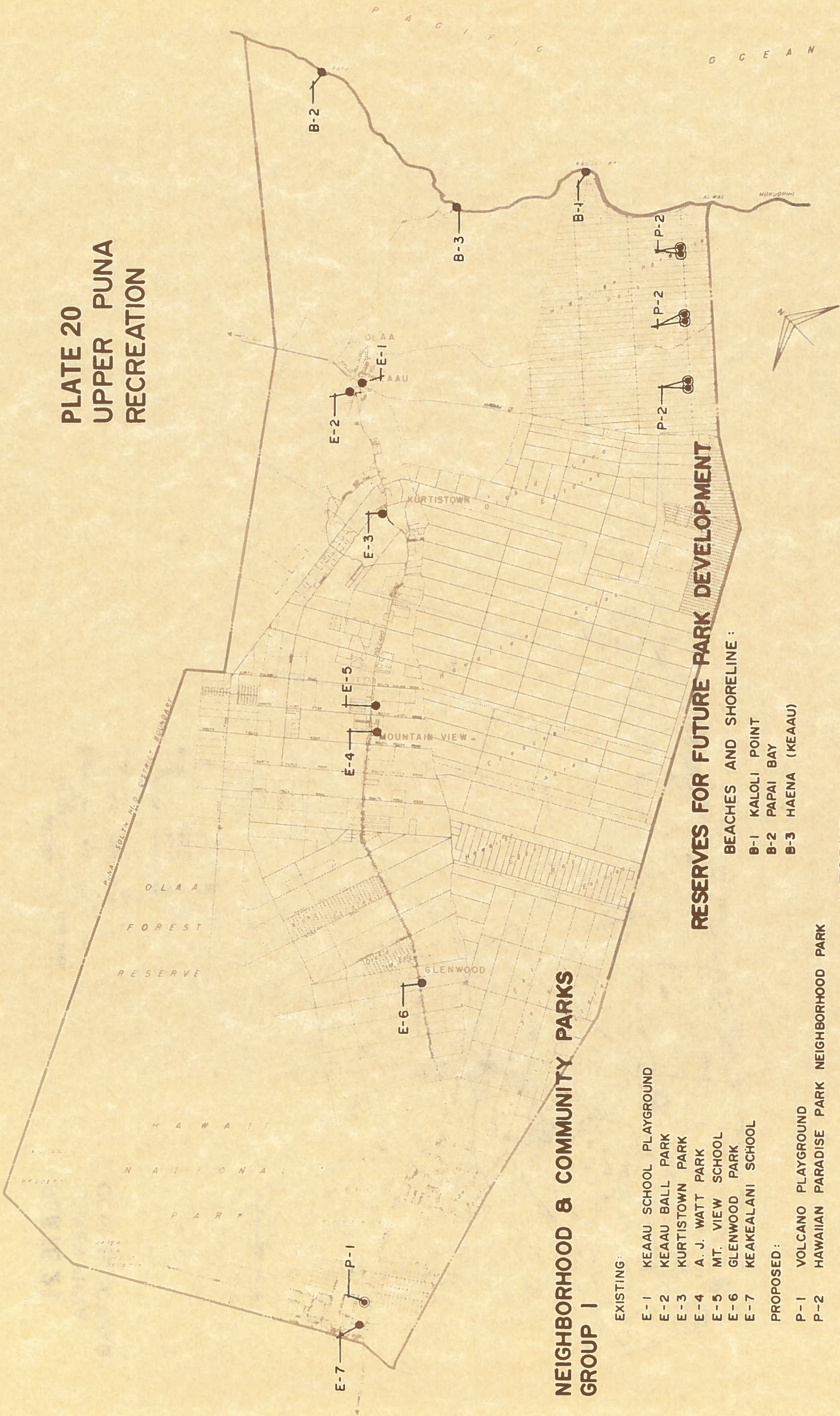
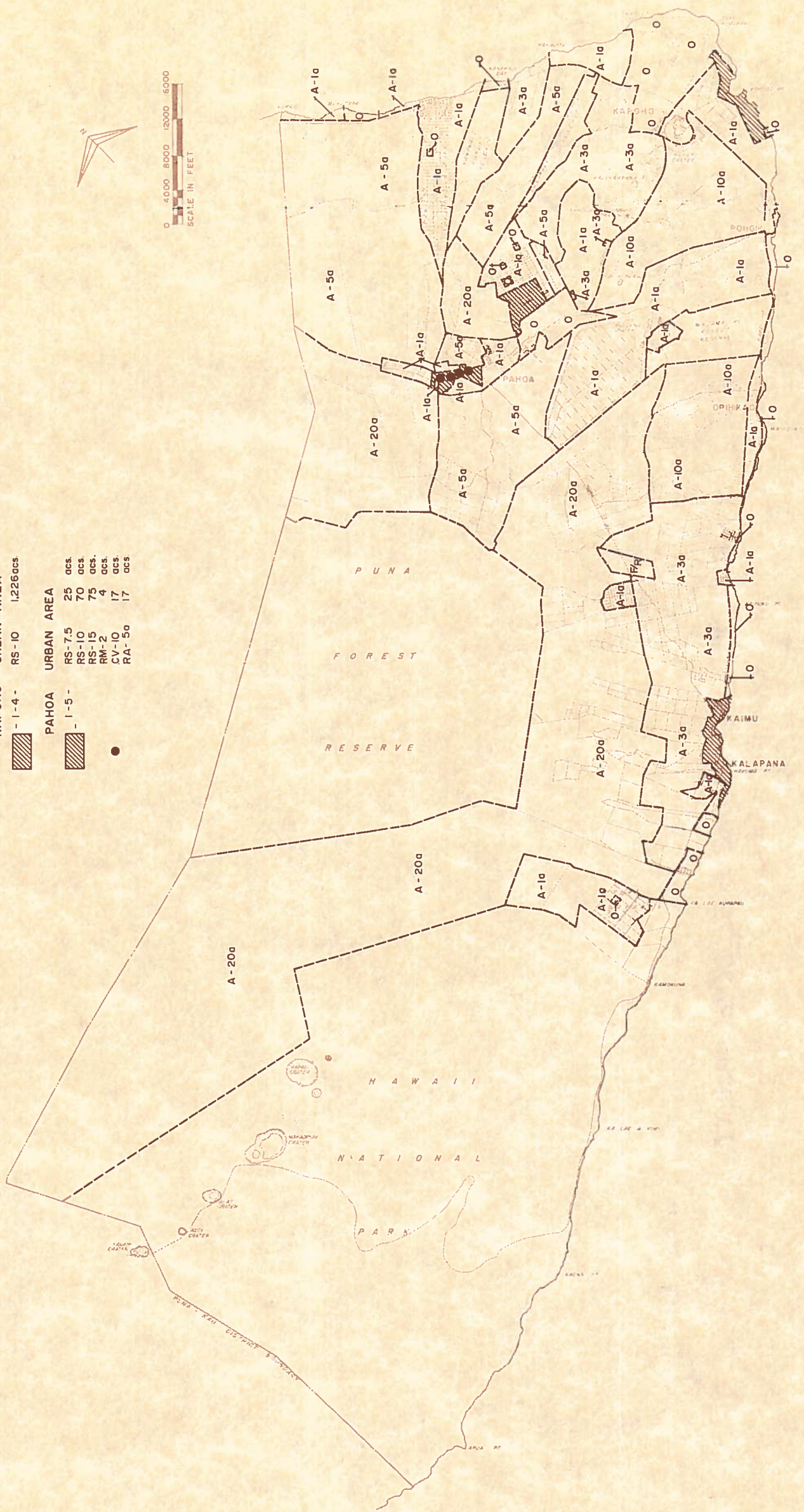
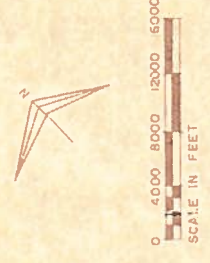
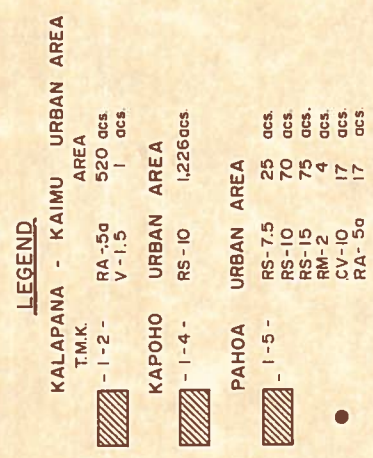
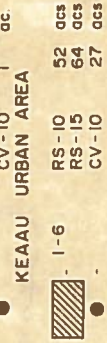


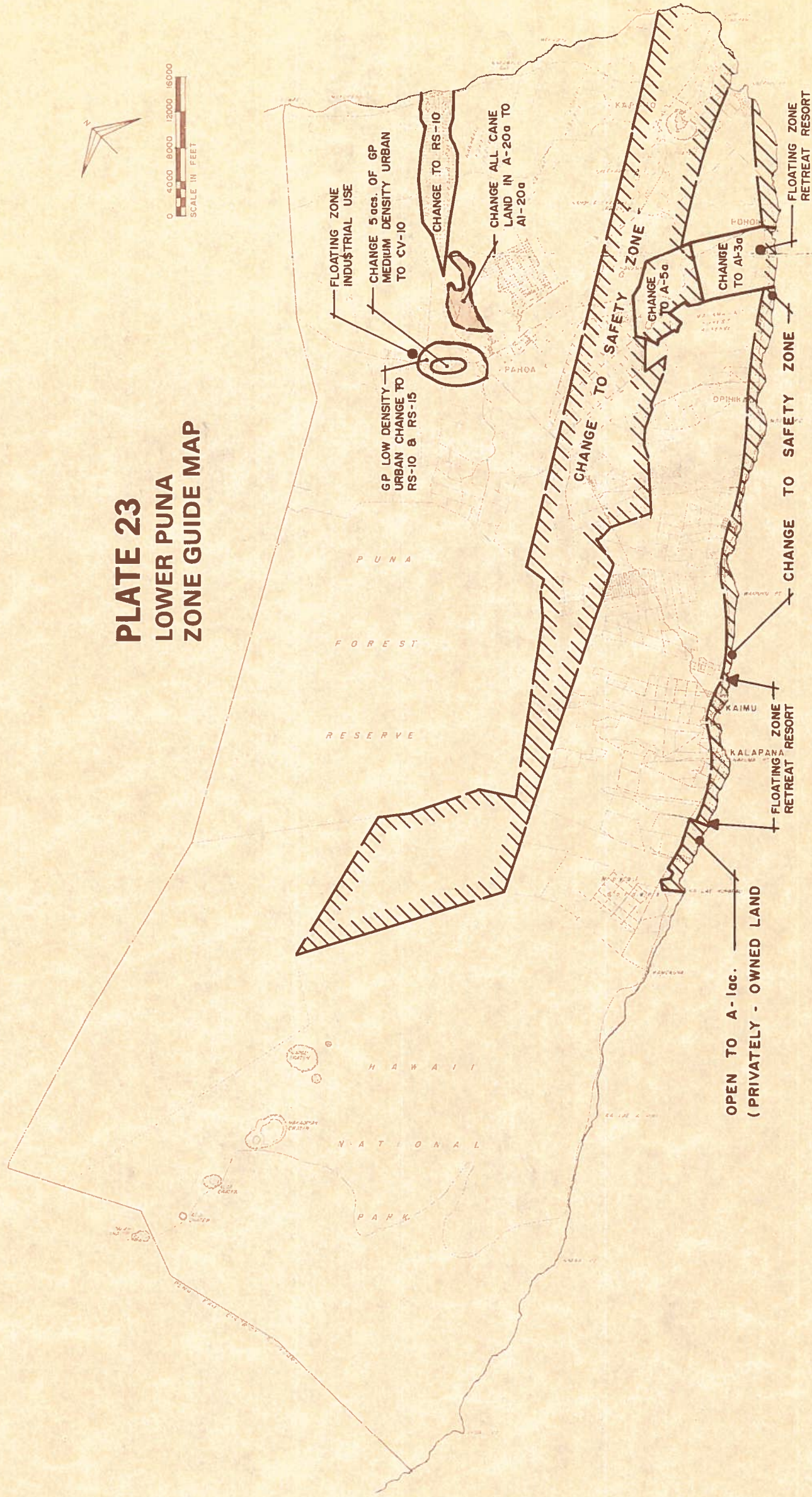
PLATE 21
LOWER PUNA
COUNTY ZONING



EXISTING COUNTY ZONING



91



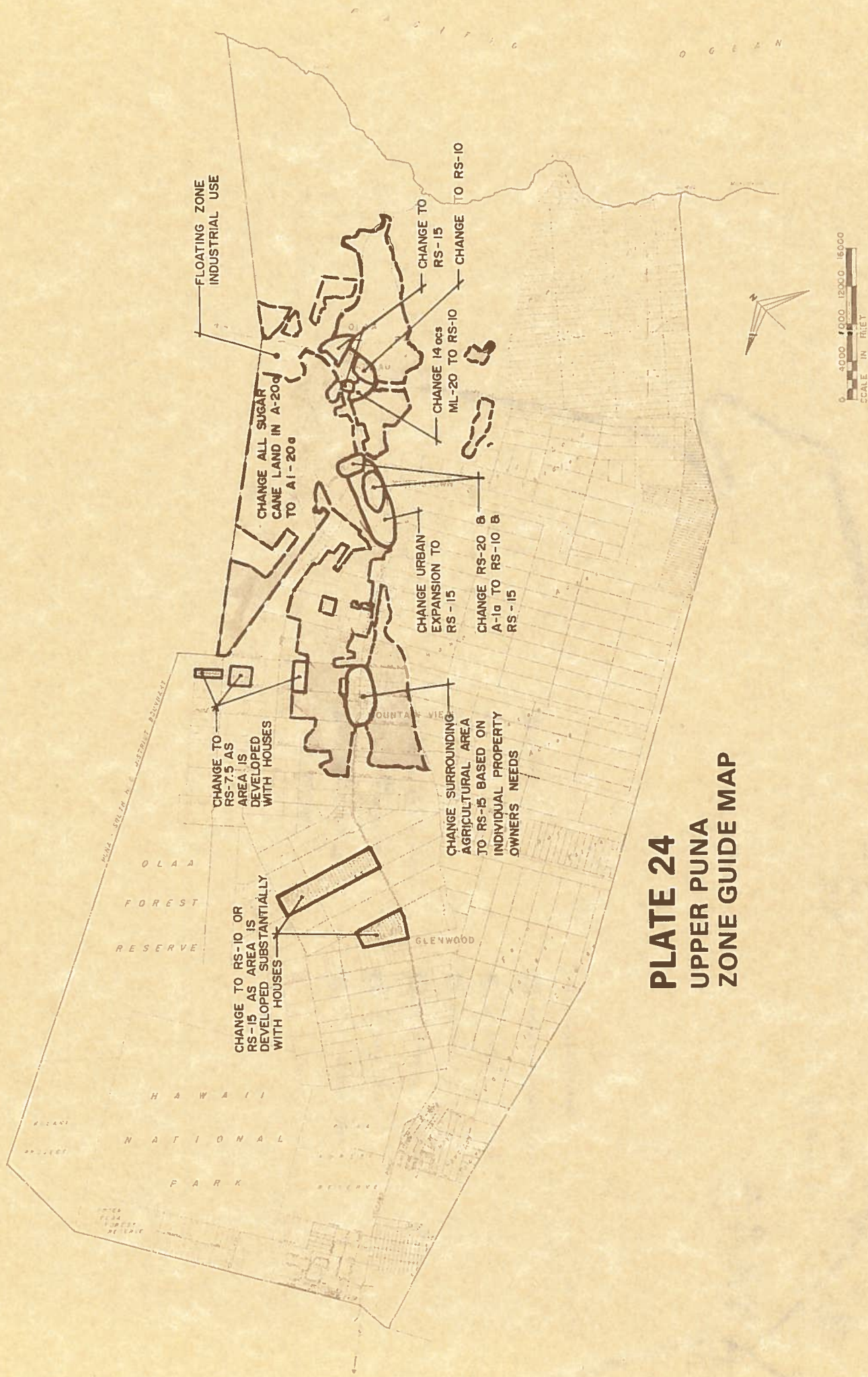


PLATE 24
UPPER PUNA
ZONE GUIDE MAP

LEGEND

- SCHOOL IMPROVEMENTS
- TRANSFER STATION
- CENTRALIZED SEWER SYSTEM
- ROAD IMPROVEMENT
- BICYCLE PATH / FOOT TRAIL
- WATER LINE IMPROVEMENTS

S-6 IDENTIFICATION NO.

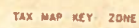




PLATE 26

IMPLEMENTATION MAP

(PROPOSED CAPITAL IMPROVEMENTS 1979-1993)

