

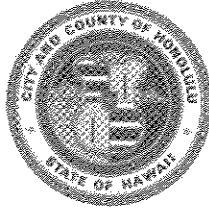
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DEPARTMENT OF GENERAL PLANNING
CITY AND COUNTY OF HONOLULU

550 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR



RECEIVED

91 MAY 17 P3:58

BENJAMIN B. LEE
CHIEF PLANNING OFFICER
ROLAND D. LIBBY, JR.
DEPUTY CHIEF PLANNING OFFICER

MM

OFC. OF ENV.
QUALITY CONTROL
May 15, 1991

Mr. Brian Choy, Acting Director
Office of Environmental Quality Control
Central Pacific Plaza
220 South King Street, 4th Floor
Honolulu, Hawaii 96813

Dear Mr. Choy:

Acceptance Notice for the Proposed
Lihi Lani Recreational Community
Folder No. 91/NS-2
Final Environmental Impact Statement (Final EIS)

We are notifying you of our acceptance of the Final EIS for the proposed Lihi Lani Recreational Community Plan, as satisfactory fulfillment of the requirements of Chapter 343, Hawaii Revised Statutes.

Pursuant to Section 11-200-23 (c), Chapter 200, Title 11 ("Environmental Impact Statement Rules") of the Administrative Rules, this acceptance notice should be published in the May 23, 1991 OEQC Bulletin.

We have attached our Acceptance Report of the Final EIS for the Lihi Lani Recreational Community and the "DOCUMENT FOR PUBLICATION IN THE OEQC BULLETIN." Should you have any questions, please contact Melvin Murakami at 527-6020.

Sincerely,

BENJAMIN B. LEE
Chief Planning Officer

BBL:lh

Attachments

cc: Obayashi Hawaii Corporation
Group 70 Limited

1991 - Oahu - FEIS - Liki Lani I

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LIHI LANI RECREATIONAL COMMUNITY
PAUMALU AND PUPUKEA, KOOLAULOA, OAHU, HAWAII



FINAL ENVIRONMENTAL IMPACT STATEMENT
APPLICATION FOR NORTH SHORE DEVELOPMENT PLAN AMENDMENT

VOLUME I

OBAYASHI HAWAII CORPORATION
HONOLULU, HAWAII

APRIL 1991

FINAL ENVIRONMENTAL IMPACT STATEMENT
Application for North Shore Development Plan Amendment

Volume I

LIHI LANI RECREATIONAL COMMUNITY

**Paumalu and Pupukea
Koolauloa District, Oahu, HI**

Applicant:

Obayashi Hawaii Corporation
Pacific Tower, Suite 2680
1001 Bishop Street
Honolulu, HI 96813

Prepared by:

Group 70 Limited
924 Bethel Street
Honolulu, HI 96813
(808) 523-5866

April 1991

LIHI LANI RECREATIONAL COMMUNITY
•FINAL ENVIRONMENTAL IMPACT STATEMENT•

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- A. Proposed Community Benefits Package, Lihi Lani Recreational Community, Obayashi Hawaii Corporation, Honolulu, HI (November 1990)
- B. Wastewater Management Plan for the proposed Lihi Lani Recreational Community, Pupukea, Paumalu, Koolauloa, Oahu, HI; Engineering Concepts, Inc., December 1990
- C. Water Supply Report for the proposed Lihi Lani Recreational Community, Pupukea, Paumalu, Koolauloa, Oahu, HI; Engineering Concepts, Inc., December 1990
- D. Storm Drainage Plan for the Proposed Lihi Lani Recreational Community, Pupukea, Paumalu, Koolauloa, Oahu, HI; Engineering Concepts, Inc., December 1990
- E. Market Assessment for the Proposed Lihi Lani Master-Planned Community, Pupukea, Oahu, Hawaii; Peat Marwick Main & Co., January 1991
- F. Agricultural Feasibility and Need for Obayashi Pupukea Project Lands, Frank S. Scott, Jr., March 1988
- G. Groundwater Conditions: Pupukea-Paumalu, Oahu, John F. Mink, Ph.D., June 1988 and Assessment of Potential Impacts, Irrigation of Lihi Lani Golf Course, Pupukea-Paumalu, Oahu, John F. Mink, Ph.D., December 1990
- H. Environmental Aspects of Storm Water Runoff, Lihi Lani Recreational Community, Pupukea, Oahu, HI, Gordon L. Dugan, Ph.D., December 1990
- I. Environmental Assessment of Fertilizer, Herbicide and Pesticide Use on the Proposed Lihi Lani Golf Course, Charles L. Murdoch, Ph.D. and Richard E. Green, Ph.D., December 1990
- J. Integrated Pest Management Program for Lihi Lani Golf Course, Wallace Mitchell and Charles L. Murdoch
- K. Botanical Survey, Sunset Beach-Paumalu, Pupukea, Oahu; Kenneth Nagata, January 1988
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- M. Baseline Assessment of the Marine Environment in the vicinity of the Lihi Lani Recreational Community, Pupukea, Oahu, HI, Marine Research Consultants, July 1988, revised December 1990
- N. Archaeological Reconnaissance Survey and Limited Subsurface Testing, Pupukea-Paumalu Development Project Area, Koolauloa District, Oahu; Paul H. Rosendahl, Ph.D. Inc., July 1988
- O. Traffic Assessment Report for Lihi Lani Recreational Community, Pacific Planning and Engineering, Inc., January 1991
- P. Noise Impact Assessment Lihi Lani Recreational Community, Oahu, HI, Darby & Associates, January 1991
- Q. Air Quality Study for the Proposed Lihi Lani Recreational Community Project, Pupukea, Oahu, Hawaii, Barry D. Neal, January 1991
- R. Landscape Design Concepts for the Proposed Access Road to the Pupukea Recreational Community; Walters, Kimura and Associates, Inc., July 1988
- S. Socio-Economic Impact Assessment of the Proposed Lihi Lani Recreational Community; Community Resources, Inc., January 1991
- T. Economic and Fiscal Impact Assessment for the Proposed Lihi Lani Master-planned Community, Pupukea, Oahu, HI, Peat Marwick and Main Co., January 1991
- U. Pupukea North Shore Golf Management Plan, Jack Nicklaus Golf Services, January 1991

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This Final Environmental Impact Statement (Final EIS) has been prepared to address the potential environmental impacts of the proposed Lihi Lani Recreational Community. It has been compiled to fulfill application requirements of the City and County of Honolulu Department of General Planning for a North Shore Development Plan Amendment to be considered in the 1991 Annual Review.

This Executive Summary includes brief descriptions of the proposed project, beneficial and adverse impacts, proposed mitigative measures and alternatives. The project's relationship to existing government policies and plans for the area is also discussed, along with required permits and approvals.

Description of the Proposed Project

The proposed Lihi Lani Recreational Community is located on approximately 1,143 acres at Paumalu and Pupukea on the North Shore of Oahu, in the Koolauloa District between Haleiwa and Kahuku. Obayashi Hawaii Corporation, the applicant, is seeking the necessary government approvals to develop a recreational community consisting of 120 country residential lots (one-acre minimum), 180 affordable housing units, an 18-hole golf course, golf clubhouse, golf driving range, tennis center, equestrian ranch, campground, hiking and horse riding trails, and community facilities.

The project site is generally located above the coastal bluff, approximately 800 feet mauka of Kamehameha Highway, with approximately 16 acres of land connecting to the highway makai of the bluff. The Sunset Beach Elementary School is located adjacent to the project site on the Haleiwa-side, and the COMSAT facilities are located on the areas above the bluff on the Kahuku-side. The site has generally rolling terrain with three steep gulches containing intermittent streams, and two large plateau areas.

The land has historically been used for different types of agriculture, where grades have permitted this use. Currently, a small part of the project site is being used for horse grazing (approximately 10 animals).

Construction of the project's roads, utilities, golf course and building sites will require site disturbances such as clearing, grubbing, grading, and excavation. Building construction will involve the golf clubhouse, tennis center, equestrian ranch, maintenance buildings, campground facilities and approximately 300 residences. Infrastructure requirements that will be constructed include: roadways; wastewater collection, treatment and disposal facilities; potable water and irrigation water supply and distribution systems; and other utilities installations.

The proposed project will create both beneficial and adverse effects on the natural and human environment. A detailed description of the existing environmental

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conditions was prepared for each environmental factor, and this was used as a background to assess potential benefits and adverse effects.

Beneficial Impacts

There are a number of project impacts that will be beneficial to residents of Sunset Beach and Pupukea Highlands, and North Shore and Oahu residents in general. Anticipated beneficial impacts of the proposed project are listed below.

1. A Community Benefits Package has been proposed by Obayashi. A major portion of this package is represented by Obayashi's proposal for a community facilities complex which will be developed on 10 acres of the site makai of the bluff and adjacent to the Sunset Beach Elementary School. This complex will include: a combined soccer field/baseball field, 25-meter swimming pool and locker rooms, outdoor pavilion and picnic area, and parking facilities. Obayashi is proposing methods for funding a portion of the operating and maintenance costs from project revenues. The final mix of community facilities is under discussion with the community and the City and County.
2. Extensive recreational facilities will be developed in the main portion of the site, including an 18-hole golf course, golf driving range, tennis center, equestrian ranch, campground, and nine miles of hiking and horse riding trails. All of these facilities will be open to public use, some requiring a user fee. Public use of the hiking and horse riding trails will be free of charge.
3. At least 559 acres of the project site will remain unaffected as natural areas in gulches and buffer areas, most of which will be contained within conservation areas. Conservation areas will be protected from project development activities.
4. Development of drainage controls will limit storm water runoff generated by the project site, to no more than existing runoff volumes. Suspended sediments eroded from the site will be less with development than under existing conditions.
5. Cooperative efforts are being undertaken to preserve the habitat for the only known examples of the Koolau Eugenia tree, located on State Forest Preserve land just mauka of the project site. Selective clearing of other encroaching plants, and propagation efforts will increase chances for survival of these rare trees.
6. Archaeological resources have been inventoried on the property, and significant sites will have intensive surveys conducted or will be preserved for future education and research.
7. Approximately 204 full-time equivalent direct construction jobs will be created over the short term period between 1993 and 1995, tailing off to approximately 79 workers between 1996 and 2000.

LIHI LANI RECREATIONAL COMMUNITY
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8. Approximately 45 direct operational jobs (full-time equivalent) will be created by 1995, increasing to approximately 60 direct jobs by 2000. Total direct, indirect and induced operational employment positions created by the project at build-out will be approximately 102 jobs.
9. Net fiscal benefits to the State government as a result of the project are expected to be \$110,000 (1990 dollars) annually by 2000. Net fiscal benefits to the City and County of Honolulu are projected to be \$840,000 (1990 dollars) annually by 2001.
10. Job training will be provided for interested local residents for positions available at Lihi Lani's golf course, clubhouse, tennis center and equestrian ranch.
11. A total of 180 affordable housing units will be provided on-site, based on a 60/40 affordable/market unit ratio for residential units planned for the site.
12. Obayashi will establish a \$600,000 scholarship and trust funds for the North Shore area students and schools.
13. Obayashi will provide a one-acre site for child care and a one-acre site for a community garden (including infrastructure).

Anticipated Short-term Adverse Impacts and Mitigative Measures

Project development activities will involve the construction of the golf course, roadways, utilities, support facilities and residences. Short-term construction-related impacts on the environment will be generated by the project, and mitigative measures will be implemented to minimize these impacts.

Anticipated short-term adverse impacts and mitigative measures are listed below.

1. Soils will be disturbed for grading and excavation, and some soil erosion will occur. An Erosion Control and Sedimentation Plan for the construction will be prepared for the project, which must be approved by the City and County of Honolulu Department of Public Works. Proposed mitigation will include soils management measures and drainage controls that will minimize soil erosion.
2. Surface water (as storm runoff) will be slightly affected by additional suspended sediments as a result of soils erosion during the construction period. Proposed soils management measures and drainage controls will minimize soil erosion and subsequent addition of suspended sediments to storm water runoff.
3. Introduced wildlife species occurring in areas of the project site that will be cleared for construction will be displaced temporarily to undisturbed areas. Landscape plantings are expected to provide replacement habitat for some wildlife types. Approximately 559 acres of the site will remain as undisturbed habitat areas.

LIHI LANI RECREATIONAL COMMUNITY
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4. During high precipitation periods, slight amounts of suspended sediments contained in surface runoff from the project site will enter the coastal waters. Measures proposed for soils management, erosion controls and drainage controls will minimize marine water quality and marine ecology effects.
5. Trucks and worker vehicles will create a short-term effect on traffic conditions on local roadways, mainly Kamehameha Highway and its nearby intersections. Mitigative measures that will be implemented to minimize short-term traffic effects will include off-peak truck use of highways, and possibly staggered worker start and finish times.
6. Noise will be generated by construction activities on the project site. Construction operations must comply with the City and County of Honolulu Noise Ordinance, which limits construction operations and resultant noise to daytime hours and maximum levels.
7. Air quality will be affected by the generation of fugitive dust, and construction equipment and worker vehicle emissions. Dust conditions will be controlled by frequent watering of roadways, and equipment will be maintained in proper working order to minimize emissions.
8. Construction activities will be most visible at the entrance on the makai section of the project site, along the access roadway route across the bluff. The construction of some structures located near the bluff edge along the Kahuku-side plateau will be visible, including the clubhouse and a few residences. Views of the construction operations on the site will be minimized by proper equipment and materials storage, minimized vegetation clearing, expedient re-vegetation and non-intrusive security lighting.
9. Modifications to Kamehameha Highway will be done to construct a left-turn lane into the new project access road. Highway construction will be limited to off-peak hours, and maintenance and protection of traffic will be undertaken according to Hawaii Department of Transportation requirements.
10. Emergency medical facilities in Kahuku may occasionally be utilized by construction workers during the period 1993 to 2001.

Anticipated Long-term Adverse Impacts and Mitigative Measures

Once the Lihi Lani Recreational Community is completely developed and full operations are underway, some long-term adverse effects will have occurred or will continue to occur. Mitigative measures have also been proposed to minimize the long-term adverse effects of the project.

Anticipated long-term adverse impacts and proposed mitigative measures are listed below.

LIHI LANI RECREATIONAL COMMUNITY
• FINAL ENVIRONMENTAL IMPACT STATEMENT •

1. Grading of the project site will change some of its topographic features. Grading changes will only be undertaken where necessary and will be coordinated with drainage improvements. Under the County Ordinance, only 15 acres of land can be cleared at one time. A City and County of Honolulu Grading Permit must be obtained prior to construction, and proposed grading changes will be fully reviewed and approved.
2. Minor contributions of fertilizer constituents and pesticides will enter storm water runoff generated on the project site. Intermittent streams will collect and transport some of this runoff during peak precipitation periods. Fertilizers and pesticides (approved types) will be carefully controlled in amounts applied following an Integrated Pest Management IPM program. No applications will be made during high precipitation periods. A certified golf course manager will supervise irrigation and maintenance activities.
3. Minor concentrations of nitrates from treated sewage effluent and fertilizer and pesticides could enter groundwater through percolation of precipitation and irrigation water. Application of irrigation water, fertilizers and pesticides will be carefully controlled by a certified golf course manager to avoid over-application. The installation of groundwater monitoring wells will be required to establish baseline pre-project conditions and periodically assess groundwater quality to detect any potential degradation of the aquifer.
4. Approximately 190,000 gallons per day (gpd) of potable groundwater (maximum rate) will be utilized by the project from the Waialua BWS water supply wells. Actual water use is likely to be less due to the low occupancy of residential units at this community, and water conservation measures to be implemented. The Waialua aquifer has the capacity to supply the project without detrimental affects.
5. Approximately 0.77 mgd of irrigation water will be drawn from the brackish water aquifer underlying the site during peak use periods and will be utilized by the golf course, golf driving range, common area landscaping, equestrian ranch and landscaping on country lots. The golf course will require approximately 0.57 mgd at peak use, of which 0.2 mgd will be provided by diluted treated wastewater effluent from the marsh treatment system. Over-pumping of groundwater will be avoided by careful management of pumping facilities. Safe pumping rates for these facilities will be approved by the Board of Water Supply and the Department of Land and Natural Resources.
6. Approximately 338 acres of existing vegetation will be removed in the course of constructing the proposed development. No substantial stands of native plants will be affected by the project. Extensive landscaping will be performed to re-establish vegetation across much of the area. Some of the vegetation removed in the clearing effort will be replanted within temporary nursery and the development areas. Obayashi will continue participating in a cooperative effort to preserve and enhance the habitat for the rare Koolau Eugenia trees, located on the State Forest Reserve land mauka of the property.

LIHI LANI RECREATIONAL COMMUNITY
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7. Existing habitat for birds and other wildlife species will be affected over the 338-acre cleared areas. Some wildlife species will leave these areas, and relocate in adjacent open space areas within the project site. Landscape plantings will re-establish some habitat areas in the golf course perimeter and other planted areas around roadways and buildings.
8. Slight amounts of suspended sediments, fertilizer constituents, organic material and pesticides will be introduced to the ocean during peak storm water runoff periods. The concentration of suspended sediments in runoff from the project will be lower than current levels after the project is completed. Drainage controls and restrictive fertilizer and pesticides application rates, as well as special design features for on-site containment, will minimize the effect of these potential contaminants on marine water quality and marine ecology. Chemicals and nutrient concentrations in runoff carried off-site by intermittent streams will not create adverse impacts on the ocean environment. A baseline survey of ocean water quality has been made. Ongoing ocean water quality monitoring surveys will be conducted during the construction period; and, if necessary, beyond to assess potential water quality effects of the project.
9. There are 23 significant archaeological sites in the project area. Sixteen of the 23 significant sites will undergo archaeological data recovery and the remaining seven sites will be preserved. Fifty-four historical sites were located within the project area, and recommendations for treatment of sensitive sites will be reviewed by the State Department of Land and Natural Resources, Historic Sites Section.
10. Lihi Lani will create a new intersection to Kamehameha Highway at the project access road. Weekend peak hour traffic (Sunday pm) generated by the project (enter and exit) will be as follows: 95 trips for affordable housing, 36 trips for community facilities, and 197 trips for the main portion of the project. The increase in ambient peak hour traffic volumes of 795 vehicles above present conditions (from 1,260 to 2,055 vehicles per hour) will create the greatest future traffic impact on Kamehameha Highway in this area. A left-turn lane into the project access road will be installed to minimize delays associated with highway through-traffic. With or without the project, through-traffic flow along Kamehameha Highway at this location will experience delays during peak periods. Entrance onto Kamehameha Highway from the project access road will also experience delays during peak traffic periods.
11. Noise will be generated by vehicles traveling to and from the project on local roadways, and by the operation of the maintenance equipment.
12. Parts of the project will be visible from Kamehameha Highway, Sunset Beach Elementary School, nearby residences and local beaches. Visible elements of the project will include: the project entrance, the project access road and

LIHI LANI RECREATIONAL COMMUNITY
• FINAL ENVIRONMENTAL IMPACT STATEMENT •

possibly parts of the clubhouse and residential structure roofs. Design plans will minimize the visibility of structures, roadway features and lighting from the areas makai of the project and from Sunset Hills and Pupukea Highlands.

13. A total of 120 country lot residences and 180 affordable housing units are proposed upon completion of the project. Total full-time residential population of Lihi Lani will be approximately 193 persons at the country lots and approximately 504 persons at the affordable housing. The population increase associated with Lihi Lani is of too small a magnitude (0.07 percent of the project 2,010 Oahu population) to materially alter the degree of consistency of the North Shore's development capacity with its Population Distribution Guidelines.
14. The project will create a maximum of two tons per day of refuse for removal and disposal by the private carting firm at an appropriate City and County landfill or other solid waste disposal facility. Property tax revenues generated by the project are expected to alleviate any shortage in the waste disposal facilities capacity due to the added demand caused by the project.
15. As many as 140 to 165 school children could be added to local schools by the project, creating an impact on the capacity of area schools. At least 72 percent of the school age children will be generated by the project's affordable housing. This increase will exceed the capacity of Sunset Elementary School and Kahuku High and Intermediate School. Tax revenues generated by the project are expected to more than pay for any increase in operational costs.
16. Public services such as police and fire protection, emergency medical facilities and recreational facilities will be required by the project, but only a minor effect is expected on these services. Property tax revenues generated by the project are expected to cover any increase in operational costs caused by the project.

Alternatives to the Proposed Project

Four alternatives to the proposed project have been considered involving different land use and development concepts. These alternatives include: the no-action alternative, an agricultural alternative, an agricultural subdivision alternative, and a recreational alternative. Included below are brief discussions of each alternative, selected associated impacts, and a comparison with the proposed project.

The no-action alternative would keep the project site in its present undeveloped condition. Small scale agricultural use for horse grazing could possibly be continued. Erosion of the property would continue unmitigated. No beneficial or adverse effects would be generated by this alternative. The owner of the land would continue to pay property taxes for this land without gaining any return on the initial investment or tax payments. In terms of environmental consequences, this alternative would create the least adverse and beneficial effects of all alternatives considered.

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An agricultural use alternative was considered which would involve the intensification of agricultural use on the site. Approximately 460 acres could be utilized for cultivated crops, tree fruit crops and grazing. Extensive land clearing would occur under this plan, and soil erosion and drainage problems would be created. Water quality and water use considerations would also be significant under this alternative. The establishment of a profitable agricultural enterprise on this land would not be realistic due to high crop production costs and existing market conditions.

An agricultural subdivision could be developed on the site under the existing AG-2 zoning. Approximately 350 two-acre lots could be subdivided with adequate roads and utilities. There would be requirements for wastewater collection, treatment and disposal facilities to support the entire development, with disposal by irrigation on the makai section of the site. Traffic generated by this development would be approximately 308 peak hour vehicle trips. No community facilities would be developed under this scenario. The affordable housing requirement for this project would be satisfied at an off-site location. In comparison to the proposed project, this alternative would create similar to greater environmental impacts without the benefits of recreational facilities development.

The recreational alternative would involve development of only recreational facilities within the project. This alternative would include: two 18-hole golf courses, two clubhouses, driving range, a tennis center, equestrian ranch, campground, and hiking and horse riding trails. Community facilities would also be constructed in this scenario. Approximately 586 acres would be developed, and impacts to topography would be substantial due to grading and extensive vegetation clearing due to the added golf course area. Additional non-potable water would be required to irrigate the additional golf course area, and potable water requirements would be greater. Traffic would be slightly less under this plan. No housing would be created by the recreational alternative, and property tax revenues would be less than with the proposed project. The environmental impacts of this alternative would be less than the proposed project in some cases, and greater in others.

Relationship to Existing Policies and Plans

This Final EIS includes a detailed discussion of how the proposed project is generally consistent with most existing State and City/County policies and plans for the area. Specific measures are being taken to minimize project plans which contradict any of these policies and plans. Plans and policies considered in this evaluation were:

1. Hawaii State Plan
Objectives and Policies, Priority Guidelines, and Functional Plans
2. City and County of Honolulu General Plan
3. North Shore Development Plan
4. State of Hawaii Coastal Zone Management Plan Program
5. Special Management Area Rules and Regulations of the City and County of Honolulu

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An extensive discussion of the project as compared to these policies and plans is contained in Section 6.

Required Permits and Approvals

Several "discretionary" permits and approvals will be required to implement the proposed project. These are as listed below with their related agencies.

1. State Land Use District Boundary Amendment
Agriculture to Urban (28-acre affordable housing site)
Agency: State Land Use Commission
2. North Shore Development Plan Amendment
Land Use Map (golf course, affordable housing and community facilities)
Public Facilities Map (water, wastewater, drainage and road systems)
Agency: City and County Department of General Planning/City Council
3. Zoning District Change
Agricultural (AG-2) to Country District (country lots)
Agricultural (AG-2) to Other Residential District (affordable housing)
Agency: City and County Department of Land Utilization/City Council
4. Special Management Area Use Permit
Agency: City and County Department of Land Utilization/City Council
5. Conditional Use Permit
Tennis Center and Equestrian Ranch
Agency: City and County Department of Land Utilization
6. Conditional Use Permit/State Special Use Permit
Wastewater Treatment Facilities
Agency: City and County Department of Land Utilization

SECTION 1 - Introduction

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I. INTRODUCTION

This section presents the background information on the project site, including location, ownership and present use, site characteristics, project history and the purpose of this Environmental Assessment. Detailed information regarding the project plans, environmental factors, assessment of environmental impacts, alternatives and consistency with existing land use plans and policies is presented in the following sections of this report.

1.1 LOCATION

The property encompassed by this project consists of approximately 1,143 acres of wooded land, fields, bluffs and valleys located in Pupukea on the North Shore of Oahu in the Koolauloa Judicial District. The Tax Map Key designations for the area are: TMK 5-9-05: 06, 38, 82 and TMK 5-9-06: 01, 08, 18, 24. The project site is located approximately 60 to 75 minutes by car from Honolulu. Figure 1 shows the project site in relationship to the island of Oahu.

1.2 OWNERSHIP AND PRESENT USE

The project site has been owned by Obayashi Hawaii Corporation, and/or its parent company Obayashi Corporation, since 1974. Obayashi Hawaii has been in Hawaii for over 24 years, and has constructed buildings in Honolulu, Hawaii Kai and on Kauai with a local work force. Obayashi Hawaii owns the Sheraton Poipu on Kauai. Obayashi Hawaii has also developed subdivisions on Maui (Kaanapali Hills and Kulanani Estates) and has developed a 240-unit affordable housing subdivision (Waialaelae Estates) on Kauai. The parent company, Obayashi Corporation, is a major general contractor in Japan. For the remainder of this document, Obayashi Hawaii Corporation is referred to as Obayashi.

The site consists primarily of vacant wooded slopes and valleys, and plateaus with ground cover and lower field vegetation types. Portions of the gently sloped plateau areas, and the makai section of the site along Kamehameha Highway are presently used for horse grazing. The total area in use is about 50 acres, with approximately 10 horses.

1.3 SITE DESCRIPTION

The project area consists of two large plateaus separated by a narrow, steep gulch and bordered on either side by similar steep gulches (Figure 2). Although one small parcel connects the property with Kamehameha Highway, most of the site is above the pali, not visible from the highway. Several intermittent streams pass through the project site, as shown in Figure 2. Pakulena Stream extends through the center of the site. Paumalu Stream forms the Kahuku-side boundary and Kalunawaikaala Stream delineates the Haleiwa-side boundary. These stream channels collect



LEGEND

 PROJECT BOUNDARY

PROJECT BOUNDARY MAP
LIHI LANI RECREATIONAL COMMUNITY
 SOURCE: USGS TOPOGRAPHIC QUADRANGLE (1983)

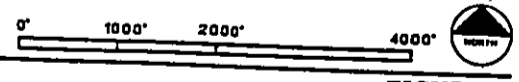


FIGURE 2

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drainage during high precipitation events, discharging into the adjacent lowlands and eventually the ocean. Kaleleike Stream is a branch of Paumalu Stream that crosses the site near its mauka boundary.

Remnants of old government roads are designated on legal maps of the project site, which are narrow "paper roads" that extend haphazardly across the site. Physical signs of an old roadway for the most part do not exist. The origin and purpose of these roads is unknown; however, they may have once been used for coast and geodetic survey, agricultural, watershed and/or military purposes. Obayashi is currently in the process of obtaining the fee ownership interest in these remnant roads from the State Board of Land and Natural Resources.

Along the top edge of the bluff, near the Kahuku-side and Haleiwa-side boundaries, lie two former Army defense lookout/gunnery bunkers that were likely manned at times during WWII. The government roads may have formerly provided access to these bunkers. On legal maps, a right-of-way is shown entering the mauka boundary of the site extending to near two state-owned parcels located within the Obayashi project. The two parcels are labelled as watershed land on historical maps. The right-of-way may have been used for access to wells that may have once existed on the two parcels.

The elevation range of the project site is approximately 20 feet above mean sea level (msl) near Kamehameha Highway, ranging to nearly 850 feet above msl on the uplands mauka of the plateau regions. From the upland portions of the property, views of the Waianae Mountain Range and parts of the coast from Mokuleia to Sunset Beach are available, including spectacular ocean and sunset views.

The project area is primarily unutilized vacant land with dense forest, stream valleys and open fields. Steep slopes limit potential uses in many areas. Previous uses of the land have been mostly unprofitable agriculture, including grazing and pineapple and avocado cultivation.

1.4 SURROUNDING LAND USES

The surrounding Sunset Beach-Pupukea-Waimea community is primarily a low density residential area with a few commercial and agricultural uses. Residential, agricultural, and vacant open space areas border the project site. The plateau on the Kahuku-side is occupied by the facilities of COMSAT. The plateau on the Haleiwa-side of the upland area is occupied by large lot (one-acre and larger) subdivisions known as Pupukea Highlands and Sunset Hills. Lands mauka of the upland area are preservation lands and leased from the State of Hawaii by the Boy Scout's Camp Pupukea. The Girl Scout's Camp Paumalu is located along the northeastern portion of the mauka boundary of the property. The makai portion of the site is bounded by residences on the Kahuku-side and the Sunset Beach Elementary School on it's Haleiwa-side.

The Kuilima Resort is located approximately five miles towards Kahuku. Some limited retail and service businesses are located along Kamehameha Highway in the

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Sunset Beach area, including Kammies Market and Sunset Beach Store. Beach-front and inland residences, beach-front parks, the Sunset Beach Elementary School and agricultural land uses make up the majority of land within the lowlands makai of the project from Sunset Beach to Waimea Bay. Haleiwa is the nearest commercial center, located approximately eight miles southwest of the site.

1.5 PROJECT HISTORY

The Obayashi Hawaii Corporation has owned its land at Pupukea since 1974. Possible development of this property by Obayashi was the subject of a previous study by Belt, Collins and Associates, Ltd. (February, 1980). The 1980 study examined development policy, alternate plans, infrastructure requirements and order-of-magnitude costs for several potential future uses of this project site. Two alternative development plans considered at that time included: (1) a large residential subdivision (350 lots), and (2) a mixed-use development (single-family residential, multi-family residential, commercial and institutional uses).

The proposed project has been named the Lihi Lani Recreational Community. Due to its exceptional location on the higher elevation lands overlooking the Pacific Ocean and beaches below, the project was given a Hawaiian name which translates as "Edge of Heaven". The name was given by Abraham Piianaia in a ceremony on 23 July 1988. In a brief dedication speech in Hawaiian and English, Piianaia spoke of "this land perched high, rising inland of Paumalu." He asked the ancestral guardians of the land to approve of the name. Mr. Piianaia was the first Director of the Center for Hawaiian Studies at the University of Hawaii at Manoa. He currently teaches Hawaiian Studies and Geography at the Manoa campus.

During the period May through September 1988, members of the North Shore community attended open public meetings regarding specific issues relating to the proposed project. These meetings were organized by Obayashi Hawaii Corporation and their representatives under the broadly defined Community Advisory Group (CAG). The last CAG meeting was held in 1989.

In September 1988, Obayashi Hawaii Corporation filed a Petition for a Land Use District Boundary Amendment to the State of Hawaii Land Use Commission. The application called for redistricting 833 acres of the 1,143-acre site from Agriculture to Urban designation. The master plan for the proposed project in 1988 called for two golf courses, clubhouse, driving range, equestrian ranch, tennis center, 160 one-acre market lots, a helipad and hiking trails and bridle paths. Obayashi withdrew its application in February 1989 to establish greater community involvement and awareness regarding its development goals and potential community benefits.

Since February 1989, Obayashi Hawaii Corporation has been meeting with representatives of community organizations and individuals within the surrounding North Shore communities. These meetings have helped to better identify concerns of the public regarding potential environmental and social impacts of developing this land, and potential community benefits.

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In September 1989, several community association members assigned from Sunset Beach and Pupukea Highlands, and representatives of Obayashi Hawaii Corporation, formed the Joint Planning Committee (JPC). This Committee was formed with the purpose of evaluating the potential options for land use of the Obayashi property. The JPC began meeting with the understanding that a "clean slate" approach would be followed, with all ideas for use of this land being evaluated equally. The JPC met regularly through 1990 to address specific tasks, including: establishing guidelines for future use of the property; evaluating alternative land uses; and identifying potential community facilities and benefit programs. A series of four open public meetings were also held during 1990 to present information to the community and obtain comments and responses on the presented topics.

The JPC and the broader community input in land planning was integrated into a new master plan for the Obayashi site. Consensus was not achieved on the selection of land use elements in the master plan. Guidelines established by the JPC were broadly accepted by the community and are listed in Table 1.

As a result of the community involvement process, Obayashi formulated a new master plan for their property which addresses needs of the local community as well as the Owners.

The proposed project is planned to be a recreational community designed to include a golf course, including clubhouse and driving range, a tennis center, an equestrian ranch, horse pastures, a campground and hiking trails. These facilities will occupy about 339 acres of land. Approximately 120 "country" lots of one-acre or more will also be subdivided on about 161 acres of the site. Many of these lots are expected to be developed as second or vacation homes for the owners, and only 50 to 60 homes are expected to be occupied by full-time residents. Approximately 180 affordable housing units are proposed as well, to serve more of the local demand for housing. Finally, a community facility on approximately 10 acres is proposed, in response to the local community needs identified through the Joint Planning process. Approximately 559 acres of the site will be retained as undisturbed open space. Other major elements of the development that will be constructed and installed include: potable and non-potable (irrigation) water systems; an access and circulation roadway system; drainage facilities, including retention ponds; a wastewater collection and treatment system; and electrical, telephone and television cable systems. Details of the project Master Plan and design features are included in Section 2.2.

The elements of the current Obayashi proposal, as compared to the 1988 proposal, are consistent with several concerns raised by the community, including:

1. **Community Facilities and Site** - The current project has definitive plans for constructing facilities and dedicating 10 acres of land, including a soccer field, parking area, meeting pavilion, swimming pool and support infrastructure. The 1988 project had no plans for developing community facilities.
2. **Affordable Housing** - Obayashi Hawaii Corporation proposes to develop 180 affordable housing units on-site.

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TABLE 1

PROJECT GUIDELINES

1. It will not cause an increase in soil erosion.
2. It will not cause an increase in silt and suspended sediment in runoff from the property.
3. It will not cause an increase in the rate of storm water runoff from the property.
4. It will minimize the reduction of vegetation on the property.
5. It will utilize brackish water in place of potable water where possible for irrigation water uses, and establish irrigation water conservation measures.
6. It will minimize the amount of potable water used, and establish potable water conservation measures.
7. It will control the application of fertilizers and pesticides in a manner consistent with an Integrated Pest Management (IPM) program.
8. It will preserve the most significant archaeological resources on the property, and properly document any other sites that could be affected.
9. It will minimize the impact on vehicle through-traffic along Kamehameha Highway.
10. The visual impact of any new use of the property will be minimized. Any access road to the project shall be designed to minimize views of the roadway, bench cuts in the bluff and vehicles. Any structures developed on the site should be located and designed to minimize their visibility from locations off-site. Any use of lights on the property should not be intrusive at off-site locations.
11. Noise generated by any new construction and post-construction activities on the property will be minimized.
12. It will insure that any toxic sprays and gases, dust and/or noxious odors generated or released on the property do not reduce air quality in neighboring communities.
13. It will include some recreational usage by the community.
14. It will create an overall image which is similar to the image and feeling experienced in Pupukea Highlands, and other rural country areas of Hawaii.
15. Disposal of sewage shall have no deleterious effects on the surrounding ecosystems, including the ocean. An ocean outfall shall not be used to dispose of sewage effluent.
16. It will not cause an adverse impact on ocean water quality and ocean ecosystems.

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3. Golf Course Development - Obayashi Hawaii Corporation has reduced its earlier plans for development of 36 holes (two golf courses) to a single 18-hole golf course.
4. Potable Water Use - Non-potable water is used in dual water systems for irrigation of residential areas, golf course areas, and landscaped common areas. A xeriscape program will be instituted to conserve water. This measure was taken in response to concerns over potable water use by the project.
5. Pesticides Use and Control - Chemicals used to maintain the golf course and common areas are a great concern to the community, with respect to ground water and ocean water quality. Obayashi Hawaii Corporation plans strict controls over chemical types and use through an Integrated Pest Management (IPM) Program.
6. Wastewater Treatment and Disposal - The disposal of the project's wastewater has been a community concern since its outset. Obayashi Hawaii Corporation plans to treat its sewage through an organic process involving oxidation ponds and marshes. The resulting effluent will be diluted and disposed of by land irrigation on the golf course.

These master plan features are an indication of the Developer's intent to create a project which generates the greatest possible benefits and least possible negative effects on the adjoining community.

1.6 PURPOSE AND CONTENTS OF THE ENVIRONMENTAL IMPACT STATEMENT (EIS)

This Final EIS has been prepared to identify and evaluate the existing conditions and potential impacts of the development of the Lihi Lani Recreational Community on the natural and human environment. The Final EIS is required as part of an application to the City and County of Honolulu, Development Plan Land Use Map Amendment and Public Facilities Map Amendment.

There is an Executive Summary prepared which summarizes the entire document. Section 1 is the Introduction which presents background on the project, the generalized development proposal, and the purpose and contents of the document. Section 2 contains a detailed project description, including ownership and present use of the site, the Master Plan, construction activities, market demand, scheduling and costs, and benefits to the community.

Section 3 includes a discussion of existing State and County land use and zoning designations for the project site. Changes in land use and zoning classification are also discussed in this section, along with other approvals required to complete the project. Section 4 includes the description of existing environmental conditions,

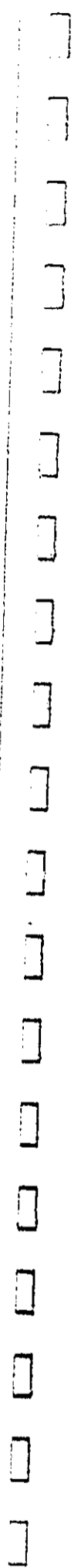
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anticipated environmental impacts and recommended mitigation measures. All environmental factors are considered in this assessment, such as soils, water quality and use, ecology, traffic, archaeological resources, views, noise, and community services, along with other factors. Mitigative measures are recommended to minimize potential adverse impacts generated by the project.

Section 5 is a presentation of alternatives to proposed action, including no-action, agricultural use, and residential subdivision development. Section 6 includes a discussion of the relationship of the project to existing policies and plans for the area. A summary of unresolved issues is included in Section 7.

Section 8 is a list of references used in preparing the report. Section 9 contains copies of all written comments received and corresponding responses. A list of the preparers of this report follows Section 9.

Section 10 (Volume II) includes copies of technical reports prepared by consultants for the project. Specific technical reports have been prepared to evaluate the disciplines of agricultural feasibility, storm water runoff, fertilizer and pesticide use, Integrated Pest Management (IPM), water supply and ground water quality, landscaping water conservation, marine resources, botany, terrestrial vertebrates, archaeology, traffic, noise, air quality, infrastructure, marketing, fiscal concerns and demographics and social character. Information contained in these reports has been highlighted in the applicable sections of Section 4.



SECTION 2 – Project Description

2.0 PROJECT DESCRIPTION

This section presents a discussion of the proposed Lihi Lani project, including the elements of the master plan and construction activities. Market demand for the new golf course and residential development is described in this section, along with various benefits to the community that will result from the project.

2.1 Master Plan Development Goals

The overall goal of this project is to develop a recreational community on approximately 1,143 acres in Pupukea, including preservation of significant resources and the creation of substantial amenities for the surrounding North Shore community. The various elements of the development plan, as shown in Figure 3, include: one 18-hole golf course, including a clubhouse, maintenance facility and driving range, an equestrian ranch, horse pasture, a tennis center, 120 one-acre country lots, 180 affordable housing units, riding and hiking trails, a campground and a community facilities center.

In support of the development, facilities that will be constructed include: access and circulation roadways; a wastewater treatment and disposal system; a potable water supply and fire protection system; a non-potable irrigation water system; and other utilities systems.

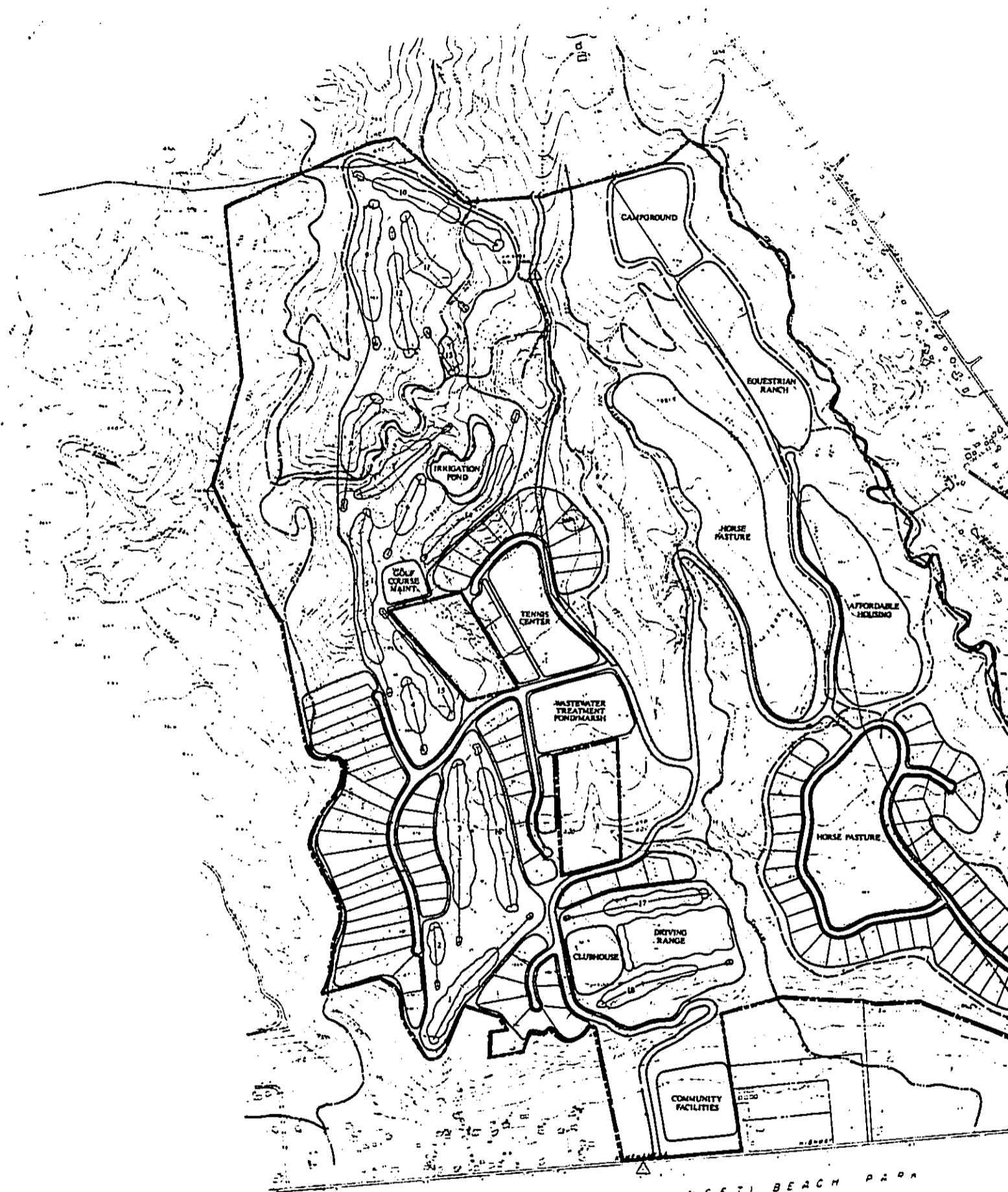
Approximately 559 acres of the site will not be used and will remain undisturbed, as open space within the project. This area is not planned to be affected by site clearing, construction or operations at this project. Hiking trails and bridle paths will be established through approximately nine miles of the project.

A brief description of each element of the master plan is presented below.

A. Golf Course

An 18-hole championship golf course is planned for the project covering approximately 193 acres, to be designed by Jack Nicklaus. This course will become a semi-private golf club, with limited opportunities provided for play by the public on a fee basis. It will be challenging for the better golfer due to its narrow fairways and complex topography. Additional tees and varied pin placement will make this course especially suited for tournament play. It is possible that a professional golfing tournament could be held on this course in the future.

The golf course will be constructed on and around the Kahuku-side plateau. The total area covered by this golf course will be approximately 193 acres, of which approximately 90 acres will be used to develop greens, tees, fairways and roughs. The Master Plan (Figure 3) shows the proposed layout of this golf course. The course will afford spectacular ocean, mountain and valley views. Ponds will be constructed as water hazards on several holes, and will serve aesthetic and storm water runoff



MASTER PLAN
LIHI LANI RECREATIONAL COMMUNITY
 JANUARY 1991

PUUKEA - PAUMALU (SUNSET) BEACH PARK

GOLF COURSE	193 ACRES
GOLF COURSE MAINTENANCE AREA	3 ACRES
CLUBHOUSE	6 ACRES
DRIVING RANGE	10 ACRES
TENNIS CENTER	12 ACRES
EQUESTRIAN RANCH	19 ACRES
HORSE PASTURE	78 ACRES
CAMPGROUND	15 ACRES
COMMUNITY FACILITIES	10 ACRES
SUBDIVISION (120 LOTS)	166 ACRES
AFFORDABLE HOUSING	28 ACRES
ROADWAYS	25 ACRES
WASTEWATER TREATMENT	14 ACRES
IRRIGATION POND	5 ACRES
OPEN SPACE	559 ACRES
<hr/>	
TOTAL	1143 ACRES
HIKING TRAILS/BRIDLE PATHS	(±9 MILES)

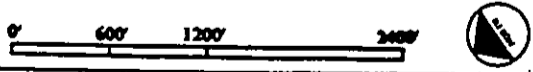
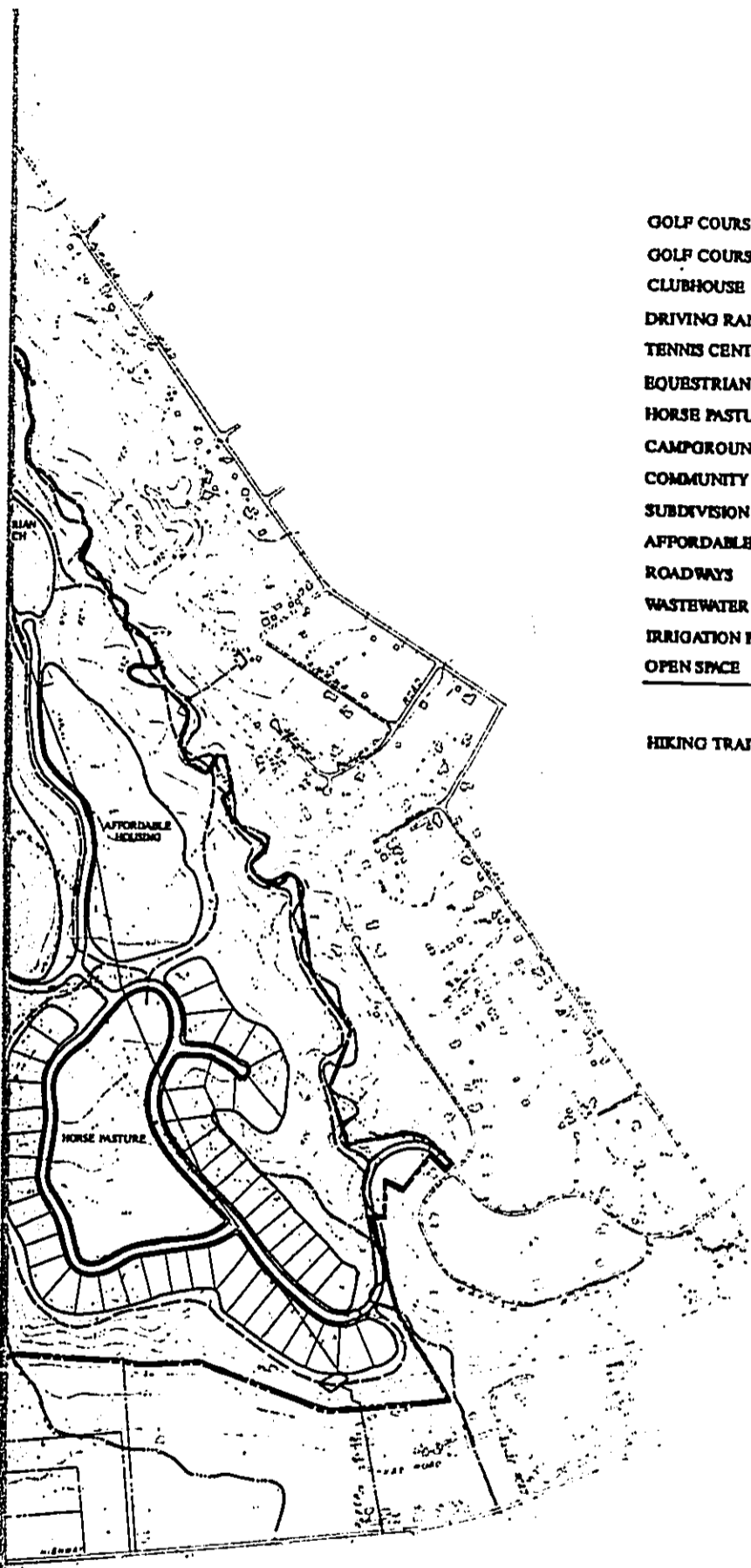


FIGURE 3

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control purposes. Irrigation storage will be provided at a five-acre pond located in the mauka portion of the golf course.

Construction is scheduled to begin in 1993 assuming all necessary government approvals are obtained. Approximately 24 months will be required for construction of the golf course, with completion projected for 1995. Actual construction and opening dates will depend on future market conditions and the timing of government approvals.

B. Clubhouse

Associated with the golf course will be a six-acre clubhouse area, including a 45,000 sq. ft. clubhouse structure. The clubhouse will include: a restaurant, snack bar, office, meeting rooms, locker rooms, a kitchen and a golf pro-shop. Details of the clubhouse facilities are presented in Table 2(a). Surrounding the clubhouse will be an expansive lanai, walkways, gardens and practice putting greens. Most areas of the clubhouse will be accessible to the public, include the snack shop, other dining facilities and the pro-shop. There will also be some private locker room facilities, dining area and meeting facilities provided for club members.

C. Driving Range

A golf driving range will be constructed on approximately 10 acres located adjacent to the clubhouse. This practice area will be open to the public for a fee, and will operate only during daylight hours. The driving range will contain approximately 25 tee positions, and a small manager's office.

D. Golf Maintenance Area

As shown in Table 2(b), the maintenance area will contain a building to house maintenance equipment and offices for the maintenance staff. This area will also contain the raw materials needed for the golf course maintenance, including sand, fuels and chemicals.

E. Tennis Center

On an approximately 12-acre area, the Lihi Lani Tennis Center will include 12 tennis courts, a tennis clubhouse, small swimming pool, and other facilities, as shown in Table 2(c). The Tennis Center will be located on a plateau area centrally located on the project site. This facility will be surrounded by a circulation road and residential lots. A small parking area will be included with this facility.

F. Equestrian Ranch

On the higher elevation areas of the Haleiwa-side plateau, approximately 19 acres are planned for the Equestrian Ranch. A 10-acre area will be utilized for facilities such as barns, an arena, warm-up areas, paddocks and trailer and automobile parking. The

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TABLE 2
FACILITIES PROGRAMS

The following facilities programs are preliminary and schematic in nature, but provide a general notion of the scale and types of amenities under consideration for the recreational component of Lihi Lani.

2(a) CLUBHOUSE

Approximately six acres are available for these facilities.

Facilities	Approximate Areas (sq. ft.)
• Clubhouse	45,000
• Golf Cart Storage	15,000
• Lanai	10,000
• Swimming Pool	10,000
• Four Tennis Courts	30,000
SUBTOTAL	(110,000)
• Landscaping, entry road, walkways, buffer, etc.	31,000
• Parking (320 spaces @ 400 sq. ft./space)	128,000
TOTAL AREA	269,000 (± 6 acres)

2(b) GOLF MAINTENANCE AREA

Approximately 3 acres are available for this facility.

Facilities	Approximate Areas (sq. ft.)
• Nursery/Maintenance Building	10,000
• Equipment yard	60,000
• Parking	3,500
• Buffer area/landscaping roads	50,000
TOTAL AREA	123,500 (± 3 acres)

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2(c) TENNIS CENTER

Approximately 12 acres are available for this facility.

Facilities	Approximate Areas (sq. ft.)
• 12 Tennis Courts	86,000
• Clubhouse Structure	20,000
• Parking (200 spaces)	80,000
• Walkways, landscaping, entry road, etc.	64,000
TOTAL	250,000 (± 6 acres)

2(d) EQUESTRIAN RANCH

Approximately 19 acres are available for this facility.

Facilities	Approximate Areas (sq. ft.)
• Two barns for up to 50 horses	10,500
• Auxiliary Barn	4,600
• Arena Area	61,200
• Two Paddocks	43,000
• Feed and Maintenance Structure	1,800
• Parking (60 spaces)	24,000
• Trailer Parking	13,000
• Landscaping, walkways, entry road riding trails, grass overflow parking, warm-up area, buffer, etc.	280,500
• Open Riding area	200,000
• Uncleared buffer area	190,000
TOTAL AREA	828,000 (± 19 acres)

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2(e)

COMMUNITY FACILITY

Approximately 10 acres are available for this facility, with an additional 2 acres for facilities such as a day care center and a community garden.

Facilities	Approximate Areas (sq. ft.)
• Center/building	5,000
• Outdoor pavilion(s)	3,500
• Children's playground	10,800
• Baseball/soccer field	80,000
• Picnic/barbeque	43,000
• Parking (225 spaces)	90,000
• Swimming Pool (25 meter)	20,000
• Day Care Site	43,000
• Community Garden Site	43,000
• Open Area (drainage)/Landscaped	186,000
<hr/>	
TOTAL	524,300 (± 12 acres)

2(f) CAMPGROUND

Approximately 15 acres are available for this facility.

Facilities	Approximate Areas (sq. ft.)
• 12 cabins (300 sq.ft. per cabin)	3,600
• Mess hall/meeting room	1,500
• Parking (30 spaces)	12,000
• Restroom/showers	700
<hr/>	
TOTAL	17,800 (± 0.40acres)

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remaining acreage will be taken up with an open riding area and uncleared, vegetation areas to serve as a buffer. Table 2(d) includes a listing of the various facilities planned for this area.

G. Country Subdivision Lots

It is planned that approximately 120 one-acre and larger country lots will be subdivided within the site, mainly along the perimeter of the two major plateau areas on either side of Pakulena Gulch. The country lots will encompass approximately 166 acres. Internal circulation roadways will provide access to each residential lot. Different lot locations will include ocean shoreline views, mountain and valley views, and golf course views. Country lot homes at Lihi Lani will generally not be visible from Kamehameha Highway, except possibly a few located on the Kahuku-side plateau.

Strict design guidelines will be established and enforced in the development of residences at this project. Where appropriate, design standards which are more restrictive than the Country District zoning requirements will be included in a Code of Covenants, Conditions and Restrictions. In an effort to minimize water usage throughout the community, restrictions will also be developed for the country lots with respect to water intensive landscaping and percentage of landscape area that may be planted as turf or lawn. These measures are described more fully in Section 4.8.

H. Affordable Housing

A total of 180 affordable housing units will be developed on a 28-acre site on the Haleiwa-side plateau. Although no definitive plans have been made regarding building types, both attached and detached single-family homes are being considered.

I. Hiking and Horse Riding Trails

With the cooperation of two locally-organized committees for hiking trails and horse activities, a nine-mile network of hiking trails has been designed through Lihi Lani. Trail alignments take advantage of existing paths and the natural terrain, in some sections providing expansive views of the Sunset Beach shoreline, the Waianae Mountain Range, Kaena Point and the Pacific Ocean. Other areas traverse more isolated mauka locations, through ironwood forests and heavily vegetated gulches.

Access to the trails will be open to the public at no fee. Trail connections will be available from the internal streets in residential areas and at points more directly accessible from public parking areas at the clubhouse equestrian ranch and tennis center. Public access to hiking trails will be restricted to daylight hours for safety reasons.

J. Campground

Approximately 15 acres are planned for development of a campground. This area will remain largely natural, with approximately two acres proposed for improvements, including: 12 six-person sleeping cabins, a meal/meeting room, restrooms and showers. The facilities will accommodate groups who reserve the campground for overnight outings on weekends only. The campground will be open to the public at a fee, but operated and maintained by the landowner.

K. Community Facility

In response to the stated needs of the local north shore residents, a community facility will be developed by Obayashi on approximately 10 acres near Kamehameha Highway. Discussions with the Joint Planning Committee are ongoing to determine the appropriate facility program. At present, Obayashi has committed to developing the following: a main building for meetings and indoor activities, a 25 m. swimming pool and locker rooms, an outdoor pavilion, picnic and barbecue facilities, a baseball/soccer field, and parking and roadway facilities. Table 2(e) outlines a preliminary facility program for the community facility area. The final mix of facilities is currently under discussion with members of the local community.

L. Land for Day Care Center and Community Garden

Obayashi will also provide two acres of land in the makai portion outside these 10 acres for future development sites for a day care center and a community garden.

M. Entrance and Access Roadway

Access to the Lihi Lani project will be via a new entrance road extending mauka into the project site from Kamehameha Highway. The access road will extend approximately 800 feet to the base of the bluff, then traverse the steeply-sloped face of the bluff for approximately 2,000 feet to reach the highland plateau near the proposed clubhouse area (Figure 3). The construction of this roadway will require bench cuts in the bluff to stabilize slopes and vegetation clearing; however, an extensive landscaping program will be undertaken along the roadway route to buffer views. Special lighting design will also be employed along the entry road where necessary to avoid glare effects on nearby residents outside the project.

From this point, access to the various recreational or residential sites will be provided by the circulation roadway system. Emergency and utility maintenance access will be available at the Haleiwa-side project boundary via Wilinau Road.

N. Circulation Roadway System

As shown in the Master Plan (Figure 3), a circulation roadway system is planned to provide access to the residences and recreational amenities throughout the site. The paved surface and shoulders of two-lane circulation roadway system will occupy approximately 25 acres in area and extend for approximately 22,500 feet (4.3 miles).

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The circulation roadways will have an asphalt surface with grassed shoulders and landscaping. They will be privately owned and maintained by a property owners association. The roadways leading to the major facilities (golf course, tennis center, and equestrian ranch) and the hiking trailheads will be open to the public. Some of the residential areas may have night-time security controls to restrict public access.

O. Wastewater Collection, Treatment and Disposal

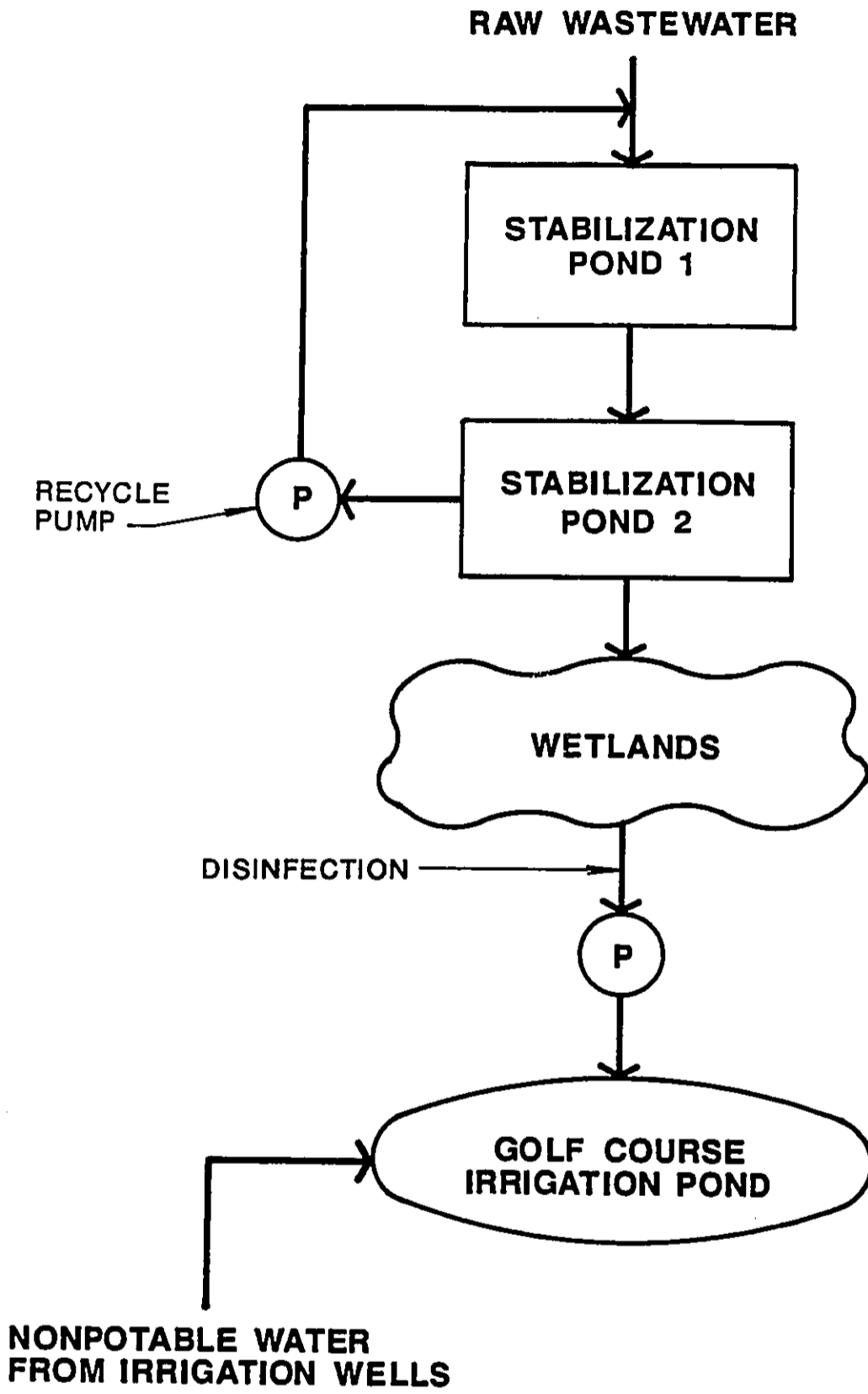
Wastewater will be generated by the project from the residences, maintenance building, clubhouse, tennis center, equestrian ranch, campground and community facility. A Wastewater Management Plan for the project has been prepared by Engineering Concepts, Inc. (December 1990). Information from this report is included here and in Section 4.17.2. The complete report is included as Appendix A.

A wastewater collection system will be installed primarily along the proposed circulation roadway system, and will be connected to all buildings where wastewater will be generated. Appendix A contains a routing plan for the wastewater collection system on-site. Gravity sewers will be used, where topography permits, to convey wastewater to a centrally-located wastewater treatment facility.

The wastewater treatment facility will encompass approximately 14 acres and consist of system of oxidation ponds and marshes which will provide advanced secondary treatment of the wastewater generated on-site. Dr. Robert Gearheart (Humboldt State University, California) is assisting Engineering Concepts, Inc. in the design of this treatment system. He has successfully designed, constructed and operated similar types of systems in California. Sewage pump stations will be installed where topography requires, such as for the clubhouse areas. A schematic flow diagram for the facultative pond and wetland treatment system is depicted in Figure 4.

Advanced secondary wastewater treatment will be conducted through the use of stabilization or facultative ponds followed by a wetlands system for effluent "polishing". Upon approval by the Department of Health, Board of Water Supply (BWS) and Department of Land and Natural Resources (DLNR), treated effluent will be disposed by mixing the effluent with irrigation water (10 to 20 percent effluent and 80 to 90 percent brackish irrigation water) and irrigating parts of the golf course. This method of effluent disposal will provide appropriate treatment of effluent and also could provide up to 20 percent of golf course fertilizer needs. Chlorination or ultraviolet light will be used to disinfect effluent bacteria and virus.

Based on a projected wastewater flow rate of 200,000 gallons per day, a total of eight acres of pond surface area is required. The wastewater treatment facility will require about 10 acres of fenced area, plus and additional two acres for a wetlands system to receive pond effluent. The wetland treatment marsh will be planted with a hardstem bulrush found commonly on Oahu. The plant can be found locally at the marsh in Haleiwa, in Waimea stream and other wetland sites on the north shore of Oahu. These plants pump oxygen into the water via their stems and tubers. They also serve as attachment sites for microorganisms that transform and degrade certain



FLOW DIAGRAM FOR WASTEWATER TREATMENT AND DISPOSAL
LIHI LANI RECREATIONAL COMMUNITY

SOURCE: ENGINEERING CONCEPTS, INC.

FIGURE 4

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compounds in wastewater, improving its quality as a reclaimed effluent. These compounds include BOD, suspended solids, nitrogen, phosphorus, fecal and total coliform and others. These constructed wetlands will be approximately 1.5 to 2.0 feet deep with four to five feet of free board. If necessary, the wetland could be flooded on a temporary basis, to store reclaimed wastewater.

P. Potable Water System

The proposed potable water system for the project will utilize the Board of Water Supply (BWS) transmission and storage system presently serving the Pupukea Highlands and Sunset Hills developments. This system derives water from wells located in Waialua and Haleiwa. Obayashi Hawaii Corporation has credit to a portion of the water in this system since the former land owners participated in the development of the water system.

The proposed potable water system is shown in Figure 5. Three BWS potable water reservoirs are located in the vicinity of the project each with 0.5 million gallon (mg) capacity. Areas located below an elevation of 70 feet are serviced by the Pupukea 170-foot system. Areas between elevations 70 and 500 are serviced by the Pupukea 600-foot system. The Pupukea 893-foot system services areas located between elevations 500 and 800 feet.

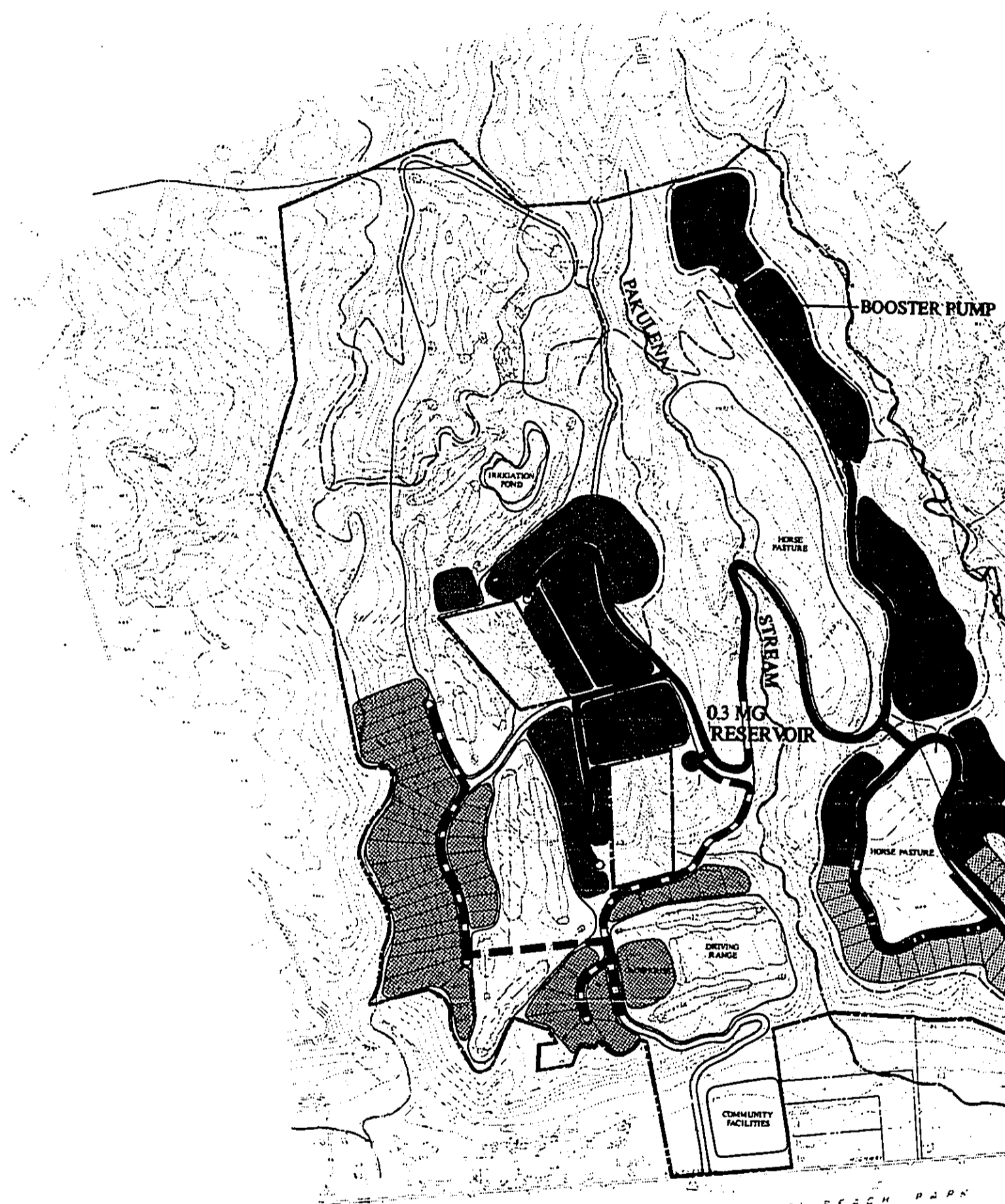
Due to elevation differences within the site, the water demand will be divided into a high service zone (elevation above 500 feet) and low service zone (elevation below 500 feet). The high service zone will be supplied by a new transmission line extended along Alapio Road and Wilinau Road from the Pupukea 892-foot System. The low service zone will be supplied by a new transmission line extended along Alapio Road and Wilinau Road from the Pupukea 600-foot System.

Refer to Appendix B for a more detailed description of the water transmission system and for the breakdown of the specific estimated water demand for each use within the project.

A new 0.3 mg reservoir will be constructed on site at the 600-foot elevation to provide storage to meet clubhouse fire flow demands. The reservoir will also act as a breaker tank to reduce water pressure in the 892-foot system for distribution on the property below the 500-foot elevation in certain areas.




Q. Non-potable (Irrigation) Water System

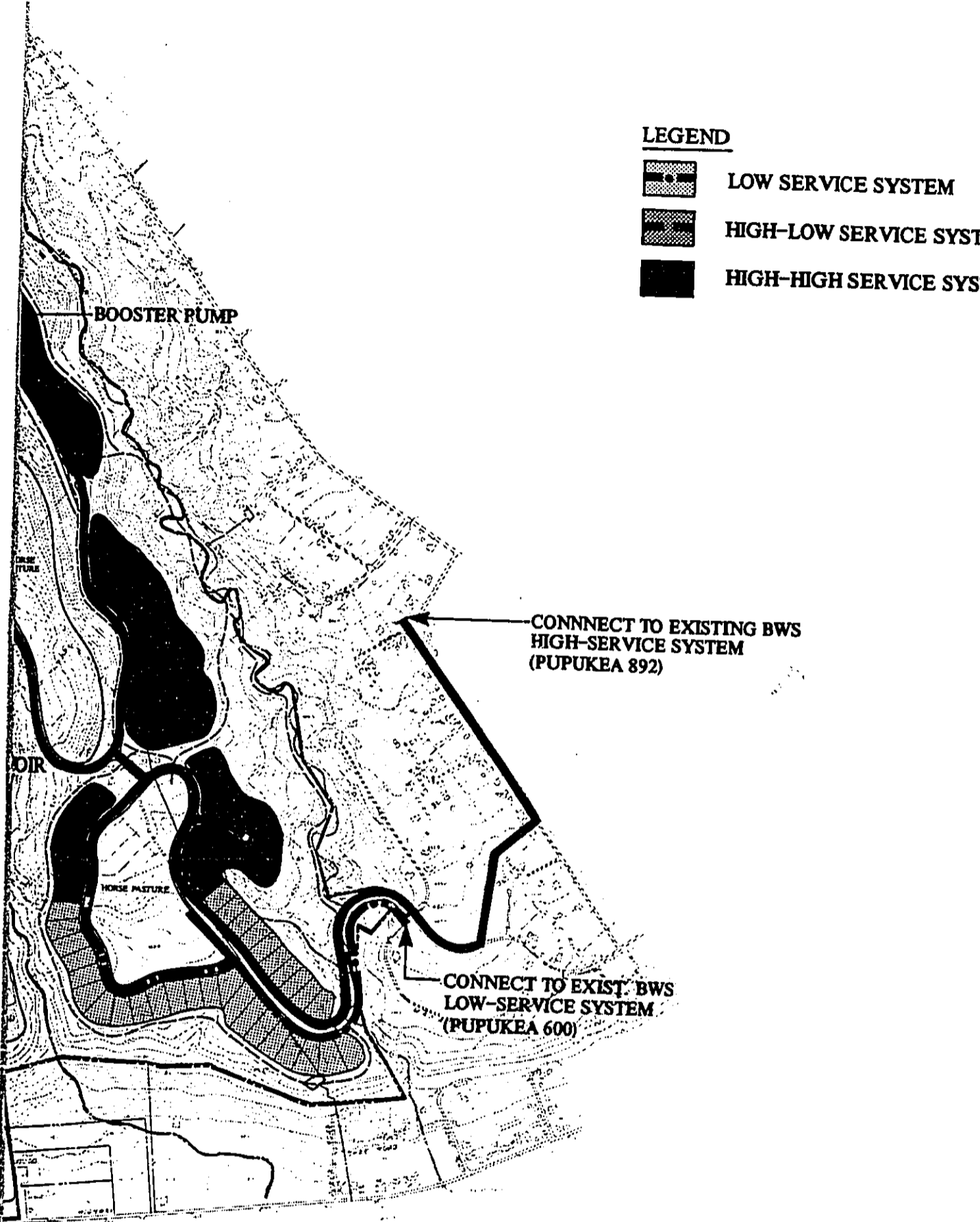
A non-potable water source for irrigation of the golf course and community landscaping will be developed on the project site. Two existing wells will be utilized to meet the irrigation water requirements. The wells, drilled to a depth below sea level (approximately 450 feet below the surface), can produce up to 1.0 million gallons per day (MGD). Details of the non-potable water system design are presented in Appendix B.



PROPOSED POTABLE WATER SYSTEM
LIHI LANI RECREATIONAL COMMUNITY
 SOURCE: ENGINEERING CONCEPTS, INC.

LEGEND

-  **LOW SERVICE SYSTEM**
-  **HIGH-LOW SERVICE SYSTEM**
-  **HIGH-HIGH SERVICE SYSTEM**



BEACH PARK

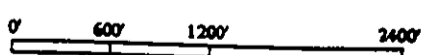


FIGURE 5

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In addition to the on-site wells, an estimated 200,000 gallons per day of wastewater effluent (advanced secondary treated) will be available for irrigation once the project is developed. Treated effluent will be pumped from the on-site wastewater treatment marsh to a storage pond located within the golf course. Effluent and non-potable well water will be blended within the pond for irrigation. The irrigation pond will have a four to eight million gallon capacity, providing several days of storage. In addition, the pond will be designed with two to three feet of freeboard above the normal water level to provide up to 10 days of effluent storage during periods of prolonged precipitation. The pond will be lined to prevent infiltration of irrigation water. Other irrigation storage ponds will be located within the golf course; however, these other ponds will not receive treated effluent.

R. Drainage Facilities

Grading of the golf course will include creation of retention and detention areas through which storm water runoff will be routed. Some of these areas will serve as temporary detention and sedimentation basins during construction, while others will be designed as permanent water detention features within the golf course layout. Certain water features will provide for both retention of runoff water during heavy storms and serve as aesthetic features in the landscaping. A storm drainage report prepared for the project is included in Appendix C.

The main control of runoff on the golf courses and other parts of the developed will be provided by detention areas. Low areas within the golf course will be confined by cart paths or roadways. Detention of water during storms will be provided by these depressed areas, which will most likely be between the play areas on the golf course. Water would be controlled by spillways over cart paths or culverts under roadways. The detention basins will control the potential increase of on-site runoff so that the amount of runoff from the developed project which reaches the intermittent streams will not be significantly greater than that which occurs under existing undeveloped conditions. Some detention basins along the golf course will contain marsh vegetation to aid in filtering sediments and act as sinks for nutrients and chemicals.

S. Solid Waste Disposal

Solid waste such as debris generated during construction, will be trucked off-site. Cleared trees which cannot be retained will be used primarily for mulch. Solid waste generated by the project will be collected by a private collection company and disposed of at the nearest available City and County sanitary landfill. It is estimated that up to three tons per day of refuse will be generated by the various components this project upon completion and full occupancy.

T. Other Utilities

Electricity, communication and cable television conduits will be installed underground along the proposed access and circulation roadways. Utility lines will be installed underground throughout the project.

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2.2 CONSTRUCTION ACTIVITIES

Construction activities at the project will involve vegetation clearing, grading (cut and fill), excavation, rock drilling and blasting, construction of buildings and roadways, and planting and landscaping. A brief description and qualification (where possible) of the extent of each construction activity follows. An estimated construction phasing schedule is provided in Table 3.

A. Vegetation Clearing and Grubbing

Selective vegetation clearing will occur to create buildable areas for the construction of all the project elements described in Section 2.3.1. Within the 584-acre area to be occupied by the project uses, some sections will be completely cleared, while other sections will be selectively cleared or retained as buffers and natural area transition zones.

Golf course design will be sensitive to preserving vegetation on steep slopes and significant trees and tree clusters. Efforts will be made to preserve as much of the existing vegetation as possible, to retain the natural beauty of the land at the golf course.

As shown in Table 4, complete clearing and grubbing will occur over approximately 363 acres to accommodate construction of the project features. Extensive vegetation clearing will be required for the affordable housing (+28 acres), roadways (+25 acres), wastewater treatment facility (+14 acres), golf clubhouse, maintenance facility and driving range (+19 acres), tennis center (+12 acres), equestrian ranch (+10 acres), and community facilities (+10 acres). Selective clearing is proposed for the golf course, horse pastures, campground and the country residential lots. No clearing is proposed for the horse pasture/range areas. Some of the vegetation removed in the clearing effort will be replanted within the temporary nursery and the development areas. Impacts to existing vegetation are discussed in Section 4.8.

The remainder of cleared vegetation (not replanted) from the site will be trucked off-site.

B. Grading (Cut and Fill)

Site grading will be required in many cases to accommodate the construction of the project design elements, described in Section 2.3.1. Earthwork on-site will grade the land to allow for structures and roadways to be constructed. Extensive grading will be required to complete the golf courses. Fill will be placed in uneven topography areas, where required, as earth layers will be removed (cut) to allow construction to progress. Most, if not all, excavated materials will be retained on-site to minimize the quantity of earthwork materials that will be transported off-site.

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TABLE 3

ESTIMATED CONSTRUCTION PHASING TIMETABLE

TIME PERIOD	FACILITY
1993 - 1995	90 affordable housing units Community Facilities 60 market lots (Kahuku side) Wastewater treatment facilities Roadways Water System Golf Course, including clubhouse and driving range Equestrian Ranch Campground Riding and hiking trails
1996 - 1997	90 affordable housing units Tennis Center 60 market lots Additional support infrastructure, as required (i.e. water, sewers, roads, etc.)

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TABLE 4
 ESTIMATED VEGETATION CLEARING AREAS

Development	Total Area (acres)	Estimated Cleared Area (acres)
Golf Course	193	120
Golf Course Maintenance Area	3	3
Clubhouse	6	6
Driving Range	10	10
Tennis Center	12	8
Equestrian Ranch	19	10
Horse Pasture	78(a)	0
Campground	15	2
Community Facilities	10	10
Subdivision (120 Lots)	166	97
Affordable Housing	28	28
Roadways	25	25
Wastewater Treatment	14	14
Irrigation Pond	5	5
Open Space	<u>559</u>	N/A
TOTAL	1143	338

(a) Includes approximately 40 acres of existing pasture land and low shrub vegetation area.

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C. Excavations

Excavations for roadways, building foundations, storm water detention ponds, irrigation water storage reservoirs, piping, and utility trenches will be required to complete the project. Utility installations will mainly occur along the access/circulation roadway system, extending approximately 24,200 feet along the project's roadways. For the entrance road extending from Kamehameha Highway to the clubhouse area, rock and fill removal alone is estimated at approximately 105,000 cu. yds. Additional excavation work may be necessary along Kamehameha Highway to connect proposed utilities to the existing distribution systems. Materials excavated for the trenches and foundations is expected to be reused on-site.

D. Rock Drilling and Blasting

To enable the construction of the access road from Kamehameha Highway across the makai parcel and traversing the bluff face, rock removal will be required. The length of access road that will cross the steep sections of the bluff face is estimated at approximately 1,200 feet. In order to build a road across this area, approximately 50,000 to 60,000 cu. yds. of rock will be removed. Some drilling and blasting is expected to be required for rock removal. Rock debris will be utilized on-site and not transported off-site for disposal. Other parts of the circulation roadway system and other development features may also require isolated rock removal.

E. Construction of Buildings and Roadways

An effort will be made to provide the major public recreational or community facilities in the first phase of the project development. Construction of approximately one-half of the affordable priced homes will be initiated in the first phase, however, occupancies may occur over a longer period, subject to consumer demand. Approximately one-half of the country lots may be available in the first phase, however the home construction schedule will vary from buyer to buyer; there will not be a simultaneous, short-term effort to complete houses on all available lots. The second phase will bring on the remainder of the affordable and market priced homes, the tennis center and any additional support infrastructure, as required.

The number of workers on the site and on local roadways will be spread over an intense two-year construction period. Construction of the internal circulation roads will be spread over the two phases of the project, and will involve earthwork operations. Roadway development will require clearing, grading, road bed construction, drainage facilities installation, paving, lighting and other safety provisions.

F. Planting and Landscaping

Extensive landscape plantings will be incorporated with the entire project. The golf courses and clubhouse will be landscaped extensively with ornamental and native plants designed to frame the course features and enhance the aesthetic beauty of the completed courses. The access roadway will receive special attention by the landscape architect (Walters, Kimura & Associates, Inc.) for the entrance and access

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road/bluff crossing area. In the roadway section crossing the bluff face, plantings common to the area will be located to blend the access roadway with the natural vegetation and land features. The entrance area will also be tastefully designed with native and ornamental plantings to compliment the Kamehameha Highway corridor through Sunset Beach. The basis for landscaping design will utilize xeriscape principles (water conservation) along the lines of the voluntary guidelines recently developed by the Board of Water Supply.

2.3 MARKET DEMAND

The market demand for an additional semi-private golf course and new market rate and affordable residential homes at Lihi Lani has been identified through a Market Assessment prepared for this project by KPMG Peat Marwick (December 1990, Appendix D). Information from the Market Assessment for each of the major proposed development elements is given below.

2.3.1 Golf Course

An 18-hole semi-private golf course is being proposed at this project. This tournament level course will be designed by Jack Nicklaus, with completion scheduled for 1994.

The anticipated demand for use of the semi-private golf course includes three sub-markets: local country club players, local recreational players and Oahu visitors. In general, the local country club players would become members and gain the right to have full privileges at the semi-private golf course and country club. There will also be limited opportunities for public play, with local recreational players utilizing the course through small social golfing clubs and foursomes. The Oahu visitor golf market is anticipated to include the following: traveling golfers staying mainly in Waikiki, visitors who purchase golf packages, and Kuilima Resort hotel and condominium guests who desire to play another nearby course. The market mix is expected to change over the period 1995-1999, with an increase in private member players as residences on the country lots are completed.

There are 30 golf courses presently operating on Oahu that support the various golfing market segments. An inventory of golf courses on Oahu (as of 1990) is presented in Table 5. Oahu has many restricted-use golf courses with four private and nine military golf courses. There is also a relative lack of golf courses in the Waikiki resort area, and golf tour operators presently package day-trip tours to several popular daily-fee and resort courses on the island.

Of the 17 other golf courses on Oahu, nine are daily-fee golf courses, five are municipal golf courses, and three are resort golf courses. At present, there is only one municipal golf course in the North Shore/Koolauloa area which is the nine-hole City and County golf course at Kahuku. There are no daily-fee courses in the North Shore/Koolauloa area. Area players currently utilize the Kahuku 9-hole municipal golf course and the 18-hole Kuilima Resort golf course, or travel to other locations on the island.

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TABLE 5
EXISTING GOLF COURSES ON OAHU (1990)

<u>HOLES</u>	<u>HOLES</u>	<u>LOCATION</u>
Resort:		
Makaha Resort and Country Club	18	Makaha Valley
Kuilima Resort	18	Kahuku
Ko Olina Resort	18	Ewa
Private:		
Waialae Country Club	18	Waialae/Kahala
Oahu Country Club	18	Nuuanu
Mid-Pacific Country Club	18	Lanikai/Kailua
Honolulu International Country Club	18	Salt Lake
Municipal:		
Ala Wai Golf Course	18	Honolulu
Kahuku Golf Course	9	Kahuku
Ted Makalena Golf Course	18	Waipio/Waipahu
Pali Golf Course	18	Kaneohe
West Loch	18	Ewa
Daily Fee:		
Bay View Golf Center (Par 3)	18	Kaneohe
Hawaii Country Club	18	Kunia
Hawaii Kai Championship Golf Course	18	Hawaii Kai
Hawaii Kai Executive Golf Course (Par 3)	18	Hawaii Kai
Makaha Valley Country Club	18	Makaha Valley
Mililani Golf Course	18	Mililani
Moanalua Golf Club (1)	9	Moanalua
Olomana Golf Links	18	Olomana/Kailua
Pearl Country Club	18	Pearl City/Aiea
Military:		
Barbers Point Golf Course	18	Barbers Point NAS
Hickam Golf Course	18	Hickam AFB
Kalakaua Golf Course	18	Schofield Barracks
Kaneohe Marine Golf Course	18	Kaneohe MCAS
Leilehua Golf Course	18	Schofield East Range
Navy Marine Golf Course	18	Aliamanu
Fort Shafter	9	Fort Shafter
Hickam (Par 3)	9	Hickam AFB
Ford Island	9	Ford Island NAS

(1) Course is open for public Monday through Fridays only.

Source: Based on published information.

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Based on the information available, 24 golf courses are currently being planned on Oahu, which are listed in Table 6. Six of these golf courses are presently under construction.

In the North Shore/Koolauloa area, there are eight other planned golf course projects besides Lihi Lani, including: two 18-hole golf courses in Mokuleia (Mokuleia Land Co.), an 18-hole golf course in Waialua (Oceanic Properties), three 18-hole golf courses at Punamano (Campbell Estate), one 18-hole golf course at Malaekahana (Campbell Estate), and another 18-hole golf course at Malaekahana (Kuilima Resort Co.). As with Lihi Lani, none of these eight courses have any approvals at present. There have also been some very preliminary indications of plans for one or two golf courses to be developed in Haleiwa on lands owned by Bishop Estate. Projects that could be most competitive with the Lihi Lani Golf Course would include the two Kuilima Resort Golf Courses. The Punamano Golf Courses, if developed, would also be competitive because of their proximity.

With appropriate market planning, Lihi Lani and the two Kuilima courses, could serve complementary markets and support the emergence of the North Shore area of Oahu as a small golf center, with three high-quality courses for both resident and visitor golfers. Other golf developments in the area could also be supported by the existing and projected golf market. The development of all eight of the proposed golf courses for the North Shore/Koolauloa area is not expected to occur in the foreseeable future.

Golf development at the Lihi Lani project will be associated with an internationally known golf course designer (Jack Nicklaus) to overcome possible disadvantages of the site because of its North Shore location on Oahu, and to differentiate itself from other planned developments.

Full operation at the proposed golf course could be anticipated within six years following first marketing, or by about 1998. The sales absorption of the projected 500 memberships is estimated to occur over a five year period. At full operation, the course could be anticipated to accommodate nearly 48,000 rounds of golf annually.

2.3.2 Country Lots

Also proposed as part of the project is a single-family residential subdivision of approximately 120 one-acre and larger country lots. It has not been decided whether lots will be sold unbuilt, or that the individual homes will be constructed by Obayashi. Either Obayashi or private builders will construct the homes following strict guidelines for design and layout.

Based on market mixes achieved at other comparable developments, and on the characteristics of the site and the proposed development, the market for the country lots is expected to be composed principally of couples or families seeking a primary or second/vacation home. The projected country lot buyer market mix is: Hawaiian residents seeking a primary or vacation home (45 to 55 percent); western U.S.

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TABLE 6
 Proposed Golf Course Developments on Oahu (1990)

Under Construction	Region/Location	Type	Holes	Status
Ewa (Hawaii Prince) Golf Course	Ewa Beach	Semi-Private	27	Expected to be operational in 1991
Kapolei Golf Course	Kapolei Village	Municipal	18	Expected to be operational in 1991
Makakilo Golf Course	Makakilo	Semi-Private	18	Expected to be operational in 1991
Minami Golf Course	Kaneohe	Semi-Private	18	Expected to be operational in 1991
Royal Hawaii Country Club 1	Maunawili	Semi-Private	18	Expected to be operational in 1991
Kuilima Resort Golf Course 2	North Shore	Resort	18	Expected to be operational in 1991
PROPOSED				
Bay View Expansion	Windward	Semi-Private	18	Pending City Council approval
Ewa Gentry Golf Course	Ewa	Semi-Private	18	Pending City Council approval
Ewa Marina	Ewa	Semi-Private	18	Needs development plan amendment
Haleiwa Golf Course	Haleiwa	Semi-Private	18	Preliminary, no permits applications filed
Heeia Golf Course	Windward	Semi-Private	18	Needs Environment Impact Study
Heeia Kea Golf Course	Windward	Semi-Private	18	Needs Environment Impact Study
Kailua Drive-In	Windward	Semi-Private	18	Preliminary, needs SMP
Kipapa Ridge Estates	Central	Semi-Private	18	Preliminary, no permits applications filed
Ko Olina Resort Course 2	Ewa	Resort	18	Preliminary, no permits applications filed
Kunia Golf Course	Central	Not known	18	Development plan amendment proposed, rezoning require
Lihl Lani	North Shore	Semi-Private	18	Needs development plan amendment
Mali Kai	Ewa	Not known	18	Preliminary, no permit applications filed
Makaha Valley Country Club	Ewa	Daily fee	9	Pending City Council approval
Malaekahana Golf Courses	Ewa	Daily fee	36	EIS approved for both courses
Malu Lani Golf Course	Laie	Semi-Private	18	Needs environmental impact study
Mokuleia Golf Course	Windward	Daily fee	18	Pending City Council approval
Mokuleia Golf Course 2	North Shore	Private	18	Pending City Council approval
Ohikilolo	North Shore	Not known	18	Preliminary, no permit applications filed
Puuloa	Ewa	Semi-Private	18	Pending City Council approval
Royal Hawaiian Country Club 2	Ewa	Semi-Private	18	Approval pending performance of first course
Royal Kunia Golf Course 1	Maunawili	Semi-Private	18	Pending City Council approval
Royal Kunia Golf Course 2	Central	Semi-Private	18	Pending City Council approval
Waianaes Kai	Central	Semi-Private	27	Pending City Council approval
Waiaua Golf Course	Waianaes	Not known	36	Development plan approval, rezoning required
Waihee Valley Golf Course	Central	Municipal	18	Preliminary, no permits applications filed
Waikane Golf Course 1 (Pan Pacific)	Windward	Semi-Private	27	Development plan pending
Waikane Golf Course 2 (Hoyu)	Windward	Semi-Private	18	Development plan pending
Waialeale Golf Course	Windward	Semi-Private	18	Waiting for grading permit
West Loch/Ewa Villages Course 2	Waialeale	Semi-Private	18	Preliminary, no permits applications filed

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residents seeking a vacation or future retirement home (30 to 40 percent); and other U.S. or foreign residents seeking a vacation home (10 to 20 percent).

Based on the analysis of current market conditions among selected comparable projects and characteristics of the site and preliminary development plan, preliminary average lot sales prices are estimated (in 1990 dollars) at: \$375,000 for ocean view lots; \$325,000 for golf course view lots; and \$200,000 for other interior lots.

Absorption of the lots at similar developments on Oahu and neighbor islands has been strong since 1987, with price increases not deterring sales. Demand at comparable projects has ranged from 70 sales per year per project for one-acre lots, to approximately 104 sales per year per subdivision for estate lots of more than one acre.

There are no known plans for new golf-oriented or large lot subdivisions on Oahu. Due to the strong visitor base and growing population of the island, it is anticipated that sales absorption of the project will be fairly rapid. Based on the projected lot sales prices and current market conditions, the 120 estate lots could be completely sold within about four years of marketing, or by about 1997.

Lot purchasers could also be granted reduced price memberships in the semi-private golf club, in order to integrate the residential and golf elements of the development, and to establish a stable resident base for the golf course.

2.4 BENEFITS TO THE COMMUNITY

The Lihi Lani Recreational Community will include several features that will be available for public use. In addition to the golf course, the public will be able to use the driving range (by fee), nine miles of hiking trails and bridle paths (at no cost), tennis center (by fee), equestrian ranch (by fee) and campground (by fee). Parts of the clubhouse facilities will also be open to the public, including the snack bar, restaurant and golf pro-shop.

Numerous meetings with residents of the area have been held over the last three years to discuss issues and concerns, including possible programs and facilities which Obayashi could provide for the community. During 1989-1990, meetings of the Joint Planning Committee have helped to better define the types of programs and facilities that are of specific interest to residents of Sunset Beach and Pupukea. As a result of these discussions, Obayashi has prepared a community benefits package which lists the various programs and facilities that would be provided pending the issuance of all necessary approvals. This list is included as Appendix A, and accompanied the initial Obayashi application for North Shore Development Plan Amendment filed in November 1990. The benefits package includes a community facilities package includes a community facilities complex (soccer/baseball field, swimming pool and locker rooms, meeting hall, picnic area, parking facilities). Other elements of the package include scholarship programs and kama'aina golf rates.

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•FINAL ENVIRONMENTAL IMPACT STATEMENT•

The exact details of the community benefits package will be specified in a bilateral development agreement between Obayashi and the community. The Development Agreement will commit Obayashi to performing specific activities and providing funds to the community as claimed in the benefits package. The Development Agreement commitments to be made by Obayashi must be consistent with the requirements and conditions imposed by the government review agencies. It is possible that the community may create a non-profit group to administer funds provided to the community through the Development Agreement.

SECTION 3 - Land Use and Zoning Controls

3.0 LAND USE AND ZONING CONTROLS

This section includes a description of the existing State and City and County land use and zoning designations for the project area. Changes in land use classification and zoning required to implement the proposed action are described, as well as other required approvals. A list of permits and approvals required to implement the proposed action is included in Table 7.

3.1 STATE OF HAWAII

3.1.1 State Land Use District

The entire 1,143-acre project site is located within the State Land Use Agricultural District.

In 1972, the Land Study Bureau (LSB) of the University of Hawaii classified all lands on Oahu according to productivity and suitability for agriculture. Overall ratings of crop productivity range from Class A to E, with A being the best. On the Obayashi land, there are approximately 0.2 acres of Class A soils and 162 acres of Class B soils. The remainder of the area (975 acres) is classified as either Class C, D, or E soils. LSB soil classifications for the project are shown in Figure 6.

The provisions of the Hawaii Record Statutes relating to the State Agricultural District (Sections 205-2 and 205-4.5, HRS) distinguish between uses permitted on A and B classified lands (commonly referred to a "prime" or "good" agricultural lands) and those permitted on C, D, and E (or "marginal") lands.

Permissible uses of LSB Class A or B lands generally include crop cultivation, farming, wind energy facilities, aquaculture, livestock raising, and related support uses. For lands with LSB classification C, D, or E additional uses are possible, such as open area recreational facilities, including golf courses and golf driving ranges. Section 205-2, HRS recognizes the inclusion of substantial areas of land with marginal agricultural value in the Agricultural District with the following statement: "These districts may include areas which are used for, or are not suited to, agricultural and ancillary activities by reason of topography, soils and other related characteristics".

3.1.2 State Land Use Boundary Amendment

The project has been designed in conformance with the State Land Use Commission restrictions for Agricultural lands. Although the site includes some LSB A and B rated lands, land uses proposed for these areas are consistent with the permissible uses for such lands under Section 205-4.5, HRS. Land uses proposed for A and B

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TABLE 7

REQUIRED PERMITS AND APPROVALS

<u>PERMIT/APPROVAL</u>	<u>AGENCY</u>
1) North Shore Development Plan Amendment Land Use Map (Golf Course, Affordable Housing and Community Facilities) and Public Facilities Map (Water and wastewater facilities, roadways and drainage)	City Department of General Planning, Planning Commission, City Council, Mayor
2) Land Use District Boundary Amendment Agriculture to Urban (Affordable Housing)	State of Hawaii Land Use Commission
3) Zoning District Change Agricultural (AG-2) to various districts	City and County of Honolulu
4) Special Management Area Use Permit	City Department of Land Utilization, City Council
5) Conditional Use Permit (Tennis center, equestrian ranch and campground)	City Department of Land Utilization
6) Site Plan Review (Community Facility)	City Department of Land Utilization
7) Special Use Permit/Conditional Use Permit (Wastewater Treatment Facility)	City Department of Land Utilization, City Planning Commission

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rated lands are horse pasture, a tennis center, country lots (one-acre minimum), an irrigation pond, and portion of the affordable housing area. The relationship of master plan uses and LSB soil ratings is shown on Figure 7.

Of these proposed land uses, a portion of the 28-acre affordable housing development would require an amendment to the Land Use District Boundary from Agriculture to Urban. The Affordable Housing Site must be changed to State Urban District because the proposed density is less than once acre, and it will be redesignated from Agriculture to Residential on the City DP Land Use Map. An application for this amendment may be filed in 1991.

3.2 CITY AND COUNTY OF HONOLULU

3.2.1 General Plan

The objectives and policies of the City and County of Honolulu General Plan set forth comprehensive statements concerning the needs of the people of Oahu and the functions of government. According to the General Plan, the North Shore Development Plan area is to remain as a rural area, with 1.6 to 1.8 percent of the projected 2010 Oahu population. In 1989, an estimated 1.7 percent of the Oahu population lived in the North Shore areas (Development Plan Status Review, 1990, City and County of Honolulu).

In addition, it is a policy of the General Plan to "encourage the private provision of recreation and leisure-time facilities and services". Sections 4.16.1 and 6.2.1 contain a discussion of the relationship of the project to the General Plan population guidelines.

The total number of full-time residents of Lihi Lani at complete development will be approximately 193 persons at the country lots and approximately 504 persons at the affordable housing. The population increase associated with Lihi Lani is of too small a magnitude (0.07 percent of the projected 2010 Oahu population) to materially alter the degree of consistency of the North Shore's development capacity with its Population Distribution Guideline.

3.2.2. Development Plan Land Use Map

Current Designation: The area is currently designated "Agricultural" on the North Shore Development Plan Land Use Map. The agricultural category of land use is defined as including those areas suitable for crop growing, grazing and the raising of

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livestock, flower gardening, nurseries or orchards, aquaculture or similar activities. This classification also includes areas surrounded by or contiguous to such lands but not well suited to agricultural or accessory activities due to topography, soils or similar constraints. According to the designation definition, uses complementary to agricultural uses may be permitted in these areas.

Proposed Amendment: An application to amend the North Shore Development Plan (DP) Land Use Map has been submitted as the first application for governmental review of this project. This Draft Environmental Impact Statement has been prepared in order to meet the application requirements. Figure 8 shows the areas of the project for which an amendment to the DP Land Use Map is requested. These project areas include: 212 acres for the golf course (Agriculture to Preservation), 28 acres for the affordable housing (Agriculture to Residential), and 10 acres for the community facilities (Agriculture to Preservation).

A requirement of the DP Amendment application for the proposed golf course is provision of a community benefits package which is discussed in greater detail in Section 2.6 and Appendix A.

3.2.3 Zoning

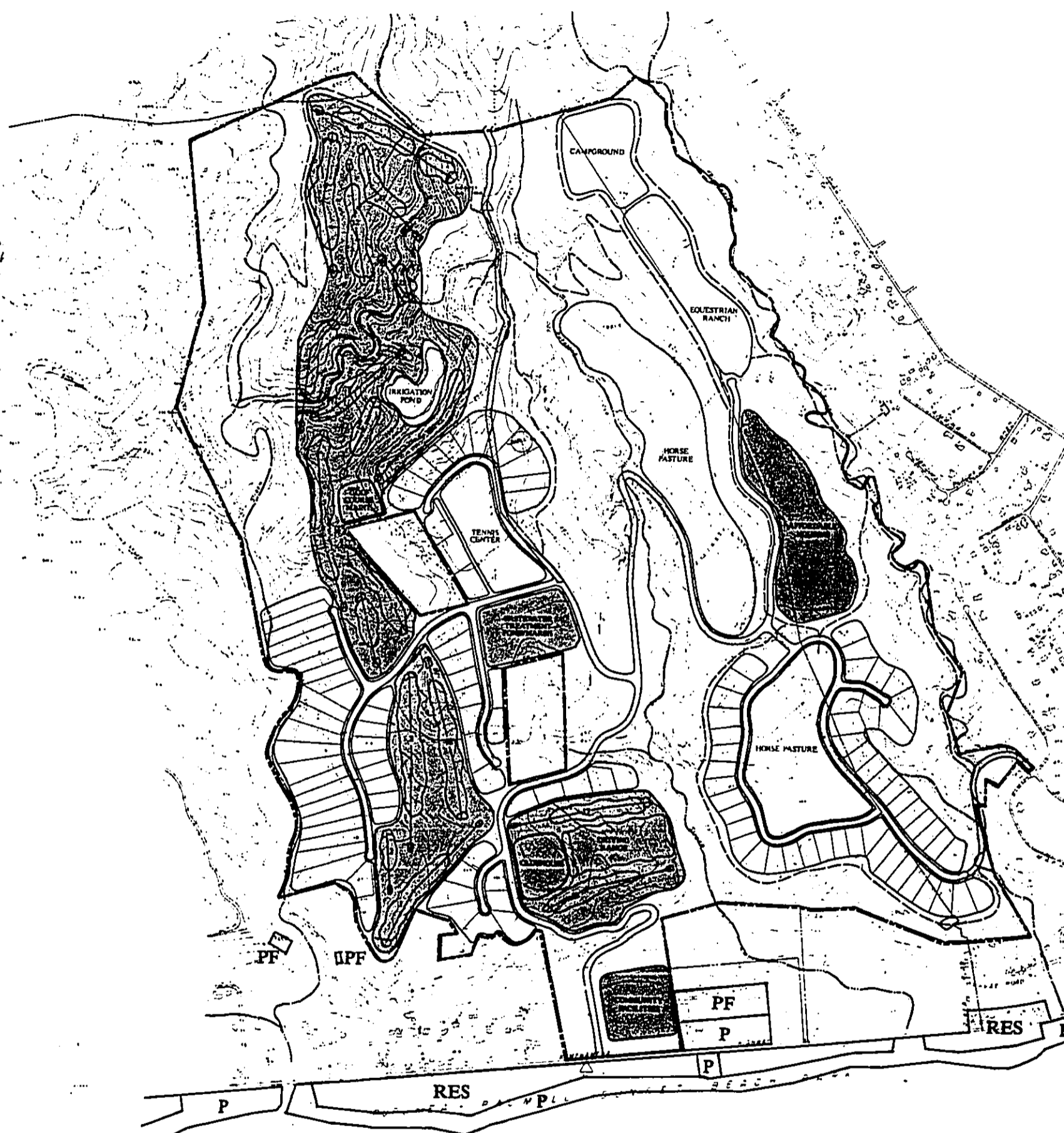
Existing Zoning District: The zoning is AG-2 General Agricultural District. These districts generally include lands which are predominantly classified as "Other" under the Agricultural Lands of Importance to the State of Hawaii (ALISH) system, as discussed further in Section 4.3. (Lands predominantly classified as "Prime" or "Unique" under the ALISH system are generally zoned AG-1 Restricted Agricultural District). Twenty-nine percent (328 acres scattered in eight different areas) of the property is classified as "Other", and fifty percent is unclassified because of steep slopes.

The City and County recognizes that the overall feasibility of agriculture on these lands is limited due to extreme topographic variations and/or separated agricultural soil sections. Outdoor recreational facilities (except golf courses) are permitted in the AG-2 General Agricultural district as conditional uses.

Proposed District Changes: Several areas of the project will require modification to the current AG-2 General Agricultural zoning. The proposed zoning changes are summarized below:

General Preservation (P-2): A zoning change to P-2 General Preservation district is required to permit the development of the golf course and accessory uses over approximately 212 acres. The golf course and driving range are principally permitted; the golf clubhouse and maintenance facility are permitted accessory uses.

Country Residential (Country): A zoning change to a Country district is required to permit the country lots, which requires a one-acre minimum lot size.



DP AMENDMENT REQUEST AREAS
LIHI LANI RECREATIONAL COMMUNITY
 SOURCE: CITY AND COUNTY OF HONOLULU DEVELOPMENT PLAN MAP (1983)

SUMMARY OF AMENDMENT AREAS

<u>REQUEST</u>	<u>LAND USE</u>	<u>ACREAGE</u>
From Agriculture to Residential	Affordable Housing	28
From Agriculture to Public Facility	Wastewater Treatment	14
From Agriculture to Park	Golf Course	193
	Driving Range	10
	Clubhouse	6
	Maintenance Area	3
	Community Facilities	10
		<u>222</u>
TOTAL		264 ac.

LEGEND

- P PARK
- PF PUBLIC FACILITIES
- RES RESIDENTIAL

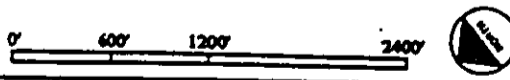


FIGURE 8

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Other Residential: The desired zoning for the affordable housing has not been determined. The development standards for several residential zones (e.g. R-3.5, R-5, R-7) will be studied further to determine the "best fit" with the proposed housing product. A mix of both attached and detached, single-family housing is under consideration. Some type of Planned Unit Development (PUD) could also be considered for the affordable housing.

All of the proposed changes in zoning are subject to approval by the City Council. The review process involves public hearings before both the Planning Commission and City Council.

3.3 OTHER REQUIRED APPROVALS

3.3.1 Conditional Use Permit (CUP)

Some of the outdoor recreation uses within the project are permitted in the AG-2 General Agricultural district subject to a conditional use permit, namely: the tennis center, equestrian ranch, and the campground. These uses are classified as "Type 1" conditional uses and do not involve a public hearing as part of the review process.

The golf course maintenance facility is permitted within the proposed A-2 General Agricultural district as a conditional use. This conditional use is classified as "Type 2", which requires a public hearing as part of the review process. A Special Use Permit is also required for this facility which is granted by the Planning Commission.

3.3.2 Conditional Use Permit (CUP) for Wastewater Treatment Facilities

To construct and operate the new wastewater treatment facilities to serve the project, a Conditional Use Permit must be obtained from the City and County, Department of Land Utilization. The wastewater treatment facility is classified as a "Type-B" utility, which requires a "Type-1" Conditional Use Permit.

3.3.3 Site Plan Review

The community facility is permitted in the AG-2 General Agricultural district subject to Site Plan review by the City Director of Land Utilization. Prior to submission for application for a site plan review permit, the applicant shall first present the proposal to the North Shore Neighborhood Board 27, and the local community associations. Adjacent property owners may request a public hearing, prior to final action by the Director.

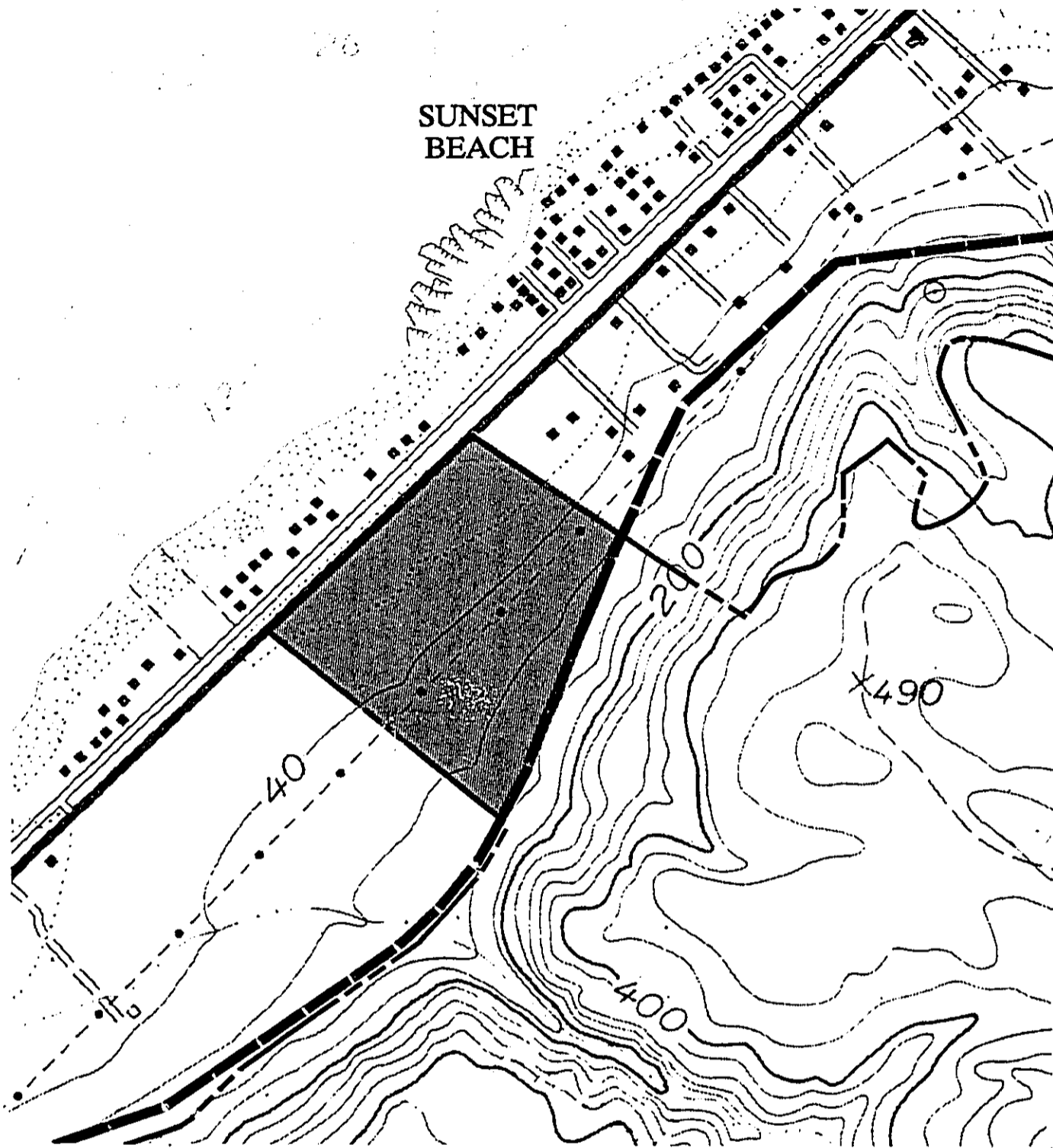
3.3.4 City and County Special Management Area

A Special Management Area (SMA) boundary generally extends along the lower portion of the bluff in the Pupukea-Sunset Beach area (Figure 9). The SMA is a coastal resource zone which receives special attention in the review of development proposals. Approximately 30 acres of the site lies within the SMA.



A SMA Use Permit must be obtained to allow for the construction of the access road and the community facility. The City Council is the approving authority for this permit. The Director of Land Utilization must hold a public hearing as part of the Department's review of the application.

3.3.5 Ministerial

Other approvals will be required to implement the proposed action, including: Well Drilling/Withdrawal Permit (State Water Commission), Wastewater Treatment System Approval (State Department of Health, City Department of Public Works) and Roadway Entrance Approval (State Department of Transportation). These are generally classified as "ministerial" review and approval processes as opposed to the previously described approvals, which are more "discretionary" in nature and do not normally include public input.



LEGEND

-  SMA BOUNDARY
-  SMA AREA WITHIN OBAYASHI PROPERTY

**SPECIAL MANAGEMENT AREA
LIHI LANI RECREATIONAL COMMUNITY**

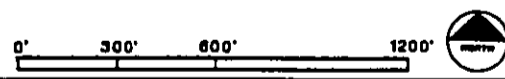


FIGURE 9

**SECTION 4 – Description of Environmental Setting
Anticipated Impacts and Mitigative Measures**

4.0 DESCRIPTION OF ENVIRONMENTAL SETTING, ANTICIPATED IMPACTS AND MITIGATIVE MEASURES

This section presents background information on the existing human and natural environment. Utilizing this background, the proposed project is evaluated as to the potential for it to generate significant environmental impacts. Impact discussions are divided into short-term construction-related impacts, and long-term operations-related impacts.

Mitigative measures have also been recommended to minimize the potential impact of the project construction and operation. Technical consultant reports have been prepared to supplement the impact assessment. Findings from these reports are summarized herein; the complete texts are enclosed as Appendices A-U.

4.1 CLIMATE

A. Existing Conditions

Annual average daily maximum and minimum temperatures have been recorded at the State Key Station 896.00 located at the Pupukea Farm. This weather station is at the elevation level closest to the site. Temperatures range from the low 60's to the mid-80's depending on the time of day and the season. Daily temperatures vary by about seven degrees between winter and summer seasons, and 15 to 18 degrees between day and night. Cooler temperatures are experienced at higher elevations in this area.

Precipitation has a definite seasonality on Oahu and at the site. Rainfall has been recorded by the Hawaii Sugar Planters Association at the Pupukea Farm State Weather Station. The median annual rainfall at this station is 51.7 inches. The distribution is uneven and varies from month-to-month, heavy at some times and non-existent at others.

The Pupukea area is subject to both trade winds and Kona storms, but damage from these storms is less severe than in the more exposed areas such as Kahuku. Average wind velocity is eight to ten miles per hour, with the prevailing wind directions being northeasterly and easterly.

Cloud cover is an indication of the amount of sunshine an area receives. On this particular area of the island, slightly less than one-third of the days per month are clear, about a third are partly cloudy, and a little more than a third of the days are cloudy.

The average relative humidity approximates 74.6 percent on the northern coast of Oahu, slightly lower in the summer and higher in the winter.

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B. Anticipated Impacts and Mitigative Measures

Design of the proposed project will be typical for a tropical climate, with extensive use of outdoor recreational facilities. The proposed project will have no affect on climatic conditions and no mitigative measures are required.

4.2 TOPOGRAPHY

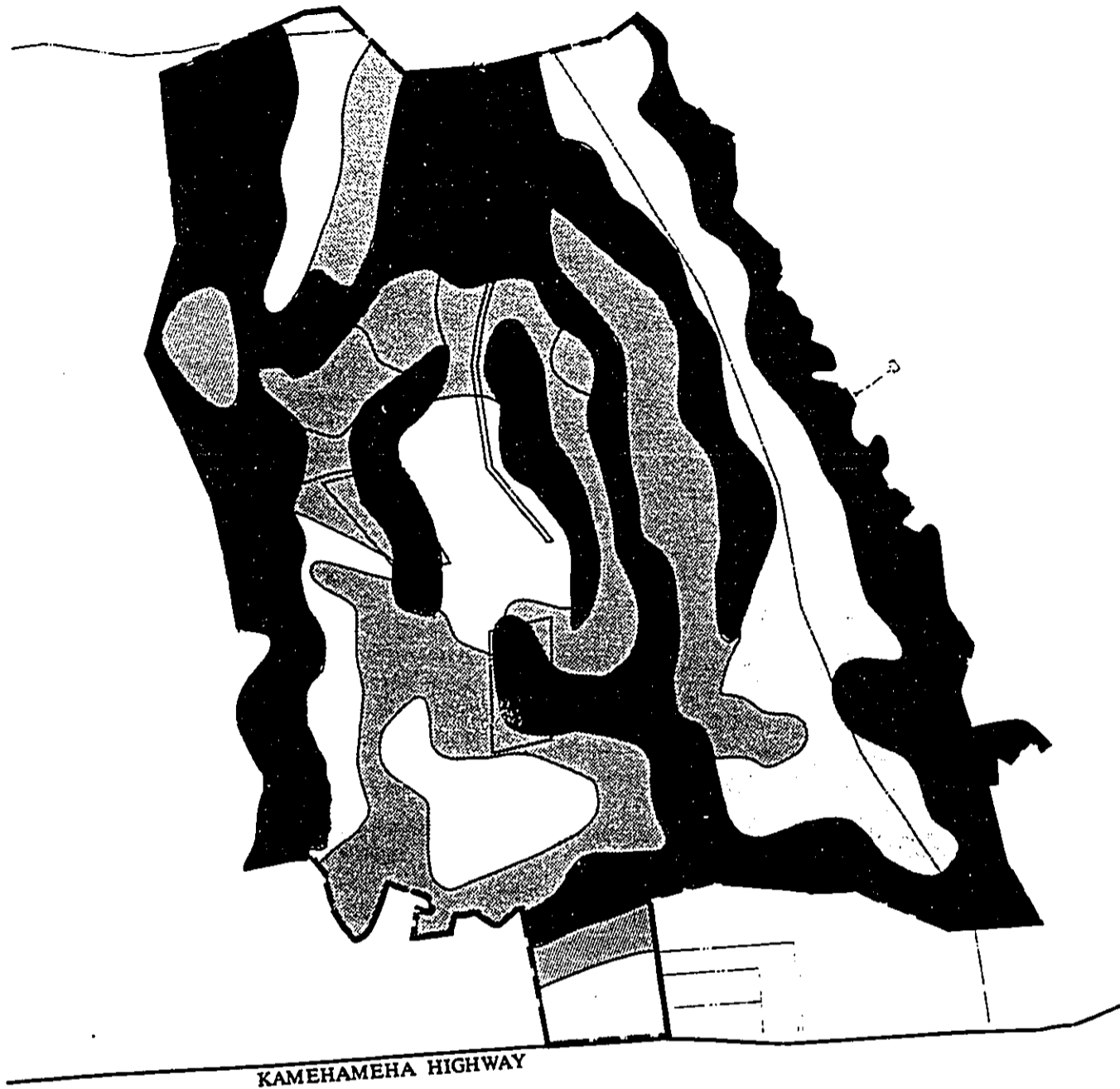
A. Existing Conditions

The project site consists of two large plateaus which are separated by a narrow, steep gulch in which there is an intermittent stream called Pakulena Stream. It is bordered on the Kahuku-side by the valley of Paumalu Stream and on the Haleiwa-side by the valley of Kalunawaikaala Stream (Figure 2). Elevation ranges from 20 feet above mean sea level (msl) near Kamehameha Highway to nearly 850 feet above msl in the uplands behind the plateau areas. Puu Waihuena is a hill located on the Kahuku-side of Pakulena Stream at elevation 730 feet above msl.




The terrain is extremely rugged on top of the pali between the plateaus. The bluff is very steep, jagged and rocky. Approximately 20 percent of the area has very slight (0-10 percent) slopes, another 10 percent is moderately (10-20 percent) sloping, and the remaining 70 percent is characterized by steep (20 to 30 percent) and very steep (over 30 percent) slopes (Figure 10). Lands on the makai section of the site along Kamehameha Highway are primarily level or moderately sloped, with some low-lying pockets of land.

B. Anticipated Impacts

As much as possible, the project will be designed to minimize changes to topography. The development of the recreational and residential facilities will require disturbance of the natural vegetation. Consistent with other Jack Nicklaus golf courses, existing vegetation will be preserved during construction wherever possible. As discussed in Section 2.3.2, clearing and grading will occur on approximately 120 acres to prepare the lands for construction of the golf course, with approximately 338 acres total for the entire project. Development of the building sites will require some grading to establish a level building surface. Rock removal will also be required to build the access road across the bluff. The bluff area will not be modified except for the construction of the access road. Cut material from grading will mostly be retained on the project site. The amounts of cut and fill will be balanced in the grading plan to minimize the need to import fill or to export excavated material.



LEGEND

-  SLIGHT TO MODERATE (0-20%)
-  STEEP (20-30%)
-  VERY STEEP (30%+)

**SLOPE ANALYSIS
LIHI LANI RECREATIONAL COMMUNITY**

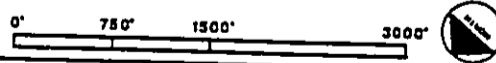


FIGURE 10

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C. Mitigative Measures

Several mitigative measures, as listed below, will be implemented to minimize impacts on topography.

Project Design: The land uses in the master plan and siting of facilities will be designed to avoid changes in topography as much as possible. The site's natural slopes and features will be respected to minimize grading requirements.

Grading Ordinance Compliance: All grading operations will be conducted in a manner which will ensure full compliance with dust and erosion control and other requirements of the City and County Grading Ordinance. A grading permit must be obtained from the City and County to modify the topography of the site. The grading plans for the site are reviewed and approved in this process.

4.3 SOILS

A. Existing Conditions

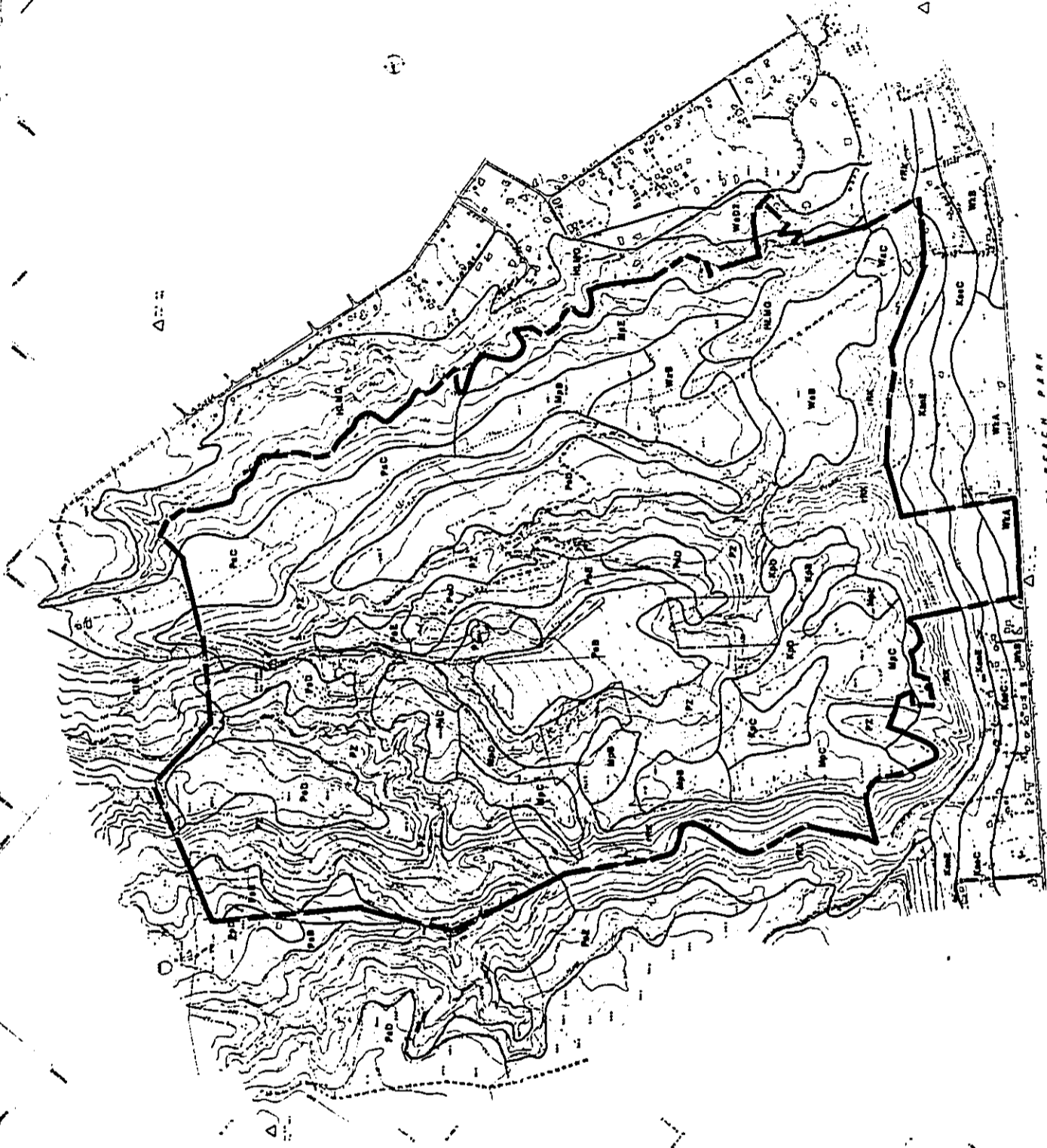
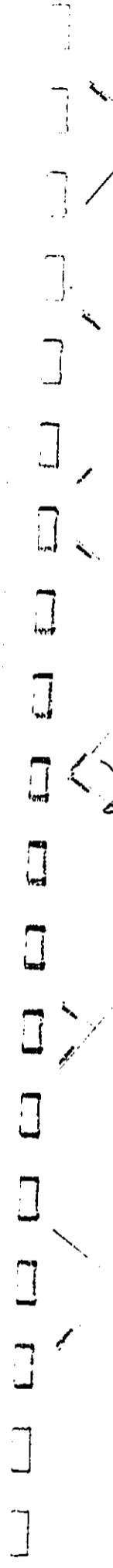
Soil types or classifications for the project area are based on soil surveys by the USDA Soil Conservation Service (SCS) (1972), shown in Figure 11. The University of Hawaii Land Study Bureau (LSB) classifications, and the Agricultural Lands of Importance to the State of Hawaii (ALISH) designations are used to show the agricultural viability of the land considering its soils .

Based on the SCS Soil Survey, a total area of 806 acres, or 71 percent is categorized as soil classifications IV - VIII (exclusive of the State water reserve parcels). These classifications denote a poor soil quality if non-irrigated. Under the LSB classification system, 707 acres or 62 percent of the land is poorly rated in the D and E categories (similar to the SCS IV - VIII categories) (Figure 11).

ALISH designations for the project site are shown in Figure 12. Under ALISH Prime Agricultural Land constitutes 328.2 acres, or 30 percent of the total land. Other Important Agricultural Land makes up 237.9 acres, or 21 percent of the land. Fifty percent of the total acreage is unclassified consisting of steep, rocky, eroded gulches. A summary of ALISH soils classifications is included in Table 8.

The Department of Agriculture's Land Evaluation and Site Assessment (LESA) analysis corroborates the previous findings. It shows that 73 percent of the total project area ranks below the agronomic scale cutoff value of 66, or is of a poor soil quality for agricultural use.

Many of the site's steep slope areas currently experience erosion. Vegetation has been eliminated in these areas by natural forces, exposing soils to wind and rain, and allowing for substantial erosion of soils.

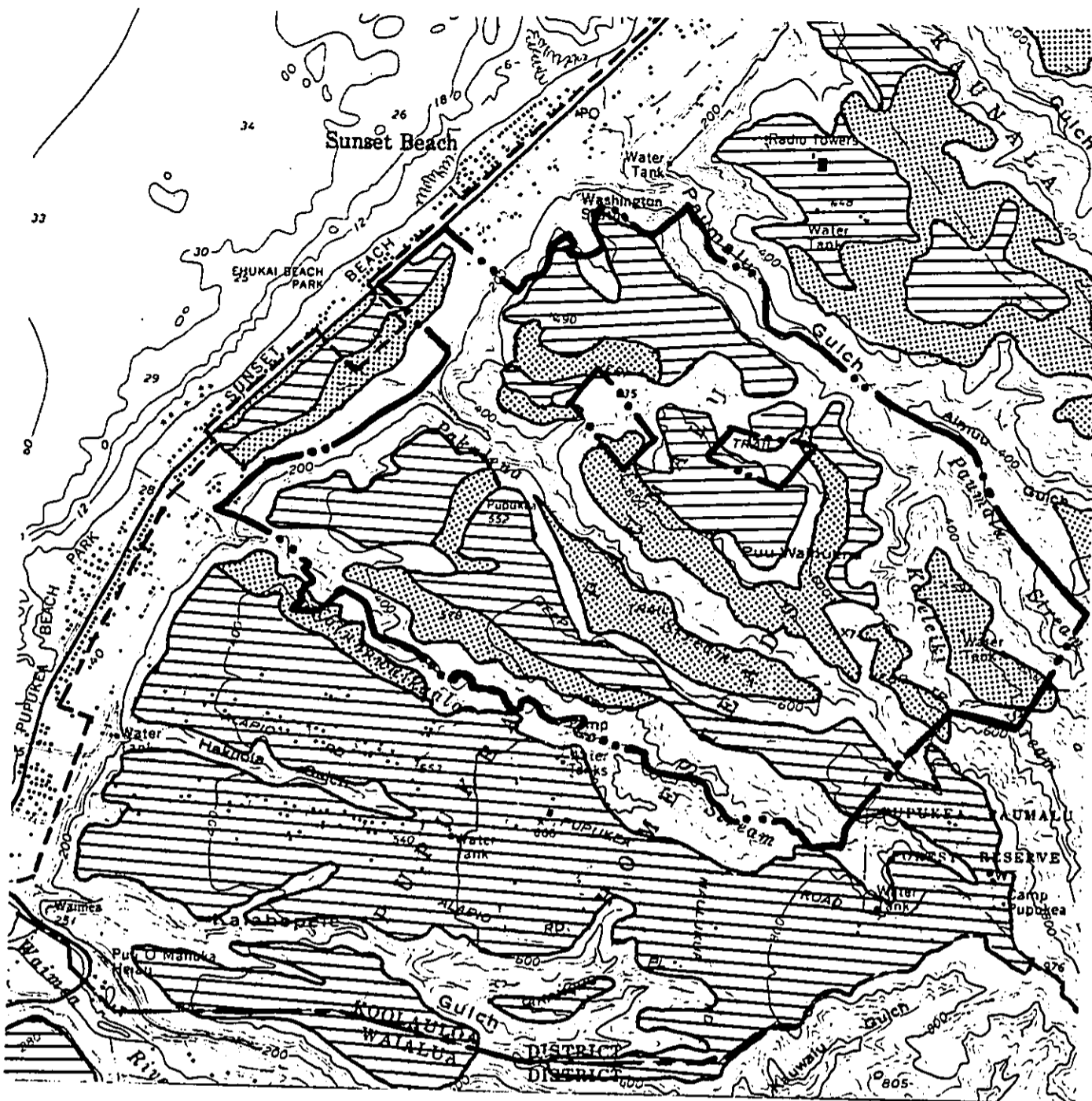


SOIL CAPABILITY CLASSIFICATIONS
 LIHI LANI RECREATIONAL COMMUNITY
 SOURCE: U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE (1972)

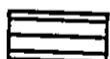


PUPUKA - PAUMALU (SUNSET) BEACH PARK



FIGURE II



LEGEND

-  PRIME AGRICULTURAL LAND
-  OTHER IMPORTANT AGRICULTURAL LAND
-  UNCLASSIFIED

**AGRICULTURAL LANDS OF IMPORTANCE
TO THE STATE OF HAWAII (ALISH)
LIHI LANI RECREATIONAL COMMUNITY**

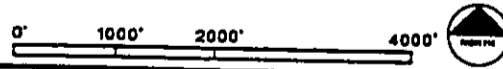


FIGURE 12

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TABLE 8
 SOILS CLASSIFICATION AND DISTRIBUTION

	CROP CAPABILITY CLASSIFICATION	AGRICULTURAL CAPABILITY	% SOILS ON PROJECT SITE (NONIRRIGATED)
1. USDA SOIL CONSERVATION SERVICE	Class I - IV	EXCELLENT	15.6
	Class III	MODERATE	13.5
	Class IV - VIII	POOR	70.9
2. LAND STUDY BUREAU, UNIVERSITY OF HAWAII	Class A + B	EXCELLENT	14.4
	Class C	MODERATE	23.4
	Class D + E	POOR	62.4

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B. Anticipated Impacts

Preparation of the land for construction will involve grading and clearing operations. At the same time, the proposed design will include a natural setting which will preserve extensive amounts of the existing vegetation. Of the total 584 acres proposed for development, approximately 338 will be cleared of vegetation to accommodate construction of the proposed land uses; the other 246 acres will remain uncleared, preserving the existing vegetation, including lands within the golf course edges and portions of residential lots, especially steep-slope areas. The remaining 559 acres are outside proposed development areas and will remain naturally vegetated and uncleared.

Clearing and grubbing activities during construction will temporarily disturb the soil retention values of the existing vegetation and expose the soils to erosional forces. Since the developing areas of the project site are located at the top of two plateaus, wind erosion could occur. Precipitation events will also cause the erosion of soils over disturbed areas of the land.

There will be a beneficial impact resulting from the project's long-term landscaping and erosion control program. Existing erosion areas on steep slopes will be planted with ground cover vegetation to minimize soil erosion.

C. Mitigative Measures

The impact of construction activities and long-term operations on soils will be mitigated by several measures, as listed below:

Construction Erosion Control: Construction activities will follow strict erosion control measures specified in the following:

- a. City and County of Honolulu's Grading, Grubbing and Stockpiling Ordinance No. 3968, (1972);
- b. DPW's Soil Erosion Standards and Guidelines, (1975);
- c. The State Department of Health's Water Quality Standards, Chapter 37-A, Public Health Regulations, (1968);
- d. The SCS's Erosion and Sediment Control Guide for Hawaii, (1968).

Prior to issuance of a grading permit, the project proponent shall submit an erosion control plan for approval by the City and County of Honolulu, Department of Public Works, which shall include applicable measures as specified in the regulations cited above. Such erosion control measures may include, but are not limited to, the use of cut-off ditches, temporary ground cover and detention ponds.

Watering and Landscaping: In particular, a watering program will be implemented to minimize soil loss through fugitive dust particulate emission levels from

construction sites. Other control measures include good housekeeping on the job-site, and pavement or landscaping of bare soil areas as quickly as possible.

Landscaping and Long Term Erosion Control: Landscaping will generally return the soil retention value of the removed vegetation. Lihi Lani will have extensive plantings throughout its grounds, and establish control over existing erosion areas on steep slopes. This continuous, long-term management of the property will significantly reduce erosion from existing conditions.

4.4 AGRICULTURE

The following section includes a discussion of the existing agricultural uses of the site and its potential for further agricultural use. Impacts of the proposed project on agriculture and adjacent farm lands are evaluated herein, along with mitigative measures to minimize effects on agriculture. A report was prepared by Frank S. Scott, Jr., Ph.D. (March 1988) to assess agricultural feasibility and need for the lands proposed for the Lihi Lani project, and information from this report is included below. The entire report is included in Appendix F.

A. Existing Conditions

Most of the land is ecologically infeasible for any type of crop production or grazing. Seventy-one percent of the land area (807 acres) consists of soil types in very low compatibility classifications for agricultural use, as defined by the Soil Conservation Service (SCS) (excluding the State water reserve parcels). These areas are very badly eroded and consist of steep, rocky gulches.

The approximately 176 acres of better agricultural soils (according to LSB ratings) consist of many scattered small plateau areas, surrounded by steep, badly eroded gulches. This configuration prevents economies of scale and increases the cost of infrastructure for crop production. At one time in the past, when manual labor was the method used for planting and harvesting, crop production may have been feasible on some parts of the site. Other previous attempts to develop agriculture for an avocado farm and sugar cane did not succeed. For the reasons described previously, however, there is only very limited use potential for agriculture at the present time.

Currently, about 50 acres of the site are being used to graze 10 horses. Fences, a farm shack and equipment sheds are the only evidence of agriculture on the upper levels of the site. Mowing operations are necessary to keep the growth of shrubs under control in the grazing pasture.

B. Anticipated Impacts

People who are allowed to graze their horses on the property will be asked to move their animals to the equestrian ranch area. There will be no economic or employment impact as a result of this action.

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Farming use of other adjacent lands will not be affected by the proposed development. Small lot farms operating in Pupukea Highlands and along the lower Pupukea area do not directly border on the project site. These small farms are, in some cases, dependent on infrastructure that will service the project, such as water supply mains, electric lines and roadways. Development of the project is not expected to affect these facilities, as discussed later in Section 4.17.

Prime agricultural soils will be primarily used for horse pasture as well as some parts of country lots, tennis center, roads and affordable housing. Because the feasibility of agricultural use of the site is minimal, these uses will not affect agriculture on the North Shore.

C. Mitigative Measures

Given the marginal utility of the land for agricultural uses as established by Scott (1988), no mitigative measures are needed to minimize affects on agriculture as a result of the project. Except for the small grazing use of the property, no existing agricultural uses will be affected. Intensive agricultural use is not feasible. Thus, the future potential for establishing viable agricultural operations will not be affected.

Equestrian Ranch and Horse Grazing Activities: The project includes a large emphasis on future expansion of horse-related activities, which typically require agricultural lands. Horse grazing, training, boarding and riding areas will utilize some of the best agricultural lands on-site.

Use of Prime Agricultural Lands: The master plan for Lihi Lani has been formed to avoid development on prime soils wherever possible, because of its potential for small scale agriculture in the future. Golf course development will not occur on LSB-rated prime soils. Some portions of the country lots, tennis center, roads and affordable housing will be built on LSB-rated prime soils. However, much of the LSB-rated prime soil areas will be used for horse pasture.

Community Garden Site: A one-acre area on the makai portion of the site will be dedicated for a community garden.

4.5 GROUNDWATER RESOURCES

This section includes a discussion of the existing aquifer which underlies the site, the potential for deriving water supply from the aquifer, and the anticipated impacts that could result from the proposed project. Mitigative measures have also been recommended to minimize effects on groundwater.

A. Existing Conditions

Hydrogeological studies of the area and the proposed project have been prepared by Mink (June 1988; December 1990), and information from these studies has been included in this section. The complete reports are included in Appendix G.

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The project site is located in the northern sector of Oahu, which is underlied by the Kawaiiloa Aquifer System (University of Hawaii, 1988). This aquifer is unconfined and basal in the lavas of the Koolau Volcanic Series. The Kawaiiloa Aquifer System extends from the Anahulu River near Haleiwa to the Koolau rift zone at Waialeale. The principal aquifer in the system is a thin basal lens of fresh to brackish water floating on sea water. This basal lens is the least robust in northern Oahu, having a hydraulic head of less than three feet at a distance of one to two miles from the coast. On the Waialua-side of the Anahulu boundary the basal head is about 10 feet, while in the dike aquifers of the rift zone in Waialeale it varies from 10 to 20 feet. The Pupukea-Paumalu basal lens is a thin aquifer of highly permeable Koolau basalt. The aquifer is open at the coast and consequently the lens discharges into the sea in a narrow band parallel to the coast. The hydraulic head and thickness of the lens is small because no effective caprock wedge exists to impede groundwater discharge.

The historical inventory of local wells is limited to a well and a test boring that were drilled on the Obayashi property in 1946 and 1956, respectively. Obayashi has since completed the installation and testing of two wells intended for non-potable irrigation water supply. At one time the Board of Water Supply (BWS) relied on a small pumping station at Sunset Beach for local water supply needs, located in lower Paumalu Valley just outside the Kahuku-side boundary of the property. These wells are not presently used but are considered operable by the Board.

The top of the saturated aquifer is just above sea level, located a minimum of 400 feet and as much as 650 feet below the ground surface. Several feet of soil and subsoil constitute the surface, below which 25 to 100 feet of saprolite transitions into unaltered fresh Koolau basalt. The soil mantle is an effective medium for depleting biological constituents. The saprolite is thoroughly altered basalt in which most minerals have been hydrated and permeability elements destroyed by the expansion of rock mass, which is a very effective filter for removing particulate material escaping below the root zone. Percolate reaching the saturated aquifer in fresh basalt is clear of biological matter, but includes solutes such as nitrogen and chloride.

It is not possible to accurately calculate groundwater flow with the available information. However, utilizing hydraulic head and distance data with an assumed value for aquifer hydraulic conductivity, a low estimate of 5.0 million gallons per day (mgd) can be justified for groundwater flow in this area.

A number of shallow wells have been drilled on the coastal plain between Waimea and Sunset Beach, but most are not used. These wells provide brackish water suitable only for salt-tolerant crops. In addition, there are a few injection wells for disposing of local drainage and treated sewage located in the Sunset Beach lowland areas. Of four deep borings drilled, data from these indicate that groundwater occurs as a thin basal lens. This resource could be exploited to yield potable water at modest rates of draft, and irrigation water at higher rates.

The BWS wells at Paumalu have successfully yield potable water to the area in the past, since they were pumped at low rates of only about 60,000 gallons per day (gpd) (0.06 mgd) from this aquifer. These wells are not currently in operation. The

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municipal supply for Sunset Beach currently comes from the BWS Waialeale wells. On the Waimea-side of the sector, including Pupukea Highlands, water from wells located in Waialua is used.

The sustainable yield of the basal aquifer between Waimea and Paumalu is about 3.5 mgd. This figure is derived from the estimated flux of 3.0 mgd/mile, of which about 45 percent is developable as potable water. Within the limits of the property, the proportional allocation of sustainable yield is 1.5 mgd.

Two on-site irrigation water source wells have been developed on the site. These wells were completed in 1989 under permits issued by DLNR, and each have capacity to pump up to 0.5 mgd. These wells have been temporarily capped, and are not in use.

B. Anticipated Impacts

The potential for the project to affect groundwater involves possible long-term impacts on both the quality and quantity of the resource. Extraction of potable water and irrigation water will both draw upon the existing and future quantity of the groundwater source for the area. Considerations for groundwater quality relating to this project include land application of fertilizers, diluted treated wastewater effluent, pesticides, and non-potable irrigation water; and other uses of chemicals on the land. Each of these potential impacts are discussed below.

Because the groundwater aquifer discharges into the nearshore ocean, potential impacts to groundwater quality must also be considered relative to the coastal marine environment, which is discussed in Section 4.10.

Potable Water Use Impacts: The project plans involve deriving approximately 190,000 gpd (0.19 mgd) of potable water through the existing BWS Waialua Water Supply System. This system currently provides potable water to the Pupukea Highlands area and the North Shore on the Haleiwa-side of Pupukea Road. As of 1988, water use was 2.17 mgd, with future commitments up to a total of 2.5 mgd. The allotment for this region is 2.73 mgd, therefore, 0.23 mgd would be available from the BWS for future developments.

The Waialua aquifer has adequate reserves to supply the proposed project with its estimated potable water needs (Mink, June 1988). The Board of Land and Natural Resources (BLNR) has determined the maximum sustainable yield for the BWS Waialua wells at 3.0 mgd. However, the current allotment for this region is 2.73 mgd. An additional 0.27 mgd can be granted to the BWS by permit from the BLNR. To provide the necessary water quantity to the Lihi Lani project, it is likely that the developer will participate in additional source development. Because of the surplus aquifer capacity in Waialua, the project will not adversely affect water supply for the North Shore area.

Water supply facilities existing in the area and proposed for development at the project are discussed in Sections 2.2 and 4.17.1, and in Appendix C.

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Irrigation Water Use Impacts: On-site development of two irrigation water wells was completed in 1989 under permits issued by the DLNR. These wells were developed to provide sufficient groundwater of acceptable quality to satisfy irrigation demands for the proposed golf course and market residential lots. A single well may be adequate for average demand, but augmentation with a second well assures a supply to meet all contingencies, including periods of mechanical problems.

The two irrigation water wells are located in Pakulena Gulch at an elevation of approximately 430 feet above msl. These wells were drilled to an approximate depth of 465 feet (below the ground surface), and are capable of a pumping rate of 350 gallons per minute (gpm). The salinity of the water drawn from the wells is 200 to 300 mg/l chloride, which will be adequate for irrigation purposes.

Approximately 0.77 mgd will be removed through the on-site wells for irrigation purposes during peak periods. Approximately 200,000 gpd of treated wastewater effluent will be blended with non-potable water for irrigation of portions of the golf course. The irrigation use of treated effluent will amount to about 37 percent of the total daily average golf course irrigation (0.57 mgd) at peak use.

The removal of 0.77 mgd of non-potable groundwater at peak periods for irrigation through these wells is not expected to adversely affect water supply at other wells in the area. This is below the proportional sustainable yield of 1.5 mgd for the property, as compared to the entire basal aquifer between Waimea and Paumalu. The irrigation wells are located more than one-half mile away from the BWS potable water wells in Paumalu Valley. According to Mink (1990), operation of these wells will not create a drawdown effect that could reduce the current quantity or quality of water being drawn from the Board of Water Supply wells at Sunset Beach.

The salinity of the water to be applied as irrigation will be between 200 and 300 mg/l chloride. The ambient groundwater which surplus irrigation will affect has a salinity of approximately 100 mg/l chloride for pumping rates less than about 150 gpm. A worst-case analysis by Mink (1990) shows the average chloride concentration of natural groundwater could be increased by 16 mg/l chloride, which could raise the total aquifer concentration to a maximum of 116 mg/l. The recommended upper limit for potability is 250 mg/l chloride. This value was derived from a mixing cell model that employs expected parameters of rainfall recharge, irrigation recharge, element concentrations in applied irrigation, and concentrations in the ambient groundwater. Aquifer concentration of chlorides due to irrigation water application are expected to be less because 37 percent (0.2 mgd) of irrigation water will be diluted with treated effluent (low chloride concentration).

Impacts Due to Application of Fertilizers: Irrigation and fertilization of lands on Oahu currently takes place over several important basal aquifers in Oahu without compromising their utility (except where chemicals have been misused). The Pearl Harbor aquifer, for example, is overlain by about 10,000 acres of sugar cane and pineapple. This aquifer is the potable water supply for the most populated portion of the State, and the land above it is fertilized and irrigated without noticeable adverse

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water quality effects to the basal lens. Similarly, the Waialua basal aquifer is located beneath areas planted in these crops.

Lihi Lani will include an 18-hole golf course, driving range, landscaped common areas, and private residential lots -- all of which will involve the use of fertilizers for turf and other vegetation. The proposed golf course will require the greatest amount of fertilizer use. For a typical 18-hole golf course in Hawaii, fertilizer use rates differ for the various areas of the course. Greens and tees receive the most frequent application (two and four weeks, respectively) while fairways and roughs are fertilized less frequently (eight weeks and three months, respectively). Complete fertilizers are usually applied, meaning those that include nitrogen, phosphorus and potassium. Nitrogen is applied in larger quantities and is the only fertilizer element likely to enter the groundwaters. Historically, 18-hole golf courses in Hawaii, have total annual nitrogen application of over 16 tons.

The golf course at Lihi Lani will have approximately 90 acres of total maintained turf area. Fertilizer application rates for this golf course have been calculated in Murdoch and Green (December 1990) and are shown in Appendix I. The golf course will be designed to minimize high application areas, such as greens and tees, to approximately eight acres. Greens and tees are the most highly manicured areas on the golf course, and pose the greatest risk for contributing nitrogen to groundwater since they receive the most frequent fertilizer application and irrigation. Fairways are the largest area of a golf course, and this course is planned to have approximately 46 acres of fairway. Fairways are much less maintained than tees and greens, yet must be fertilized and irrigated regularly. The least maintained area on the golf course is the rough, which is allowed to grow tall, is infrequently fertilized and irrigated. Lihi Lani's golf course is planned to have approximately 36 acres of rough. The golf course will utilize approximately 15.6 tons of nitrogen, 89 percent of which will be supplied by applied fertilizer and 11 percent supplied by nitrogen in treated effluent disposed by land irrigation (discussed in the following section).

The proposed golf course will be irrigated under strict management to avoid excess irrigation, and will primarily use slow-release nitrogen fertilizers instead of soluble nitrogen fertilizer. Excessive irrigation only serves to pass the nitrogen beyond the turf root zone, where it provides little benefit to turf growth. Carefully managed irrigation will restrict the amount of soluble nitrogen leaching through the soil and ultimately reaching the underlying aquifer. A golf course which does not strictly manage its irrigation will create waste and cost to the operation, and could contribute greater quantities of nitrogen to the groundwater.

When soluble nitrogen fertilizers are carefully applied to turf areas of a golf course, approximately 90 to 95 percent of the nitrogen is used by the plants. If only soluble nitrogen fertilizers are used at Lihi Lani, approximately 5 to 10 percent of the soluble fertilizer nitrogen (1.6 tons annually) could potentially leach below the root zone of plants on the golf course, and eventually enter groundwater. Lihi Lani's golf course, common areas and residential lots will primarily utilize slow-release nitrogen fertilizers instead of soluble nitrogen fertilizers, since they cause significantly less leaching of nitrogen below the soil profile. The use of the slow-

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release nitrogen fertilizers generally in place of soluble nitrogen fertilizers will reduce the loss of nitrogen through the soil profile to 1.5 percent, which will equate to 0.2 tons of nitrogen per year contributed to groundwater from the golf course area. Soluble nitrogen forms will be used periodically in low growth periods, but only in small quantities that will be utilized almost completely by turf plants and the soil ecology.

Obayashi is investigating new technology to line the greens and tees on the golf course with synthetic plastic liners and collection systems to capture leachate from these areas of high fertilizer application. Collected leachate will be transmitted to artificial marshes located near tees and greens. Leachate will be diluted by the marsh waters, and plants will utilize the nitrogen with 80 percent removal efficiency, as experienced in artificial marshes used for effluent treatment. Approximately 17 percent of the applied nitrogen for the golf course (2.6 tons per year) is applied to greens and tees. It is expected that the leaching nitrogen, estimated at 0.04 tons per year, will be captured by the leachate collection system and mostly be captured in the marsh system. This design measure will further reduce the estimated nitrogen contribution to groundwater from the golf course to approximately 0.16 tons per year.

The golf course and other land uses involving fertilizer application will be developed on lands which range in elevation from approximately 450 to 750 feet above the basal aquifer. The vertical distance between the point of nitrogen application and the basal aquifer will allow for further dilution of nitrogen leaching below the root zone. Once contacting the aquifer, nitrogen dilution effects will again be substantial, considering the expansive volume of the underlying aquifer. As described earlier, groundwater concentrations in other Oahu aquifers have shown minimal degradation by fertilizer nitrogen application on agricultural lands. The quality and quantity of nitrate infiltration from the proposed golf course and other land uses involving fertilizer application is not expected to degrade the basal aquifer.

Mink (1990) has modeled the worst-case potential contribution of nitrogen to groundwater below the project site. This analysis evaluated a worst-case scenario which does not include marsh system capture of nitrogen from golf course areas, and assumes 10 percent leaching of nitrogen applied. Aquifer nitrogen concentration is 0.5 mg/l concentration found in water drawn from existing on-site wells. Average nitrogen concentration in the underlying aquifer is increased by 0.4 mg/l to a predicted concentration of 0.9 mg/l under this worst case scenario. This value is well within the EPA potable water limit of 10 mg/l. Lower concentrations are expected to result from the use of slow-release nitrogen fertilizers (only 1.5 percent leaching to groundwater) over the entire golf course and landscaped common areas, and the implementation of marsh treatment of percolate from tees and greens.

Approximately 3.5 lbs./day of phosphorus will be applied in the fertilizer mix to golf course turf. Unlike nitrogen, phosphorus generally becomes fixed to soil particles and will not infiltrate to groundwater.

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Groundwater Impacts Due to Wastewater Disposal: A study of wastewater treatment and disposal for Lihi Lani has been prepared by Engineering Concepts, Inc. (December 1990) (Appendix B). The proposed development is expected to generate approximately 200,000 gallons per day of wastewater, all of it classified as domestic. The wastewater will be treated by facultative stabilization ponds and marshes. This natural wastewater treatment will be designed with assistance by Dr. Robert Gearheart of Humboldt State University, Arcata, CA. Marsh technology has been proven by Dr. Gearheart to be an effective method for treatment of domestic wastewater which is environmentally sensitive. This treatment will provide wastewater treatment at an advanced secondary level.

Treated wastewater will be diluted with non-potable water, and disposed of by land irrigation of the golf course in an acceptable manner approved by the State. Treated wastewater effluent will have the following characteristics: BOD - 5 to 15 milligrams per liter (mg/l); suspended solids - 5 to 15 mg/l; nitrogen - 5 to 7 mg/l; phosphorus - less than 6 mg/l; and total coliforms - less than 23 per 100 milliliters (ml). Adequate disinfection will also insure that coliform counts do not exceed 240 per 100 ml in any sample. These levels are acceptable for secondary treated effluent according to proposed Hawaii Administration Rules, Title 11, Department of Health, Chapter 62, Wastewater Systems. Disposal of diluted secondary-treated effluent by irrigation methods is also regulated by the Department of Health, Department of Land and Natural Resources and the Board of Water Supply.

Local disposal of the secondary treated effluent is technically possible by means of injection wells, land spreading, infiltration ponds, and land irrigation. Most of the project site lies inland of the Board of Water Supply "pass/no-pass" line (which extends roughly along the base of the bluff), mauka of which injection wells and infiltration ponds are not permitted except by variance. There are no "clear-cut" regulations for irrigation disposal of effluent. Previous projects with disposal planned in areas makai of "pass/no-pass line" have gained approvals for this process on a case-by-case basis.

A reasonable way for this project to dispose of the effluent is in golf course or other land irrigation. This is a proven technique of effluent disposal in Hawaii, and its practicality has been demonstrated by field investigations conducted by the Water Resources Research Center of the University of Hawaii. Tests showed that percolate from irrigation water consisting of secondary effluent does not carry bacteria or viruses through the soil mantle. Carefully managed irrigation applications at the project will minimize infiltration of nitrates and other nutrients.

The volume of treated wastewater effluent (200,000 gpd) will amount to about 35 percent of the peak golf course irrigation needs (0.57 mgd). Artificial wetlands are known to reliably polish treated effluent from facultative ponds to nitrogen levels of 5 to 7 mg/l. This concentration will be further diluted in the storage pond. Assuming that the entire 10 lbs/day of nitrogen in the effluent is applied to the golf course turf, effluent will supply approximately 11 percent of the nitrogen requirement for the golf course (1.7 tons per year).

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Typically, only 5 to 10 percent of properly applied soluble nitrogen eventually infiltrates the groundwater with the other 90 to 95 percent utilized by plant and soil ecology uptake. This utilization rate applies to all soluble nitrogen sources applied to the golf course from both fertilizer and treated effluent. Land application of treated wastewater effluent could eventually add approximately 0.17 tons per year of nitrogen from percolate to the groundwater. Dilution of the nitrogen through the 450 to 750 foot vertical travel beneath the soil to the aquifer, and dilution within the immense volume of the groundwater lens will further reduce its concentration within the aquifer. Nitrogen input to groundwater is not expected to reduce the quality of this aquifer.

Phosphorus removal in wetland systems is not effective because of the limited contact opportunities between wastewater and the soil. Approximately 10 lbs./day of phosphorus will be generated by the reclaimed effluent origin. When applied to golf course turf, phosphorus tends to strongly fix itself to the soil particles. Because of the natural affinity for fixation and the small amounts involved, virtually no quantity of phosphorus is expected to infiltrate into the groundwater.

The presence of bacteria and viruses will be within allowable limits and will not reach aquifers. Bacteria and viruses will essentially be removed from treated effluent during the final treatment steps. The remaining bacteria and viruses will generally be removed in contact with organic material and particles in the soil profile. The saprolite layer is a very effective filter that removes any particulate matter and biological material which may have escaped below the root zone.

Wastewater effluent does not normally contain concentrations of heavy metals and other contaminants in excess of EPA limits. Any heavy metals included in wastewater at the project are expected to be effectively captured in facultative pond/marsh treatment of effluent.

To minimize the possibility that return irrigation could have an effect on groundwater quality, effluent irrigation will be restricted to the golf course areas which are most distant from the BWS Sunset Beach wells. The normal flow path of groundwater beneath the golf course is directly toward the coast. The pumps in the BWS Sunset Beach wells are quite small and currently are not operating. These wells are not likely to generate a drawdown cone that would pirate much of the flow beneath the golf course.

Groundwater Impacts Due to Application of Pesticides: Pesticide is a loosely used term for chemical applied to control either pest insects or diseases of turfgrass and landscaping vegetation. Pesticides consist of herbicides (weed killer), insecticides (insect killer) and fungicides (fungus killer). All of these types of chemicals will be required to maintain turf quality on the proposed golf course, and to maintain turf and landscaped vegetation in common areas and on private residential lots. The amount and frequency of pesticide use, and the types of chemicals used to control pests, are the concerns for potential impacts to groundwater quality in the aquifer underlying the proposed project.

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The approach to the controlled use of pesticides at the proposed golf course at Lihi Lani will involve a technique developed and utilized extensively in agriculture called Integrated Pest Management (IPM). IPM programs have been developed in the past by the agriculture industry for specific crops as a means to control waste and costs through unnecessary or excessive pesticide usage. The control of pesticide overuse is a major concern for the natural and human environment, to minimize the potential for pesticides entering surface water, groundwater and the air. The goal of the IPM program will be to use cultural, chemical and biological control measures to suppress pest populations to levels at or below the aesthetic or economic threshold which is set. The health of the golf course turf is critical in keeping the pest populations down, and minimizing the need to apply pesticides. IPM does not eliminate the use of pesticides on a golf course, rather it creates a high level of turf management and control over the use of pesticides, which results in less overall use of pesticides.

Different types of IPM programs have been instituted successfully at golf course developments throughout the United States and also in Europe and Japan. Mitchell and Murdoch (December 1990) have developed a detailed Integrated Pest Management Program for the Lihi Lani Golf Course. Information from this report is included in this section, and the complete report is included in Appendix J. Implementation of the IPM program at Lihi Lani is expected to result in a reduction of total pesticide usage as much as 30 to 40 percent, as compared the pesticides application amounts at typical golf courses in Hawaii. The reduced pesticide use, included with other control measures discussed later in this section, will greatly reduce the potential impact of pesticides affecting the quality of the groundwater aquifer below the site.

IPM involves extensive knowledge about the management of healthy turf, and the potential pests and diseases of the crop being cultivated. The keys to successful implementation of a golf course IPM program are the experience and thoroughness of the golf course management staff. Knowledge of the types of pests and diseases experienced at Lihi Lani will be crucial in identifying turf problems early before they become widespread. The frequency and area of pesticide applications are carefully controlled in this manner, and the result is an overall lower use of pesticides over the golf course. The golf course superintendent and staff must maintain the turf in healthy condition and monitor it constantly, identifying turf problems immediately and apply pesticides in a carefully controlled manner.

Pesticides will be applied in carefully controlled quantities, only as required, following the planned IPM program which will use pesticides less frequently and in less quantities than has traditionally occurred on Hawaii golf courses. Tees and greens will constitute approximately eight acres of the golf course, and the majority of pesticides application will occur in these areas. The remainder of the golf course (82 acres of fairways and roughs) will receive infrequent pesticide applications. Occasionally, there will be a need to apply some pesticides to sites on the fairways. Roughs will rarely be treated with any pesticides. The chemicals used will only be those approved for golf course application in Hawaii, regulated by the U. S.

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Environmental Protection Agency and the State of Hawaii Department of Agriculture.

Many of the pesticides proposed for use are highly sorbed to organic matter in the turf and the high organic content soils which are found on the project site. Soils rich in organic matter will be utilized in sections of the golf course where organic content may be low, such as steep areas. Several feet of soil and subsoil constitute the surface, below which 25 to 100 feet of saprolite transitions into unaltered fresh Koolau basalt. Murdoch and Green (1990) predict that there will be no measurable amounts of this chemical detected in groundwater.

Studies conducted throughout the U. S. in much more permeable soil profiles than the Lihi Lani site show that very little of the applied chemicals passes below the soil profile and reaches the groundwater aquifer (Cape Cod; Cohen, 1988). Groundwater quality will not be adversely affected as a result of pesticides application at this project.

Pesticide chemicals have varying toxicity to human and wildlife, and these chemicals also vary in their persistence and mobility in the environment. The IPM program developed for Lihi Lani identifies the types of chemicals expected to be required for application to control pests and diseases. The program calls for the use of the least toxic chemicals in the lowest possible concentrations and lowest volumes for application which will be needed to cure a pest or disease problem. At times it may be more environmentally responsible to use a more toxic compound in small doses to eliminate the pest problem, to avoid more frequent and voluminous applications of a less toxic compound. The Golf Course Manager will have the ultimate responsibility over the choice of pesticide used, concentration mix, area for application, volume to be applied, and timing of application. The Golf Course Manager will be certified through strict training programs (and regular update programs) to ensure their ability to safely control chemical use. This manager will follow state-of-the-art management techniques in safeguarding the human and natural environment from exposure to toxic chemicals in pesticides. The Golf Course Manager will also be concerned about the costs involved with overuse of pesticides, because they are extremely expensive products.

Irrigation control is another key in golf course management which affects the ability of applied pesticides to pass through the turf root zone and soil profile. The Golf Course Manager also is responsible for the irrigation program, which must consider the areas applied with pesticides. Irrigation soon after application of pesticides will be avoided, to discourage washing pesticides through the soil profile without time to interact with the turf and organic material in the soils. The Golf Course Manager will be aware of weather conditions to avoid applications of pesticides prior to precipitation events.

Mink (1990) has evaluated the potential impact to groundwater quality due to the application of pesticides at the proposed golf course and residential lots at Lihi Lani. Pesticides use as proposed for the project is not expected to degrade the quality of the groundwater aquifer at the site due to: (1) the IPM measures taken to reduce and

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control pesticides application, (2) the capacity of on-site soils to uptake chemicals, (3) breakdown of chemicals in surface waters exposed to sunlight, and volatilization, (4) depth to groundwater and the dilution of leached liquid in its travel to the aquifer, and (5) the dilution capacity of the aquifer. Recharge water may contain residues of pesticides if these chemicals are improperly used, but by limiting pesticide types to those that break down during soil and saprolite passage, and controlling their application, the quantities reaching groundwater are expected to be non-detectable.

Obayashi is investigating new technology for design of the golf course, and will incorporate new approaches, where feasible, to further deter impacts to the groundwater. The golf course design will include the installation of synthetic plastic liners under the tees and greens to capture leachate from these high application areas for pesticides. Approximately eight acres of the golf course will be lined, which will greatly reduce the potential impact of leaching pesticides to groundwater. Leachate collected from the tees and greens will be directed to small artificial marshes which will allow for pesticides to be degraded by sunlight and exposure to vegetation and organic material. These marshes would be lined to prohibit infiltration of pond waters to groundwater. Excess water leaving the marshes is expected to contain little or no concentration of pesticide chemicals.

C. Mitigative Measures

Several mitigative measures are recommended to minimize the adverse effects of the project on the quantity and quality of groundwater resources.

Reduced Potable Water Usage at Market Lots: Potable water usage is not expected to be as great as calculated for the project due to the varied occupancy of the residential properties. Of the 120 market residence lots that will become developed, only 60 homes will be occupied by full-time residents. The other 60 homes will likely be second vacation homes, and will utilize less potable water and generate much less wastewater than full-time occupant units.

Seasonality of Precipitation: Rainfall varies over the year at Pupukea, with wetter months being during the winter. Irrigation water demand from the on-site wells will typically be near it's estimated maximum (0.77 mgd) during the summer months. Very little irrigation will be required during the wetter seasons. Pumping requirements stated earlier are calculated based on the maximum requirements for the golf course, common areas and country lots.

Potable Water Conservation Practicer: Extensive water conservation practices will be employed at Lihi Lani to reduce the requirement for potable water. Private residential lots will be required to install typical water conservation items such as low-flush toilets. Potable water will be conserved by the use of non-potable water for irrigation of the golf course, common areas and residential lots. Country residential lots will have dual water systems, with irrigation systems installed for the non-potable irrigation water. This measure will reduce the potential maximum potable water requirement as much as 48,000 gpd for the country lots alone.

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Xeriscape Plantings: Conservation of non-potable water will be accomplished by implementing a xeriscape plan for the landscape planting design and maintenance of common areas and private residential lots. Xeriscape is a method of landscape planting which uses plants which require less water than traditional landscape plantings. A xeriscape plan will be prepared for Lihi Lani (Weissich, 1990) which identifies the vegetation types which will be used in the landscaping of common areas, and country residential lots. The xeriscape plan is expected to reduce non-potable water consumption by as much as 50 percent in these areas, as compared to standard landscaping irrigation water requirements.

Catchment and Recharge of Precipitation: The eight-acre wastewater treatment pond, two-acre marsh system and five-acre irrigation storage pond will serve as catchment ponds for irrigation water. The irrigation of the captured water will somewhat reduce the total volume of non-potable irrigation water to be derived from the on-site wells. Rainfall will also dilute the chloride concentration of water within the irrigation pond which is drawn from on-site wells. During the months with greater rainfall, substantially less pumping of the irrigation wells will be required.

Irrigation Water Control: Irrigation water use will be strictly controlled to amounts that are necessary to maintain the golf course and the common landscaped areas. A certified golf course manager will be employed, who will ensure proper irrigation water use. Excess irrigation is never desirable to the golf course manager because of the waste and extra costs created by pumping of water. Excess irrigation could also cause undesired "washing out" of fertilizer and pesticide below the intended turf root zone, as well as the potential degradation of groundwater quality by leached chemicals.

Integrated Pest Management (IPM) Program: An IPM program will be instituted to minimize the frequency and amounts of pesticides being applied at the golf course. The types of chemicals being utilized for treatments will be the lowest possible, in terms of toxicity and their persistence and mobility, and total amounts applied. When compared to traditional pesticides application rates, IPM programs typically reduce total pesticide usage at golf courses from 35 to 50 percent. The reduction of the total amounts of pesticides being used will reduce the potential for their release to the groundwater and environment outside the golf course. Fertilizer and pesticides will also be applied under the supervision of the certified golf course manager, who will strictly control the amounts following the IPM program and avoid over-application.

Management of Chemical Storage and Use: The golf course maintenance area is the point on the site where the greatest quantities of toxic chemicals will reside. It is planned to contain the entire maintenance area within a chemical control area, where impermeable collection surfaces would be installed. Activities in and around buildings and maintenance areas will be prevented from releasing chemicals into the ground by accident. Mixing and storage areas for pesticides, fuel storage and loading areas, equipment maintenance areas, equipment washing areas and areas storing chemicals associated with maintenance would all be included in this

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chemical control area. Runoff and washing waste from this chemical control area will be collected and treated, and recycled within the maintenance area water system.

Land Application of Treated Wastewater Effluent: As described earlier, treated wastewater effluent will be disposed through dilution with irrigation water and application to the golf course. Nitrogen compound contributions to groundwater will be minimal under this method of wastewater disposal. As a result of the 10-day residence period for treated effluent in the marsh system, effluent nitrate levels will be 5 to 7 mg/l which is well below the 20 mg/l concentration required by the State. The total nitrogen applied to the golf course will be the combined contribution of fertilizer and treated wastewater effluent. Caution will be used in the irrigation scheduling to avoid over-irrigation, and this will minimize the infiltration of nitrate and other nutrients and allow their uptake by turf plants.

Slow-Release Nitrogen Fertilizer Use: Lihi Lani will utilize slow-release fertilizers on the golf course, landscaped common areas and require its use on residential lots. The overall effect on groundwater quality in the aquifer underlying the project site due to nitrogen application is expected to be minimal because of slow-release nitrogen fertilizer use and aquifer dilution effects. A study by Brown et al. (1982) on highly porous sand golf greens in Texas compared the amount of nitrogen lost by leaching from various nitrogen sources, using liberal irrigation rates to encourage leaching. Results of their study over a five month period showed leaching of approximately 23 percent of nitrogen when applied as soluble nitrogen. Application of slow-release nitrogen fertilizers, which are commonly available and effective in use on golf course and residential landscaping, showed only 1.5 percent nitrogen leaching. If soluble nitrogen fertilizer was to be applied on the Lihi Lani golf course, it could potentially contribute as much as 3.1 tons of nitrogen per year to the aquifer. The use of the slow-release nitrogen fertilizers in place of soluble nitrogen fertilizers will reduce the loss of nitrogen through the soil profile to 1.5 percent, which will equate to 0.2 tons of nitrogen per year from the golf course area.

Organic Rich Soil Utilization: Many of the pesticides proposed for use are highly sorbed to organic matter in the turf and the high organic content soils which are found on the project site. Soils rich in organic matter will be utilized in sections of the golf course where organic content may be low. Use of organic-rich soils will effectively remove much of the pesticides penetrating the root zone and potentially reaching groundwater.

Lining of Golf Course Tees and Greens, and Marsh Treatment: Obayashi is investigating new technology for the design of the golf course at Lihi Lani, and is proposing to have the approximately eight acres of tees and greens lined with synthetic plastic liners to collect leached liquids from these areas. Approximately 20 percent of the pesticides and 17 percent of the fertilizers applied to the golf course will be contained within these systems. Small artificial marsh areas will be established within the golf course to receive collected leachate and treat it through natural processes. These marshes would also be lined to prevent infiltration to groundwater. Excess water leaving the marsh is expected to contain little or no concentration of pesticide chemicals. Pesticides in the collected leachate will be

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diluted by marsh waters, degraded by sunlight and air exposure, and taken up by organic materials in the marsh. Fertilizer nitrogen captured in these systems will be utilized by plants, with 80 percent capture efficiency expected, as experienced with the effluent treatment marsh systems. The implementation of the marsh systems will further minimize the potential for pesticides and nitrates to enter groundwater.

Groundwater Monitoring Program: As a precautionary measure to protect against contamination of groundwater, the State of Hawaii Department of Health requires all new golf course developments to install monitoring wells down-gradient of new projects. Obayashi will install and maintain monitoring wells as required by the State. Existing groundwater quality measurements must be undertaken to determine background levels prior to operation of the golf course. Periodic testing of groundwater samples will be undertaken to assess the potential degradation of the groundwater aquifer. Should adverse parameter levels be detected in groundwater which are a result of the golf course or other project operations, measures will be taken immediately to eliminate the source of the contaminants. The monitoring wells will provide an ultimate test of the effectiveness of the nitrate and chemical control programs instituted at Lihi Lani.

Controlled Use of Wastewater Effluent:

The use of a wastewater effluent and brackish water mixture for landscape irrigation will be coordinated with the State Department of Health. Irrigation areas will be carefully selected to avoid potential adverse effects upon the BWS Sunset Beach Well. If there is any resulting degradation of the Sunset Beach Well which is attributable to Lihi Lani, Obayashi will make up the difference in supply from another source.

4.6 SURFACE WATER

This section presents a discussion of the existing surface water conditions, existing drainage conditions, potential impacts and mitigation measures to be implemented. Potential impacts of the proposed project on surface water are discussed in detail, including two technical consultant reports prepared to address storm water runoff (relating to water quality) and fertilizer and pesticide effects on water quality. Mitigative measures are discussed which will minimize both drainage and water quality impacts.

4.6.1 STORM WATER RUNOFF

Drainage conditions within the project site, and potential project impacts on drainage, were evaluated by Engineering Concepts, Inc. (January 1991) and Dugan (December 1990). Their reports are included as Appendices C and H, respectively. Their findings are summarized below.

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A. Existing Conditions

The site spans three watersheds: the Paumalu Stream watershed, the Pakulena Stream watershed, and the Kalunawaikaala Stream watershed (Figure 13). A small, makai portion does not drain any of these watersheds, but slopes directly toward Kamehameha Highway.

The Paumalu Stream watershed is the largest of the three watersheds affected by the project. It encompasses approximately 1,970 acres and stretches almost 3.5 miles inland from Kamehameha Highway to Pupukeya-Paumalu Ridge. The Paumalu Stream watershed contains three sub-watersheds; Aimuu Gulch, Paumalu Stream and Kaleleiki Stream, none of which are perennial.

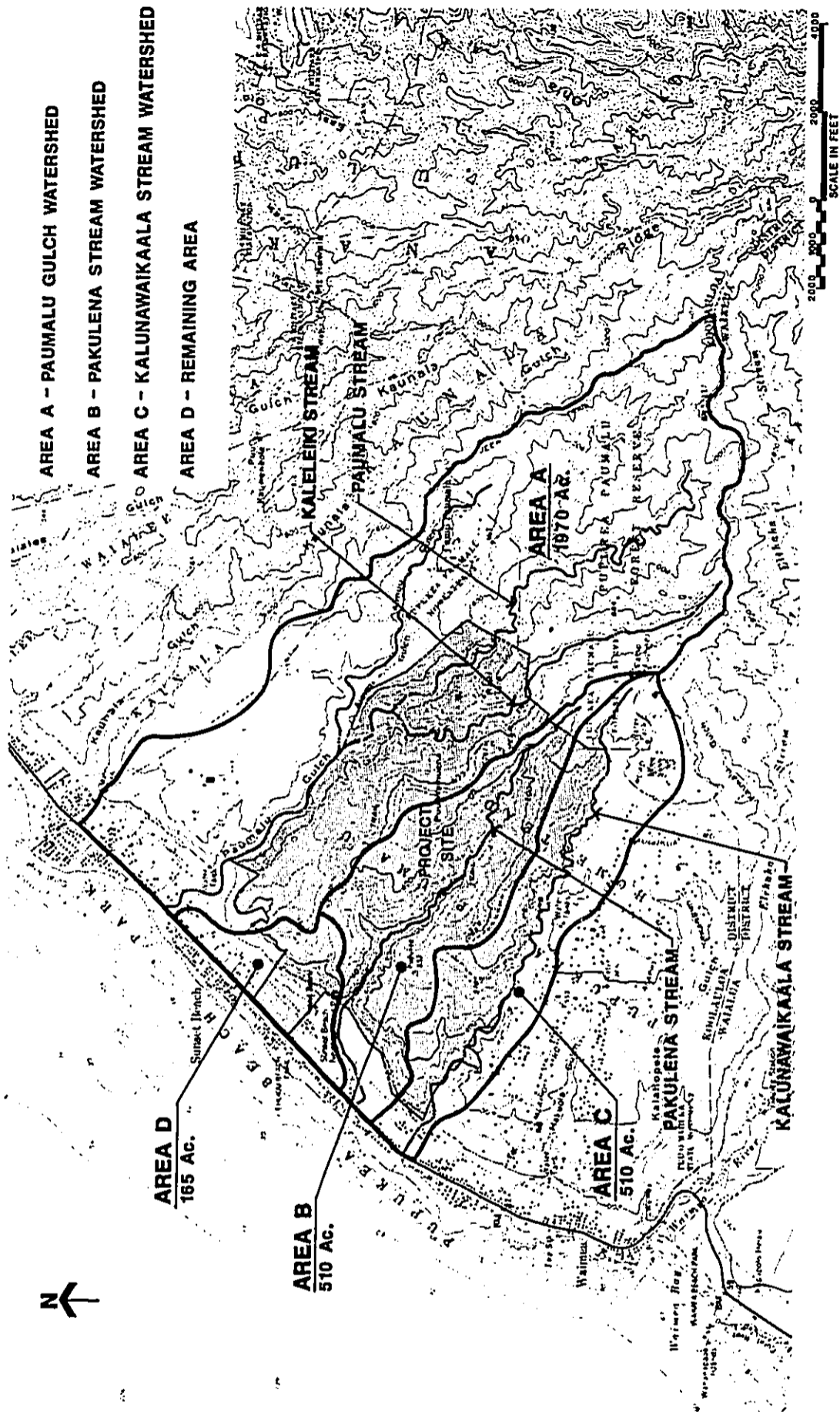
The Pakulena Stream watershed covers approximately 510 acres, most of which fall within the project site. The Pakulena Stream watershed terminates approximately two miles inland from Kamehameha Highway at an elevation of 960 feet above sea level.

The third watershed, Kalunawaikaala Stream watershed, also covers an area of approximately 510 acres. Portions of the Sunset Hills and Pupukeya Highlands subdivisions fall within this watershed. The Kalunawaikaala Stream watershed converges with the Pakulena Stream watershed approximately two miles inland from Kamehameha Highway.

The three watersheds are characterized by steep gulches bordering relatively flat to rolling plateaus. The plateaus are covered with tall grasses, scrub brush, and trees, with the gulches having generally dense tree cover and moderately thick underbrush.

Currently, there are no drainage improvements on the site. Runoff flows overland to the three gulches and is conveyed to existing culverts at Kamehameha Highway. The culvert serving the Paumalu Stream is located approximately 3,200 ft. from the Kahuku-side boundary of the site fronting Kamehameha Highway. Culverts serving the Pakulena Stream and the Kalunawaikaala Stream are located, respectively, approximately 2,200 ft. and 3,800 ft. from the Haleiwa-side boundary of this area. The runoff from the makai section flows overland, collecting on the property in the lowlands along the mauka side of Kamehameha Highway.

Flooding of the Sunset Beach area is known to occur during heavy rains. Much of the flooding can be attributed to the many sump areas along Kamehameha Highway between the Paumalu Stream and Pakulena Stream crossings. A flood insurance study for the City and County of Honolulu was prepared by the US Army Corps of Engineers in 1980. This report included the Sunset Beach area and mentioned that the principal flood problem in the area is the lack of defined streams adequate to convey storm runoff to the oceans. The report further mentions that flooding in the lower flat lands is due to the lack of adequate drainage systems and local depressions. Obstruction of the stream crossings at Kamehameha Highway may also contribute to



**WATERSHED AREAS
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SOURCE: ENGINEERING CONCEPTS, INC. (DECEMBER 1990)

FIGURE 13

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the flooding of the area. The culverts were observed to be clogged with sand, rubbish, and vegetation, with the channels to the ocean filled with sand to the point of being barely discernible.

Storm water volumes generated on the property under existing conditions (1990) are shown in Table 9.

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map, portions of Zone "X" and "D" fall within the project boundaries (See Figure 14). Zone "X" refers to areas outside of the 500-year flood plain; Zone "D" refers to areas in which flood hazards are undetermined. There was a floodway study performed for Paumalu Stream, which terminates makai of the Obayashi property.

B. Anticipated Impacts

The proposed project will involve "development areas" totaling approximately 584 acres over the 1,143 acres; however, the actual area that will be affected by construction of the improvements will be substantially less. As discussed in Section 2.2, construction operations will alter approximately 338 acres of the property, as defined by substantial clearing and grubbing of vegetation and grading. Much of the remaining undisturbed area consists of steep terrain along the slopes of the gulches and buffer strips separating the golf course fairways, residences and other project elements.

Drainage patterns are expected to remain similar to existing conditions, although some diversion of runoff through the golf course areas and detention basins in scattered locations throughout the site are proposed. The natural slopes and vegetation of areas unaffected by the construction of improvements will be maintained.

The proposed development will increase the quantity of peak runoff generated to various degrees, depending on storm conditions. Changes in land surface types will be made by the construction of impervious surfaces such as roads and buildings. As shown in Table 9, the total volume of storm water runoff volume generated under full development conditions for the two-year, one-hour duration storm, is over four times greater than for present (1990) conditions. The incremental difference, however, is only 5.1 acre-ft., and 65 percent of this increase was calculated to be from the impervious roadway surfaces.

At higher rainfall intensities and durations, the difference between existing and developed conditions decreases, because soil saturation increases, and more runoff occurs regardless of the degree of development. For the 100-yr., 24-hr. storm, which was the greatest calculated incremental storm water runoff volume, the difference between existing conditions and the developed project is approximately eleven percent.

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TABLE 9
STORM WATER RUNOFF VOLUMES

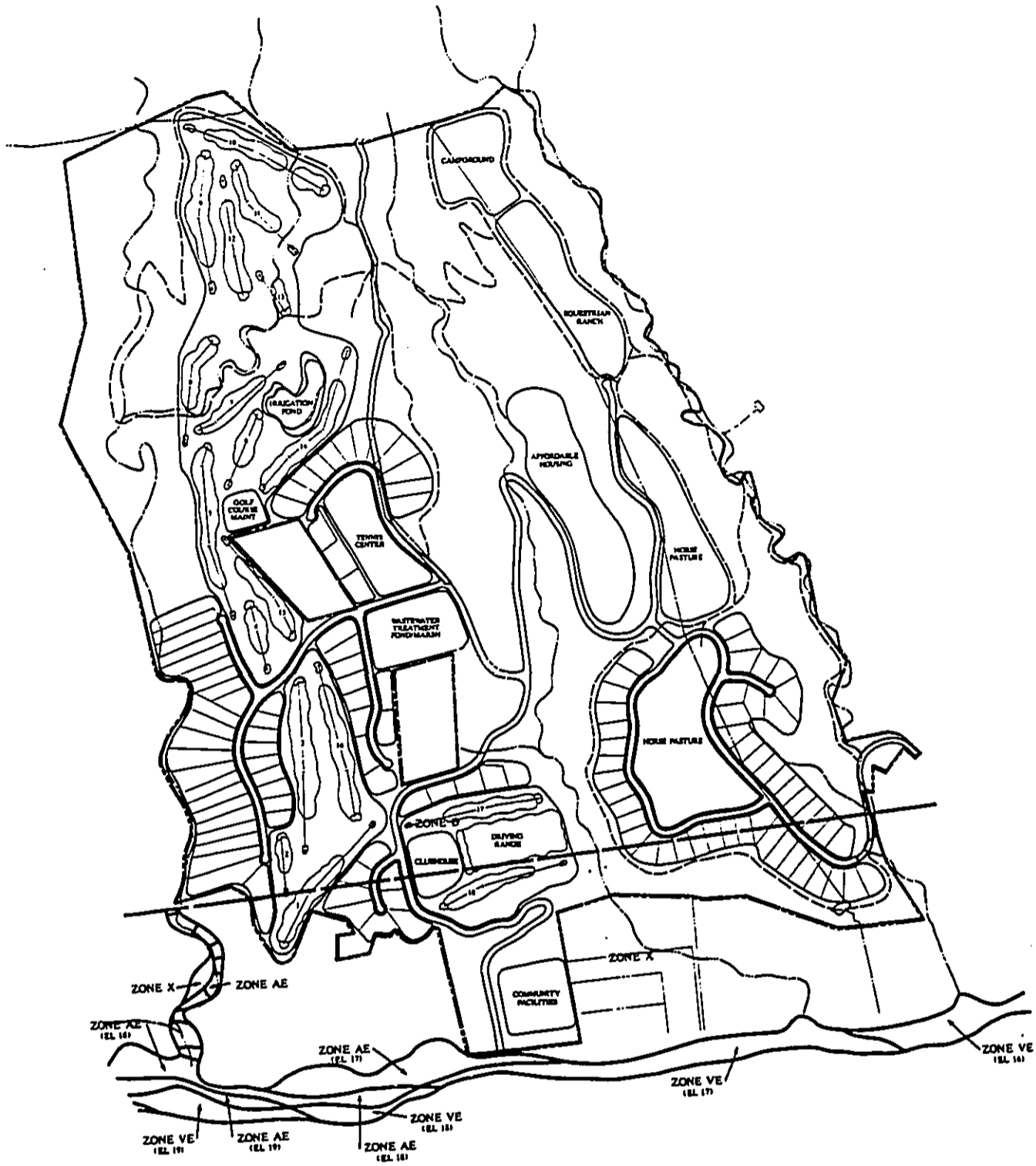
STORM CHARACTERISTICS			HYDRAULIC (acre ft./event)		
Duration (hr.)	RI (yr.)(1)	Amount (in)	1990	1997(2)	Increase(3)
1	2	1.5	2.1	7.2	5.1
1	10	2.1	7.6	16.4	8.8
1	50	3.0	21.6	35.2	13.6
1	100	3.5	31.6	47.6	16.0
24	2	5.0	68.2	89.9	21.7
24	10	8.5	175.6	205.7	30.1
24	50	10.4	240.9	274.8	33.9
24	100	13.0	334.6	370.0	35.4

(1) RI = Recurrence Interval

(2) Year of Full Development

(3) Increased hydraulic volumes are controlled on-site as discussed in Section 4.6.1.c.

Source: Dugan (December 1990)



**FLOOD ZONE BOUNDARY
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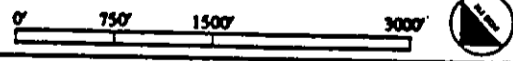


FIGURE 14

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The calculated increased runoff generated correspondingly indicates less potential ground water recharge within the site. In this situation, however, the calculated reduction in potential recharge will be abated somewhat by the planned layout of the project, in that developed areas are interwoven with undeveloped areas. This should tend to increase the recharge potential in the undeveloped areas.

The runoff values presented (acre-ft./event) represent a volume of water and should not be confused with peak discharge rates, which represent the maximum volume of storm water runoff discharge per unit of time (e.g. cubic feet per second or million gallons per day). Peak discharge rates are required for engineering design of proposed drainage facilities and ascertaining the capacity of existing facilities, while total runoff provides a more realistic estimate of impact on water quality. Peak discharge rates will be calculated during the engineering design of grading and drainage plans for the golf course and other areas to be altered for construction of the project's facilities. These rates will be calculated using City and County of Honolulu Drainage Standards.

With respect to flooding, the proposed development lies outside flood hazard areas, as defined by the FEMA Flood Insurance Rate Maps.

C. Mitigative Measures

Several measures will be implemented to insure the public safety at on-site and off-site areas with respect to runoff volume, off-site flow and its constituents. These measures are discussed as follows.

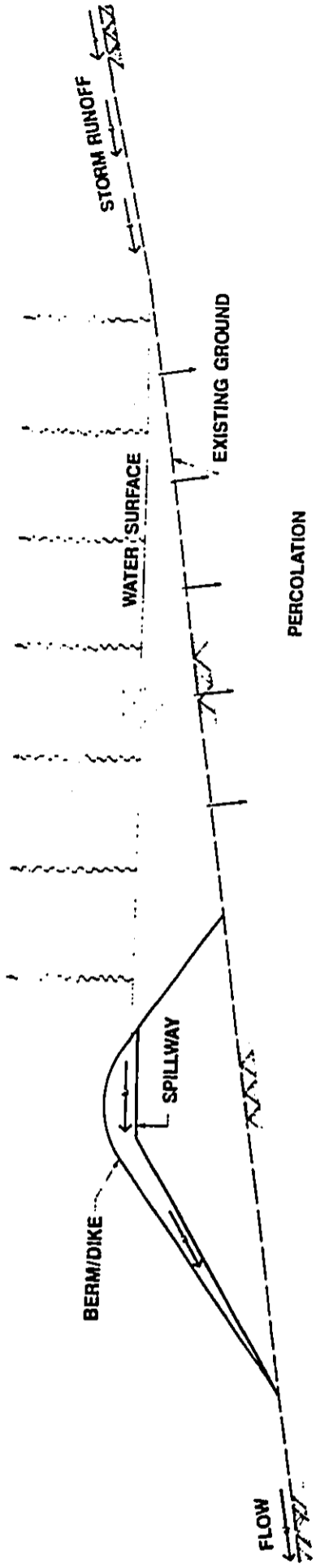
Detention and Retention Ponds: The extensive open nature of the proposed development will allow the incorporation of detention basins and other mitigative measures into the project design, such that both on-site and off-site drainage impacts will be minimal. Specific measures will be taken to ensure that the maximum storm water volumes and flow rates in the intermittent streams crossing the site will be similar or less than the volumes and rates which occur without the project.

Most of the increase in runoff will result from the development of homes, roadways and other impervious surfaces. For many of the residential lots, and for major roadway sections, storm runoff can be routed through the golf course areas to dampen the runoff rate. Detention basins will also be incorporated into the golf course designs to further dampen peak flows. Typical detention basin concepts are shown in Figure 15.

Most of the remaining lots are steeply sloping over most of the area, with runoff sheet flowing to the three intermittent streams. The dense natural vegetation on these steep areas will be retained, and will continue to dampen the runoff intensity.

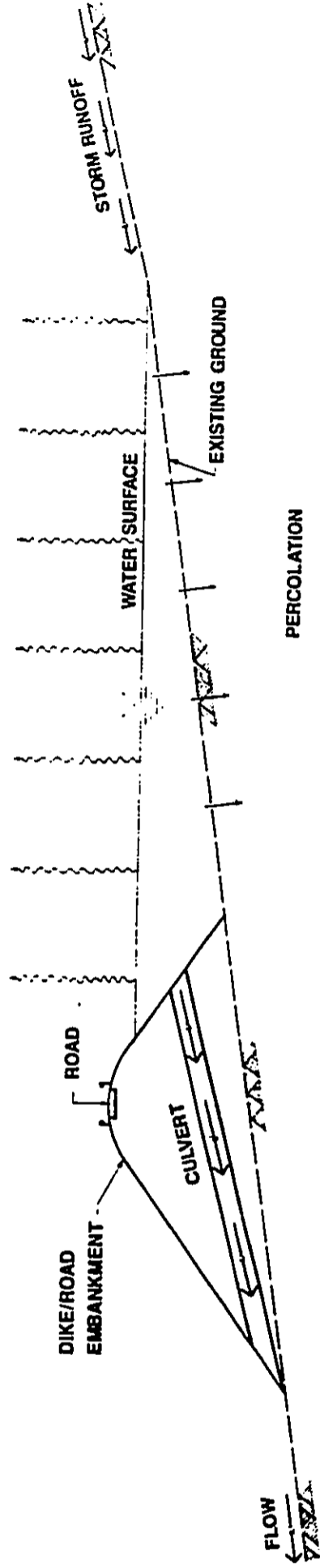
Flow Rate/Erosion Controls: Because of the detention and retention ponds, the runoff flow rate will be controlled and flow will be routed through swales at many

EVAPORATION



PERCOLATION

EVAPORATION



PERCOLATION

DETENTION BASIN DESIGN CONCEPTS
 LIHI LANI RECREATIONAL COMMUNITY

SOURCE: ENGINEERING CONCEPTS (DECEMBER 1990)

FIGURE 15

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locations. As a result, erosion in the intermittent stream gulches will be reduced from existing conditions. Obayashi will obtain an approved Erosion Control Plan prior to commencement of construction from the Department of Public Works.

Detention Basin and Injection Wells Along Kamehameha Highway: Detention basins and injection wells will be provided on the makai area fronting Kamehameha Highway, in order to mitigate the increase in peak runoff flows resulting from the construction of the access road to the project. Injection wells are planned, similar to those installed along Ke Nui Road, to aid in dissipation of ponded runoff. The basin will be sized to approximately six acres, which will ensure that the construction of the roadway and any other improvements on the site will not increase flooding problems on surrounding properties. The system will be capable of containing runoff from the 100-year design storm. Obayashi will comply with Department of Health Administrative Rules, Chapter 11-23, "Underground Injection Control" which requires UIC permits for the construction and operation of all injection wells.

Construction Schedule: Obayashi will endeavor to schedule the six-month road construction period to coincide with the lower precipitation period of April to October.

4.6.2 SURFACE WATER QUALITY

A. Existing Conditions

Surface water bodies exist on the site as intermittent streams which flow during high precipitation periods. As shown in Figure 13, three intermittent streams have poorly defined stream channels which extend through the lowland gulches. No perennial streams, ponds or lakes are found in the area.

Paumalu Stream is found in the gulch which forms the Kahuku-side boundary. Paumalu Stream is the largest of the three on-site intermittent streams, and it collects drainage from a tributary called Kaleleiki Stream (Figure 13). These two streams merge near the Kahuku-side boundary. Paumalu Stream passes through lowlands makai of the bluff, then under Kamehameha Highway (bridge), and discharges into the ocean at Sunset Beach.

Pakulena Stream extends across the center of the site through a lowlands valley between the two major plateau areas. This intermittent stream discharges into lowlands makai of the bluff. During high precipitation periods, the lowland areas collect excess flows and the stream passes through a culvert underneath Kamehameha Highway, and discharges into the ocean south of Ehukai Beach Park.

Kalunawaikaala Stream is located in the lowland valley which forms the Haleiwa-side boundary. This intermittent stream extends across the lowlands makai of the site (off-site), crosses under Kamehameha Highway through a culvert and discharges onto the ocean at Ke Waena Beach.

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There are no surface water areas which regularly exist on the site. The source for any intermittent surface waters is primarily overland runoff that occurs during high precipitation periods. Runoff is contributed to these streams by the small watershed areas of the surrounding valleys. The groundwater contribution to the intermittent streams is negligible, as discussed further in Section 4.5.

The only major surface water bodies in proximity to the site include the Waimea River, located approximately two miles to the south, and the Pacific Ocean, located across Kamehameha Highway.

There is no water quality data from the intermittent streams that pass through the project, nor is there sufficient data from the nearby streams, including Waimea River. Utilizing data relating to nutrient outputs from rural and agricultural lands, average annual nitrogen and phosphorus concentration values of 0.90 mg/l and 0.09 mg/l, respectively, were estimated as existing water quality conditions. The suspended solids concentration value for the existing undeveloped conditions was also estimated at 800 mg/l.

B. Anticipated Impacts

Potential impacts to the intermittent streams and surface water quality on-site and off (downstream), include both short-term, construction-related effects and long-term, operation-related effects.

Modification of Stream Channels: Development of the project site as proposed will involve some modification of stream channels on-site for roadway construction and drainage improvements. Pakulena Stream will be crossed by the circulation roadway at the center of the site. The channel of this intermittent stream will be connected by a culvert under the roadway. A small branch of this stream will also be crossed by the roadway passing near an existing State Water Preserve parcel.

A short branch of the Kalunawaikaala Stream will be connected by a culvert where the stream will be crossed by the emergency access road, connecting to Wilinau Road. A portion of this stream channel may need be relocated to accommodate the circulation roadway.

Within the golf course, Kaleleiki Stream (a branch of Paumalu Stream) will be crossed by the fairways of four golf holes (8th, 10th, 11th and 13th). Fairway breaks and walking and cart bridges will be included to avoid modification of the stream channel.

Short-term construction-related effects on intermittent streams and surface water quality include erosion and sedimentation due to construction area runoff, stream channel modifications for roadway construction, and the installation of culverts and retaining walls. The site will be cleared of vegetation over approximately 338 acres. This clearing operation, and subsequent grading for site development, will create exposed soil areas that could be eroded by storm water runoff without the implementation of soils management measures during construction. For example,

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clearing of vegetation will be limited to 15 acres at one time, following the County grading ordinance. Soils on cleared areas must be stabilized by temporary vegetation or other measures prior to the clearing of new areas.

Stream channel modifications will disturb the soils and rock lining the channel, causing the potential for added short-term water quality impacts from suspended sediments. Only small sections (up to 100 feet) of the intermittent streams channels are expected to be modified by the work, and the operations could be completed in a relatively short time period (four to six weeks).

Long-term operational activities are not expected to create significant adverse effects. Activities which may create the most environmental concerns with regard to surface water quality and quantity include: the application of pesticides and fertilizers; irrigation disposal of treated effluent; suspended sediments contained in storm water runoff; and the potential reduction in intermittent stream flow due to ground water withdrawals. These concerns are all addressed below.

Fertilizer and Pesticides Application Impacts on Runoff: The development and maintenance of the golf course will require application of fertilizers to supply essential nutrients to turf grasses (and ornamental plants). Pesticides will also be required to control the associated weed, disease and insect pests that affect grasses and plants. These chemicals will be applied to the greens, tees, fairways and parts of the roughs on the golf course. Private residences constructed on the estate lots will also use small amounts of fertilizers and pesticides.

The potential for adverse water quality effects that may result from fertilizer and pesticide application was evaluated in technical studies by Dugan (December 1990) (Appendix H) and Murdoch and Green (December 1990) (Appendix I). Their findings are summarized below.

Fertilizers may be subject to movement from the application point by runoff during high intensity storms, or by movement toward ground water. The primary fertilizer elements of concern for possible contamination of ground and surface waters are nitrogen and phosphorus. Under normal conditions of irrigation and precipitation, phosphorus attaches itself very tightly to iron and aluminum hydroxides which are plentiful in the soils. Phosphorus is expected to move little if any from the site of application. Under extreme storm conditions, where phosphorus may not penetrate the soil, the phosphorus concentration in runoff waters from the completed project could be several times higher than the concentration under existing conditions. This potential condition will be mitigated, however, because fertilizer applications would be timed to avoid severe weather conditions, otherwise the effectiveness of the application would be poor. In addition, the use of detention basins, injection wells and diversion through the golf course buffer will promote phosphorus removal by means of absorption onto settled suspended solids, and an increase in contact with bare soil and/or nutrient uptake by vegetation in the drainage path.

The detention basins are designed to slowly release the collected storm water runoff to the intermittent streams, thus phosphorus is expected to accumulate within silt

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collected in these basins. Even if small amounts of phosphorus are carried in runoff waters, there should be no adverse effect on marine water quality (addressed under Section 4.10).

The fertilizer constituent of primary concern is nitrogen. While ammonium nitrogen (NH_4) moves little in soils, nitrogen applied in the ammonium form can be converted to the oxidized nitrate forms (NO_3 and NO_2) which are not bound to the soil and moves readily with water. Because of high nitrogen uptake by turf grasses, however, nitrogen will be used rapidly after application. Only under conditions where rainfall occurs soon after application of a soluble nitrogen source would there be excessive loss of nitrogen by surface runoff, or by leaching below the root zone. This nitrogen movement will be controlled at Lihi Lani by applying a slow-release nitrogen fertilizer. The storm water concentration of nitrogen by the completed project to the intermittent streams crossing the project site is estimated to be 0.60 mg/l with the exception of roadways (1.41 mg/l). Runoff will be routed to detention/retention basins, waste bunkers, grassy swales, and small artificial marshes, which contain plants that will utilize much of the nitrogen.

Pesticides application, including herbicides, insecticides and fungicides, will be required at the project. Of the three pesticides types, the most frequently used in Hawaii are herbicides. The herbicides used on the golf course and common areas will primarily be MSMA and metribuzin. MSMA is tightly sorbed on soil colloids, and metribuzin, though quite mobile in soils, is readily degraded in surface soils. The potential for contamination of surface waters by pesticides will be minimal because of measures being implemented at Lihi Lani to significantly reduce the frequency and amounts of pesticides applied through an Integrated Pest Management (IPM) program for the golf course and common areas. Detention and retention ponds, waste bunkers and grassy swales, and artificial marshes will act as sinks for runoff and cut the concentration of pesticides in golf course runoff ultimately reaching the intermittent streams. As a result, pesticides usage is not expected to cause adverse surface water quality impacts in the intermittent streams or in the receiving waters of the ocean.

Suspended Sediments in Runoff: Dugan (December 1990) (Appendix H) prepared a study of the potential environmental impact resulting from sediment and nutrient loads into intermittent streams crossing the site.

The construction period will have the greatest potential for generating suspended sediments in runoff. As described in Section 4.3, extensive measures will be implemented to minimize soil erosion from construction sites.

The incremental load of suspended sediment is expected to decrease for all storms considered. In addition, the interspersed areas among undeveloped areas should tend to notably decrease the suspended sediment loads flowing from the project site. As compared to existing conditions, the suspended sediment concentration in runoff waters during a 10-year storm (24-hour duration) from the developed project is expected to be only 36 percent of the present level.

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Detention basins and artificial marshes to be developed within the project will retain a large percentage of suspended sediments generated by runoff. Runoff waters entering the intermittent streams will also deposit sediment within the stream channels on-site or in the lowlands stream channel makai of the project. During peak runoff conditions, the intermittent streams will continue to discharge into the nearby Pacific Ocean, although the suspended sediments in the discharged runoff water are estimated to be significantly lower when the full project development is completed. The effect of the reduced suspended sediment load into coastal waters is addressed in detail in Section 4.10.

Effects on Stream Flow: Stream flow in the three streams on the project site is intermittent, and they flow only during peak storm water runoff periods. There are no perennial fresh water streams within the project boundaries. The frequency of stream flow periods is not expected to be affected by the withdrawal of groundwater, since the aquifer is located far below the stream elevations. Details of the hydrology of the project area are presented in technical reports prepared by Mink (June 1988; December 1990). This information relating to groundwater is presented in Section 4.5.

During storm events, increased runoff generated on the project site by rainfall on impervious surfaces will be controlled by on-site detention basins. The intermittent streams crossing the project area will receive storm water runoff volumes that are similar or less than existing conditions. Details regarding drainage conditions and proposed storm water controls are discussed in Section 4.6.1.

C. Mitigative Measures

A number of measures will be implemented on the project site to minimize effects on water quality in the intermittent streams passing through the site.

Erosion Controls: Measures are proposed to minimize the short-term impact of soil erosion on stream water quality and suspended sediment input. Soil erosion mitigation measures recommended by the State DOH, City and County, and SCS are included in Section 4.2. Under the County Grading Ordinance, clearing of vegetation can only be done on 15 contiguous acres at a time. Diversion ditches will be constructed to divert overland runoff into collection/detention areas on the project site. In addition, soil stockpiling will be conducted to contain excavated earth in controllable areas prior to its use elsewhere on the site. Expedient revegetation of exposed areas on the site will also minimize erosion of soils.

Increased Percolation in Turfed Areas: Percolation of precipitation into turfed areas will also be increased over the present undeveloped conditions; therefore, runoff and its constituents will be decreased.

Irrigation Management: Golf course and common area irrigation management is critical to minimizing fertilizer and pesticide impacts on surface waters. If excessive irrigation water is applied, the likelihood of nitrate movement in surface waters or

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movement to ground water is increased. A U.S. Weather Bureau Class A evaporation pan and computer irrigation management will be used to measure evaporation and properly schedule irrigation application in the management of the golf course. Irrigation scheduling will follow programs described in Golf Course and Grounds Irrigation and Drainage (Jarret, 1985). Likewise, fertilizer application schedules will be timed so that heavy applications of soluble fertilizers are not applied during the rainy months of this area (October through January). Slow-release nitrogen fertilizers will be applied in most cases, and especially during the rainy season; these fertilizers release nitrogen at a rate comparable to the rate which is used by turf.

Integrated Pest Management: An IPM program will be instituted to minimize the frequency and amounts of pesticides being applied at the golf course. The types of chemicals being utilized for treatments will be the lowest possible, in terms of toxicity and their persistence and mobility. When compared to traditional pesticides application rates, IPM programs typically reduce total pesticide usage at golf course from 35 to 50 percent. The reduction of the total amounts of pesticides being used will reduce the potential for their release to the environment outside the golf course.

Ponds, Swales and Artificial Marshes: In combination with the measures being taken to reduce fertilizer and pesticides usage on the golf course, sinks for runoff will be developed at detention and retention ponds, waste bunkers and grassy swales, and artificial marshes. Each of these areas will increase the time that fertilizers and pesticides in runoff will be exposed to water, sunlight, soils, vegetation and organic material. The sink areas will allow for dilution, uptake and breakdown of the nutrients, chemicals and suspended sediments in runoff before water is released into the intermittent streams. Sink areas will greatly minimize the potential for adding contaminants into the intermittent stream water and the nearshore ocean.

Certified Golf Course Management: A well-qualified Certified Golf Course Superintendent will be responsible for managing the golf course. Mitigative measures proposed above are also based on sound management practices that will be followed with regard to fertilizer and pesticide application and irrigation. The Golf Course Manager will be thoroughly trained and experienced in the implementation of the IPM program and the management of chemicals on the site.

Animal Wastes - Best Management Practices: The project will establish a minimum setback from stream channels of 100-feet for horse pasture areas. Natural vegetation will be retained between the ranch and the stream channel, allowing for filtering of runoff from the ranch. Horse droppings will be collected on a regular schedule within the horse ranch area, and removed from the ranch in a timely fashion. There will be no waste disposal or stockpiling at the horse ranch. The operator will either compost the wastes to create mulch material for use on-site or dispose of the wastes at a government approved location off-site. The Department of Health's "Non-point Source Pollution Management Plan" will be followed for additional Management Practices.

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Urban & Runoff Control - Best Management Practices: Runoff from residential areas will be released through natural vegetation swales, first passing through detention basins in some locations, to help eliminate potentially adverse concentrations of chemicals through evaporation, sunlight breakdown, dilution and uptake of organic material.

4.7 TSUNAMI/FLOOD HAZARD

A. Existing Conditions

The entire project area lies outside the 100-year boundary for floods attributable to either storms or a tsunami. According to the Flood Insurance Rate Map (FEMA, 1987) the project site falls within two flood hazard zones, Zones D and X. The zone dividing line runs approximately 1,800 feet mauka of Kamehameha Highway near the bluff's edge. The area mauka of the line is in Zone D, where flood hazards are undetermined. Flooding is not known to be a problem anywhere along the intermittent streams within the site area.

B. Anticipated Impacts

The site is not part of a floodway or flood fringe area, nor within a designated tsunami inundation area. No part of the project is known to be subject to potential flooding. Storm drainage will be controlled by detention areas established throughout the project, which will minimize flooding both within and downstream of the site. Discharge of runoff from the project will be no greater than existing conditions. Details of storm drainage control are discussed in Section 4.6.1.

C. Mitigative Measures

Drainage Improvements: Drainage improvements, as discussed in Section 4.6.1, will include adequate provisions to prevent any flooding problems in the uplands or on the portion of the project site near Kamehameha Highway, as well as on lands adjacent to the project. No mitigative measures are needed to avoid flood hazard areas since none exist within the project area.

4.8 VEGETATION

A detailed botanical survey of the project area was conducted by Kenneth Nagata (January 1988). Field studies to search for wetlands along the Paumalu and Kaleleiki streams were conducted by Char & Associates (March 1991). The complete reports of these surveys are enclosed, as Appendix K. Existing conditions on the site are discussed in this section, along with anticipated impacts on vegetation. Mitigative measures have been proposed to minimize effects on vegetation in some parts of the project.

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A. Existing Conditions

Nine broad vegetational communities were identified, as shown in Figure 16. A list of the vegetation species found on the site is included in Table 10.

The general vegetation of the project site was found to be a complex of secondary forests consisting of ironwood and eucalyptus, grasslands, herblands and weedy brushlands. Four native species were found in significant number with *huehue* and *'ākia* being the most abundant. *'Ulei* and *pula'a* are also widespread throughout the site, generally restricted to sunny exposed areas on the upper slopes.

Four trees of Koolau *Eugenia* were discovered in a small moist ravine just mauka of the upper boundary of the project site. At this time, these trees are the only known Koolau *Eugenia* specimens in the world.

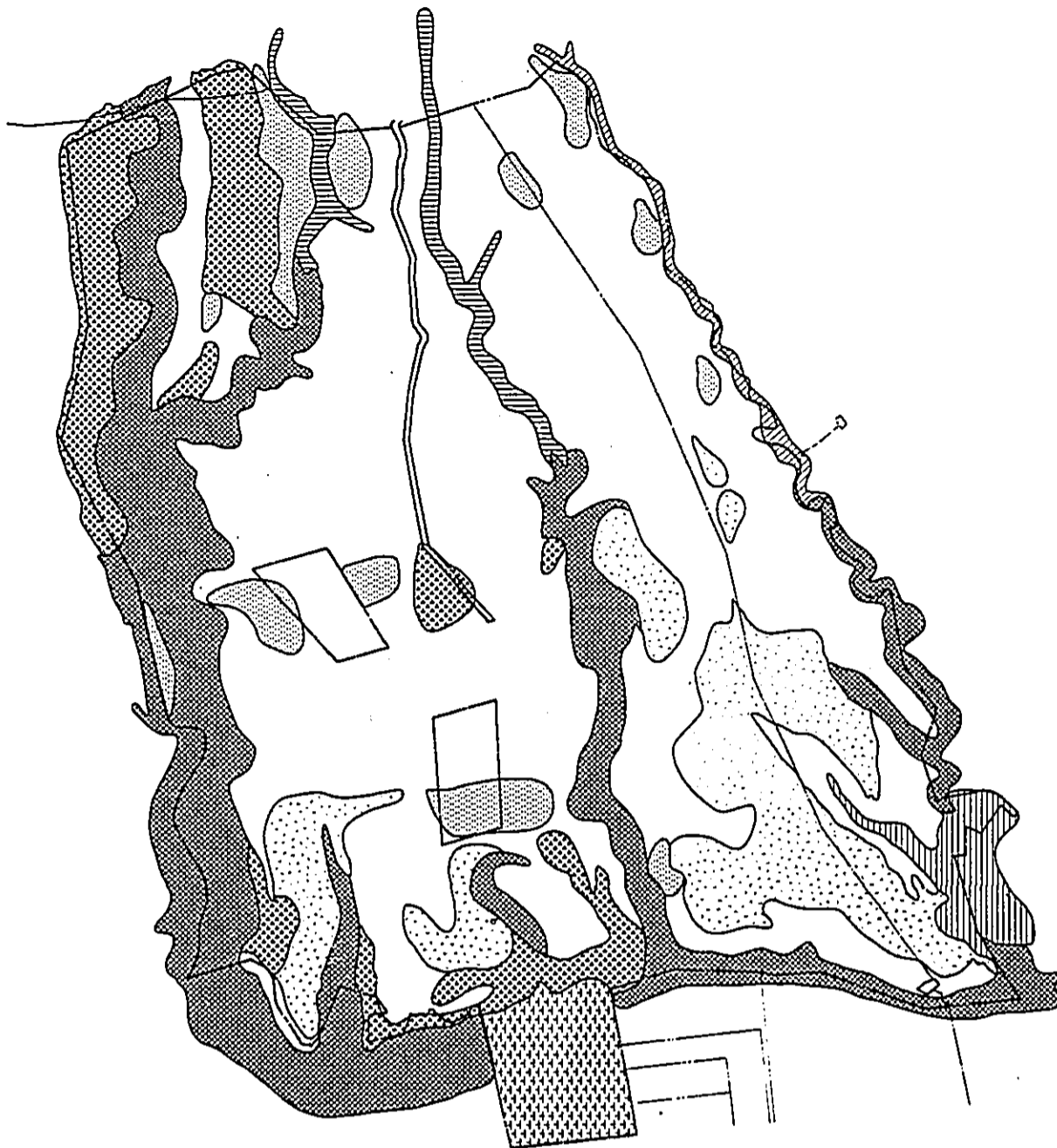
Vegetation communities are categorized according to the relative abundance of the vegetation type. A description of the nine vegetation categories is provided below.

1. **Casuarina Forest (CF)**: The most prevalent vegetation type in the entire project site is the Casuarina Forest which is dominated by ironwood trees 20 to 50 feet tall. Many species are associated with this community, but in small numbers. The most abundant native plant *huehue* is common throughout the forest; occasionally spotted are the *'ākia*, *pukiawe*, *ūlei* and *'uhaloa*.
2. **Eucalyptus Forest (EUC)**: Several large groves of swamp mahogany, a smaller grove of an unidentified species and a single extensive grove of Murray red gum are found within this plant community on the project site. Silk oak and ironwood are widely scattered throughout the forest. Several native species are also associated with the Eucalyptus Forest, and with the exception of occasional spots of *huehue* and *'ākia*, all are considered rare.
3. **Waltheria Herbland (WH)**: Currently a portion of the plateau is being utilized as a pasture. The pasture consists of Waltheria Herbland dominated by the indigenous *'uhaloa*. In some sections it provides nearly 100 percent of the cover, in others, Jamaica vervain is co-dominant. The only other native species in this community besides the *uhaloa* is the *'ūlei*.











There are intensively grazed areas characterized by a larger grass component consisting largely of golden beardgrass, West Indian dropseed, Hilo grass and three-flowered beggarweed.

4. **Grassland (G)**: Grassland communities are found on the plateaus often adjacent to the Waltheria Herbland communities and on the upper slopes of the gulches. Most of the Grassland community appear ungrazed and in certain places on the plateau the grasses attain heights of three to five feet.

Common in the Grassland are Jamaica vervain, partridge pea, Spanish clover, and Asiatic pennywort. Several other species are found in smaller numbers.



LEGEND

- | | | | |
|---|------------------------------|---|------------------------------|
|  | CASUARINA FOREST |  | SCHINUS BRUSH |
|  | EUCALYPTUS FOREST |  | PSIDIUM GULCH ASSN. |
|  | WALTHERIA HERBLAND |  | MIXED GULCH ASSN. |
|  | GRASSLAND |  | PSIDIUM CLIDEMIA GULCH ASSN. |
|  | PSIDIUM CLIDEMIA GULCH ASSN. |  | LOW WASTELAND |

**VEGETATION COVER TYPES
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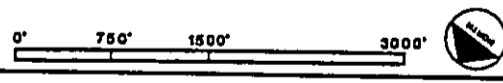


FIGURE 16

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TABLE 10

LISTING OF VEGETATION SPECIES ON PROPERTY

The listing below includes vegetation species that were identified by Kenneth Nagata (January, 1988) on the proposed site of the Lihi Lani Recreational Community project.

<u>COMMON NAME</u>	<u>SCIENTIFIC NAME</u>
huehue (N)	<u>Cocculus ferrandianus Gaud.</u>
'akia (N)	<u>Wikstroemia oahuensis.</u>
'ūlei (N)	<u>Osteomeles anthyllidifolia Lindl.</u>
pala'a (N)	<u>Spenomeris chusana (L) Copel.</u>
Koolau euginia (E)	<u>E. Koolauensis Deg.</u>
ironwoods	<u>Casuarina equisetifolia</u>
pūkiawe (N)	<u>Styphelia tameiameia (Cham.) F. Muell.</u>
'uhaloa (N)	<u>Waltheria americana L.</u>
swamp mahogany	<u>E. robusta Sm.</u>
Murray red gum	<u>Eucalyptus camald ulensis</u>
silk oak	<u>Grevillea robusta A. cunn.</u>
Jamaica vervain	<u>Stachytar pheta jamaicensis (L.) Vahle</u>
golden beard grass	<u>Chrysopogon aciculatus</u>
West Indian dropseed	<u>Sporobolus indicus</u>
Hilo grass	<u>Paspalum conjugatum Berg.</u>
three-flowered beggarweed	<u>D triflorum (L.) DC.</u>
partridge pea	<u>Cassia leschenaultiana</u>
Spanish clover	<u>D. canum</u>
Asiatic pennywort	<u>Centella asiatica</u>
Strawberry guava	<u>Psidium cattleianum</u>
Christmas berry	<u>Schinum terebinthifolius Raddi</u>
Koster's curse	<u>Clidemia hirta</u>
'ōhi 'a-lehua (N)	<u>Metrosideros collina</u>
naupaka (N)	<u>Scaevola gaudichaudiana</u>
uluhe (N)	<u>Dicranopteris linearis</u>
sensitive plant	<u>Mimosa pudica var. unijuga (Duchass & Walp.) Griseb</u>
ageratum	<u>Ageratum conyzoides</u>
perennial foxtail	<u>Setaria geniculata (Poir.) Beauv.</u>
lantana	<u>Lantana camara</u>
Formosa Koa	<u>Acacia confusa Merr.</u>
Java plum	<u>Eugenia cumini</u>
rose apple	<u>Eugenia jambos</u>
mango	<u>Mangifera indica L.</u>
avocado	<u>Persea americana Mill</u>
breadfruit	<u>Artocarpus altilis (Parkins. exZ) Fosb.</u>
coffee	<u>Coffea arabica</u>
banana	<u>Musa x paradisiaca L.</u>
coconut	<u>Cocos nucifera L.</u>
thatching grass	<u>Hyparrhenia rufa (Nees.) Stapf</u>
kiawe	<u>Prosopis pallida (Humb. & Bonpl. ex Willd.) HBK.</u>
sourgrass	<u>Tricachne insularis</u>

E = Endemic
N = Native

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The Grassland community together with the Waltheria Herbland are remnants of former pasture lands. They are being invaded by strawberry guava and ironwood, reducing their original size by more than 50 percent. On the other hand, Grassland communities on the gulch slopes appear to have been quite stable in the past two decades. On the lower portions of the slopes, Christmas berry forms a transitional zone between the Grassland community above and the Schinus Brush community below.

5. **Psidium-Clindemia Gulch Association (PCGA)**: This community type is found on the floor and lower slopes of the moist upper reaches of the major gulches in the project site. It consists of dense stands of strawberry guava 10 to 20 feet tall with an understory dominated by koster's curse.

Numerous species are associated with this community type such as 'ohi 'a-lehua, naupaka, uluhe, pala'a, pukiawe and 'äkia. They are found in small to moderate numbers on the middle slopes transitional zone areas. Exposed sites on the gulch floors are occupied by common weedy species such as Jamaica vervain, Asiatic pennywort, partridge pea, Spanish clover, sensitive plant, Hilo grass, and ageratum.

6. **Schinus Brush (SB)**: The Schinus Brush dominates the middle and lower parts of the major gulches, the lower slopes of the seaward cliffs and most of the small ravines. This vegetation community is best developed on the floors of the ravines where moisture is more readily available. Associated with these moist sites are partridge pea, perennial foxtail, Asiatic pennywort and lantana.

This vegetation type is characterized by dense stands of Christmas berry 10 to 20 feet tall with occasional emergent Formosan Koa, swamp mahogany and Java plum.

7. **Psidium Gulch Association (PGA)**: This community type is characterized by dense stands of strawberry guava 15 to 25 feet tall with occasional ironwood, silk oak and rose apple. It is only found in the moist, upper half of the gulch which constitutes the southerly boundary of the project.

Several large mango, avocado and breadfruit trees are found in the upper reaches of the gulch. In addition, coffee has become naturalized in one section and several banana plants and one coconut tree were found. This indicates that portions of the gulch were cultivated in the past.

8. **Mixed Gulch Association (MGA)**: The vegetation in the lower portion of the south boundary gulch is a mosaic of several community types. It is the smallest plant community in the project area, and it consists of small groves of strawberry guava, Christmas berry, Java plum, ironwood and small fields of thatching grass grasslands and Waltheria Herbland.

9. **Lowland Wasteland (LW)**: Another vegetational mosaic, this area consists of a patchwork of individual units too small to be feasibly mapped. The area borders

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Kamehameha Highway with a grove of ironwood and closed-canopied *kiawe*. Behind this are found a heterogeneous community of weedy species, with sourgrass being common throughout.

Numerous common native plant species are found on the project area, but they are generally few in numbers, and occur mostly as widely scattered individuals. Small pockets of native vegetation also exist, but they are degraded, scattered and Nagata (1988) does not interpret these as viable communities.

Four trees of Koolau *Eugenia* were discovered in a gully just mauka of the project site on State Forest Preserve land. They are the only known specimens in the world and must be protected.

The Paumalu and Kaleleiki stream surveys (Char 1991) did not find any wetlands in the survey area. Physically, the Paumalu and Kaleleiki streams do not broaden out on the property, thus providing areas where soil and organic matter may be unloaded, accumulate and wetland species take root. The absence of wetlands corroborates the findings of Nagata's surveys in 1988.

B. Anticipated Impacts

Development of the project will involve transforming some portions of the existing site into a recreational and residential community. Approximately 363 acres of vegetation will be cleared to allow development of the project, as shown in Table 5. Several plant communities will be affected, primarily the Casuarina Forest, *Waltheria* Herbland and *Schinus* Brush areas. It should be noted that the various species associated with each plant community are not considered rare or endangered, with the exception of the Koolau *Eugenia* trees, which are considered "localized" and "rare" by Fosberg and Herbst (1975). The Koolau *Eugenia* are located off-site and would benefit from the cooperative management efforts by the State and Obayashi.

C. Mitigative Measures

Several mitigative measures will be implemented to minimize adverse effects on vegetation.

Koolau *Eugenia* Trees: Obayashi will continue to participate in a cooperative effort with botanists from the State Department of Land and Natural Resources (Division of Forestry and Wildlife), to protect and monitor these rare trees. Measures may include the gradual elimination of threatening encroachment by exotic species. This could afford more optimal growing conditions for the trees and help to ensure their survival. Systematic monitoring of flowers and fruits for propagation experiments, with the long term goal of increasing the population, will be included. No actions will be taken with respect to these trees without the explicit direction and guidance from DLNR. As requested by DLNR, Obayashi will refrain from specifying the exact location of these trees.

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Erosion Control: Measures will also be taken to alleviate runoff and soil erosion effects on undisturbed vegetation throughout the project site. Steps will be taken during the construction phase to reduce erosion tendencies, as discussed in Section 4.2.

Landscaping and Native Plant Introduction: Obayashi will identify and transplant some native species to an on-site nursery, for propagation and eventual relocation to select sites within the project. Extensive landscaping is planned for the site within golf course, residential and common areas.

Conservation Area Establishment: Obayashi will also identify and maintain the majority of open space area as a "conservation area". The purpose will be to preserve and enhance, as possible, the native and endemic species in the North Shore area. The gulches and associated vegetation on this site are part of small watershed areas, which are integral to the water cycle for the immediate vicinity. The conservation area would include provisions for trails and interpretation.

Other Significant Trees: Nagata (1988) and Weissich (1990) have conducted an extensive inventory of significant trees and groves of trees which are special, natural features on the property. These trees will be retained wherever possible, and integrated within developed areas.

4.9 WILDLIFE

A study of the existing wildlife (terrestrial vertebrate) populations on the project site, including amphibians, reptiles, mammals, and introduced and indigenous birds, was prepared by Andrew J. Berger Ph.D. (January, 1988). A preliminary survey of four streams on the project site: Paumalu, Kaleleiki, Pakulena, and Kalunawaikaala, was conducted by Anne M. Brasher (March 1991). The complete reports are enclosed as Appendix L. Resident and migratory species were considered in Berger's study. This inventory is based on field studies of the project area and research of existing information regarding the area and its habitat types.

A. Existing Conditions

Terrestrial Vertebrate

As described in Section 4.8, the project site contains a variety of vegetation cover types and is generally uncleared except for some agricultural uses. This habitat diversity allows for some variety in wildlife types occurring in the area.

There are several species of birds inhabiting the area, but none are an endangered species. Because of the geographical mobility of birds, they can appear in the area at anytime. Table 11 presents a complete listing of wildlife in the project area, including introduced and indigenous birds.

Several of the bird species are considered as serious pests which cause damage to crop and flower gardens. These species include the Red-vented Bulbul and the Japanese

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TABLE 11
WILDLIFE SPECIES

The following listing presents wildlife species which were identified on the property, or are expected to occur on the property. This inventory is based on field studies and research by Andrew J. Berger, Ph.D. (January, 1988).

<u>COMMON NAME</u>	<u>SCIENTIFIC NAME</u>
<u>Amphibians</u>	
Giant Neotropical Toad	<u>Bufo marinus</u>
American Bullfrog	<u>Rana catesbeiana</u>
<u>Reptiles</u>	
Blind Snake	<u>Typhlops braminus</u>
Skinks	<u>Family Scincidae</u>
Geckos	<u>Family Gekkonidae</u>
<u>Introduced Birds</u>	
Cattle Egret	<u>Bulbucus ibis</u>
Rock Dove or Feral Pigeon	<u>Columba livia</u>
Spotted or Lace-necked Dove	<u>Streptopelia Chinensis</u>
Barred or Zebra Dove	<u>Geopelia striata</u>
Barn Owl	<u>Tyto alba pratincola</u>
Melodious Laughing-thrush	<u>Garrulax canorus</u>
Red-vented Bulbul	<u>Pycnonotus cafer</u>
White-rumped Shama	<u>Copysychus malabaricus</u>
Japanese White-eye	<u>Zosterops japonicus</u>
Japanese Bush Warbler	<u>Cettia diphone</u>
Common Indian Myna	<u>Acridotheres tristis</u>
Nutmeg Mannidin or Ricebird	<u>Lonchura punctulata</u>
House Finch	<u>Carpodacus mexicanus frontalis</u>
Red Jungle Fowl	<u>Gallus gallus</u>
Black-crowned Night Heron	<u>Nycticorax n. noactli</u>
Lesser Golden Plover	<u>Pluvialis dominica fulva</u>
<u>Mammals</u>	
House Mouse	<u>Mus musculus</u>
Indian Mongoose	<u>Herpestes auropunctatus</u>
Pig	<u>Sus scrofa</u>
Roof Rat	<u>Rattus rattus</u>
Polynesian Rat	<u>Rattus exulans</u>
Norway Rat	<u>Rattus norvegicus</u>

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Several of the bird species are considered as serious pests which cause damage to crop and flower gardens. These species include the Red-vented Bulbul and the Japanese White-eye. The House Finch is another destructive bird. It is also known as the Papaya Bird in Hawaii, but it is predominantly a seed-eater which prohibits the potential growth of such crops.

Cattle Egrets are common throughout the project site. At least one flock of pigeons also inhabits the area. Other birds often found in the area include: the Spotted or Lace-necked Dove; the Barred or Zebra Dove, which is a game bird; and the Melodious Laughing-thrush (Chinese Thrush). The Lesser Golden Plover is a migratory bird found in the area. This type frequents lawns in residential areas and golf courses.

Located in the project area are several mammal species, including the house mouse, various rat species and the mongoose. None of these mammals are an endangered species. With the possible exception of the house mouse, all of the smaller mammals prey on birds, their eggs and their young.

There are no endemic amphibians or land reptiles in the Hawaiian Islands. All have been introduced such as the common toad, frog, snake, skinks and geckos. These amphibians and land reptiles are in the project area, but none are rare, endangered or of any special significance.

Stream Survey

The stream surveys (Brasher 1991) note the presence of fish, insect and other invertebrates in the intermittent streams on the Obayashi property. Several benthic organisms were identified. One native "fish" was observed in a post-larval form in Paumalu Stream (*Sicyopterus stimpsoni*). These "fish" have an amphidromous life cycle, meaning that eggs are laid in the stream, hatch, then wash out to sea. After spending a larval phase as marine plankton, the post-larvae return to the streams, where they spend the remainder of their life cycle. The presence of these "fish" in Paumalu stream is a random occurrence. The probable outcomes are, one, the stream channel will dry up and the "fish" will perish, or two, the "fish" may reach some permanent water in the upper reaches of the stream where, given adequate food and other requirements, they could survive through adulthood. There were no adults found in the survey, although upper reaches of the stream (off-site), were not surveyed.

B. Anticipated Impacts

None of the birds found in the project area are considered to be an endangered species, and some of them are destructive pests. Other species found on the project site provide pleasure for people through their song and beauty. The proposed project is not expected to have a significant adverse effect on the area's available habitat for the bird species found on the site.

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Currently, there are no habitats found on the site for some species of birds, such as the Black-crowned Night Heron or the *Pueo* (Hawaiian Owl). However, the construction of golf course ponds and landscaping might provide foraging habitat for these birds and allow their introduction to the area.

Long ago the native vegetation of the Pupukea area was almost totally cleared for forestry and agricultural purposes. The existing introduced vegetation on the project site does not, for the most part, provide suitable habitat for any of Hawaii's endemic forest birds. Disturbance to this on-site vegetation, over 30 acres, and subsequent development and replanting, is expected to have no significant impact on available habitat for endemic birds.

All the amphibians and land reptiles that occur in the project area are introduced animals, and none are considered to be a rare or endangered species. Loss of some individuals or their displacement due to development of the property is not expected to be a significant environmental effect on amphibian or reptile species.

According to Berger (January, 1988), all of the introduced species of mammals in Hawaii have proven to be highly destructive to man, his buildings, products, agricultural crops and/or the native forests and their animal life. None of the mammals occurring in the project area is an endangered species, and none is of any concern as far as detrimental effects resulting from this project.

The fertilizers and pesticides used in golf course maintenance pose little or no hazard to birds frequenting the grassed areas or ponds associated with the golf courses. Fertilizers are relatively non-toxic unless ingested in large amounts, and all herbicides and fungicides used in golf course maintenance in Hawaii are of low to moderate toxicity. The only chemicals used in Hawaiian golf course maintenance which are highly toxic to birds are the organic phosphate insecticides, especially chloropyrifos. However, chloropyrifos are strongly adsorbed on the thatch layer of turf and move little from the site of application.

Because of the absorption of organic phosphate insecticides on organic layers in turf and their rapid breakdown, there is little chance of their movement from grassed areas into the ponds and waterways associated with the proposed golf course. Label instructions strictly prohibit their direct application to streams and ponds. In addition, other insecticides with reduced toxicity can be substituted for chloropyrifos with little loss of effectiveness. The threat to birds by pesticides application is expected to be minimal.

C. Mitigative Measures

No significant impact is expected to occur to any wildlife species on the property; however, several measures will be implemented that will minimize effects on wildlife due to project development. These will include: minimized clearing of vegetation, extensive re-vegetation and landscaping planting, establishment of aquatic habitat areas, and control of pesticide application.

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Minimized Vegetation Clearing: Vegetation will be cleared over approximately 338 acres (29 percent) of the 1,143-acre site. Existing vegetation will remain in the most steeply sloped areas along the ravines and between homes, roads, golf holes and other elements of the project. The majority of existing habitat areas (approximately 71 percent) will remain unaffected.

Re-Vegetation of Cleared Areas: Re-vegetation of many cleared areas will occur, with 90 acres being replanted with turf and the remainder in natural ground cover and landscaping vegetation. Extensive ornamental and native landscape vegetation species will be planted for buffer and perimeter areas. These landscaped areas will again serve as habitat areas for some wildlife.

Aquatic Habitat Creation: New aquatic habitat areas will be developed as part of the project's design, mostly integrated with the golf course as water hazards, retention ponds and aesthetic features. Aquatic vegetation will become established at those water features, and aquatic wildlife will become added to the faunal component, such as aquatic birds and fish.

Pesticide Controls: Use of pesticides will be controlled on the site with special care to avoid impacts on wildlife. Only those pesticides which are allowed by law will be applied. Application will be supervised by a certified golf course manager. A more detailed discussion of these mitigative measures is found in Section 4.8.

Paumalu Stream: Measures will be taken to detain run-off on the project site and minimize the amount of silt entering the Paumalu stream channels, minimizing affects on stream biota.

4.10 MARINE RESOURCES

This section includes a discussion of the existing marine environment along the shoreline near the project, and potential impacts to this environment as a result of development of the Lihi Lani Recreational Community. A detailed study of the potential impact on the marine environmental resources of the area was prepared by Marine Research Consultants (December 1990). Findings of this study are presented in this section, and the complete report is enclosed in Appendix M.

A. Existing Environment

A baseline assessment of the near shore marine environment was conducted during June 1988. The primary objective of this assessment was to construct a comprehensive qualitative and quantitative description of existing water chemistry parameters that can be used to evaluate the magnitude of possible changes that might result from construction and operation of the project. In addition, qualitative assessments of the near shore biological communities inhabiting the area were conducted in order to evaluate the potential for changes to biota from alteration of water chemistry.

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An additional objective of the baseline assessment was to evaluate the degree of natural stresses (e.g. wave scour, freshwater input) that influence nearshore communities in the vicinity of the proposed development. Typically, the composition of reef communities is intimately associated with the magnitude and frequency of these stresses, and any impacts caused by the proposed development will be superimposed on natural environmental factors.

Water Chemistry: For the existing situation at Pupukea, the marine communities considered are coral reefs. Potential existing alterations of these communities could consist of additions of dissolved nutrient materials from fertilization and sewage effluent disposal, along with introduction of suspended solids from storm water runoff. Nutrients added to the marine environment can provide the potential for indirect changes which can result in environmental degradation, by enhancing the growth of benthic algae and seaweed. This has been shown to be the cause of decreased coral growth, an example of which was Kaneohe Bay during the 1970's. Suspended sediment loading is a stress to which Hawaiian reef corals are well adapted. As long as corals are not buried by sediment, and if the sediment stress is not a permanent feature of the environment, corals are generally able to "clean" themselves to avoid coverage and slowing of growth.

Water quality was evaluated along two transects oriented perpendicular to the shoreline, directly offshore of the proposed project where it nearly extends to the shoreline. At each transect, water samples were collected over the widest possible salinity range to evaluate the effects of ground water efflux. Samples were collected from the highest reaches of wave wash to a distance of approximately 500 meters (m) offshore, and taken at the surface and near the bottom at offshore locations. Duplicate samples of the tap water from Ehukai Beach Park were also analyzed, as representative samples of ground water at the project site.

Water quality parameters that were evaluated in these samples included the 10 specific criteria designated for open coastal waters by the State of Hawaii Department of Health (DOH). Detailed results are presented in Appendix K. Summarized below is the evaluation of the nutrient parameters of nitrogen (nitrate + nitrite, ammonium nitrogen), phosphorus and silica.

Water chemistry analyses of samples indicated relatively high levels of nitrate + nitrite and silica. No distinct pattern was observed with respect to distance from shore for total nitrogen or ammonium nitrogen. However, sampling data showed that nitrate + nitrite and silica are found in near shore waters at higher concentrations than in offshore waters. In the absence of stream flow or surface runoff, influx of ground water in the near shore zone is the only source of nutrient subsidy to the receiving environment. Nitrate + nitrite and silica are nutrients that are present in high concentrations in groundwater.

Relatively small enrichment of phosphorus does occur in the coastal waters as a result of groundwater infiltration, but there was virtually no indication of increased

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levels either near the shoreline or in surface layers. This is apparently due to dilution and mixing processes.

Salinity is the best indicator of the degree of groundwater influence on near shore water chemistry. Decreases in salinity were found in the near shore zone, the result of mixing of fresh ground water with open ocean water.

At the present time there is an external dissolved inorganic nitrogen source within the near shore zone. The source is probably attributable to leaching from residential cesspools near the shoreline. Thus, baseline conditions of water quality in this area are characterized by man-induced alterations to the existing environment. There is no indication, however, that the nutrient subsidy is resulting in negative biological impacts in the near shore zone.

Chlorophyll a is another water quality parameter that does not exhibit any pattern with respect to distance offshore within the near shore zone. Turbidity, dissolved oxygen, pH and temperature measurements also do not indicate any consistent variation with respect to distance from shore or depth.

Biological Community Structure: The marine environment off the proposed project location is characterized by seasonal intense wave activity which limits the development of reef biota to those assemblages which can withstand the impact of breaking waves. As a result, coral communities are limited to thin veneers. Reef fish communities (described in detail later in this section) are limited owing to the lack of habitat shelter and apparent overfishing. Such community assemblages which are pre-adapted to high stress conditions are less susceptible to alteration from additional man-induced stresses.

Because of the extremes in wave stress, physical parameters for development of extensive benthic communities must be considered sub-optimal. As a result, the area is not characterized by well established coral communities that comprise high percentages of bottom cover in areas where wave stress is not severe. Within the near shore boulder zone, the only observed organisms are benthic algae; reef building corals and motile organisms were not observed. It appears that the occurrence of algae in the boulder zone is seasonal, with blooms occurring in the summer when wave stress is minimal.

Further offshore on the reef platform, the dominant benthos remains benthic algae. In this zone, however, hermatypic (reef-building) corals also occur. Because corals are essentially "permanent" features of the biotic community (in that they do not re-colonize an area seasonally), they must be able to withstand the full range of environmental stress inherent in the physical environment. Growth forms of coral observed in the study area are generally restricted to flat encrustations, an adaptation that favors resistance to breakage from wave stress.

Nine species of coral were observed on the reefs off the Sunset Beach area. Bottom coverage by corals increases with distance offshore, grading from about one percent at the shoreward border of the reef to about 20 percent at 500 meters from shore.

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Porites lobata is the most abundant coral species, as on most Hawaiian reefs, occurring in a variety of growth forms. Observed coral and algae species are listed in Appendix M.

Motile benthos, such as sea urchins and sea cucumbers were generally rare off the project area. The most common urchin observed was Echinometra matheai, a species that bores into calcium carbonate surfaces and occupies depressions within the reef platform.

Reef Fish Communities: The reef fish community off the proposed development area is characterized by a low population density and generally small body size of most individuals. This is probably a result of both scarcity of shelter in the physically stressed habitat, and the effects of overfishing. Although a total of 49 species were noted, only a few species were common (Appendix M). In particular, the saddleback wrasse and small convict tang were the most abundant species observed. Schooling surgeonfish were common at some sites. Most other species were represented by only occasional or rare individuals.

In the shallow near shore boulder-sand zone, fish species were observed that are adapted to high surge habitats. These included the Christmas wrasse, blackspot sergeant, as well as the saddleback wrasse and convict tang.

Deeper water areas on the reef platform harbored a somewhat richer fauna, particularly in areas where bottom structure was dominated by large undercut grooves and depressions. When approached by divers, mixed-species schools of surgeonfishes quickly retreated to the shelter afforded by these features. Although these schools were dominated by convict tangs, other species included the whitebar surgeonfish, the orangeband surgeonfish and the ringtail surgeonfish.

Apparent overfishing in the survey area is evidenced by the virtual absence of some sought-after fish groups, such as goatfishes, jacks, squirrelfishes and parrotfishes. Species of surgeonfish commonly taken as food tended to be small, and nearly all fishes quickly retreated or took shelter as divers approached. Combined with the scarcity of shelter, this apparent overfishing has produced a significantly depleted fish fauna.

Threatened or Endangered Species: Three species of marine animals that occur in Hawaiian waters have been declared threatened or endangered by Federal jurisdiction. The threatened green sea turtle (Chelonia mydas) occurs commonly along the shoreline of the major Hawaiian Islands and is known to feed on selected species of macroalgae. The endangered hawksbill turtle (Eretmochelys imbricata) is found infrequently in waters off Hawaii. Several small green sea turtles were observed in the near shore area during the course of the present survey, and such sightings are common for the entire north shore of Oahu.

Populations of the endangered humpback whale (Megaptera novaeangliae) are known to spend the winter months in the Hawaiian Islands. The present study was carried out during the period when the whales were absent.

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B. Anticipated Impacts

Development and operation of the proposed Lihi Lani Recreational Community will create new inputs to the marine environment in the form of small amounts of dissolved chemicals and suspended particles within storm water runoff and groundwater, as discussed in Sections 4.5 and 4.6. Operation of the golf course will include fertilization with commercial mixes and treated sewage effluent. Application of the treated effluent will contribute approximately 11 percent of the total necessary nitrogen fertilizer. Most of the fertilizer applied to the golf course will be slow-release nitrogen sources which will not contribute appreciable amounts of nitrate to groundwater or surface water runoff.

Maximal nitrogen contributions to groundwater from the project, under a worst case scenario, equate to less than 50 percent of the existing cesspool input at Sunset Beach makai of the project site. Actual nitrogen contributions will be a fraction of this amount due to use of slow-release nitrogen fertilizers (only 1.5 percent leaching to groundwater) and marsh capture of leachate and runoff from section of the golf course. These nitrogen reduction measures are not accounted for in the worst case analysis. Chemical and biological uptake processes during transit through soils and the aquifer will further reduce the potential nutrient subsidy to the nearshore marine environment. Minute amounts of pesticides in runoff and groundwater could be contributed to the ocean.

Wave and current mixing in the near shore environment will dilute any nutrient subsidies to the extent that there will be no degradation of ocean water quality and biotic community structure. Studies of four other golf course situations on the west coast of the Island of Hawaii reveal that as long as the receiving environment is a well-mixed coastal area, nutrient contributions to the ocean are below the level of detection. The surveyed courses have been in operation for eight to 23 years, and all employ treated sewage and commercial fertilizer applications. It is extremely unlikely that the development of Lihi Lani will result in detectable alteration to the marine environment.

Erosion during construction presents the greatest potential for changes in the near shore ocean. Such effects can be minimized by careful planning and management during the construction process. However, if erosion events do occur, the effects to water quality will be temporary, and not substantially different than siltation events that occur at present. Suspended sediments in runoff from the site will be much less under the developed condition due to erosion controls on-site.

Estimates of storm water runoff characteristics indicate that delivery of suspended solids to the ocean will decrease following construction of the development relative to existing conditions. Fresh water and nutrient input will increase; but inputs will be episodic in nature and will not constitute chronic stresses. The high mixing regime of the receiving environment will likely disperse storm inputs rapidly.

C. Mitigative Measures

Several mitigative measures will be employed to minimize the effects of the project on the marine environment.

Erosion Controls: Probably the greatest potential for detrimental impacts to the marine environment will arise from high intensity storms (rainfall) storms during construction. Where possible, construction phases involving exposed lands will be scheduled during the summer months, when rainfall is lowest. Erosion will also be minimized by compliance with all governmental regulations and standards.

Managed Fertilizer Applications: It has also been shown that there is a potential for nitrate enrichment in runoff and groundwater from golf course fertilization. The realization of this potential is prevented through sound golf course management practices followed by a Certified Golf Course Manager. For example, timing of fertilization to avoid periods of heavy rainfall, and the use of slow-release fertilizers, will minimize nitrate percolation into groundwater. A large percentage (80 percent) of fertilizer material will be composed of commercial mixes rather than treated sewage effluent (with soluble nitrate). Because economics is an important aspect of golf course management, it is also unlikely that excessive amounts of commercial mixes will be applied. Nitrates in runoff and surface leachate on portions of the site will be trapped in artificial marshes, as discussed in Sections 4.5 and 4.6.

Managed Pesticides Usage: Pesticides are not expected to be introduced to the ocean from the project, largely as a result of controlled pesticide use on the project. The planned IPM program will minimize pesticides applications and the Golf Course Manager will avoid application during precipitation periods and avoid over-irrigating applied areas. As discussed in Section 4.5 and 4.6, pesticides will not travel off-site in amounts which could cause water quality impacts.

Marine Environment Monitoring and Modeling: An ongoing marine environment monitoring program will be instituted to assure that the development will not contribute to environmental degradation. It will employ the same conservative mixing model employed in the present study. Initial phases of the monitoring plan will involve defining the "pre-development envelope" of water quality parameters. Such an envelope would take into account the present nutrient enrichment that is apparently a result of coastal area cesspool leachate. Repetitive sampling during each phase of construction and operation of the development will indicate if parameters remain within the envelope.

An advantage of using a mixing model as a modeling tool is that the method is sensitive enough to identify changes in water quality parameters at levels within the natural tolerance of the biological communities. Thus, water quality changes can be identified before environmental degradation occurs. If it is determined that operation of the development is causing environmental changes, further measures will be taken to eliminate the source of degradation.

4.11 ARCHAEOLOGICAL AND HISTORIC RESOURCES

An investigation of archaeological and historic features was conducted on the project site by Paul H. Rosendahl, Ph.D., Inc. (PHRI) during the period January to March 1988. The findings of this report (PHRI, May 1988) are summarized in the following discussion, and the entire report is included as Appendix L.

A. Existing Conditions

1. Previous Archaeological Work

Over the past 15 years, a number of archaeological investigations have been conducted in the Pupukea and Paumalu area. However, most of the investigations have been specific to Waimea Valley, and only a limited amount of work has been done outside of the valley.

Archaeological work within Waimea Valley includes work by Mitchell (1976, 1977), Moore and Luscomb (1974), and Takemoto (1974). While all the past work in the valley is relevant to the present project, one valley site is of particular interest. This site was excavated in the 1970's, and has been identified as a former single-family habitation and farm, with agricultural terraces and small mounds thought to have been used for cultivating sweet potatoes (Mitchell 1977). Dated to about 1840, this site may be contemporary with a single-family farmstead tentatively identified on the project site.

Archaeological investigations outside Waimea Valley include studies by Dennison (1979), Rogers (1976), and Yent (1979). Rogers recorded a burial cave in a seaward cliff less than half a kilometer southwest of the project site. The cave, though only 8.4 square meters in area, contained the remains of at least nine individuals. Two individuals were in wooden coffins. One secondary burial was in a wooden canoe. Remains of other individuals were bundled in braids of sennit. A wide range of artifacts were found in the cave: a coconut bowl, gourd calabashes, glass bottles, and a wooden walking stick with a rubber tip. After the contents of the cave were inventoried, the cave's entrance was sealed by the Department of Anthropology, University of Hawaii. The cave, which was estimated to date to between the 1700's and the early 1800's, was interpreted as a burial cave for several generations of a single family (Rogers 1976).

During the study by Dennison (1979), a walled enclosure was identified a short distance southwest of the project area. This enclosure, which measured approximately 330 square meters, was interpreted as an historic animal enclosure of little significance, and it has since been destroyed. During the 1979 study by Yent, two burials were identified just northwest of the present project area, in the sand dunes at Sunset Beach (Yent 1979). Exposed by winter storms, the burials (disarticulated male and female bones) were later reinterred in the more stable inland portion of the dunes. Apparently due to the method of interment, the burials were thought to be associated with the extensive prehistoric midden deposits preserved in the dunes at Sunset Beach.

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The only site previously recorded within the project area (listed as Site T-34 in the present report) was first discovered by Gary McCurdy, a nearby land owner. McCurdy, who found the site a year or two before Hurricane Iwa struck the Islands, reported it to the Bishop Museum. According to McCurdy, Bishop Museum reported that the site consisted of a small cave containing two secondary burials: remains of an adult male and possibly a juvenile female. Present with the burials were several fragments of a burial canoe. Checks with Bishop Museum during March and April of this year, yielded no records of the site.

2. Historical Background

The earliest written descriptions concerning the lands of Pupukea and Paumalu coincide with early landings of European and American sailing ships at Waimea Bay. The earliest landing of a ship at Waimea Bay was by Captain Cook in 1779. Subsequently, other ships landed, encouraged by the abundance of fresh water in the area of the bay and the sheltered anchorage the bay afforded (Takemoto, 1974). Other than accounts of landings at Waimea Bay, there is little early historical written data on the lands of Pupukea and Paumalu. This is probably due to the land's remoteness from Honolulu and due to the agriculturally marginal nature of the lands, which did not attract many people.

Land Commission Awards allowed for several kuleanas to be established in Pupukea and Paumalu. These were comprised of small house lots, saltlands and sweet potato fields (Estioko-Griffith, 1986). The rest of Pupukea was owned by King Kamehameha III, and was used as grazing land for wild goats and cattle, which were common on Oahu by 1809 (Morgan, 1948).

During the early to mid-historic period (late 1700's to mid-1800's), cattle production began to replace agricultural cultivation uses of many lands. These livestock were uncontrolled in most areas and caused the destruction and abandonment of many small kuleanas, including some in Pupukea-Paumalu. In addition, sandalwood logging also caused the deforesting of much of Oahu, including sections of the project site.

During the 1860's, small-scale farming in the Pupukea-Paumalu area gave way to large-scale plantation agriculture. Originally, sugarcane was produced in the coastal lowlands (Morgan, 1948). From 1900 to 1910 the coastal highlands of the North Shore (including the project area) were opened up for pineapple production (Estioko-Griffith, 1986). The plantations' greatest period of prosperity was 1920 to 1925 (Hungerford, 1963).

By 1928, many of the pineapple plantations in Pupukea were being replaced by avocado orchards. Gradually, agriculture in the area was reduced, and a major factor in the decline was the abandonment of the Oahu Railroad & Land Company lines in 1947. Turnover of agricultural land to residential communities has occurred on the North Shore since 1950 (Estioko-Griffith, 1986). At the property, the abandonment of

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plateau fields and avocado orchards has led to their being used as grazing land since the early 1960's (J. Hitch, pers. comm.).

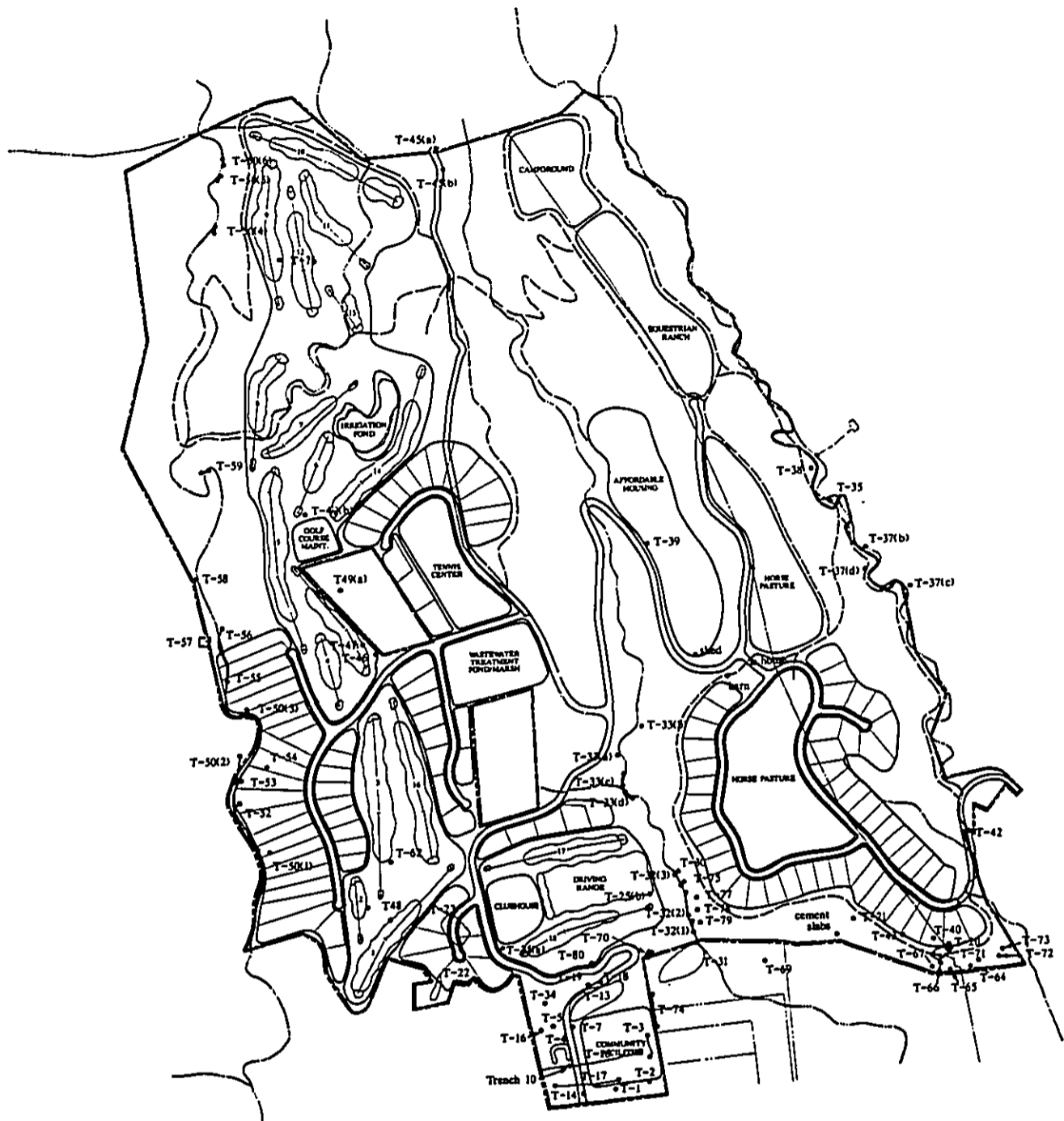
3. Archaeological and Historic Findings on the Project Site

During the present reconnaissance survey of the project area, 60 previously unrecorded archaeological sites were identified. Of the 60 identified sites, 50 are totally within the project area, four are partially within its boundaries, and six are totally outside the area. The 60 sites are comprised of at least 112 features representing 15 feature types. Feature types include: terrace, retaining wall, free-standing wall, rockshelter, cave, pavement, enclosure, cairn, petroglyph, mound, and a variety of historic types including earthen, concrete, masonry, wood, and metal constructions. The general locations of the sites are indicated on Figure 17. Table 12 provides a detailed breakdown by site listing, component feature, functional interpretation and cultural resource management value mode assessment.

Six of the 60 sites identified in the study are located immediately outside of the project boundaries. The 54 sites within the project area appear to represent three temporal periods: 25 sites date to the late prehistoric and/or historic period; 22 sites date to about 1880 to 1920; and seven sites date to 1920 to 1970. Most of the sites reflect economic and subsistence activities; however, several sites are related to either military activity or mortuary/ceremonial activities. Most of the features within the project area are stone structures, and most of these have been damaged to varying degrees whether by cattle grazing, by agricultural clearing, or by natural occurrences such as landslides, alluviation, and stream erosion.

4. General Significance Assessments and Recommended General Treatments

To facilitate State and County review, general significance assessments and recommended general treatments for the 54 sites identified within or partially within the project area during the reconnaissance survey are summarized in Table 13. Significance categories used in the evaluation process are based on the National Register criteria contained in the Code of Federal Regulations (36 CFR Part 60). The State Department of Land and Natural Resources-Historic Sites Section (DLNR-HSS) uses these criteria to evaluate eligibility for both the Hawaii State and National Register of Historic Places. Sites determined to be potentially significant for information content (Category A, Table 13) fall under Criterion D, which defines significant resources as ones which "...have yielded, or may be likely to yield, information important in prehistory or history." Sites potentially significant as representative examples of site types (Category B, Table 13) are evaluated under Criterion C, which defines significant resources as those which "...embody the distinctive characteristics of a type, period, or method of construction..., or that represent a significant and distinguishable entity whose components may lack individual distinction."



**ARCHAEOLOGICAL RESOURCES SITES MAP
LIHI LANI RECREATIONAL COMMUNITY**

SOURCE: PAUL H. ROSENDAHL, Ph.D. INC. (JULY 1988)

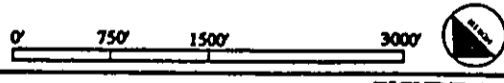


FIGURE 17

TABLE 12

LIHI LANI RECREATIONAL COMMUNITYSUMMARY OF IDENTIFIED SITES
PUPUKEA-PAUMALU DEVELOPMENT PROJECT AREA

Site Number	Formal Site/Feature Type	Tentative Functional Interpretation	*CRM Value Assess.			Comments
			R	I	C	
T-1	Linear mound	Agricultural(?)/ceremonial(?)	M	L	L	Possible disturbed terrace; coral offerings?
T-2	Alignment and basalt scatter	Agricultural(?)	L	L	L	Bulldozed/disturbed by cattle
T-3	Mod. outcrop	Agricultural(?)	L	L	L	Bulldozed
T-4	U-shaped earthen berm	Railroad siding(?)	L	L	L	Early 20th century(?)
T-5	Terrace	Agricultural	M	L	L	High, well-preserved terrace wall
T-7	Cairn	Trail or property marker(?)	L	L	L	Collapsed; early historic(?)
T-13	(Complex of 13 features)	Habitation; agricultural; rock art	M	L	M	Late prehistoric/early historic
T-14	Well and foundation	Water source	L	L	L	Early to mid-20th century(?)
T-15	Ditch	Irrigation	L	L	L	Early 20th century(?)
T-16	Linear mound	Water diversion(?)	L	L	L	Poss. diverted water away from Site T-5; early historic or prehistoric
T-17	Ditch	Irrigation	L	L	L	Early 20th century(?)

*Cultural Resource Mgmt.--Nature: R = scientific research, I = Interpretive, Value Mode Assessment C = cultural

Degree: H = high, M = moderate, L = low

TABLE 12 (Continued)

Site Number	Formal Site/Feature Type	Tentative Functional Interpretation	CRM Value Assess.			Comments
			R	I	C	
T-18	Rockshelter	Temp. habitation; quarry	M	L	L	Short stone wall present near shelter
T-19	Rockshelters [2]	Temp. habitation	M	L	L	Artifacts include coral abrader, polished basalt
T-20	Reinforced concrete bunker	WII coastal defense	L	M	L	Outside project area
T-21	Retaining wall	RR or wagonroad bed	L	L	L	From early 20th century plantation
T-22	(Complex of 4 features)	WWII coastal defenses	L	L	L	Includes a tiered concrete bunker
T-23	(Complex of 9 features)	Poss. plantation manager's home	M	L	L	Early 20th century(?); in poor condition
T-25	Retaining walls [2]	RR or wagonroad bed	L	L	L	Road is on 1904 map
T-30	Rockshelters [3]	Temp. habitation(?)	M	L	L	Prehistoric with internal and external walls
T-31	(Complex of 6+ features)	Agricultural	M	M	M	Outside project area; early historic(?)
T-32	Retaining wall	RR or wagonroad bed	L	L	L	Road on 1904 map
T-33	(Complex of 4 features)	RR or wagonroad beds	L	L	L	Portions of site on 1904 map
T-34	Cave	Burial	H	L	H	Early historic/prehistoric; previously recorded?

[#] Number of features

TABLE 12 (Continued)

Site Number	Formal Site/Feature Type	Tentative Functional Interpretation	CRM Value Assess.			Comments
			R	I	C	
T-35	Retaining wall	Indeterminate	L	L	L	Outside project area
T-37	(Complex of 4 features)	RR or wagonroad bed; retaining walls; water crossing	L	L	L	Early 20th century
T-38	Pumphouse	Water source	L	L	L	Operated 1950 to 1970
T-40	(Complex of 2 features)	WWII command post(?)	L	L	L	Includes collapsed shed, steps, concrete slabs
T-42	Dam	Agricultural	L	L	L	Outside project area; comprised of basalt boulders
T-43	Reinforced concrete bunker	WWII coastal defense	L	L	L	Part of system formed by T-20, -22, and -40
T-45	(Complex of 3 features)	Trench complex	L	L	L	WWII related; mostly outside project area
T-46	Retaining wall	RR or wagonroad bed	L	L	L	Early 20th century
T-47	Bottle and rubbish scatter	Trash dump	M	L	L	Early 20th century(?)
T-48	Mounds [2]	Agricultural clearing (?)	L	L	L	Early 20th century
T-49	Retaining wall	RR or wagonroad bed	L	L	L	Early 20th century (?)
T-50	(Complex of 3 features)	Wagon road	L	L	L	Road on 1904 map

TABLE 12 (Continued)

Site Number	Formal Site/Feature Type	Tentative Functional Interpretation	CRM Value Assess.			Comments
			R	I	C	
T-52	(Complex of 2 features)	Animal pen	L	L	L	c. 1900(?)
T-53	Retaining wall	RR or wagonroad bed	L	L	L	Early 20th century(?)
T-54	Rockshelter	Temp. Habitation(?)	M	L	L	Prehistoric/early historic(?)
T-55	Wall	Boundary(?)	L	L	L	c. 1900(?)
T-56	Retaining wall	RR or wagonroad bed	L	L	L	Early 20th century(?)
T-57	Enclosure	Animal control	L	L	L	Mostly outside project area
T-58	(Complex of 3 features)	RR or wagonroad bed	L	L	L	Road on 1904 map
T-59	Retaining wall	RR or wagonroad bed	L	L	L	Early 20th century(?)
T-62	Linear mound	Agricultural clearing(?)	L	L	L	Early 20th century(?)
T-64	Rockshelter with wall	Temp. habitation	M	L	L	Early historic/prehistoric; volc. glass collected
T-65	Rockshelter with wall	Temp. habitation	M	L	L	Early historic/prehistoric(?)
T-66	Rockshelter	Temp. habitation	M	L	L	Early historic/prehistoric scatter of exotic basalt
T-67	Rockshelter	Burial/temp. habitation(?)	H	L	H	Early historic/prehistoric

TABLE 12 (Continued)

Site Number	Formal Site/Feature Type	Tentative Functional Interpretation	CRM Value Assess.			Comments
			R	I	C	
T-69	(Complex of 2 features)	Ceremonial(?); agricultural; <u>heiau</u> (?)	H	H	H	Outside project area
T-70	(Complex of 5 features)	Burials; temp. habitation; rock art	H	H	H	Prehistoric/ early historic
T-71	(Complex of 3 features)	Temp. habitation(?)	M	L	L	Prehistoric/ early historic
T-72	Rockshelter	Temp. habitation/ burial	H	M	H	Prehistoric/ early historic
T-73	Rockshelters [2]	Temp. habitation	M	L	L	Prehistoric/ early historic; may contain hearth deposit
T-74	Wall	Boundary	L	L	L	Outside project area
T-75	(Complex of 3 features)	Temp. habitation	M	L	L	Prehistoric/ early historic; internal walls present
T-76	(Complex of 4 features)	Agricultural	L	L	L	Early 20th century
T-77	Rockshelter with wall	Burial (?)	M	L	L/H	Probably prehistoric
T-78	Cave	Temp. hab./quarry	M	L	L	Prehistoric
T-79	Cave	Shrine (?)	M	L	L	Prehistoric
T-80	Cave	Burial	H	L	H	Disturbed

TABLE 13

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GENERAL SIGNIFICANCE AND
RECOMMENDED TREATMENT OF ARCHAEOLOGICAL SITES

Site Number	Significance Category				Recommended Treatment			
	A	X	B	C	FDC	NFW	PID	PAI
T-2	-	+	-	-	-	+	-	-
T-3	-	+	-	-	-	+	-	-
T-4	-	+	-	-	-	+	-	-
T-7	-	+	-	-	-	+	-	-
T-14	-	+	-	-	-	+	-	-
T-15	-	+	-	-	-	+	-	-
T-16	-	+	-	-	-	+	-	-
T-17	-	+	-	-	-	+	-	-
T-21	-	+	-	-	-	+	-	-
T-22	-	+	-	-	-	+	-	-
T-25	-	+	-	-	-	+	-	-
T-32	-	+	-	-	-	+	-	-
T-33	-	+	-	-	-	+	-	-
T-37	-	+	-	-	-	+	-	-
T-38	-	+	-	-	-	+	-	-
T-40	-	+	-	-	-	+	-	-
T-43	-	+	-	-	-	+	-	-
T-45	-	+	-	-	-	+	-	-

General Significance Categories:

- A=Important for information content, further data collection necessary (PHRI=research value);
- X=Important for information content, no further data collection necessary (PHRI=research value, DLNR-HSS=not significant);
- B=Excellent example of site type at local, region, island, State, or National level (PHRI=interpretive value); and
- C=Culturally significant (PHRI=cultural value).

Recommended General Treatments:

- FDC=Further data collection necessary (intensive survey and testing, and possibly subsequent data recovery/mitigation excavations);
- NFW=No further work of any kind necessary, sufficient data collected, archaeological clearance recommended, no preservation potential;
- PID=Preservation with some level of interpretive development recommended for consideration (including appropriate related data recovery work); and
- PAI=Preservation "as is," with no further work (and possible inclusion into landscaping), or further data collection necessary.

TABLE 13 (Continued)

Site Number	Significance Category				Recommended Treatment			
	A	X	B	C	FDC	NEW	PID	PAI
T-46	-	+	-	-	-	+	-	-
T-48	-	+	-	-	-	+	-	-
T-49	-	+	-	-	-	+	-	-
T-50	-	+	-	-	-	+	-	-
T-52	-	+	-	-	-	+	-	-
T-53	-	+	-	-	-	+	-	-
T-55	-	+	-	-	-	+	-	-
T-56	-	+	-	-	-	+	-	-
T-57	-	+	-	-	-	+	-	-
T-58	-	+	-	-	-	+	-	-
T-59	-	+	-	-	-	+	-	-
T-62	-	+	-	-	-	+	-	-
T-76	-	+	-	-	-	+	-	-
<hr/>								
Subtotal: 31	0	31	0	0	0	31	0	0
<hr/>								
T-1	+	-	-	-	+	-	-	-
T-5	+	-	-	-	+	-	-	-
T-18	+	-	-	-	+	-	-	-
T-19	+	-	-	-	+	-	-	-
T-23	+	-	-	-	+	-	-	-
T-30	+	-	-	-	+	-	-	-
T-47	+	-	-	-	+	-	-	-
T-54	+	-	-	-	+	-	-	-
T-64	+	-	-	-	+	-	-	-
T-65	+	-	-	-	+	-	-	-
T-66	+	-	-	-	+	-	-	-
T-71	+	-	-	-	+	-	-	-
T-73	+	-	-	-	+	-	-	-
T-75	+	-	-	-	+	-	-	-
T-78	+	-	-	-	+	-	-	-
T-79	+	-	-	-	+	-	-	-
<hr/>								
Subtotal: 16	16	0	0	0	16	0	0	0
<hr/>								
T-13	+	-	-	+	+	-	-	+
T-34	+	-	-	+	+	-	-	+
T-67	+	-	-	+	+	-	-	+
T-72	+	-	-	+	+	-	-	+
T-77	+	-	-	*	+	-	-	*
T-80	+	-	-	+	+	-	-	+
<hr/>								
Subtotal: 6	6	0	0	6	6	0	0	6
<hr/>								
T-70	+	-	+	+	+	-	+	-
<hr/>								
Subtotal: 1	1	0	1	1	1	0	1	0
<hr/>								
Total: 54	23	31	2	5	23	31	1	5

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Sites with potential cultural significance (Category C, Table 13) are evaluated under guidelines prepared by the Advisory Council on Historic Preservation (ACHP) entitled "Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review" (ACHP, 1985). The guidelines define cultural value as "...the contribution made by an historic property to an ongoing society or cultural system.

A traditional cultural value is a cultural value that has historical depth" (1985:1). The guidelines further specify that "[a] property need not have been in consistent use since antiquity by a cultural system in order to have traditional cultural value" (1985:7).

Of the total 54 sites identified within or partially within the project area, 48 sites are significant solely for information content. For 31 of the 48 sites, no further work is recommended. For 16 of the 48 sites, further data collection is recommended. Of the remaining seven of the 54 total sites, six are assessed as significant for information content and for cultural value. Further data collection and preservation "as is" are recommended for these six sites; however, if preservation is not compatible with development plans, further data collection is recommended for these sites. After further data collection is completed, physical preservation of these sites would not be considered essential, although some might be considered for inclusion into development landscaping. The last site, T-70, is assessed as significant for information content, as an excellent example of a site type, and as culturally significant. Further data collection and preservation with interpretive development is recommended for this site.

In order to facilitate future decisions regarding site treatments, sites are further evaluated in terms of three value modes which are derived from the State and Federal evaluation criteria. The archaeological sites are evaluated in terms of potential scientific research, interpretive, and/or cultural values. Research value refers to the potential of archaeological resources for producing information useful in the understanding of culture history, past lifeways, and cultural processes at the local, regional, and inter-regional levels of organization. Interpretive value refers to the potential of archaeological resources for public education and recreation. Cultural value refers to the potential of archaeological resources to preserve and promote cultural and ethnic identity and values.

B. Anticipated Impacts

Sixteen of the 54 archaeological sites identified by PHRI (May 1988) will be directly affected by the development of the proposed project. Figure 16 shows an overlay of the project master plan areas and archaeological sites on the property. These sixteen directly affected sites are found within the entrance area (T-4, 5, 7, 10, 13, 14, 15, 17, 18, 19, 25(a), 80); the residential area (T-23) and the community facilities (T-1, 2, 3). Indirectly affected sites, which are those which could potentially be accessed by hikers and project residents, are discussed later in this section.

Of the 16 directly affected sites, nine sites (T-2, 3, 4, 7, 14, 15, 17, 20, 25(a)) PHRI recommends for no further work of any kind. Sufficient data were collected during

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the archaeological survey, during which it was determined that these sites have no preservation potential. Based on this information, the project's effect on these areas (destruction or alteration) will not constitute any significant impact on archaeological resources. Final concurrence with DLNR Historic Preservation Division (HPD) is required for this determination, prior to any disturbance of these sites.

Seven of the 16 directly affected sites (T-1, 5, 13, 18, 19, 23, 80) are significant sites and are recommended by PHRI for further data collection, including intensive survey and testing (See Table 14). Construction activities at these sites will destroy or alter their present condition. These sites include: T-1, 5, 13, 18 and 19 at the entrance area; and T-23 in a residential area. A brief description of each of these seven sites is provided below.

Site T-1 is a linear mound used for agricultural or ceremonial purposes. This is possibly a disturbed terrace or coral offerings site.

Site T-5 is an agricultural terrace, which has a high, well-preserved terrace wall.

Site T-13 is a complex of at least 14 stone features, which may have been a single-family farmstead occupied prior to widespread introduction of western plant and animal domestications to the area.

Site T-18 is located at the base of sheer cliffs and at the crest of a talus which slopes steeply downward for 175 feet to the coastal lowlands. The site was a temporary habitation and quarry for volcanic glass which occurs naturally in the ceiling of the shelter. There may be buried cultural deposits in the shelter. Dating analysis yielded an age range of 1663-1723 for this feature. This site will be affected by the construction of the project entry road.

Site T-19 is located near site T-18 at the base of the same cliff. This site contains two small natural rockshelters. Cultural materials were recovered from these shelters and buried cultural deposits may be contained in their floors. This site will also be affected by the construction of the project entry road.

Site T-23 is situated on the plateau between Paumalu and Pakulena Gulches, and consists of nine features. This site contains the remnants of the foundations of a former residence from the early 20th century. The structure may have once been the plantation manager's home. Remaining features that exist on this site include concrete slabs, and a basin, a concrete chimney, earthen terrace and a wooden platform structure. One-acre density residential lots are proposed to be developed at this site. At present, development plans are likely to include the removal of these archaeological materials.

Site T-80 is a cave situated in the face of the cliff above sites T-18 and T-19, approximately 5.0 m below the top of the cliff and 15.0 m above the base of the cliff. Scattered among the cobbles and boulders on the floor of the cave are human

TABLE 14

SUMMARY OF SIGNIFICANT ARCHAEOLOGICAL SITES

Site	Known Burial	Possible Burial	Research Potential	Directly Affected
T-1			D	x
T-5			D	x
T-13			D,E	x
T-18			D	x
T-19			D	x
T-23			D	x
T-30			D	
T-31			D,E	
T-34	x		D,E	
T-47			D	
T-54			D	
T-64			D	
T-65			D	
T-66			D	
T-67	x		D,E	
T-69			D,E	
T-70	x		D,E	
T-72	x		D,E	
T-75			D	
T-77		x	D	
T-78			D	
T-79			D	
T-80	x		D,E	x

D = informational value
 E = cultural value

skeletal remains, which appear to represent an adult individual. This site is interpreted as a prehistoric burial cave.

Two sites (T-13 and T-80) that will be directly affected by project development are recommended by PHRI for preservation "as is". At present, it appears that these sites will be destroyed or altered substantially by project development. Approximately 60 feet of an agricultural stone wall structure at T-13 will need to be removed to allow for the construction of the project access road from Kamehameha Highway. The entry road for the project will extend across the cliff at the approximate location of T-80, and it is likely that this cave will be altered significantly or completely removed by cliff face excavations. If detailed site planning (to follow later in the planning process) can be leave these sites undisturbed or include them into the landscaping of the project, preservation could be achieved.

All planned site improvements have been carefully located and designed to avoid Site T-70, the most significant archaeological site within the project area. It will be preserved, and possibly developed for interpretive purposes.

The remaining 38 sites on the property which will not be directly affected could possibly be subject to indirect effects of visitors and residents. Many of these sites are located in steep areas of the property, which are generally inaccessible. Of these 38 sites, 14 are significant sites (T-30, 31, 34, 47, 54, 64, 65, 66, 67, 69, 70, 72, 75, 77, 78, 79) that could be indirectly affected. Six of these 14 significant sites have cultural and informational value (State criteria D, E), which include known or possible burials at T-34, 67, 70, 72, 77 and a heiau at T-69.

C. Mitigative Measures

Several mitigative measures have been proposed to minimize potential impacts to archaeological resources.

Data Recovery and Mitigation Plan: Information gathering on the site to date has been extensive, and PHRI has produced an in-depth inventory of archaeological sites. Measures have been recommended by PHRI to minimize the effect of the project on existing archaeological and historic resources. An archaeological data recovery and mitigation plan will be prepared for the significant sites on the property, which must be reviewed and approved by DLNR prior to construction. The mitigation plan will include a site-specific data recovery plan and a preservation plan.

Through the PHRI method of site sensitivity classification, the most sensitive sites have been recommended for additional data collection and interpretation or preservation by accepted methods. For the seven significant sites directly affected by the project development, all are recommended for further data collection (intensive survey and testing, and possibly subsequent data recovery/mitigation excavations). Where possible, these sites will be preserved "as is", or will possibly be included into

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the project's landscaping. This will be determined during the future detailed site planning for the project. Site specific data recovery tasks are shown in Appendix N.

Data Collection for Significant Sites: Upon approval of the Data Recovery and Mitigation Plan by the DLNR-HPD, the 23 significant sites on the property are all planned to undergo further data collection. Of these sites, seven will be directly affected by the project. Further data collection will be conducted by PHRI prior to construction at the seven directly affected sites, and at those of the 16 potentially indirectly affected significant sites which are considered accessible to hikers and residents.

Intensive Data Collection and Mitigation at Directly Affected Sites: At the seven significant sites which are not planned to be preserved, intensive data collection and mitigation excavations (if necessary) will be undertaken prior to construction, following the recommendations provided by the DLNR-HPD. These measures will provide for obtaining adequate archaeological data from these sites prior to their destruction. If possible, some of these sites (or portions of them) could be retained in the landscaping of the project, pending future detailed site planning.

Treatment of Known and Potential Burial Sites: Human remains at the directly affected site T-80 will be treated according to the recommendations of the Oahu Island Burial Council and DLNR. The recommendation may involve either burial treatment (relocation to a preservation site) or relocation of the access roadways route. Other burial sites will be preserved from potential indirect effects from hikers and residents, by routing the hiking trails away from these sites and, possibly, by fencing the sites and planting deterrent forms of landscaping.

Preservation and Interpretive Development of T-70: One significant site (T-70) will undergo further data collection and preservation, and also has been recommended by PHRI for interpretive development. This site will not be affected by the project, and will be preserved "as is" in a section of the site which will not be disturbed by construction. If desired, interpretive development will be undertaken by Obayashi based on the recommendations of the Burial Council, DLNR and the local community.

Monitoring and Notification Procedures During Construction: Where development activities for the project will involve extensive modification of the land surface, there is the remote possibility of encountering unknown or unexpected cultural features, deposits, or burials. In such a situation, work in the area of such remains would be suspended immediately until the monitoring archaeologist has the opportunity to inspect and evaluate the significance of the newly discovered remains. The Historic Sites Office of the State DLNR would be immediately notified to determine the appropriate course of action.

4.12 ROADWAYS AND TRAFFIC

This section includes a presentation of the existing roadways and traffic conditions at the project site and its surrounding area. The potential impact of the project on

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future traffic conditions is assessed in this section, as well as the recommended mitigative measures to minimize effects on traffic and transportation. A detailed Traffic Impact Assessment was prepared for the project by Pacific Planning and Engineering, Inc. (PPE) (January 1991). An edited summary of this report is included in this section, and the entire report is included as Appendix O.

A. Existing Conditions

The proposed project is surrounded by a largely rural community consisting of residential homes, recreational and agricultural use. Vehicular access to the proposed development will be from Kamehameha Highway, which is the only highway in the area providing for through-traffic along the North Shore of Oahu. A paved access road is planned from the intersection with Kamehameha Highway to the project.

1. Roadway Conditions

There are only a few roadways in the area of the project, as shown in Figure 2. Kamehameha Highway is a rural highway connecting major population centers along the North Shore of Oahu such as Haleiwa, Pupukea and Kahuku. It is a State-maintained highway with a 50-foot wide right-of-way and a 22-foot wide pavement. There is one 11-foot wide lane in each direction.

The shoulders are grassed and vehicles park along both sides of this road. Paved pullouts are provided at most bus stops. The posted speed of Kamehameha Highway is 45 miles per hour (mph) along the project site. In the vicinity of Sunset Beach Elementary School, however, the posted speed is 25 mph when indicated by flashing yellow lights.

The intersection of Kamehameha Highway with the Sunset Beach Elementary School driveway is approximately 900 feet Haleiwa-side of the project access road. This intersection operates as a stop-controlled "T" intersection. The school driveway is wide enough to permit both a left and right turn lane onto Kamehameha Highway, although it is not marked.

Pupukea Road connects to Kamehameha Highway as a "T" intersection. This intersection, however, operates as a cross intersection with the beach park driveway immediately opposite Pupukea Road providing the fourth or makai leg. The intersection is controlled by stop signs on the Pupukea Road and park driveway approaches. This intersection is approximately one and a half miles Haleiwa-side of the project access road. Pupukea Road has an exclusive left, and through/right turn lanes at the intersection with Kamehameha Highway.

2. Observed Traffic Conditions

A review of State Department of Transportation (DOT) traffic count data at the intersection of Kamehameha Highway and Pupukea Road (Station 25-A) indicated that the weekday commuter peak hours generally occur between 7:00 and 8:00 am

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and 3:30 and 4:30 pm. The weekend peak period generally occurs between 10:00 am to 3:00 pm, with a Sunday peak hour between 1:00 and 2:00 pm.

Manual counts taken by PPE at the intersection of Kamehameha Highway and Pupukea Road showed greater Sunday afternoon peak hour traffic volumes than the weekday afternoon peak hour. On Sunday, 25 November 1990 between 1:00 to 2:00 pm, a total of 1,285 vehicles were recorded in both directions along Kamehameha Highway at Pupukea Road, in comparison to 1,134 vehicles during the weekday afternoon peak hour (3:30 to 4:30 pm on Thursday, 15 November 1990). Additional traffic volume counts and turning movements (where applicable) were taken by PPE on both November 15 and 25, 1990 at the intersection of Kamehameha Highway with the Sunset Beach Elementary School Driveway.

Traffic counts were taken for school day traffic entering and exiting Sunset Beach Elementary School between 7:15 to 8:15 am, 1:50 to 2:50 pm, and 3:30 to 4:30 pm on the study day. The peak hour for Sunday at this location was between 1:00 and 2:00 pm. Traffic flow along Kamehameha Highway near the proposed project access road was generally continuous and free-flowing. At the Sunset Beach Elementary School driveway, minor delays exist for all turning movements except for the longer delays experienced left turns onto the highway. A presentation of the existing Level-of-Service analysis for these roadways is included in the following sections.

Peak hour traffic counts were also conducted for Kamehameha Highway at the outer ends of the North Shore area in Haleiwa and Kahuku. Sunday afternoon peak hour traffic (1:00 to 2:00 pm) on Kamehameha Highway was counted at both the Kahuku Sugar Mill and the Haleiwa Beach Park on Sunday, 25 November 1990. Total peak hour vehicle counts on Kamehameha Highway totaled 1,521 in Haleiwa and 958 in Kahuku.

Several observations were made during the various field traffic counts. Many vehicles observed were tourist related or had recreational equipment such as surfboards. Occasionally, long lines of vehicles were observed following a slow-moving vehicles, such as a bus. Bus stops exist at the Sunset Beach Elementary School, and at the Pupukea Road intersection with Kamehameha Highway.

3. Existing Level-of-Service

The intersections of Kamehameha Highway with Sunset Beach Elementary School driveway and Pupukea Road were analyzed to determine existing Level-of-Service (LOS) conditions. The worst case results are shown in Table 15. There is no project access road at present, therefore, no intersection analysis could be performed for existing conditions at this location.

The analysis shows that traffic movements at the intersection of Kamehameha Highway and the school driveway usually operate well. Right turns out of the school driveway experience average delays (LOS C) or better. Left turns out of the driveway onto Kamehameha Highway can experience average delays (LOS C) or

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TABLE 15

LEVEL-OF-SERVICE

TURNING MOVEMENTS

Kamehameha Highway at Project Access Road - Sunday PM (1:00 to 2:00 pm)

			1990	1997 w/o Project	1997 w/ Project
Kamehameha Highway	Haleiwa-bound	LT	n/a	n/a	C
Project Access Road	Makai-bound	LT	n/a	n/a	F
		RT	n/a	n/a	F

Kamehameha Highway at Sunset Beach Elementary School - Weekday PM (3:30 to 4:30pm)

			1990	1997 w/o Project	1997 w/ Project
Kamehameha Highway	Haleiwa-bound	LT	A	A	B
School Driveway	Makai-bound	LT	C	E	E
		RT	C	E	E

Kamehameha Highway at Pupukea Road - Sunday PM Peak Hour (1:00 to 2:00 pm)

			1990	1997 w/o Project	1997 w/ Project
Kamehameha Highway	Kahuku-bound	LT	A	B	B
	Haleiwa-bound	LT	A	B	C
Pupukea Road	Makai-bound	LT	E	F	F
		RT	A	E	E
Beach Park Driveway	Mauka-bound	LT	D	F	F
		RT	D	F	F

HIGHWAY SEGMENTS

Sunday PM Peak Hour (1:00 to 2:00 pm)

Near Haleiwa Beach Park	E	E	F
Near Pupukea Road	D	E	E
Near Sunset Beach Elementary School	D	E	E
Near Kahuku Sugar Mill	C	E	E

Source: Pacific Planning and Engineering, Inc. (January 1991)

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better. Left turns into the driveway from Kamehameha Highway experience little or no delays (LOS A).

On busy weekends at Ehukai Beach Park, the school parking lot is used for overflow beach parking and the driveway is used for U-turns off the highway. There is also a pedestrian crosswalk at the intersection that is frequently used at these times.

At Pupukea Road under weekend peak hour traffic conditions, left-turn movements from Kamehameha Highway experience little or no delay (LOS A). Left-turn movements onto the highway from Pupukea Road and the beach park parking lot currently experience long or very long delays (LOS D or E). Traffic crossing the highway at this intersection also experiences long delays (LOS D), but only a few vehicles attempt these movements. Right-turn movements from Pupukea Road onto the highway experience little or no delay (LOS A).

B. Anticipated Impacts

1. Analysis Methodology

The focus of the traffic impact analysis was to determine the impact of the project-generated traffic at the intersections of Kamehameha Highway with (a) the proposed access road, (b) Sunset Beach Elementary School driveway, and (c) Pupukea Road when the project is completed in 1997. Future traffic forecasts with and without the project were estimated for 1997. Forecasts were made for the weekday morning, weekday afternoon, and Sunday afternoon peak hours.

The estimated traffic is calculated by adding the expected project traffic to the estimates of future traffic on Kamehameha Highway. The intersections of Kamehameha Highway with the project access road and the school driveway were then analyzed for conditions without and with the 1997 project-generated traffic. The intersection of Kamehameha Highway and Pupukea Road was also analyzed without and with project-generated traffic for comparison purposes.

2. Future Ambient Traffic

The expansion of the Kuilima Resort and other known North Shore projects, along with projected growth on other areas of the island, are expected to contribute to an increase in ambient traffic on Kamehameha Highway in the project area. Future ambient traffic for the study area was calculated considering development by 1997 of the Kuilima Resort, Kahuku Villages and residential development planned in Kahuku. There are some approvals in place for these projects to progress, whereas other projects being considered in the North Shore area (e.g. Campbell Estate's four golf course proposal, Bishop Estate's preliminary plans for growth around Haleiwa) are not included in this traffic analysis for 1997.

Trip generation rates for future developments in the area of the project are presented in Appendix M. The total estimated weekday morning peak hour traffic from these

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completed projects at Kamehameha Highway will be 521 vehicles entering and 458 exiting. During the Sunday peak hour, the estimated vehicle trips generated by these projects at Kamehameha Highway will be 496 entering and 463 exiting. According to the existing traffic pattern and estimates of population and employment, these trips were distributed and assigned to the roadways. A 3.0 percent annual growth factor for traffic volumes on Kamehameha Highway was included. Details of the determination of future ambient traffic are included in Appendix O.

3. Trip Generation

Future traffic generated by the Lihi Lani Recreational Community was derived based upon the land uses for the project, shown in the Master Plan (Figure 3). Estimates of the number of vehicles entering and exiting each land use were made based upon data provided in the Trip Generation Manual (Fourth Edition) (Institute of Transportation Engineers, 1987). Table 16 shows the breakdown of vehicle trips generated by the Lihi Lani project.

A portion of the vehicle trips generated by the development are expected to be "internal trips". The project will be a recreational community that will provide many attractions for the project's residents. The golf, tennis, equestrian, camping, community facilities and hiking trails will attract trips that would otherwise have left the project for external attractions. It was estimated that approximately 15 percent of the project-generated trips on weekdays would remain within the project, with 25 percent on weekends. Approximately 60 of the 120 country lot homes are expected to be full-time residences, with the remainder part-time residences. All of the 180 affordable homes will be full-time residences.

Of note, approximately 48 percent of the total vehicle trips generated by the project during the weekdays will be associated with the proposed 180 units of affordable housing and community facilities. On weekends, approximately 40 percent of vehicle trips are generated by the affordable housing and community facilities.

4. Trip Distribution

Trip distribution is the process by which trips from one area are connected with trips from another area, thereby linking origins and destinations. The distribution of trips generated by the project was estimated based on the location of attractions and jobs.

Many attractions lie in the direction of Haleiwa, including the closest shopping areas at Pupukea Foodland and the Haleiwa shopping areas. Trips towards Haleiwa from the project will also be caused by people traveling to popular beaches, such as Waimea Bay, and by people traveling to the H-2 Freeway (starting in Wahiawa) which provides the fastest route to Honolulu. In the Kahuku direction, there is Sunset Beach, the Kuilima Resort, and the Polynesian Cultural Center. It is estimated that 60 percent of the trips entering and exiting from the development will ingress/egress to and from the Haleiwa direction, with 40 percent entering/exiting to and from the Kahuku direction.

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TABLE 16
TRIP GENERATION

WEEKDAY PEAK HOURS

<u>Land Use Description</u>	<u>Amount</u>	<u>Units</u>	<u>Morning</u>			<u>Afternoon</u>		
			<u>Enter</u>	<u>Exit</u>	<u>%</u>	<u>Enter</u>	<u>Exit</u>	<u>%</u>
Full-Time Market Homes	60	units	9	24	14%	32	19	14%
Part-Time Market Homes	60	units	7	3	4%	7	9	5%
Affordable Homes	180	units	24	66	39%	89	53	39%
Community Facility	10	acres	17	7	10%	10	24	9%
Campground	15	acres	0	0	0%	0	0	0%
Golf Course	139	acres	30	7	16%	4	50	15%
Equestrian Ranch	100	stalls	18	7	11%	12	13	7%
Tennis Complex	12	courts	<u>10</u>	<u>5</u>	<u>6%</u>	<u>16</u>	<u>25</u>	<u>11%</u>
Total Vehicle Trips Generated			115	119	100%	170	193	100%
(Less Internal Trips = 15%)			<u>(17)</u>	<u>(18)</u>		<u>(25)</u>	<u>(29)</u>	
Vehicle Trips at Entrance			98	101		145	164	

WEEKEND PEAK HOUR

<u>Land Use Description</u>	<u>Amount</u>	<u>Units</u>	<u>Sunday Peak Hour</u>		
			<u>Enter</u>	<u>Exit</u>	<u>%</u>
Full-Time Market Homes	60	units	23	21	11%
Part-Time Market Homes	60	units	19	23	11%
Affordable Homes	180	units	56	52	29%
Community Facility	10	acres	22	22	11%
Campground	15	acres	5	5	3%
Golf Course	139	acres	41	41	21%
Equestrian Ranch	100	stalls	12	12	6%
Tennis Complex	12	courts	<u>16</u>	<u>16</u>	<u>8%</u>
Total Vehicle Trips			194	192	100%
(Less Internal Trips = 25%)			<u>(29)</u>	<u>(29)</u>	
Vehicle Trips at Entrance			165	163	

Source: Pacific Planning & Engineering, Inc. (January 1991)

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5. Traffic Assignment

Traffic assignment is the process by which trips are assigned to the roadway network in the project area. Traffic from the project was assigned to Kamehameha Highway which is the only access to the North Shore and connects the major population centers. From the assignment of vehicles to the local roads, traffic forecasts can be evaluated for the intersections of Kamehameha Highway with the (future) project access road, Sunset Beach Elementary School driveway, and Pupukea Road. Details of the traffic assignments are included in Appendix O.

6. Construction Traffic Impacts

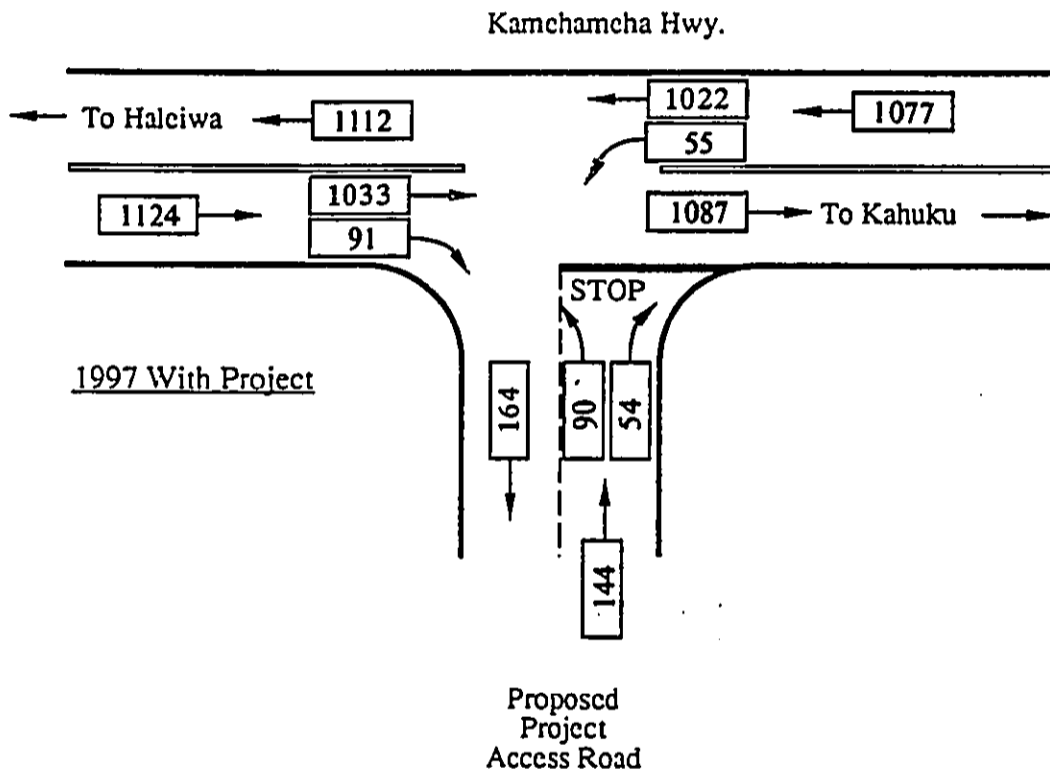
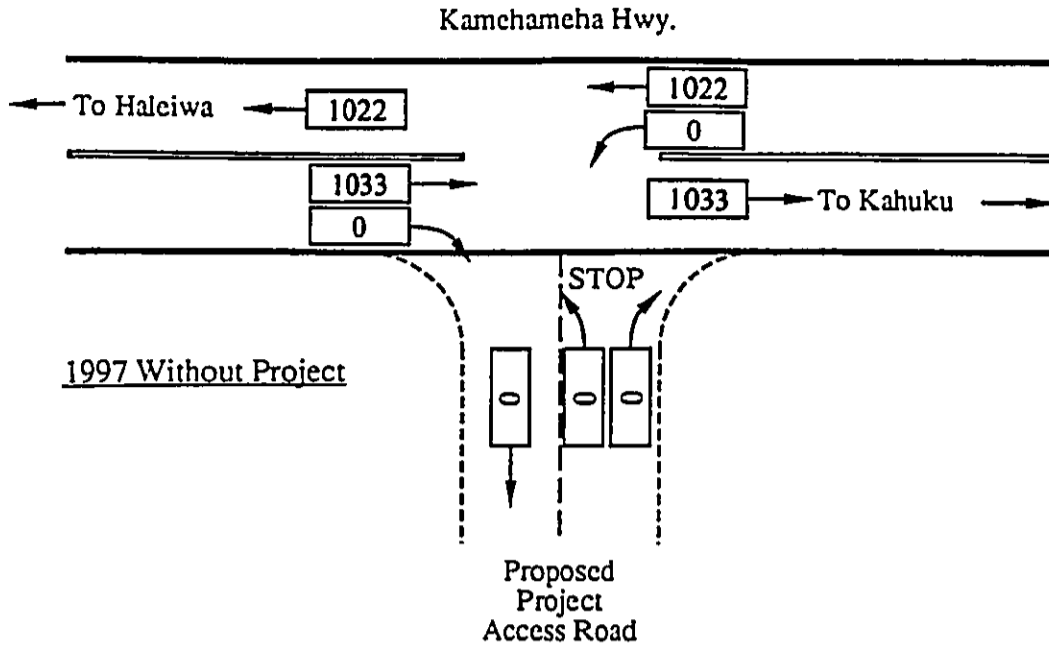
Short-term traffic impacts will occur as a result of construction-related traffic entering and exiting the project. Trucks hauling construction materials such as cement, pipes, lumber, crushed rock and asphalt concrete will average one or two trips per day. For approximately two weeks during on-site roadway construction, up to 10 trucks per hour or 80 trucks per day will be hauling asphalt concrete to the project.

Traffic generated by construction workers will occur during the early morning hours and when workers leave the project in the afternoon. An estimated 60 workers are expected at the project each day, which are expected to generate approximately 20 vehicle trips during the morning and afternoon peak hours. Most of the workers will be transported to the project on company trucks from base yards in Honolulu. Construction-related traffic entering and leaving the project will decrease beyond 1997, when the estimated work force (involved with residential construction only) is expected to drop to 10 to 30 workers daily. Preliminary plans call for most of the earth moving operations to be confined to the project site, therefore, few trucks are expected to haul fill material onto or remove excess excavated material from the site. This will further minimize truck traffic in and out of the project and along Kamehameha Highway.

7. Traffic Impacts

Impacts of the forecasted increase in traffic were assessed by the change in Level-of-Service (LOS) at the three study intersections for two separate conditions: without the project traffic, and with the project traffic. The three study intersections (project entrance, Sunset Beach Elementary School and Pupukea Road) were analyzed as unsignalized intersections. Traffic flow at the project entrance is shown in Figure 18. The results of the LOS analysis for the project entrance and intersection at Pupukea Road on the Sunset Beach Elementary School are shown in Table 15.

The results indicate that traffic in general along Kamehameha Highway will not be significantly affected by the addition of the traffic which will be generated by the project. The future increase in ambient traffic is the primary cause of changes in the Level-of-Service. The project's impact on the Level-of-Service along Kamehameha Highway at the study intersections is expected to be minimal. At the Pupukea Road



LEGEND

809 → FORECASTED NUMBER OF CARS AND DIRECTION OF TRAVEL DURING AFTERNOON PEAK HOUR BETWEEN 1:00 AND 2:00 PM ON SUNDAY

**TRAFFIC FLOW DIAGRAM - PROJECT ENTRANCE
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SOURCE: PACIFIC PLANNING & ENGINEERING, INC. (DECEMBER 1990)



FIGURE 18.

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intersection, traffic from the project will cause a slight reduction in the operation of the Beach Park driveway.

Table 15 indicates that the left turn movements from Kamehameha Highway into the project will experience minimal to average (LOS A to C) traffic delays. The creation of left turn storage lane into the project for the Haleiwa-bound lane of Kamehameha Highway will minimize delays for through-traffic.

The primary traffic flow problem will be with left turn movements out of side streets onto Kamehameha Highway, which will experience very long delays or extreme delays. These results are largely due to the traffic volumes along Kamehameha Highway.

Weekend peak hour traffic conditions at the project entrance will generally be poor with or without Lihi Lani. As indicated in Table 15, left turn movements into the project for traffic heading toward Haleiwa on Kamehameha Highway will generally operate at LOS B, which is considered a stable flow and is still in the comfortable range. Through-traffic on Kamehameha Highway will operate at LOS E (with or without the project). The right turn lane exiting the project will operate at LOS E to F. Long delays will also be experienced by vehicles making left turns out of the project access road (LOS F).

At the Sunset Beach Elementary School driveway, during the afternoon peak hour the worst Level-of-Service is the left turn movement out of the school. Even without the Lihi Lani traffic, the existing LOS C rating of the left turn movement, changes to LOS E by 1997.

Drivers turning left from Pupukea Road onto Kamehameha Highway are currently experiencing very long delays (LOS E) during the weekend peak hour. Should the current 3.0 percent growth rate for ambient traffic along Kamehameha Highway continue, the Level-of-Service at the Kamehameha Highway and Pupukea Road intersection will probably drop to LOS F by the year 1995. Through-traffic on Kamehameha Highway will operate at LOS E.

Therefore, even without the traffic from Lihi Lani, the Pupukea Road intersection may require signalization in the future. The State DOT is responsible for conducting periodic traffic assessments to determine when traffic signals are warranted at this intersection.

8. Area-wide Traffic Impacts

With respect to North Shore area-wide traffic conditions, weekend peak hour traffic flow in 1997 at Haleiwa and Kahuku is expected to operate at LOS E without the addition of project-generated traffic. The future traffic volume increases will largely be due to the growth of ambient traffic. The increase in ambient traffic volumes from 1990 to 1997 at Haleiwa is expected to be 32 percent, and 50 percent in Kahuku.

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Traffic from the project will not reduce Level-of-Service along Kamehameha Highway at Kahuku, and could have a slight impact on Kamehameha Highway operation at Haleiwa Beach Park (LOS E to F) during the weekend peak hour. Of the total traffic on the highway at Haleiwa (2,541 vehicles), traffic associated with Lihi Lani will include: 59 vehicles (affordable housing), 23 vehicles (community facilities) and 123 vehicles (main portion of project). Of the total traffic on the highway at Kahuku (1,774 vehicles), traffic associated with Lihi Lani will include: 35 vehicles (affordable housing), 13 vehicles (community facilities) and 73 vehicles (main portion of the project). In Kahuku, the project-generated traffic will represent only seven percent (121 vehicles) of the 1997 weekend peak hour traffic volume (1,774 vehicles) along the highway. These sections of Kamehameha Highway are expected to operate at LOS E at weekend peak hour (possibly LOS F at Haleiwa), if the projected growth of ambient traffic materializes.

C. Mitigative Measures

Several mitigative measures are planned for implementation to minimize the impact of traffic generated by Lihi Lani, as discussed below.

Left Turn Storage Lane on Kamehameha Highway: An exclusive left turn storage lane will be constructed at the intersection of Kamehameha Highway and the project access road, as shown in Figure 19. This improvement will alleviate possible delays or back-ups on Kamehameha Highway caused by vehicles turning left into the project access road. This should also help minimize rear-end collisions with vehicles slowing down or stopping to turn left into the project access road.

Turning Lanes Out of Project Entrance: Exclusive left turn and right turn lanes exiting from the project road will be provided so that left turning vehicles do not also delay those wanting to turn right onto Kamehameha Highway. This will help traffic flow and improve safety at the intersection.

Signal Warrant Study: Due to the projected growth of through-traffic on Kamehameha Highway beyond 1997, Obayashi will conduct a signal warrant study periodically at the intersection of the project access road with Kamehameha Highway. A warrant study is required by DOT prior to installation of traffic signals at an intersection.

Installation of Traffic Signals in Future, if Required: As traffic on Kamehameha Highway grows in the foreseeable future, it is likely that the intersection of the project access road and Kamehameha Highway will require traffic signals. It is not known how soon traffic signals will be required, and periodic warrant studies will provide the necessary data to determine their need. Obayashi will provide funding for monitoring this intersection as needed. Traffic flow along Kamehameha Highway would be interrupted by signals, allowing for vehicles to safely turn into or out of the project access road. The signals could be timed and traffic-actuated to

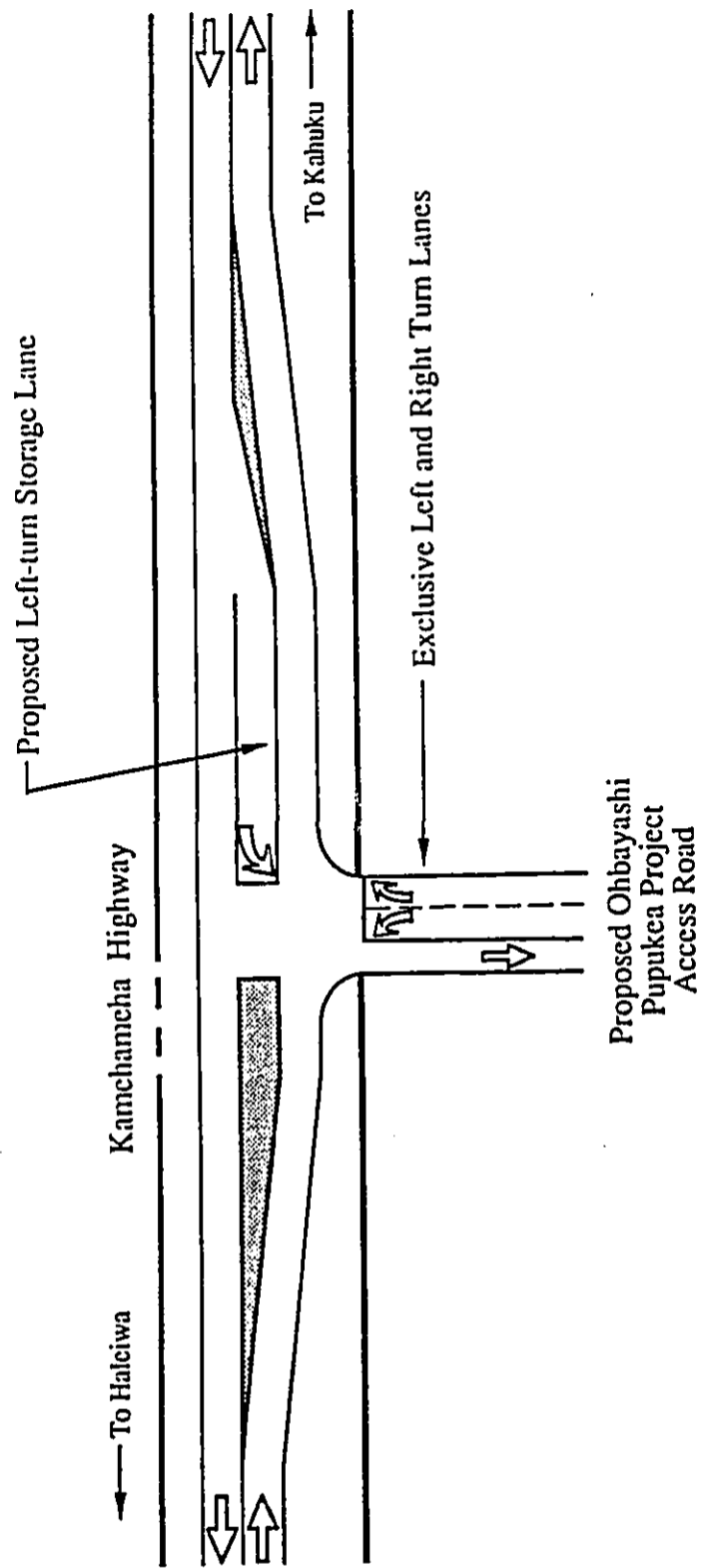


FIGURE 19

**PROPOSED INTERSECTION MODIFICATION - PROJECT ENTRANCE
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SOURCE: PACIFIC PLANNING & ENGINEERING, INC. (DECEMBER 1990)

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allow for a short red phase (or flashing yellow) during low traffic periods. Obayashi will install the traffic signals to State DOT standards if and when they are required at the project entrance.

Construction Traffic: The number of worker vehicles traveling to and from the site during the heavy construction period will be minimized by the use of company trucks and vans to carry workers from construction company base yards. Truck and heavy equipment travel on local roadways in Pupukea and Sunset Hills will be minimized by constructing the project access road in the earliest period of construction. Truck and heavy equipment travel to and from the site will be conducted during non-peak traffic hours to minimize the impact on local and commuter traffic. During construction phases of the project, special duty police officers shall be employed to assist in directing traffic and the movement of heavy equipment and supplies at the intersection of the project access road and Kamehameha Highway.

Regional Traffic: Obayashi will work with the local community and State Department of Transportation to develop solutions to the existing and future traffic problems in the area.

4.13 NOISE

Existing noise conditions and potential future noise conditions at the project and its surrounding areas were evaluated by Darby & Associates (December 1990). This technical report is included in its entirety as Appendix P. Excerpts from the report are paraphrased for the following discussion of noise conditions.

A. Existing Conditions

Noise from sources such as traffic is commonly measured in "A" weighted decibel units (dBA). The A weighting refers to the emphasis of certain sound frequencies over others to simulate the sensitivity of the human ear. The decibel scale is logarithmic, and a 10-fold increase in sound energy results in an increase of 10 dBA corresponding (approximately) to a subjective doubling of loudness. With an instantaneous change in noise, doubling of the sound energy results in an increase of three dBA, the smallest change in noise level considered to be noticeable.

Ambient noise conditions at the project site are generally quiet due to its rural setting. Ambient noise level measurements were performed at several locations surrounding the project site on 1 June 1988, as shown in Figure 20. At locations A, B and C in the Pupukea Highlands residential area, the acoustical condition was dominated by natural sounds such as birds and wind in foliage, and neighborhood noise such as dogs barking. The average or mean ambient noise levels (those exceeded 50 percent of the time, and referenced as L50) ranged from 38 to 40 dBA. At locations D and E, just mauka of Kamehameha Highway, L50 was about 45 dBA and dominated by traffic on the highway, but birds and wind in foliage were also readily audible. Residences located closer to the highway have considerably greater levels of



**NOISE MEASUREMENT LOCATIONS
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SOURCE: Darby & Associates (December 1990)

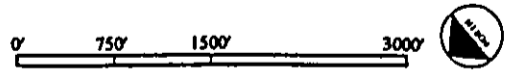


FIGURE 20

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traffic noise. At all noise monitoring sites, an occasional light aircraft or helicopter could be heard. The ambient sounds at residences near or directly on the beach are often dominated by surf noise especially during winter months.

Traffic noise level estimates were also made on 1 June 1988 on the project site at a location approximately 170 feet mauka from the center of Kamehameha Highway, with the microphone positioned about six feet above the ground. The noise level at this location averaged 53 dBA over a 10-minute period. Traffic counts (including the mix of vehicle types) were also made during the noise sample periods in order to validate the FHWA Traffic Noise Prediction Model. Based on the traffic data, the model calculated an hourly noise level of 52.8 dBA, which confirmed the field noise measurements.

The existing residential areas located near Kamehameha Highway are estimated to be exposed to a current Day-Night average sound level (Ldn) as high as 69 dB.

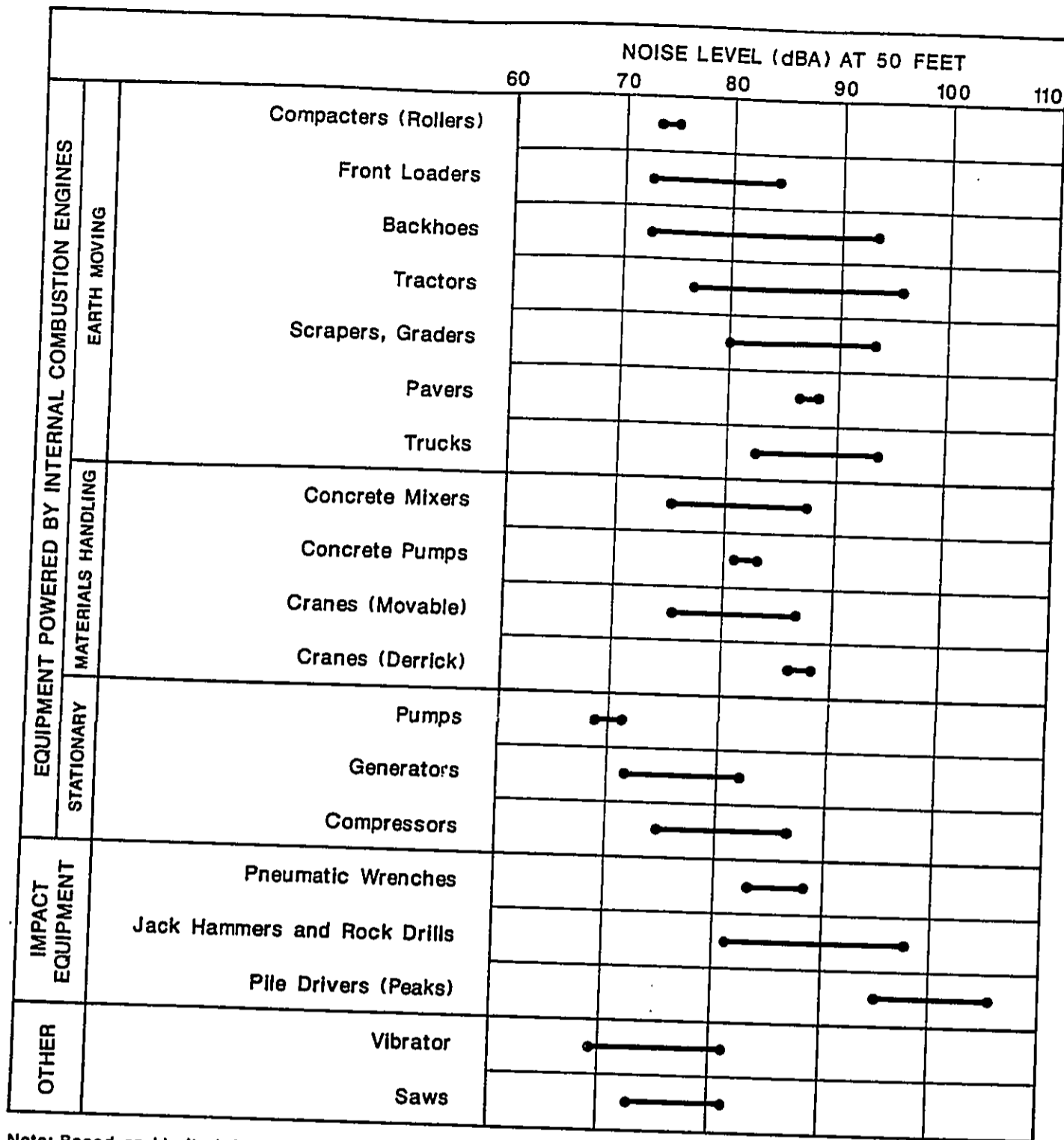
B. Anticipated Impacts

Future activities at the project that were evaluated include: construction activities, project-generated traffic, golf course maintenance equipment operations, clubhouse, tennis center, campground, and community facility activities, and stationary equipment operation (such as air conditioners and pumps). Potential noise impacts on existing homes (off-site) and on new, proposed residences within the project were considered.

1. Construction Impacts

Development of the project will involve clearing, grubbing, grading, and the construction of infrastructure and buildings. The actual amounts of noise generated in construction are dependent on the methods employed during each construction phase. Earth moving equipment, such as bulldozers and diesel powered trucks, will probably be the loudest equipment used in construction. Typical construction equipment noise levels are shown in Figure 21.

The construction of the access road across the bluff face will require rock removal over a maximum of 1,200 feet of the roadway. Equipment typically used for rock removal include rock hammers and drills, as well as blasting equipment. Equipment using impact to break rock is noisy, as shown in Figure 20, where 82 to 98 dBA at 50 feet is typical of jack hammers and rock drills. The breaking of rock by explosion usually creates a muffled "thump" sound. Noise created during rock removal will affect the Sunset Beach Elementary School and residences located near the property in Sunset Beach. This impact will be short-term in duration, and the actual time period required for drilling and blasting will be assessed after final design and geotechnical studies for the access road are complete.



Note: Based on Limited Available Data Samples

**CONSTRUCTION EQUIPMENT NOISE RANGES
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SOURCE: U.S. ENVIRONMENTAL PROTECTION AGENCY, 1972

FIGURE 21

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2. Traffic Noise

Federal Highway Administration (FHWA) highway traffic noise modeling results showed that the closest residences which are located about 40 feet from the center of Kamehameha Highway will have traffic noise levels in 1997 of approximately 72 to 73 dB LdN during the busiest hour of the week (worst case). Homes located further away from the highway will experience lower traffic noise levels, e.g., 65 dB at 125 feet, 66 dB at 100 feet, etc.. The expected future traffic noise level increase along Kamehameha Highway will be due primarily to the projected increase in traffic volumes resulting from other developments and area growth. The potential traffic noise level increase at residences located along Kamehameha Highway due to the project will be less than 0.5 dBA, and is not considered to be a significant noise impact.

Traffic noise levels at the proposed residences in the project along the internal circulation roadways should not be excessive. Assuming that the traffic volumes are highest at the intersection of the project access road and the highway, the closest residences in the project are estimated to be exposed to sound levels well below acceptable standards. Traffic noise from the highway will not contribute significantly to the overall acoustical environment at any of the proposed residences.

3. Residential and Golf Course Ground Maintenance Noise

Noise associated with ground maintenance equipment at the country lots on the Haleiwa side, such as lawn mowers and leaf blowers, could occasionally, be noticeable at times at nearby residences in Pupukea Highlands or Sunset Hills. Golf Course maintenance equipment will create noise which will only affect adjoining homes within Lihi Lani.

4. Clubhouse Noise

Noise sources from clubhouse operations could include kitchen equipment, fans, air conditioners, refrigeration equipment, pool pumps, as well as sound systems for announcements and music. Noise from the clubhouse could potentially impact the proposed country lots within Lihi Lani in the immediate vicinity of the clubhouse.

The sound from the above mentioned sources should not create a significant noise impact to the closest existing residences outside the project, which will be at least 1,200 feet distant. Sound levels acceptable at the clubhouse may occasionally be audible, but would be largely dissipated, prior to reaching existing residences.

5. Tennis Center Noise

The primary source of noise from tennis games are racquet-to-ball impact, shoe screech, shouting and yelling. A typical doubles tennis game can generate approximately 58 dBA at the edge of the tennis court. Adequate setbacks between the courts and the project's country lots, to reduce the tennis noise impacts to a level of insignificance. No off-site receptors will be affected by noise at the tennis center.

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6. Campground Noise

Depending upon the types of activities, noise levels at the campground are expected to vary widely. For example, there will be relatively quiet camping activities such as cooking, eating, hiking, sleeping and reading, which normally would not increase the ambient sound level significantly. A worst case scenario might be 20 persons singing (around the campfire), which could generate noise levels as high as 63 dBA at a distance of 50 feet.

Even in the worst case, occasional campground activity noise may be audible, but is not expected to be audible at nearby residents in Pupukea Highlands, due to the sound transmission loss over the approximate 1,200 feet between the campground and nearest residences on Pupukea Road.

7. Community Facility Noise

Activities at the community facility could include meetings, athletic or cultural events, and parties, some of which may utilize amplified sound systems. Noise generated by such systems could cause annoyance to the nearby residents and, if occurring during the school hours, the occupants of the adjacent school.

8. Stationary Equipment Noise

Noise from air conditioning equipment, pool pumps, exhaust fans, trash compactors and any other stationary equipment at the golf clubhouse, tennis center, and residences will not exceed the noise levels allowable by State and County noise regulations. Noise from equipment at the projects buildings will not be audible off-site, except possibly the community facilities. Trash pick-up and delivery vehicles are typically operated and scheduled to cause minimum disturbance to neighboring residential units. These operations are expected to meet the requirements of State and County noise regulations.

C. Mitigative Measures

Several measures will be implemented to minimize potential noise impacts at off-site receptors.

Construction Noise Control: Compliance with existing regulations will mitigate construction noise generated by the project to acceptable levels. State and County regulations have been established to limit construction noise generation. Prior to construction, a permit will be obtained from the State Department of Health for operating construction equipment, power tools and vehicles which emit noise levels in excess of the allowable limits. Required permit conditions for construction activities include:

"No permit shall allow construction activities creating excessive noise... before 7:00 a.m. and after 6:00 p.m. of the same day".

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"No permit shall allow construction activities which emit noise in excess of ninety-five dB(A)...except between 9:00 a.m. and 5:30 p.m. of the same day".

"No permit shall allow construction activities which exceed the allowable noise levels on Sunday and on...(certain) Holidays. Activities exceeding ninety-five dB(A) shall (also) be prohibited on Saturdays."

In addition, construction equipment and on-site vehicles or devices requiring an exhaust of gas or air must be equipped with mufflers. Construction vehicles using local roadways will satisfy the noise level requirements defined in Hawaii Administrative Rules, Title 11 (1981).

During rock removal, the immediate blast area is covered by a blast mat with the purpose of directing the explosive energy into the rock, muffling the airborne pressure pulse, and controlling flying debris. The actual blast will be perceived as a muffled "thump" sound and should cause minimal vibration through the ground to structures located below the bluff.

Operations Noise Control: The design of the community facility will include noise mitigation measures in the planning of the location and orientation of the air conditioning equipment, exhaust fans, pool pumps and other equipment, such that local noise regulations will be satisfied.

Ground maintenance equipment will be powered by internal combustion engines with exhaust mufflers. Schedules for maintenance will be arranged so noisier operations do not occur near residences (on and off the project area) before 7:00 a.m. or after 5:00 pm.

Community Facility Noise Control: The site planning for the community facility shall incorporate adequate setback distances, respecting existing residential areas. Proper sound insulation measures shall be incorporated into the building design. Events at the community center that propose the use of amplified sound outside the building shall notify the community and be scheduled at hours which do not conflict with the adjacent elementary school session neighboring residential areas.

4.14 AIR QUALITY

An air quality study of the proposed project has been prepared by Neal (January 1991). The information provided by this study is summarized below, and the actual report is included in Appendix Q.

A. Existing Conditions

Present air quality in the Pupukea area could potentially be affected by air pollutants from four different types of sources: natural, industrial, agricultural and vehicular. Natural air pollutant producers which could affect the area include the ocean sea spray, aero-allergens from plants, dust from bare soil areas, or perhaps distant

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volcanic emissions from the Island of Hawaii. Industrial and agricultural sources of air pollutants are located generally on the leeward and central portions of Oahu, which are generally down wind from the project. Upwind there are no industrial or agricultural air pollution sources for thousands of miles.

The only long-term State of Hawaii air monitoring station is located in Waimanalo. This monitoring site was selected to measure background levels of particulates. None of the other regulated air pollutants are measured at this station. For the period 1985-1989, the average annual Total Suspended Particulate (TSP) concentration at Waimanalo ranged from 20-29 micrograms per cubic meter, which is well within the State standard for TSP, and is probably typical of most locations on the Windward Coast. The maximum 24-hour average concentration was also well within the allowable limit.

Any air pollution currently affecting the project area is probably a result of either natural or vehicular sources. Since there are no nearby long-term measurements of vehicular-related pollutants, present concentrations of carbon monoxide in the project area have been estimated based on mathematical modeling of motor vehicle emissions. The results of this modeling are discussed below in association with the projected long-term impacts of the project.

B. Anticipated Impacts

1. Short-Term Air Quality Impacts

There will be two types of short-term direct air quality impacts from project construction: fugitive dust generation and on-site emissions from construction equipment. There will also be short-term indirect impacts occurring off-site from slow moving construction equipment traveling to and from the project, and from an increase in local traffic caused by commuting construction workers.

Fugitive dust emissions will arise from grading and dirt moving activities within the project. A rough estimate of uncontrolled fugitive dust emissions from construction activity has been provided by the U.S. EPA (1987), estimated at 1.2 tons per acre per month under conditions of "medium" activity and moderate climactic conditions. Uncontrolled fugitive dust emissions from construction at Pupukea would probably be lower than this because the area is relatively wet. State of Hawaii Air Pollution Control Regulations require that fugitive dust emissions be controlled to such an extent that no visible emissions of fugitive dust from construction activity should occur beyond the property line.

On-site mobile and stationary construction equipment will also emit some air pollutants in the form of engine exhausts. The larger types of equipment are usually diesel-powered. Nitrogen oxides emissions from diesel engines can be relatively high compared to gasoline-powered equipment, but the standard for nitrogen dioxide is set on an annual basis and is not likely to be violated by short-term construction equipment emissions. Carbon monoxide emissions from diesel

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engines, on the other hand, are very low and should be relatively insignificant compared to normal vehicular emissions on nearby Kamehameha Highway.

2. Long-Term Air Quality Impacts

There will be a potential long-term indirect impact on air quality along the project area's roadways due to project related traffic. By serving as an attraction for increased motor vehicle traffic, the project is considered to be a potential indirect air pollution source. In order to evaluate the potential long-term indirect air quality impact of increased traffic associated with project development, a carbon monoxide modeling effort was carried out. Carbon monoxide was selected for modeling because it is both the most stable and the most abundant of the motor vehicle generated pollutants, and it is also the air pollutant with the greatest likelihood of violating Ambient Air Quality Standards (AAQS).

The three critical air quality receptor areas identified in the vicinity of the project coincide with the three key intersections along Kamehameha Highway identified in the traffic study. The three cross streets are Pupukea Road, the Sunset Elementary School access and the project access road. The results of the modeling effort are presented in Table 17.

Estimated present (1991) peak-hour carbon monoxide concentrations were 1.5 milligrams per cubic meter (mg/m^3) along Kamehameha Highway at the proposed access road, $4.4 \text{ mg}/\text{m}^3$ at the school entrance, and $4.1 \text{ mg}/\text{m}^3$ at the Pupukea Road intersection. These estimated present concentrations are well within state and national AAQS.

In 1997 without the project, the predicted maximum one-hour concentrations are expected to increase compared to 1991 levels. This is because traffic is expected to increase substantially, particularly during the morning.

Predicted peak-hour concentrations for the 1997 scenario with the project vary between $7.2 \text{ mg}/\text{m}^3$ at Pupukea Road, $8.6 \text{ mg}/\text{m}^3$ at Sunset School, and $13.2 \text{ mg}/\text{m}^3$ at the project access road intersection at the weekend peak.

Overall, it is predicted that with the proposed project, worst-case carbon monoxide levels along roadways in the project vicinity will be higher near existing intersections compared to the without the project case but should remain within state and national AAQS. At the new intersection along Kamehameha Highway created by the project access road, air pollution concentrations will increase substantially, but all should remain within Federal AAQS. Future eight-hour carbon monoxide levels were also found to be within Federal AAQS. State AAQS could be exceeded if peak traffic and worst-case meteorological conditions occur simultaneously.

It is important to note that the worst-case meteorological conditions used for modeling have a very low probability of occurrence. A slight increase in the

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assumed worst-case wind speed from two mph to four mph would reduce the predicted carbon monoxide concentrations to about one-half of the levels shown in Table 17.

3. Pesticides Impact on Air Quality

The pesticides used on golf courses are at relatively low mammalian toxicity, ranging from hundreds to several thousand milligrams per kilogram of body weight. Because they are not highly volatile and are applied in dilute sprays (50 to 100 gallons of spray solution per acre) to open areas, there is little likelihood of toxic levels in the atmosphere. In addition, the use of ground spray equipment with low spray pressures (20 to 40 psi) and course spray droplets further reduces the potential for creating airborne fine droplets. Spray applications are only made in late afternoon or early morning hours when golfers are not on the golf course, which reduces the risk of any exposure of people to airborne spray particles.

On-site long-term direct air quality impacts are not expected to be significant. Application of chemical fertilizers and pesticides to maintain the golf courses will be required. The primary risk of using these chemicals is to the applicator rather than to individuals at possible receptor sites down wind. Individuals at down-wind sites should encounter airborne concentrations of these chemical substances only in greatly diluted form, if at all. Precautions will be taken in the application, as described in the following mitigative measures discussion.

4. Electrical Demand and Solid Waste Disposal

The annual electric demand of the project when fully developed is not expected to exceed about 3.0 to 4.0 million kilowatt-hours. As a consequence of electrical power usage, the proposed project will contribute to indirect air pollution emissions from power generating facilities, most probably provided by oil-fired generators on Oahu.

Solid waste generated by the project when fully developed is not expected to exceed 3 tons of refuse per day. If this refuse is not landfilled and all or part is burned at a municipal incinerator or other facility (such as H-power), disposal of solid waste from the project will also result in emissions of particulate, carbon monoxide and other contaminants from the incineration facility.

Long-term, quantitative evaluations of these impacts were not made, but it is likely to be relatively small since the projected emissions will be much less than 1 percent of current Oahu emissions from power generating and waste incineration facilities. Several measures have been proposed to minimize potential air quality impacts.

C. Mitigation Measures

Several mitigation measures will be implemented to minimize potential air quality impacts, as listed below.

TABLE 17

AIR QUALITY MODELING RESULTS

Estimated Worst-Case 1-Hour Carbon Monoxide Concentrations
Along Roadways Near Lihi Lani Recreational Community Project
(milligrams per cubic meter)

Roadway Intersection	Year /Scenario					
	1991/ Present		1997/ Without Project		1997/ With Project	
	AM	PM	AM	PM	AM	PM
<u>Weekday:</u>						
Kamehameha Highway at Pupukea Road	4.1	3.2	4.7	3.0	7.2	3.8
Kamehameha Highway at Sunset School	4.4	2.0	6.3	1.8	8.6	2.1
Kamehameha Highway at Project Access Road	1.5 ^a	1.0 ^a	1.8 ^a	1.3 ^a	3.4 ^b	9.9 ^b
<u>Weekend:</u>						
Kamehameha Highway at Pupukea Road	—	3.2	—	4.1	—	4.8
Kamehameha Highway at Sunset School	—	1.3	—	1.4	—	1.5
Kamehameha Highway at Project Access Road	—	1.3 ^a	—	1.4 ^a	—	13.2 ^b
Hawaii State AAQS:	10					
National AAQS:	40					

^aAssumes through traffic only on Kamehameha Highway.

^bAssumes left turn lane provided both on Kamehameha Highway and on Project Access Road and speed limit on Kamehameha Highway reduced to 35 mph.

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Dust Control: During construction of the project, adequate fugitive dust control will be accomplished by establishing a frequent watering program to keep bare dirt surfaces in work areas from becoming significant dust generators. Control regulations also require that open-bodied trucks be covered at all times when in motion if they are transporting materials likely to give rise to airborne dust. Paving of parking areas and establishment of landscaping as early as possible in the construction process will also be done to lower the potential for fugitive dust emissions.

Construction Equipment Transport: Indirectly, slow-moving construction vehicles on Kamehameha Highway can obstruct the normal flow of traffic to such an extent that overall vehicular emissions of carbon monoxide are increased. This impact will be mitigated by moving heavy construction equipment during periods of low traffic volume whenever possible.

Roadway Traffic: Roadway improvements recommended by the traffic consultant will be implemented to move traffic efficiently through the project area and to help maintain good air quality.

Pesticide Application Controls: There are certain precautions that must be followed by pesticide applicators in order to prevent significant down-wind drift when spraying. Primary among these are the use of a coarse rather than a fine spray and application under low wind speed conditions when the wind direction will not contribute to drift towards the clubhouse area or to nearby residences. Off-hours application scheduling and buffer establishment will also minimize pesticide effects on air quality. Spray hoods will be used as necessary to contain spray during windy-periods. Provided that proper safety precautions are followed, the potential for serious air quality degradation from chemical spraying for golf course maintenance will be minimal.

Odor Control: Odor control measures are not expected to be needed for the wastewater treatment facility, however, contingency provisions will be included in the design and the budget to incorporate odor abatement facilities, should the need arise.

4.15 VISUAL RESOURCES

Existing views of the project site from the surrounding area have been inventoried in this section, both descriptively and by photographs. Short-term and long-term effects on views of the site which will result from development of this project are assessed, and measures are proposed to minimize adverse effects.

A. Existing Conditions

Views of the project site are presently available from the adjacent and nearby residential properties (in Sunset Hills and below the bluff in Sunset Beach), Kamehameha Highway, Sunset Beach Elementary School, several nearby beach

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parks and from nearshore ocean locations. Most views of the project area are of the dense vegetation on the makai section, and the steep bluff and dividing gulches along the makai boundary. A view study key map (Figure 22) identifies photographs showing various views of the project site, included in Figure 23 (A, B, C, D, and E).

Only the makai part of the project area and the bluff can be seen from Kamehameha Highway, adjoining and nearby residences, the school and Ehukai Beach Park. At distances farther from the makai section, people at residences along the highway and at Sunset Beach and Ke Waena Beach Parks can only see the bluff and ravine areas of the site. People at offshore locations, such as boaters, sailboard riders and surfers, are able to view some sections of the project area above the bluff, as well as the bluff areas. Upper areas can also be viewed by people at some nearby residences in Sunset Hills and Pupukea Highlands, and at the COMSAT facilities site.

The project site lies within the North Shore Viewshed as defined by the Coastal View Study (Department of Land Utilization, 1987). The higher elevation lands are considered as an "important coastal land form", most likely relating to the views from the lowlands of the steep bluffs and ravines with their extensive natural vegetation cover. Kamehameha Highway, at the makai section of this project, is considered by this study to be a "coastal roadway with intermittent coastal views".

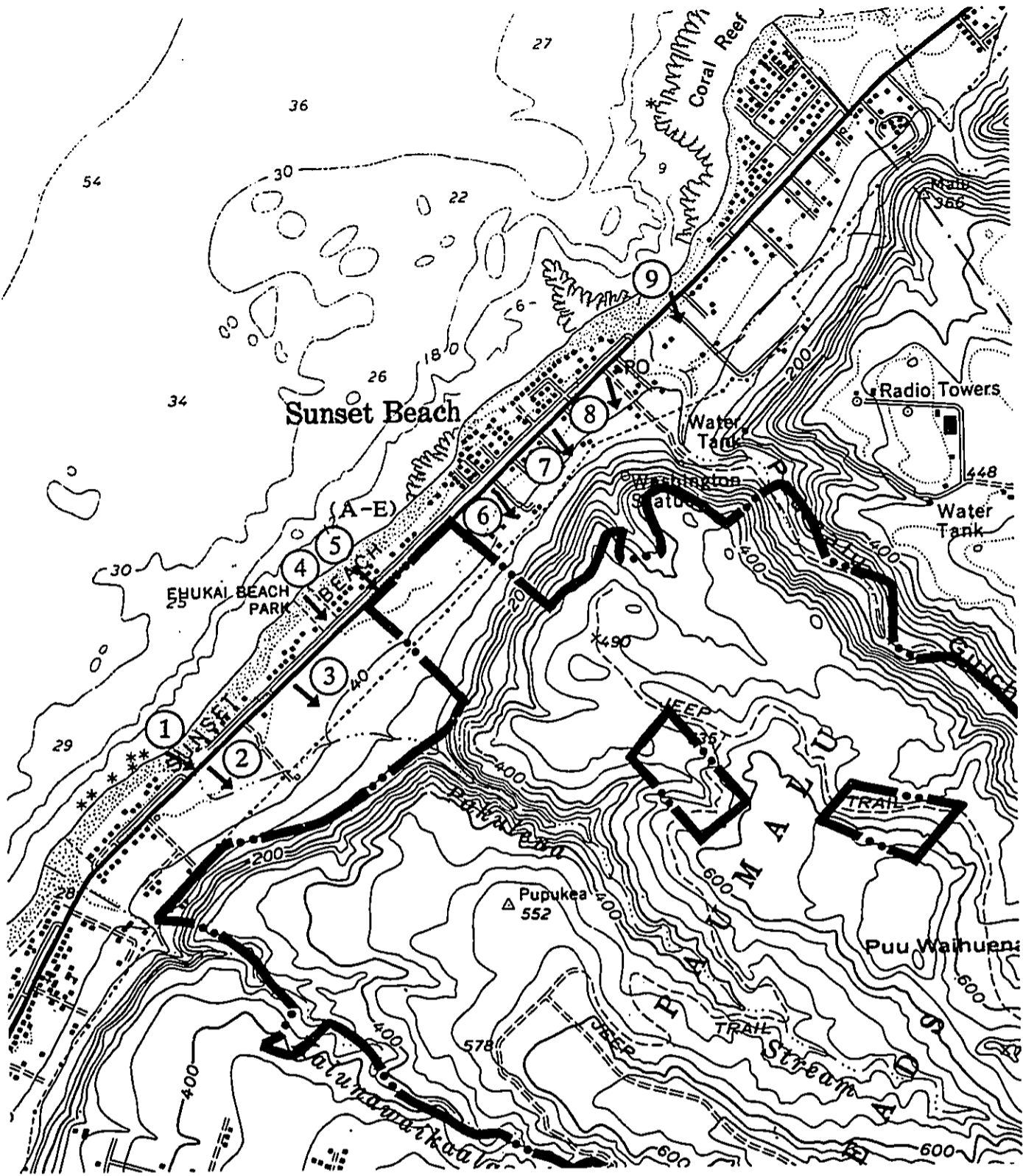
From the project area, a variety of different views are available. Along the bluff edge, where breaks in the vegetation permit, spectacular views of the coastline are available, including Ehukai Beach and Sunset Beach, Ke Waena Beach, lowlands and residences, Mokuleia, Kaena Point, and the Waianae Range.

Within the project site, views of wooded ravines and grassed plateau areas are available. Nearby residences on Sunset Hills and Pupukea Highlands can also be seen from some areas. The COMSAT facilities property can be seen from the Kahuku-side highlands on the project. Currently, there are no light sources on the project area which are visible from off-site locations.

B. Potential Impacts

1. Short-Term Visual Impacts

Construction activities will create some adverse effects on the views of the project site. Construction of the access road, parts of the clubhouse, and golf course which are located along the bluff edge, and any residences built along the bluff edge will be visible from Kamehameha Highway, the nearby residences, the school and nearby beach parks. Vegetation clearing and grading involved with construction will be visible, as will the construction of buildings and the installation of utilities. Construction activities at some locations on the main portion of the site, such as the golf course, roadways, and some residences, may be visible from some nearby residences in Sunset Hills and Pupukea Highlands. Because the development will be phased, future users of the site will also be exposed to views of construction activities. Construction activities may also be visible from some nearshore ocean locations.



LEGEND

 PROJECT BOUNDARY

**VIEW STUDY KEY MAP
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SOURCE: USGS TOPOGRAPHIC QUADRANGLE (1983)

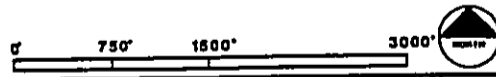
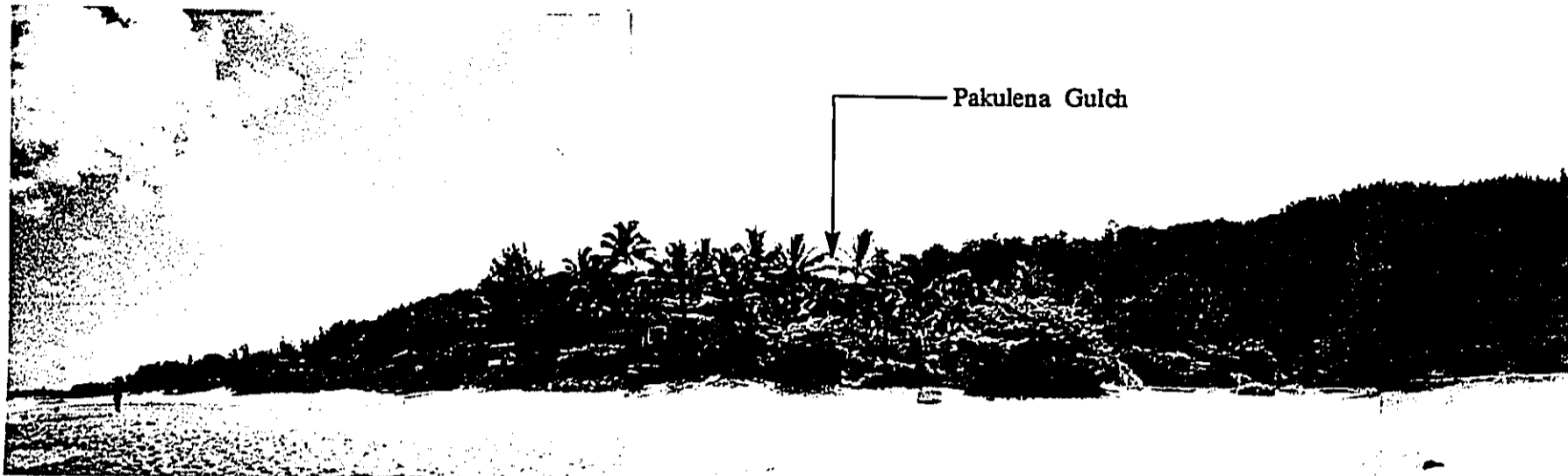


FIGURE 22



1. VIEW FROM KE WAENA BEACH

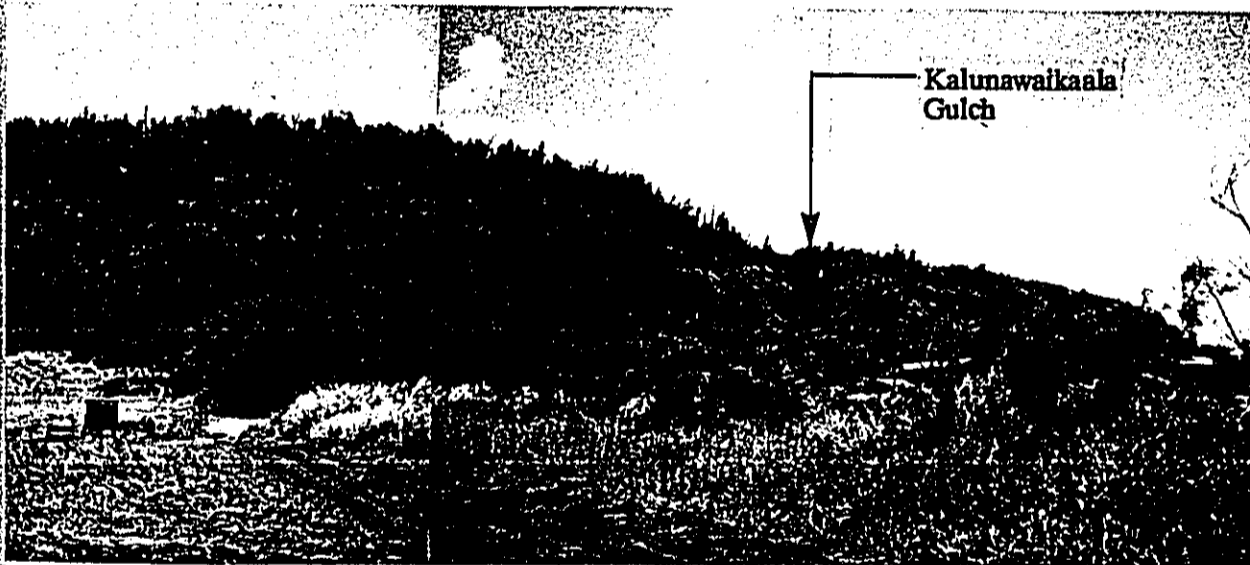


2. VIEW FROM KAMEHAMEHA HIGHWAY ACROSS FROM KE WAE

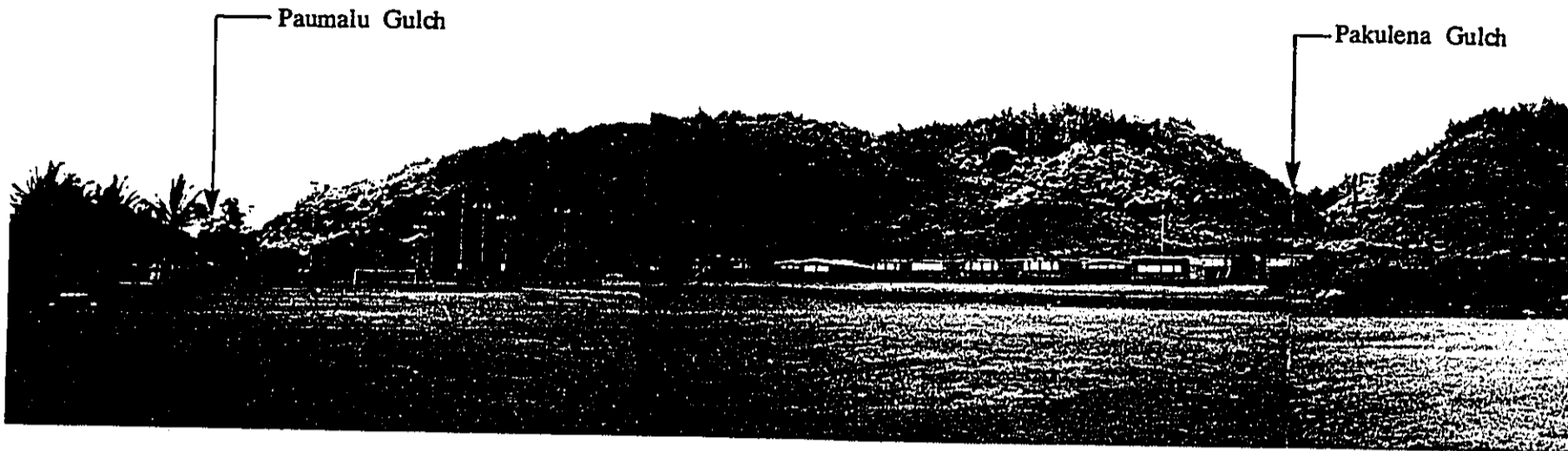
VIEW STUDY
LIHI-LANI RECREATIONAL COMMUNITY



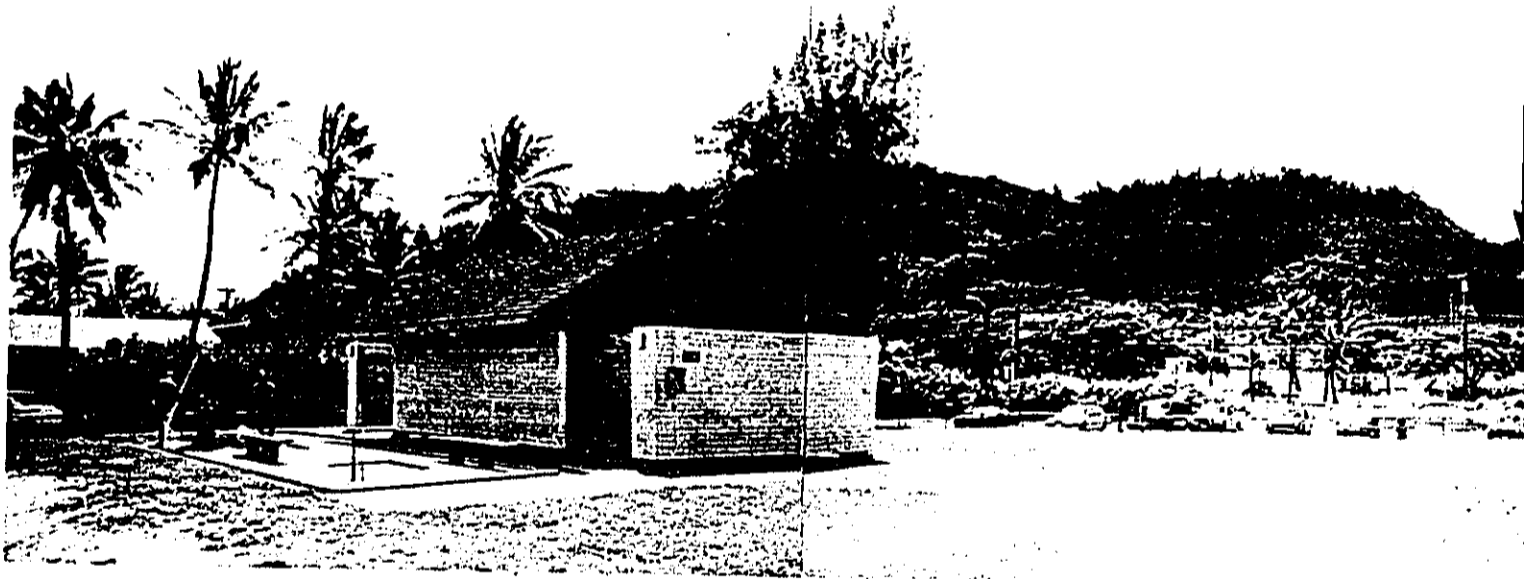
KE WAENA BEACH



CROSS FROM KE WAENA BEACH VIEW STUDY



3. VIEW FROM SUNSET BEACH ELEMENTARY SCHOOL ON SOCCER FIELD



4. VIEW FROM EHUKAI BEACH PARK

VIEW STUDY
LIHI-LANI RECREATIONAL COMMUNITY



SCHOOL ON SOCCER FIELD AT KAMEHAMEHA HIGHWAY



HUKAI BEACH PARK

FIGURE 23B



5A. VIEW TOWARD KAHUKU ALONG KAMEHAMEHA HIGHWAY AT SUNSET BEACH ELEMENTARY SCHOOL DRIVEWAY



5B. VIEW TOWARD HALEIWA ALONG KAMEHAMEHA HIGHWAY ≈300 FT. KAHUKU-SIDE OF SCHOOL DRIVEWAY



5D. VIEW TOWARD KAHUKU ALONG KAMEHAMEHA HIGHWAY AT PROPOSED PROJECT ENTRANCE



5E. VIEW TOWARD HALEIWA ALONG KAMEHAMEHA HIGHWAY AT PROJECT ENTRANCE LOCATION

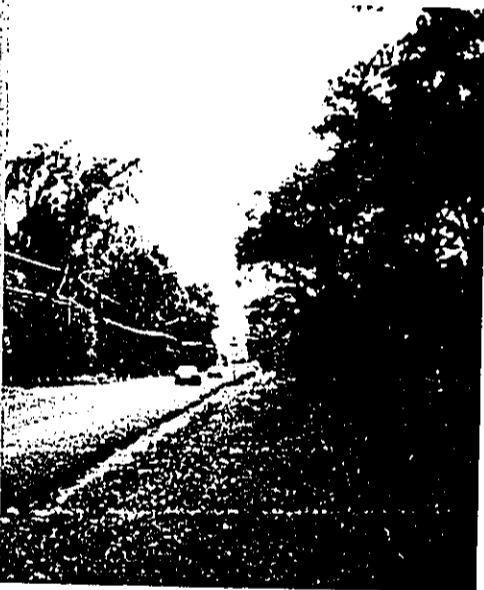
VIEW STUDY
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5A. VIEW ALONG KAMEHAMEHA
HIGHWAY - KAHUKU-SIDE OF SCHOOL



5C. VIEW INTO PROPERTY FROM KAMEHAMEHA
HIGHWAY ≈300 FT. KAHUKU-SIDE OF SCHOOL
DRIVEWAY



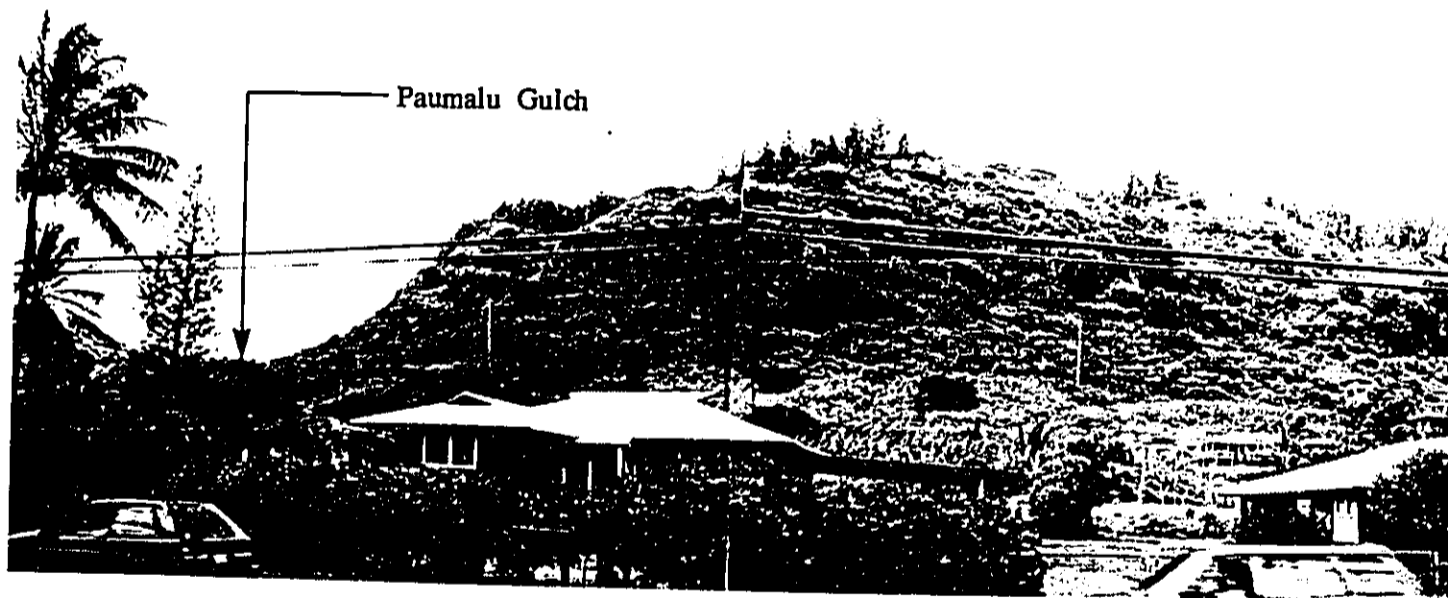
5B. VIEW ALONG KAMEHAMEHA
HIGHWAY AT ENTRANCE LOCATION



5F. VIEW INTO PROPERTY FROM KAMEHAMEHA
HIGHWAY AT PROPOSED PROJECT ENTRANCE

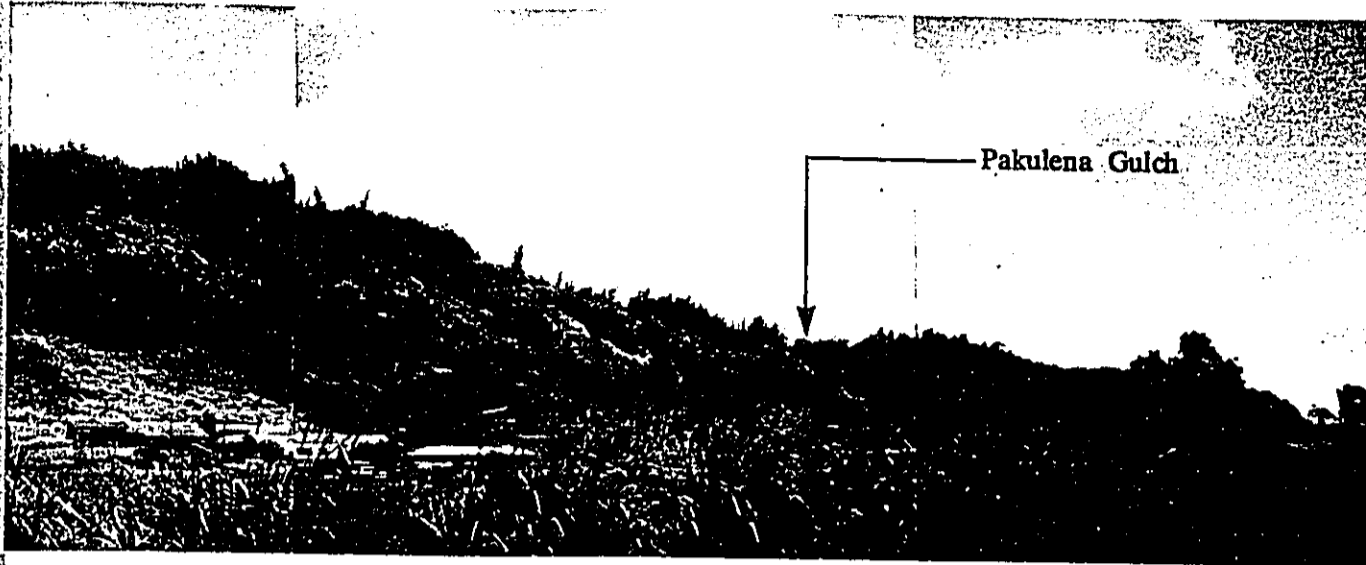


6. VIEW FROM 59-254 KAMEHAMEHA HIGHWAY (MAUI POHAKU LOA STATUE)

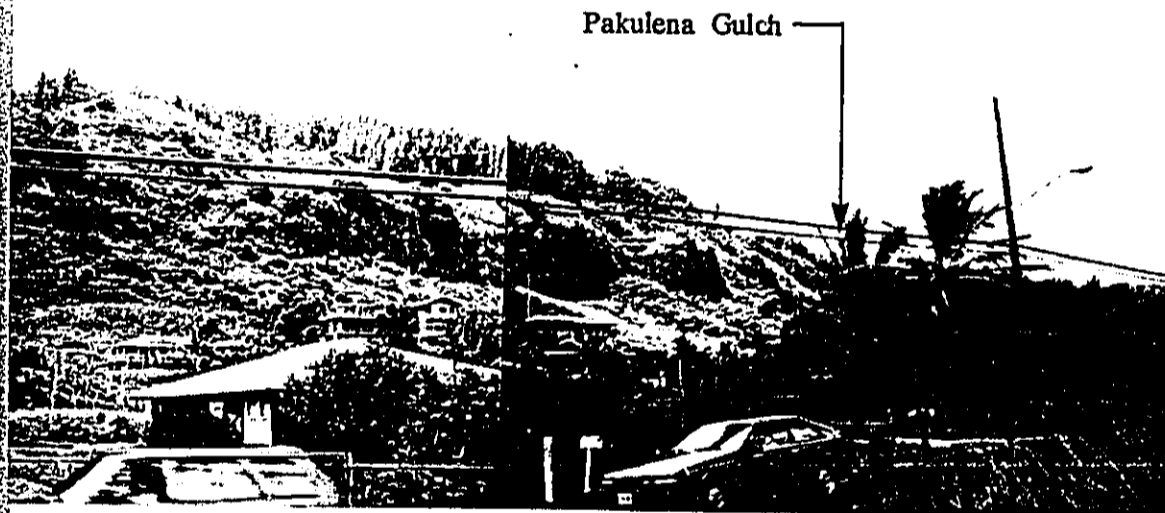


7. VIEW FROM 59-228 KAMEHAMEHA HIGHWAY (MAUI POHAKU LOA STATUE)

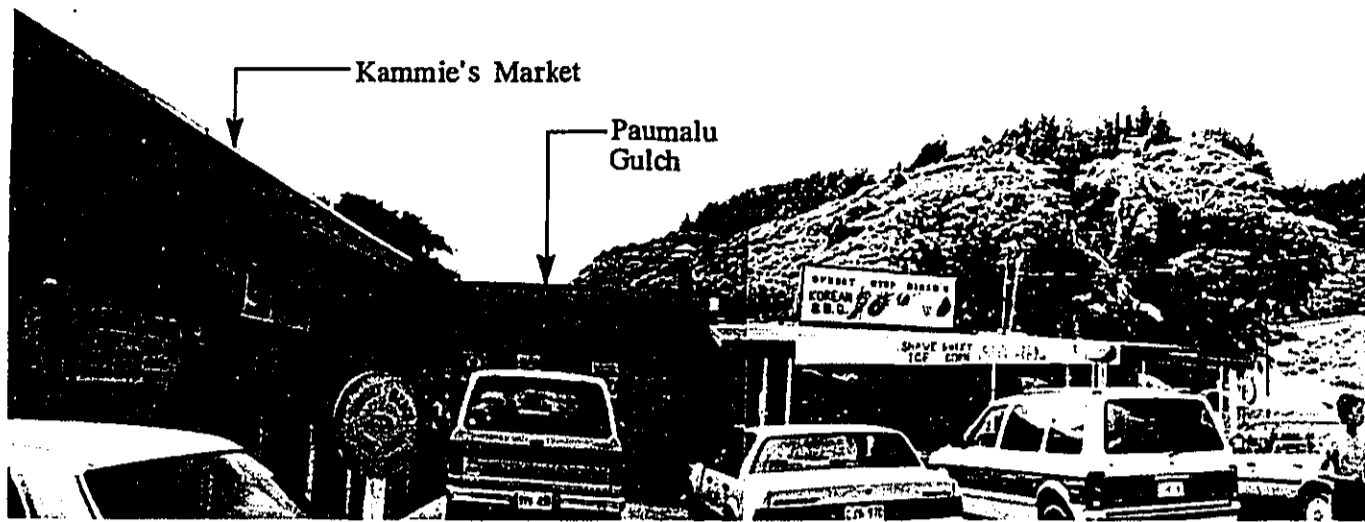
VIEW STUDY
LIHI-LANI RECREATIONAL COMMUNITY



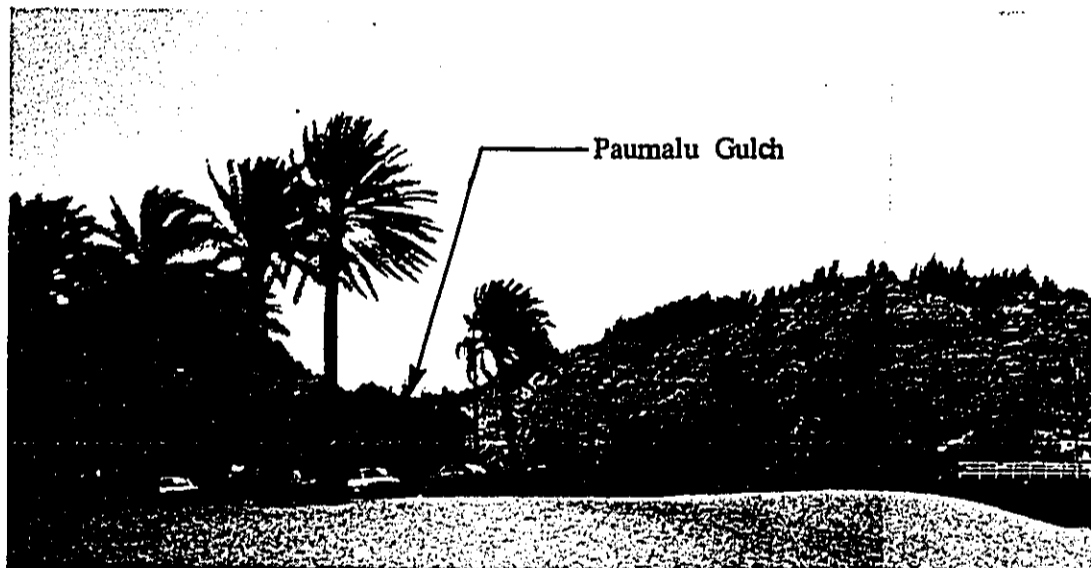
HAMEHA HIGHWAY (MAUKA SIDE)



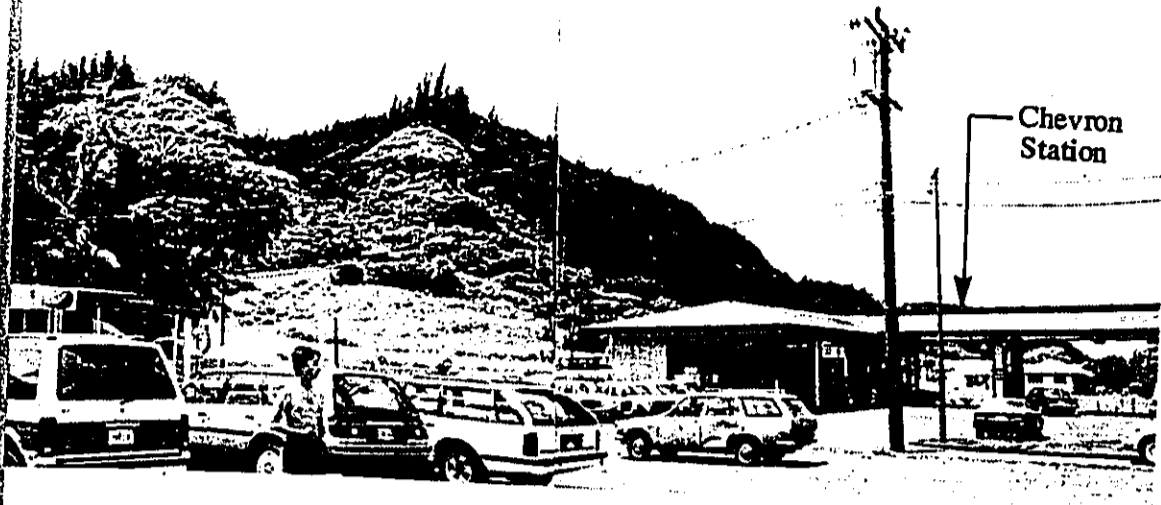
HAMEHA HIGHWAY (MAKAI SIDE)



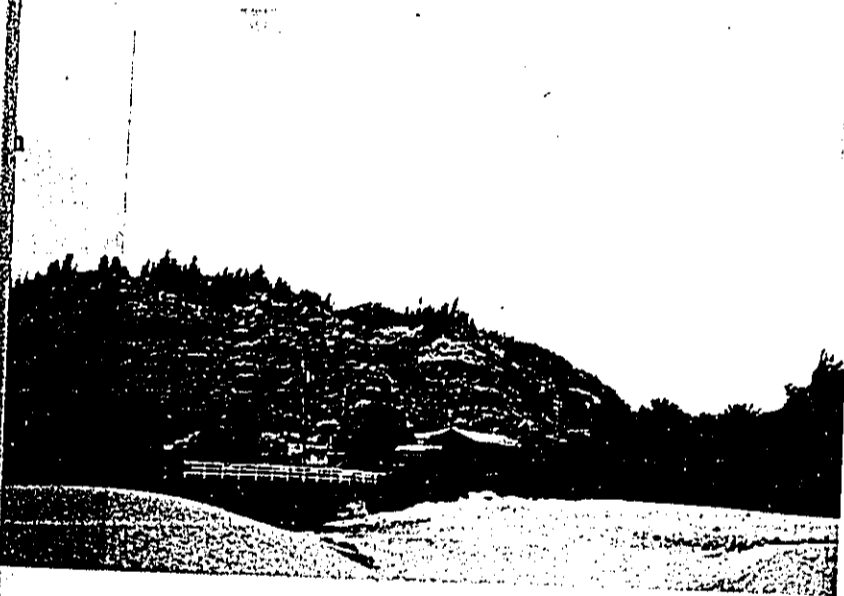
8. VIEW FROM KAMMIE'S MARKET



9. VIEW FROM SUNSET BEACH



KAMMIE'S MARKET AREA



M SUNSET BEACH

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The most apparent changes in the views of the project site will be the construction of the entrance, the access road across the bluff face, and the clubhouse near the edge of the bluff. These areas will be seen from most locations described earlier. The entrance construction will involve clearing a 60-foot wide path into the existing wooded areas on the makai parcel. Cleared vegetation, bare soils in graded areas and stored construction equipment will be evident at the entrance until it is completed.

The 40-foot wide access road (including pavement, shoulders, rolled curbs and sidewalk) will extend into the project for a distance of about 800 feet, and then cross the bluff base (areas 100 to 200 feet above msl) for approximately 500 feet. A retaining wall up to 25 feet high will be constructed along 200 feet of this part of the roadway at the bluff base. The access road will have a 180° turn mid-way along the bluff face (areas 200 to 300 feet above msl), and extend approximately 400 feet to the bluff ridge. The access road will then extend across the bluff ridge (300 to 450 feet above msl) for approximately 1,200 feet, turning mauka into the Kahuku-side plateau area.

Vegetation, soil and rock will be removed along the roadway route. Drilling or blasting of rock could be necessary in some areas. Exposed soil and rock surfaces will be present until the roadway is completed and landscape plantings have been placed. Landscaping will screen views of the access road and bluff cuts, especially after several years of growth.

2. Long-Term Visual Impacts

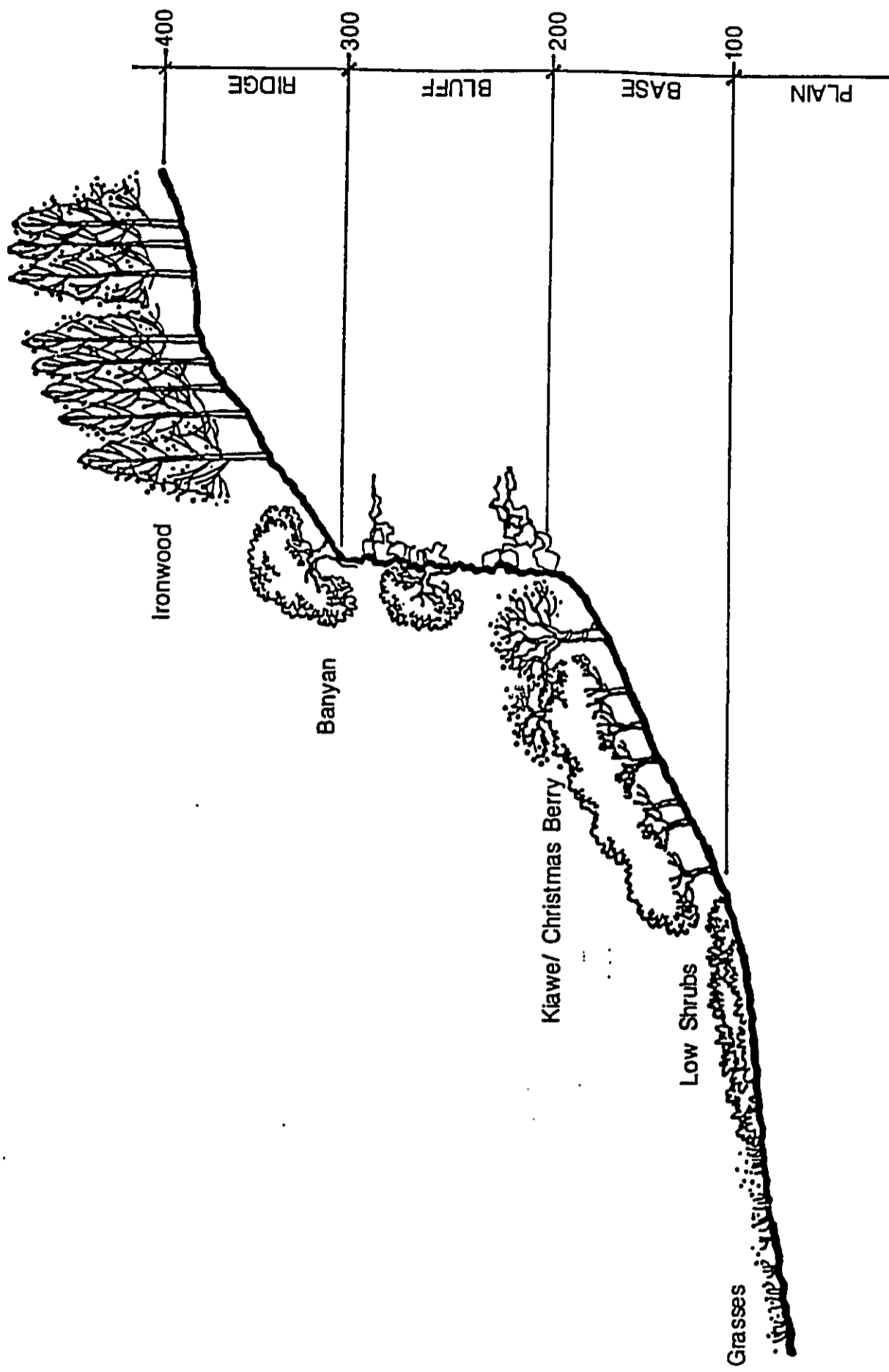
Long-term visual effects will result from the completed entrance and the access roadway crossing the bluff. The clubhouse roof, and roofs of a few residences located close to the bluff along Paumalu Gulch may be visible from locations makai of the site. Building siting, heights, materials, colors and landscaping will be carefully considered in design to avoid adverse visual effects. Views of vehicle traffic, an entry sign and some lighting fixtures will be associated with the entry road.

C. Mitigative Measures

Several mitigative measures have been proposed to minimize the impact on visual resources at this project.

Construction Period Measures: During construction, equipment will generally be contained in storage areas which are generally out of sight from Kamehameha Highway. To minimize a variety of impacts including visual effects, work on the entrance area will be completed in the shortest possible time period. Access road construction, especially in the area of the bluff crossing, will also be completed as quickly as possible.

Minimized Vegetation Clearing: To preserve existing views, vegetation clearing along the entrance, access road and bluff will be limited to only those areas which are necessary. Revegetation and new landscape planting will be accomplished as soon as possible to protect bare soils areas and shield rock face areas from view.



EXISTING VEGETATION SECTION - PUPUKEA BLUFF
 LIHI LANI RECREATIONAL COMMUNITY
 SOURCE: WALTERS, KIMURA AND ASSOCIATES, INC. (JULY 1988)

FIGURE 24

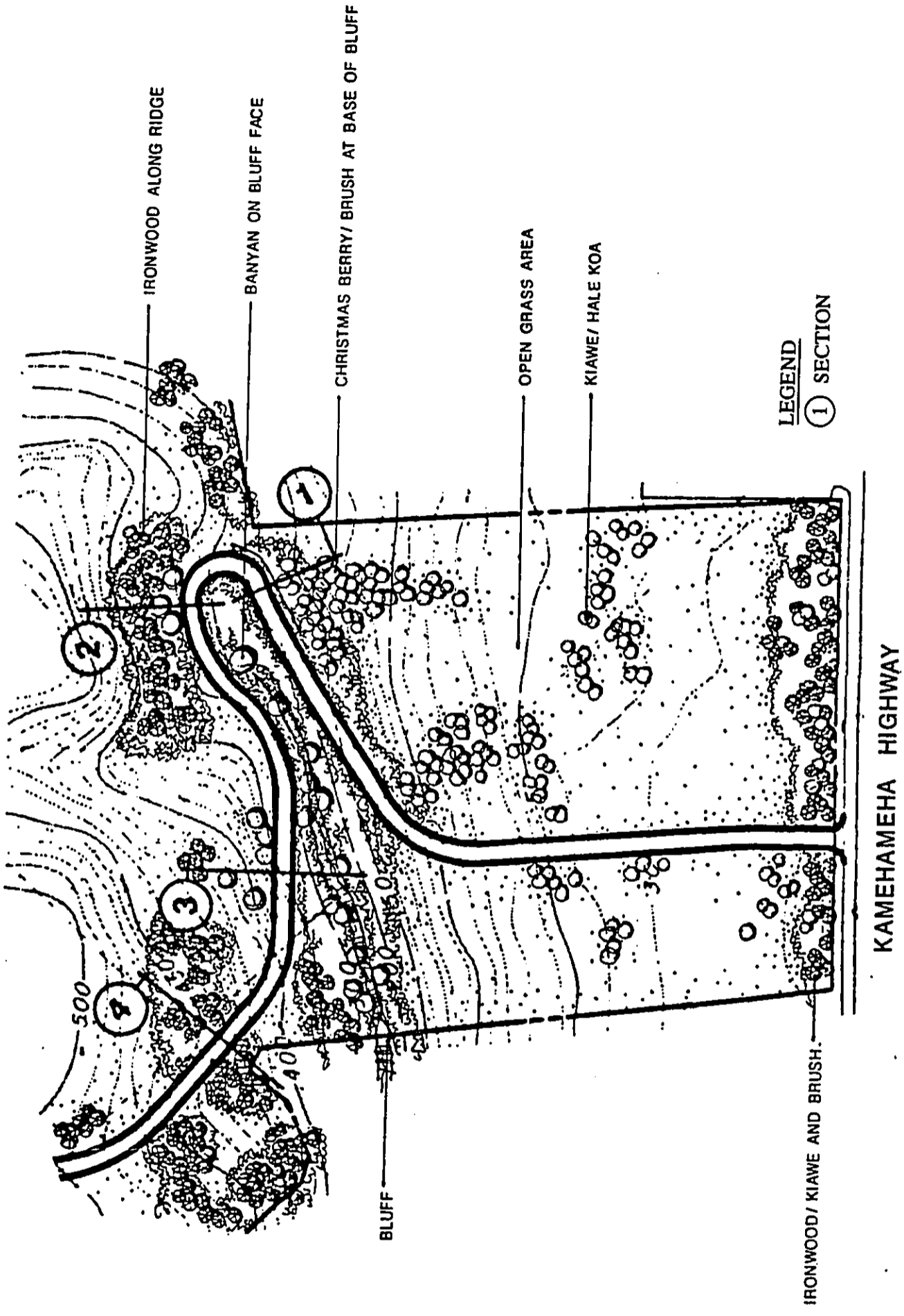
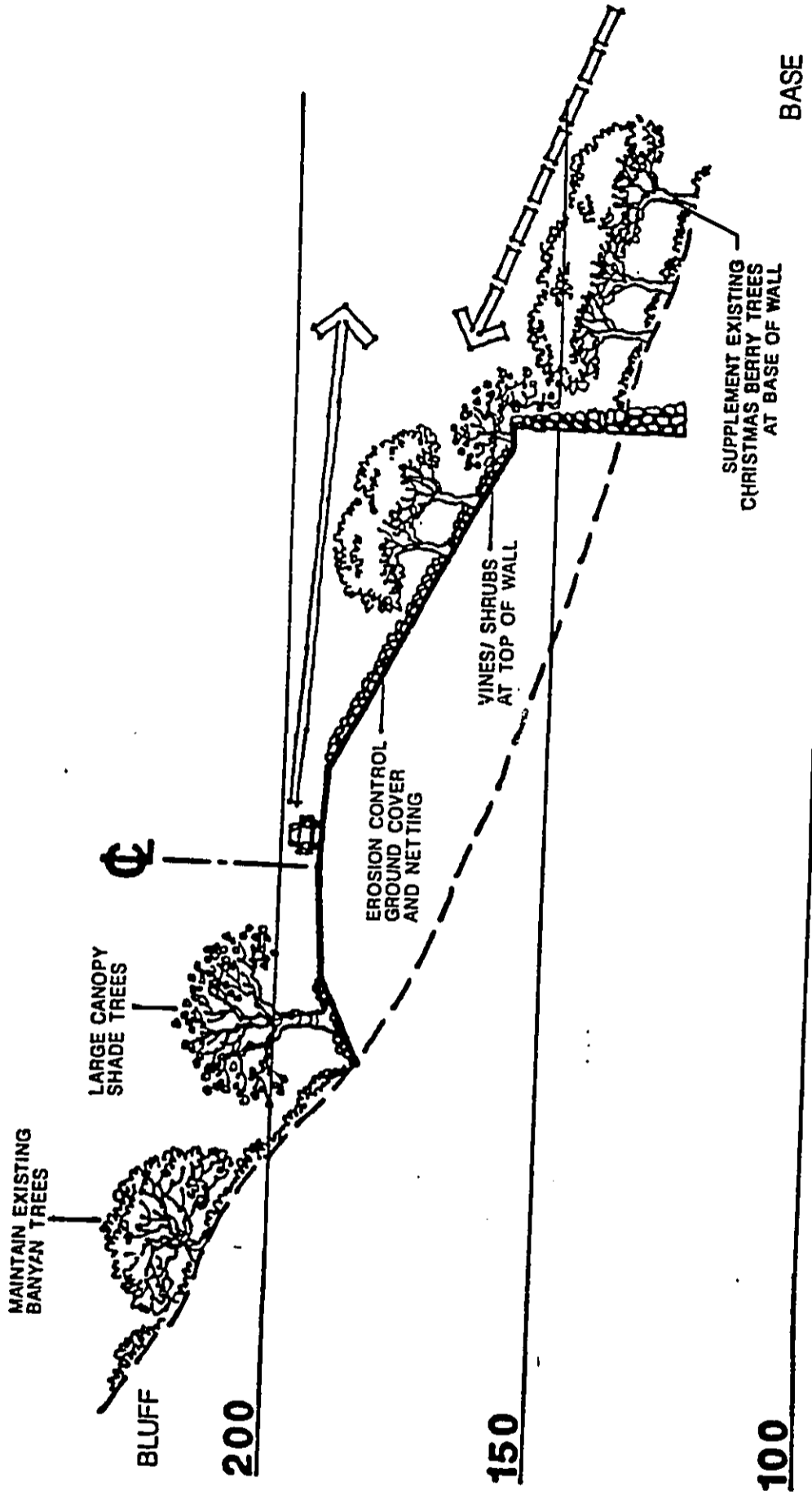


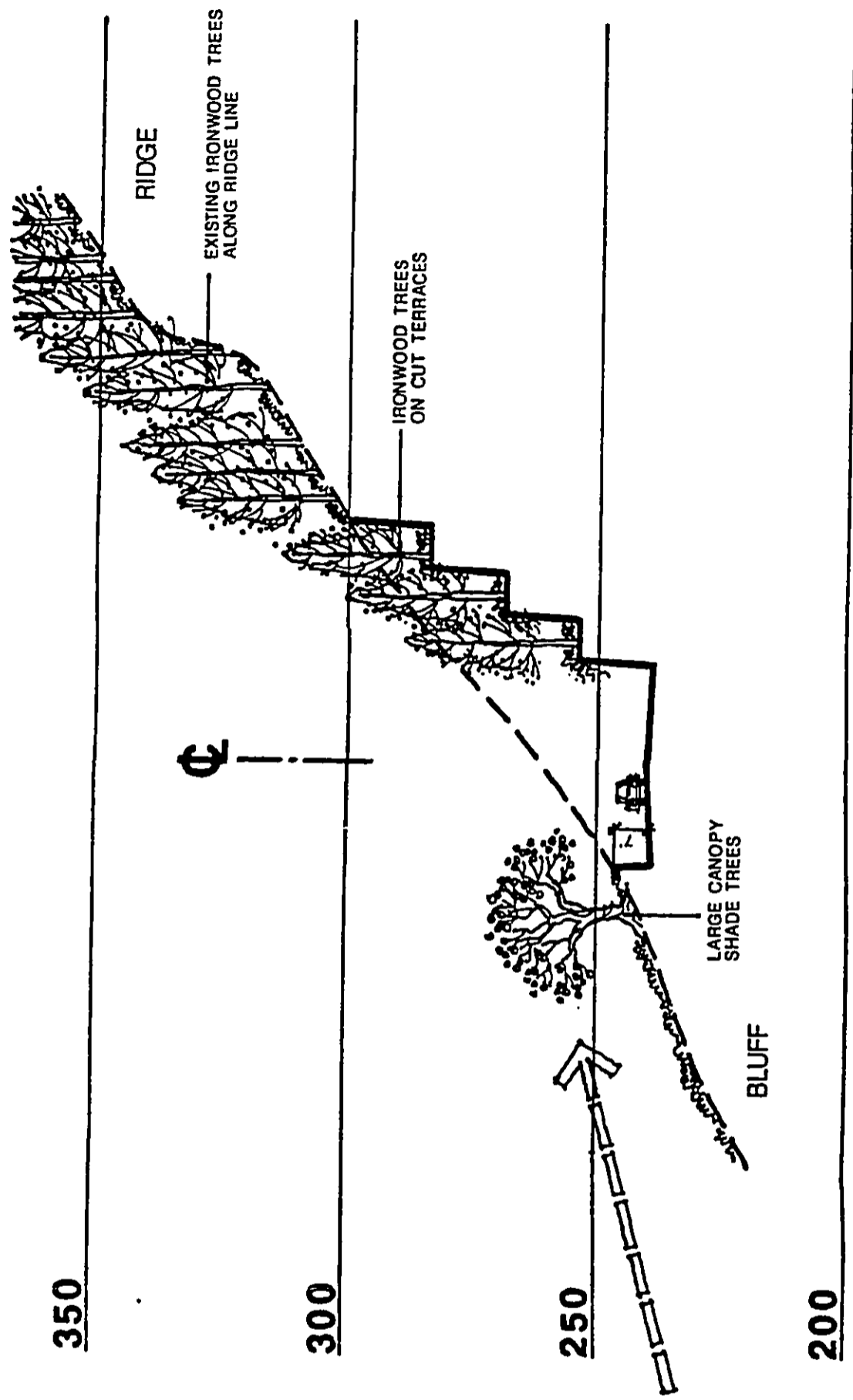
FIGURE 25



CONCEPTUAL LANDSCAPE TREATMENT ALONG PUPUKEA BLUFF - SECTION 1
 LIHI LANI RECREATIONAL COMMUNITY

SOURCE: WALTERS, KIMURA AND ASSOCIATES, INC. (JULY 1988)

FIGURE 26



CONCEPTUAL LANDSCAPE TREATMENT ALONG PUPUKEA BLUFF -- SECTION 2
 LIHI LANI RECREATIONAL COMMUNITY

SOURCE: WALTERS, KIMURA AND ASSOCIATES, INC. (JULY 1988)

FIGURE 27

DRIVING RANGE →

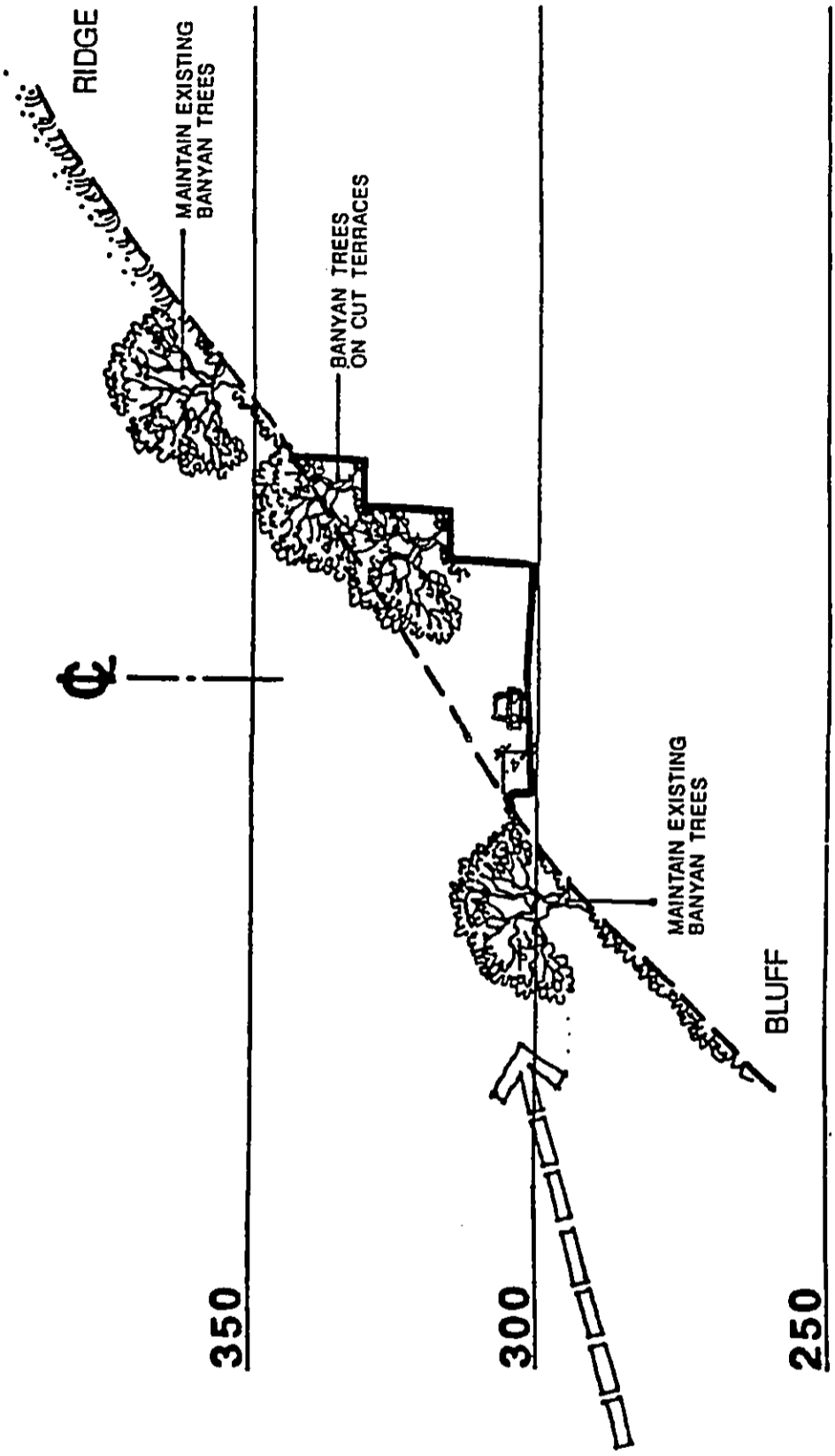
400

⊕

350

300

250



CONCEPTUAL LANDSCAPE TREATMENT ALONG PUPUKEA BLUFF - SECTION 3
LIHI LANI RECREATIONAL COMMUNITY

SOURCE: WALTERS, KIMURA AND ASSOCIATES, INC. (JULY 1981)

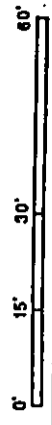
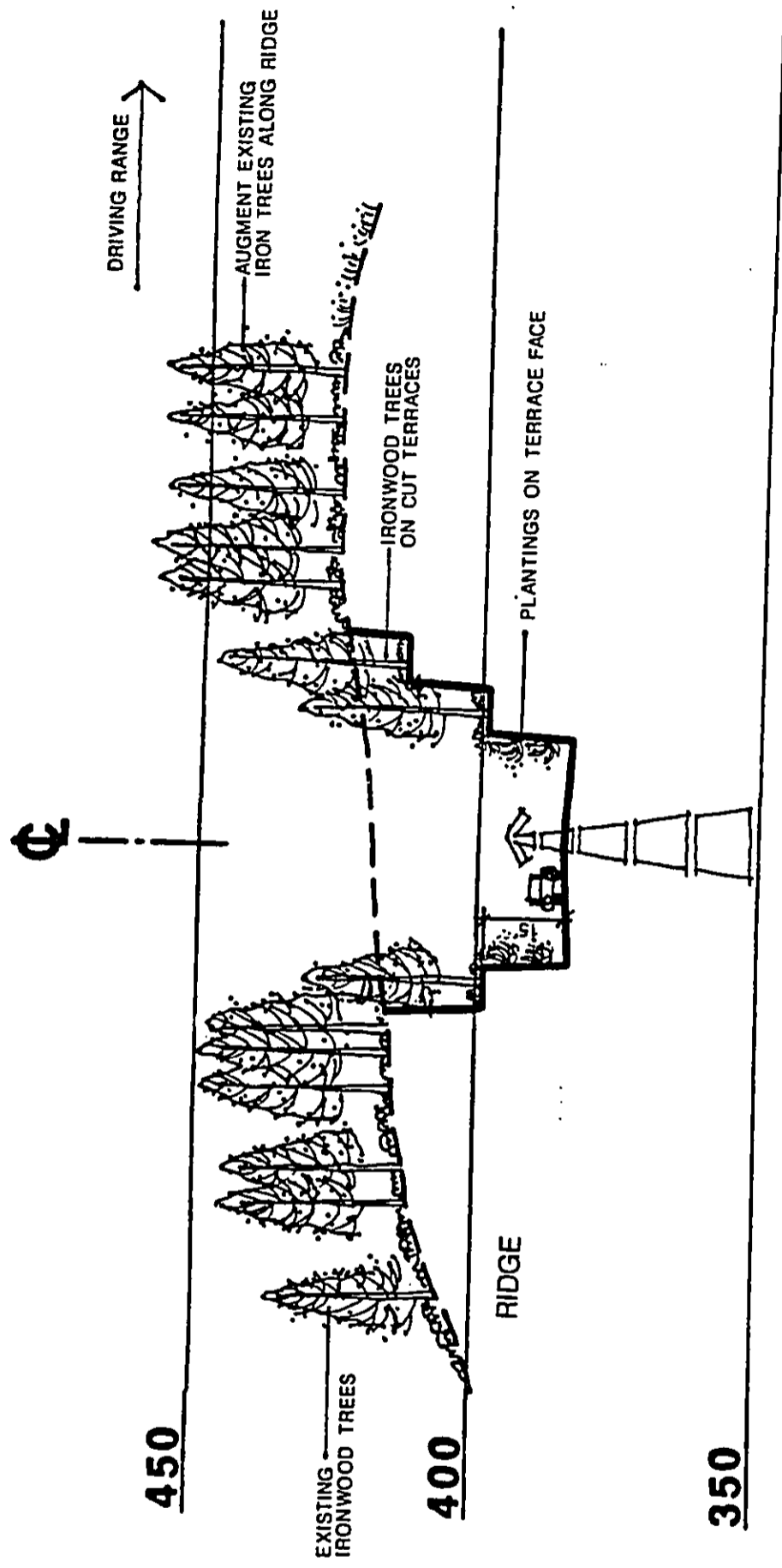


FIGURE 28



CONCEPTUAL LANDSCAPE TREATMENT ALONG PUPUKEA BLUFF - SECTION 4
 LIHI LANI RECREATIONAL COMMUNITY

SOURCE: WALTERS, KIMURA AND ASSOCIATES, INC (JULY 1988)



FIGURE 29

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Entrance Design: Design of the entrance will be tasteful and complement the existing country atmosphere and style. Lighting of the entrance, access road across the bluff face, and the clubhouse will also be subdued to avoid adverse glare and other lighting effects on nearby properties and night time visibility in the general area.

Access Road Landscaping: As shown in Figures 24-29, the access roadway will be built with predominantly depressed sections and extensive landscaping to cover the exposed rock face of terraced areas, retaining walls, the roadway, guard rails and signs. A detailed planting plan has been prepared by Walters, Kimura & Associates, Inc. (July 1988, Appendix Q) which will cover most of the road and terrace areas. Lighting of the roadway will be subdued and will not create excessive glare at adjacent and nearby residences, Kamehameha Highway and other nearby locations.

Public Access to Scenic Views of Highlands and Coast: Another visual-related measure that will be provided is the establishment of the public hiking trail system. This trail will provide views of the completed development and natural/undisturbed areas of the project area, and spectacular shoreline views from the bluff. The trail will not be visible from anywhere outside the development and removal of existing vegetation along the bluff edge for trail construction will be avoided wherever possible. To preserve the natural character of this trail, all houses to be constructed on the Haleiwa-side plateau will be set back from bluff edge and will not be visible from below.

Project Design Considerations: The development of structures at the clubhouse site and some country lots could potentially be visible from off-site locations. Obayashi intends to minimize adverse visual effects by locating facilities to fit the landscape not become prominent features. No structures will be built along the front of the coastal bluff, and buildings at these sites will be required to follow setbacks to minimize views from below. Building heights, locations, materials, colors and surrounding landscaping will be restricted through Design Standards established with participation by community representatives.

Line-of Sight Study: A detailed line of sight study will be completed in later stages of the planning process, which demonstrate the lack of views or limited views of residential structures and the clubhouse.

4.16 SOCIAL AND ECONOMIC CHARACTERISTICS

This section includes a presentation of demographic conditions in the project area, and the potential effects of the project on demographics. New data from the 1990 U.S. Census have not yet been compiled by the government, therefore, information sources reflect the 1980 U.S. Census and any available recent survey data. Economic factors and employment are also considered in this section, as well as government expenditures and revenues. A brief discussion of lifestyles is also presented herein.

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4.16.1 Population

A detailed demographic study was conducted for the project by Community Resources, Inc. (January 1991) and is included in Appendix S. Information from this report is summarized in this section.

A. Existing Conditions

The populated parts of Sunset Beach/Pupukea/Waimea fell in Block Group 2 of Census Tract 101 in the 1980 Census (U.S. Bureau of the Census, 1981). In 1980, 3,212 people lived in this area surrounding the project site. The wider study area -- the combined North Shore/Kooloauloa regions -- had a population of 24,044 in 1980. For 1989, the combined area population has been estimated as 26,396 by the City and County of Honolulu, and 28,700 by the State of Hawaii (Honolulu Department of General Planning, 1990; Hawaii Department of Business and Economic Development, 1980).

The population of the combined regions grew by about two percent annually between 1950 and 1980. The official City and County estimate for 1989 indicates a slowing of population growth to an annual average of one percent. (The State estimate indicates continuing growth, at an annual level of 1.9 percent during the 1980's.)

The 1989 estimated population of the North Shore/Kooloauloa combined regions amounts, according to the City and County, to 3.1 percent of the island-wide total. For the North Shore Development Plan Area, DGP estimates a 1989 population of 14,008.

Ethnically, the dominant group in the primary Pupukea/Sunset Beach/Waimea area is Caucasian (over 60 percent), followed by Filipino (13 percent), Hawaiian (12 percent) and Japanese (seven percent) based upon 1980 census data. This is exceptional when compared to the total study area, where Caucasians accounted for only 35 percent of the population, with good representation by Hawaiians (18 percent) and Filipinos (18 percent).

For the combined regions, only 42 percent were Hawaii-born, and in the Sunset Beach/Pupukea/Waimea area, the percentage dropped to 35 percent. Over 60 percent of household heads surveyed in that small area were originally from the Mainland United States.

B. Anticipated Impacts

The development of approximately 120 country lots and 180 affordable residences within the proposed recreational community could add approximately 252 residents by 1995, increasing to approximately 697 residents by its completion in 1997. Of this total, there could be approximately 193 full-time residents at the country lots, and approximately 504 full-time residents at the affordable housing. Affordable housing could represent about 72 percent of the total full-time population at Lihi Lani.

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It is expected that approximately 50 percent of the country lot residents will be part-time residents, in that many will be retired people who purchase a residence in the project as a second home, and others will purchase a residence as a vacation home.

Including the on-site residents, the daytime visitor and worker population within the project could lead to a "de facto population" of approximately 578 persons on-site by 1995 (including 204 construction workers) and approximately 1,019 persons upon completion of the project in 2001 (KPMG Peat Marwick, 1991).

Some addition to the in-migrant population of Oahu will occur as a result of the project. Approximately 15 percent of the project's operational employment is expected to move to Oahu from elsewhere. In-migrant workers will be accompanied by household members, with one household member per worker added to the area's population. At the time of build-out, the total on-site residential population increase attributable to the project is estimated to be 27 persons. The total in-migrant population increase including on Oahu both off-site residents and employees is estimated at 45 persons.

The 2010 GP Population Distribution Guidelines are part of the policy for population distribution projected for Oahu over the next twenty years. For the North Shore this Guideline is between 1.6 and 1.8 percent of the total Oahu population. The total projected Oahu population for 2010 is 1,019,500.

Lihi Lani will generate approximately 700 full-time residents to the North Shore DP Area. This amount of additional population equals 0.07 percent of the projected 2010 Oahu population, which is smaller than the smallest unit of measure used in the Guideline. Thus, the population increase associated with Lihi Lani is of too small a magnitude to materially alter the degree of consistency of the North Shore's development capacity with its Population Distribution Guideline.

This finding is further supported by the lack of precision in the available estimates of just the current (1989) population. For example, the State estimates a 1989 population of 28,700 for the combined census tracts of the North Shore and Koolauloa, whereas the City and County estimates it to be 26,400. This is a difference of 2,300 people, or more than three times the projected population of Lihi Lani.

Added to this are differences between valid lower and upper estimates of average household size in 2010, and of the percentage of housing units which will be occupied in that year. Each of these will by themselves have a significant impact on estimates of the 2010 population for the North Shore.

Given the multiple uncertainties as to the accuracy of projections of the North Shore's development capacity under existing zoning, it cannot be argued that an addition of 700 people to that capacity will materially alter its consistency with the 2010 Population Distribution Guideline.

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For the North Shore, a feeling of open space and low residential densities have been identified as valuable. As a low-density residential project, the proposed Lihl Lani development is in line with these goals.

C. Mitigative Measures

The project has been designed in a manner consistent with the goals of the City and County General Plan. Obayashi is currently in discussions with DGP regarding the population increase proposed. The relationship of the project to GP Population Guidelines is also discussed in Section 6.2, and will be evaluated by DGP in conjunction with other General Plan Objectives and Policies during their comprehensive review of this project.

4.16.2 Employment, Personal Income and Consumer Expenditures

This section includes a discussion of existing conditions, anticipated impacts and proposed mitigative measures regarding the relationship of the project to employment, personal income and consumer expenditures. A detailed economic and fiscal impact study has been prepared for the project by KPMG Peat Marwick (January 1991). Information from this report is summarized below, and the complete report is enclosed in Appendix T.

A. Existing Conditions

Existing conditions in the North Shore area for employment, personal income and consumer expenditures are reported below.

1. Employment

Approximately 69 percent of the residents in the Pupukea/Sunset Beach/Waimea area are part of Oahu's work force (1980 Census). According to the Kuilima Survey (1990), nearly 43 percent of these workers are employed in the greater North Shore area. A large percentage of the area's workers commute to elsewhere on Oahu, approximately 44 percent.

Considering the "country" atmosphere, a strikingly high proportion of Pupukea/Sunset Beach/Waimea adults have "white-collar" or professional/managerial jobs, approximately 46 percent. Less than two percent are part of the plantation/farm work force. Service occupations may account for a large percentage of the work force that work nights and weekends (Community Resources, Inc., 1991).

Unemployment in the total study area as of 1989 was near the island-wide average (2.2 percent). The Pupukea/Sunset Beach/Waimea area had higher unemployment at 3.4 percent (pers. comm., Fragante, Department of Labor and Industrial Resources, December 14, 1990).

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The major employers in the North Shore and Koolauloa Regions are the Kuilima Resort in Kahuku, Waialua Sugar, and the Polynesian Cultural Center in Laie. In the Pupukea/ Sunset Beach/Waimea area itself there is minimal economic activity. The Foodland supermarket is the largest retailer in the area, located at Pupukea Road. Waimea Falls Park, a top Oahu recreation and tourist attraction, employs about 40 area residents. Several agricultural operations, service stations, and "cottage industry" businesses are located along Kamehameha Highway in the project area.

Haleiwa has a variety of typical commercial activities such as grocery, restaurant, real estate and hardware. Specialty businesses such as surfboard sales and manufacturing also are found in Haleiwa.

2. Personal Income

The median household income for the Pupukea/Sunset Beach/Waimea area in 1979 was \$24,451. This figure was slightly above the County's median income (\$21,100) and substantially above the North Shore area's median income at \$17,900. Most families in the larger North Shore/Koolauloa area, however, had incomes well below the island-wide median.

Preliminary results from Community Resources, Inc., suggest that household incomes in the larger study area remain below island-wide norms, and that the median household income in the primary Study Area may have fallen to about 80 percent of the island-wide average.

3. Consumer Expenditures

Due to the limited economic activities in the area, consumer expenditures are minimal, being spent on items such as food, retail goods, household goods, and entertainment products, especially ocean-sports items.

B. Anticipated Impacts

1. Employment

Two types of employment opportunities can be expected to be created by the project, including construction jobs and operational jobs. Direct employment effects would be those supported by construction and consumer expenditures generated by the project. The total employment effects include the direct employment effects in addition to indirect and induced effects, which are supported through spending multipliers throughout the the State.

KPMG Peat Marwick (January 1991) projects that an average of 204 direct construction jobs will be available annually at the beginning of the building phase, from 1993 through 1995. Direct construction employment will tail off toward the end of the construction period to an average of 79 jobs per year in the period from 1996 through 2000. Indirect and induced construction employment is estimated at about 163 jobs in 1993-1995, down to 63 jobs in 1996 through 2000.

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The majority of direct operational employment at the development would occur in the golf-related facilities. The Lihi Lani golf course will probably employ between 30 and 40 people. Tennis center, equestrian ranch, property management and real estate sales employments are estimated to total between 15 and 20 direct employees. (Table 18).

Thus, the recreational community could be expected to have generated about 45 full-time equivalent direct operational positions by 1995, and about 60 full-time equivalent positions at project stabilization in 2000.

Indirect and induced operational employment could be expected to generate approximately 33 full-time equivalent positions by 1995, and approximately 42 full-time equivalent positions up to the year 2000.

Total direct, indirect and induced operational employment is estimated to represent about 78 full-time equivalent positions by 1995, and 102 positions by 2000 (KPMG Peat Marwick, January 1991).

2. Personal Income

According to KPMG Peat Marwick (January 1991), it is estimated that personal income paid to Hawaii residents due to Lihi Lani could be expected to amount to about \$8.5 million per year during initial construction in 1993 through 1995. In the ensuing years, it could amount to \$0.9 million per year, as construction activity subsides and operational employment demands increase.

3. Consumer Expenditures

Visitors to and residents of the community would make direct expenditures for golf-related fees and rentals and for purchases of food, beverages, other goods and services. These expenditures would, in turn, require those establishments serving direct visitor demands to purchase goods and services from other establishments in the State. The latter expenditures are considered indirect effects of the original visitor expenditures. Induced expenditures are those made by employees and proprietors with income derived from establishments benefitting from these new direct and indirect expenditures.

Projected direct, indirect and induced consumer expenditures generated by non-Lihi Lani residents as a result of the project are expected to reach approximately \$9.76 million in 1995, increasing to \$12.05 million per year by the year 2000, and \$11.78 million thereafter.

C. Mitigation Measures

The impacts of the project on employment, personal income, and consumer expenditures appear to be beneficial to the area residents and businesses. Consequently, no mitigative measures are needed or recommended.

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TABLE 18
PROJECTED DIRECT, INDIRECT
AND INDUCED OPERATIONAL EMPLOYMENT

	<u>1995</u>	<u>2000</u>
DIRECT EMPLOYMENT		
Golf Club and Course (1)	30	40
Tennis Center	-	10
Equestrian Ranch	5	5
Property Management and Sales	<u>10</u>	<u>5</u>
TOTAL	45	60
INDIRECT AND INDUCED EMPLOYMENT (3)	<u>33</u>	<u>42</u>
TOTAL OPERATIONAL EMPLOYMENT	78	102

-
- (1) Operational employment based upon comparable local golf courses similar to the semi-private course. Includes clubhouse, food and beverage, and retail facilities as well as course management and maintenance.
- (2) Estimated at 0.7 full-time equivalent positions per direct position for golf, tennis and equestrian; 0.9 full-time equivalent positions for property management and sales. Based on the Hawaii State Department of Business and Economic Development, (DBED) Input-Output Model, 1987, as reported in the 1989 State of Hawaii Data Book.

SOURCE: KPMG Peat Marwick (January 1991)

4.16.3 Housing

A. Existing Conditions

The housing market on Oahu is generally characterized by high land costs, the presence of many condominium units, and pent-up demand for housing. Near the project in Pupukea/Sunset Beach/Waimea, however, a relatively large number of housing units (14 percent) are vacant or held for occasional use in 1980 (Census). The estimated 1989 vacancy rate is about 3 percent (Honolulu Department of General Planning, 1990). High prices and a lack of available units help to explain why there appears to be widespread overcrowding and house sharing in the total study area (Community Resources, Inc., 1991).

The majority of occupied units in the project area are for rent, at a price above the average levels found island-wide and in the surrounding districts. The shore and inland areas differ in terms of occupancy. Only 36 percent of the occupied housing units in Pupukea Highlands were for rent (1980), compared to 67 percent of the shore units.

The average price of owner-occupied housing in the Pupukea/Sunset Beach/Waimea area is above the island average. The median value in the surrounding region is, however, much lower. Thus, the area near the project stands out as having both a high concentration of relatively high quality homes and, along the shore, numerous rental units.

No major changes have been proposed for the housing stock in the immediate area of the project. In the surrounding area, planned and proposed residential projects are largely intended for the visitor market, and not to meet the housing needs of persons now living in Hawaii.

Affordable housing for low to moderate-income families is being constructed at Kahuku as part of two programs. The Kahuku Housing Corporation began construction of 289 units in 1987. Current construction is now overseen by the Kahuku Village Association. Approximately 177 units remain to be built by 1993. The bulk of these homesites are reserved for Kahuku residents.

The other housing development program planned in Kahuku involves the provision of up to 200 housing units as a condition of the City and County approval of the Kuilima Resort expansion (1985 approval). These are for low to moderate income families residing in Koolauloa or the North Shore.

B. Anticipated Impacts

The development of the Lihi Lani Recreational Community is expected to add approximately 120 country lots and 180 affordable units to the study area housing supply. The price range for the affordable units will be in keeping with the requirements for affordability as set forth by the City and County of Honolulu. Some

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new employees will likely move into the Koolauloa/North Shore Region, attracted by these jobs. Based on studies conducted by Community Resources, Inc., the housing impact of employee in-migration to the combined study area is about 10 to 25 housing units after build-out. The high end of this range amounts to less than 15 percent of the affordable housing to be built at the project.

One-hundred and twenty of these homes could be constructed on lots of one acre or larger area, some of which will have ocean and golf course views. All lots are anticipated to be sold and built by 1999. These lots are expected to be sold at median to high price levels, as compared to other lots being sold in the Pupukea/Sunset Beach/Waimea area. Approximately 80 percent of the lot buyers are expected to be from Oahu or another of the Hawaiian islands; 20 percent from outside of Hawaii.

Only 50 percent of the country lot residences are expected to be occupied full-time. Many owners of residences at Lihi Lani will be retired people who purchase a residence as a second home, and others who purchase a residence as a vacation home.

C. Mitigative Measures

The applicant will fulfill conditions related to the provision of affordable housing which may be imposed in connection with project approval processes. Twenty-eight acres have been reserved for the provision of 180 affordable homes on-site. This affordable housing is planned to be built by Obayashi, representing 60 percent of the total residential units to be developed at Lihi Lani.

4.16.4 Government Revenues and Expenditures

A. Existing Conditions

The project site is currently vacant and Obayashi currently pays approximately \$104,000 per year in City and County property taxes (Peat Marwick, January 1991). There are no current public expenditures being made for direct services to the site due to its inaccessibility and undeveloped nature.

B. Anticipated Impacts

1. Revenues

Development of Lihi Lani would bring additional tax revenues to the County and State governments. County government revenues would be principally in the form of real property taxes on the new facilities. Revenues to the State government would be composed principally of general and specific excise taxes and personal income taxes paid by new State residents and the general excise tax on sales revenues attributable to day visitors to the community.

Net additional real property taxes were projected according to assessed values for other comparable golf and club facilities in the State and preliminary construction

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costs provided by Obayashi Hawaii, less the current property taxes generated by the undeveloped site. Based on these rates and estimated assessed values, the proposed residential lots, affordable homes, private club, golf course, tennis, equestrian, campground and other community facilities could be expected to generate about \$590,000 (1990 dollars) in new property tax revenues per year by 1995 for the City and County of Honolulu and about \$910,000 per year by 2000 (1990 dollars).

New revenues to the State government would be generated by the four percent general excise tax on direct expenditures by day visitors to the project. In addition, new residents attracted to the State by the employment or residential opportunities of the project would bring in additional excise sales taxes, individual income taxes and other State taxes such as liquor, tobacco, fuel, inheritance, estate and conveyance taxes. Thus, new total tax revenues to the State government attributable to the project's development are expected to be about \$210,000 per year (1990 dollars) by 1995, increasing to about \$290,000 per year (1990 dollars) by 2000 and \$280,000 per year thereafter.

2. Expenditures

New visitors and residents attracted by the project would also necessitate additional expenditures of state and county public resources.

In-migrant residents would incur public costs in terms of public safety, maintenance of highways, recreational facilities and natural resources, health and sanitation measures, special cash capital improvements, education, retirement and pension funds, public welfare and other government functions.

Day visitors increase the average daily population of the community and also require public expenditures in terms of public safety, maintenance of highways, health and sanitation, recreation and special cash capital improvements. Because visitors are expected to spend half a day or less at the site, the projections assume each day visitor incurs 50 percent of the average visitor operating costs to the County and the State.

Honolulu City and County government expenditures totaled about \$607 and \$337 per capita in 1989 dollars for residents and visitors, respectively. Based on these outlays and adjusting for inflation, public expenditures by the County on behalf of the service population for the development could be expected to reach \$20,000 per year in 1995 and increase to about \$70,000 per year by 2000 (1990 dollars).

State government operating expenditures totaled about \$2,886 per resident and \$574 per full-time equivalent visitor in 1989. Based on these operating costs and adjusting for inflation, State government expenditures are projected to total about \$30,000 per year by 1995, increasing to about \$170,000 per year at project completion in 2000 (1990 dollars).

3. Net Fiscal Impacts

A comparison of projected public revenues and expenditures attributable to the project's development is given in Table 19 as shown, the County government could expect to net \$570,000 in 1990 dollars per year by 1995, increasing to \$840,000 per year by 2001. Additional county government revenues generated by the proposed golf community and its facilities could be almost 30 times the operating expenditures incurred by the County government by 1995, and about thirteen times these expenditures by 2001.

Net additional fiscal benefits to the State government are projected to be about \$180,000 per year by 1995, decreasing to approximately \$120,000 per year by 2000, and slightly lower at \$110,000 per year thereafter in 1990 dollars. Additional State government revenues would be about seven times the expenditures incurred in 1995 and about 1.6 times to the expenditures in 2000.

C. Mitigation Measures

Since future tax revenues that will be collected by the City and County and the State are expected to offset the costs of providing some public services. No additional mitigation measures are considered necessary with respect to government expenditures.

4.16.5 Lifestyles

A. Existing Conditions

Nearly all residents of the North Shore/Koolauloa region prize "country" living. Different residents may emphasize different aspects of area lifestyles. For some, the magnificent surfing opportunities come first. For others, homes on the North Shore are prized as away from urban development, affording a chance at relatively independent lifestyles. Others live in towns where all know each other, and where residents have felt part of a community for generations.

Many area residents live in the vicinity of the project site for the water-related activities such as swimming, sailboarding, surfing, snorkeling and SCUBA diving. Nearby are the Banzai Pipeline, Sunset Beach and Waimea Bay, which are among the most famous surfing locations in the world. Local amateur surfing contests and international professional surfing contests are held each winter season (October-March) on the North Shore at Sunset Beach, Ehukai Beach Park (Banzai Pipeline), Waimea Bay Beach Park, Chunn's Reef in Kawaihoa, and at Alii Beach Park in Haleiwa.

Nearly two-thirds of the study area population in 1980 lived in small towns with business centers and well-defined neighborhoods, i.e., Waialua, Haleiwa, Kahuku, Laie, and Hauula. Many of these communities are or were once "company towns", resulting in some clear lines of social organization. They are more subject to small-town pressures for cooperation and social cohesiveness. There is a history of third-

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TABLE 19
COMPARISON OF GOVERNMENT REVENUES AND EXPENDITURES

	(In millions; 1990 dollars)	
	1995	2001
<u>County Government</u>		
New Revenues	\$0.59	\$0.91
New Expenditures	0.02	0.07
Net Additional Revenues	0.57	0.84
Revenue/Expenditure Ratio (1)	29.5	13.0
<u>State Government</u>		
New Revenues	\$0.21	0.28
New Expenditures	0.03	0.17
Net Additional Revenues	0.18	0.11
Revenue/Expenditure Ratio (1)	7.0	1.6

(1) New revenues divided by new expenditures.

SOURCE: KPMG Peat Marwick (January 1991)

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and fourth-generation families seeking preservation of their particular community as a home for the next generation.

Thus, centralized employment centers and large-scale economic activity are (to a point) historically compatible with the lifestyles and values of the community dwellers of this region. Some of these residents have banded together in response to the closure of Kahuku Plantation and the possibility the Waialua Sugar too might close.

Other residents who have in-migrated to the area for the "country" or ocean-sport oriented lifestyles are less conditioned or reliant upon employment within the greater North Shore/Koolauloa area. Some of these residents have been most active in opposing new projects seen as encroaching on the area's character.

B. Anticipated Impacts

Lihi Lani could potentially affect the lifestyles of some North Shore residents in two ways. Because of the varied recreational elements the project will offer, the development will supplement and expand the recreational activities available to residents of the area. The presence of these new activities, however, will be perceived by some North Shore residents as a threat to the continuing existence of this relatively uncrowded rural setting. The added traffic and visual effects of the project's entrance could somewhat detract from it's current setting.

A comparison of development density shows the existing gross density in the Pupukea Highlands subdivisions (1,329 acres total with 384 dwelling units or 0.87 persons per acre) is higher than that being proposed for the Lihi Lani project (1,143 acres total with 300 dwelling units or 0.61 persons per acre). The overall affect on lifestyles on the North Shore of the Lihi Lani project will be a continuation of the current development patterns and trends, and an enhancement of recreational opportunities and community facility resources.

C. Mitigative Measures

The design and operation of the development is planned to complement the existing country atmosphere of the North Shore. The intent is not for the new project to intrude on the community, but to blend into the surrounding area and become an integral part of the North Shore. The varied recreational elements offered by the project will add to the rural and recreational-oriented lifestyle of the North Shore. New hiking trails provided on the site will add new public access and scenic views (at no fee) on lands which previously were inaccessible. A community center will provide a site for area residents to pursue recreation, social and cultural activities.

A comparison of development density shows the existing gross density in the Pupukea Highlands subdivisions (1,329 acres total with 384 dwelling units or 0.87 persons per acre) is higher than that being proposed for the Lihi Lani project (1,143 acres total with 300 dwelling units or 0.61 persons per acre). The overall affect of Lihi Lani on lifestyles on the North Shore will be a continuation of the current

development patterns and trends, and an enhancement of recreational opportunities and community facility resources.

4.17 INFRASTRUCTURE

This section includes brief descriptions of the existing infrastructure on the project site and the surrounding area for water supply, wastewater collection, treatment and disposal, solid waste disposal, drainage facilities and roadways. Anticipated project impacts are evaluated along with mitigative measures proposed to minimize impacts on infrastructure. Engineering Concepts, Inc. (December 1990) has prepared technical studies of wastewater management, water supply and storm drainage for this project. The complete reports are included in Appendices B, C and D, respectively. Information from these reports is included in this section.

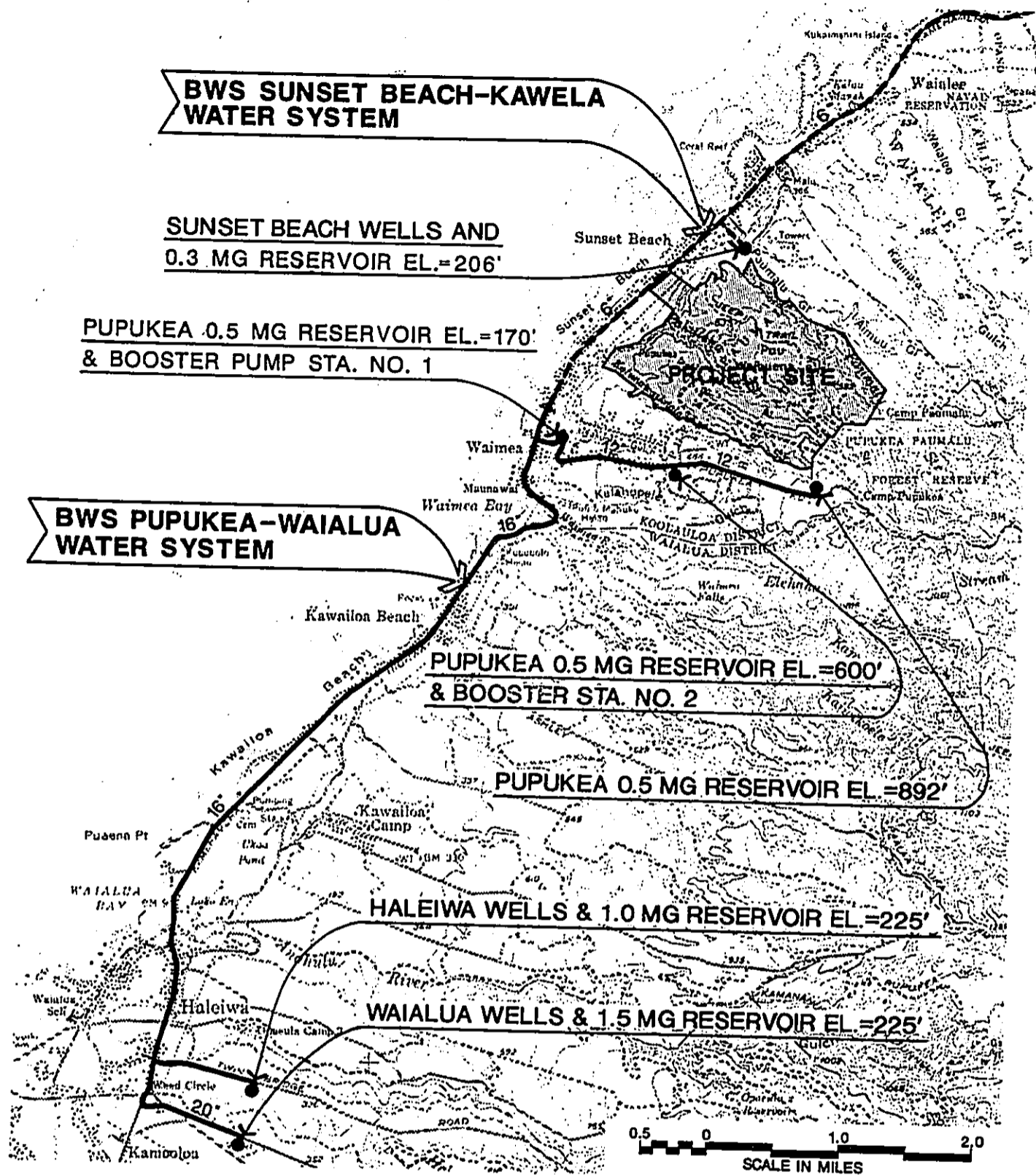
4.17.1 Water Supply Facilities

A. Existing Conditions

As discussed in Sections 2.2 and 4.5, water for areas Haleiwa-side of Puula Road on the North Shore is supplied from Board of Water Supply (BWS) wells in Waialua and Haleiwa via a 16-inch water transmission main in Kamehameha Highway. Figure 30 shows the existing water supply system, as "BWS Pupukea-Waialua Water System". All of Pupukea Highlands and Sunset Hills is served by this transmission system.

For water supply to the Pupukea Highlands and Sunset Hills area (upper and lower areas), BWS has installed transmission lines (12-inch main), pump stations and three 500,000 gallon reservoir systems (Figure 5). There are three water service zones supplied by this system. There is a storage reservoir at 170 feet elevation on Pupukea Road. This reservoir provides water for lower Pupukea to an elevation of 70 feet. Two 800 gpm booster pumps transport water to the second reservoir, located on Pupukea Road at an elevation of approximately 600 feet, and serves areas from 70 feet to 500 feet elevation. Two additional 800 gpm booster pumps transport water to the third reservoir, also on Pupukea Road, located at an elevation of 892 feet, which serves areas from 500 feet to 792 feet.

Water use from the Waialua and Haleiwa wells was estimated to be 2.17 million gallons per day (mgd) in 1988, with future commitments up to 2.5 mgd. The Board of Land and Natural Resources (BLNR) sets limitations on groundwater withdrawal. Currently, BWS' allocation from BLNR is 2.73 mgd. Thus, 0.23 mgd is currently available to the BWS for future development. The total "sustainable yield" (the maximum draft from the source that can be sustained indefinitely without detrimental effects on the aquifer or other water developments) of the wells at Waialua and Haleiwa is 3.0 mgd. Therefore, an additional allocation of 0.27 mgd could be granted to the BWS before the sustainable yield is reached.



**EXISTING BWS WATER SYSTEM
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SOURCE: ENGINEERING CONCEPTS, INC. (DECEMBER 1990)



FIGURE 30

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The property owner has water storage and transmission credits totalling approximately 485,000 gpd as a result of participating in the development of the BWS Pupukea Highlands water system (161,667 gpd at each of the three Pupukea reservoirs).

There is no water transmission system presently extending to the project area.

B. Anticipated Impacts

The project will require an average daily potable water demand of approximately 190,000 gpd (or about 0.19 mgd) to meet potable water needs. If the existing excess allotment is not available at the time of development, the BWS will need to apply to BLNR for 0.19 mgd additional allocation to meet the development needs of the project. There is 0.27 mgd available within the total sustainable yield of the Waialua aquifer (3.0 mgd), therefore, no negative effect on the water supply system (and the aquifer) is expected due to the project's water demand.

Service to the project will be extended from both the Pupukea Highlands "high" service zone (892 ft. reservoir) and "low" service zone (600 ft. reservoir). The planned Community Facilities will be served by the existing 170-foot system. In terms of infrastructure impacts, the extension of water service will require installation of new water mains through parts of Alapio Road in Pupukea Highlands and Wilinau Road in Sunset Hills. Dust, noise and traffic disturbances will result from short-term construction activities along these local roadways.

Existing BWS consumers in the Pupukea Highlands and Sunset Beach subdivision who are serviced by the 892-foot and 600-foot reservoirs will not be adversely affected by the increase in water demand by the project. These water systems in Pupukea are currently operating well below their design capacity. The systems were designed to accommodate the additional water demand of the project.

Fire protection and domestic service pressure requirements within the project will be satisfied by the development of a 0.30 mg storage reservoir on the site. This is a relatively small reservoir, requiring a maximum pad area of 100 square feet, located adjacent to the wastewater treatment facility. Construction of the reservoir will involve some vegetation clearing and minimal grading.

C. Mitigating Measures

There are several mitigative measures that will be implemented to minimize the impact on water supply infrastructure, as listed below.

Off-Site Water Facilities Construction: The potable water system associated with the project will not adversely affect the existing infrastructure for water supply. Mitigation of nuisances during construction such as dust, noise and traffic disturbances will be accomplished by: limiting construction to weekdays during working hours when many residents are not at home; use of wind breaks or

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watering to reduce dust; and observance of approved traffic control plans.

Water Source Development. Depending on potable water source limitations, Obayashi may be required to participate with the Board of Water Supply in drilling wells off-site at Waialua. Facility charges would be paid, as appropriate, for the new source development.

4.17.2 Wastewater Facilities

A. Existing Conditions

There is no area-wide wastewater collection, treatment and disposal system on the North Shore. The only existing facilities for wastewater collection treatment and disposal in the area of the project are individual cesspools and holding tanks which exist on private residential properties. At present, there are no known plans for an area-wide wastewater collection/treatment system for the Sunset Beach and Pupukea area.

B. Anticipated Impacts

Development of the project will involve the construction of a private wastewater collection, treatment and disposal system that will only serve this project. On-site advanced secondary wastewater treatment will be conducted through the use of facultative stabilization ponds followed by a wetlands system. This system is being proposed in direct response to a community preference over other "hard structure" facilities for wastewater treatment. This process is described in Section 2.2 and in Appendix B. The estimated wastewater volume at completion of the project will be approximately 200,000 gpd. Treated wastewater effluent will be utilized for irrigation of the golf course. Effluent disposal by irrigation of the golf course is discussed in Section 2.2 and Section 4.5.. Adverse impacts to the groundwater aquifer due to effluent disposal by irrigation are not foreseen.

C. Mitigative Measures

Because public wastewater facilities will not be affected by this project, there will be no mitigative measures required for public facilities. Obayashi will provide back-up measures for its on-site facilities.

Back-up Features for Wastewater Treatment and Disposal: Back-up measures will be taken with wastewater treatment and disposal facilities to ensure the safety and environmental sanctity of the community in the case of a mechanical or electrical failure. The following are the safeguards proposed for the wastewater treatment facility and sewage pumping stations:

- Odor control measures are not expected to be needed however, contingency provisions will be included in the design and the budget to incorporate odor abatement facilities, should the need arise.

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- Stand-by power will be provided to each sewage pumping station and the Wastewater Treatment Facility in case of electrical power outage. (Depending on location, some sewage pumping stations may share generators.)
- Storage vaults will be used for wastewater overflow and storage.
- Redundant or parallel sets of waste stabilization ponds, equal in capacity, will be constructed to provide operational redundancy during periodic instances for pond maintenance.
- Alarms and telemetering will be installed to provide warnings to indicate high/low liquid level conditions, equipment malfunction and other emergency conditions. Signals will be transferred through telephone lines by telemetry to the homes of key maintenance personnel as an additional safety measure during non-working hours.
- Alarms will be installed at each pump station indicating high/low liquid level conditions, equipment malfunction, and other emergency conditions.
- Pump stations, treatment ponds and the wetlands will be fenced to restrict public access. Additionally, these facilities will be landscaped or otherwise shielded from direct view.
- Effluent reuse facilities, including piping and appurtenances, in areas subject to public access will have warning signs that irrigation water is not fit for consumption. Piping and appurtenances will be labeled to distinguish the product as reclaimed sewage effluent.

The effluent will be tested to meet criteria stated in the proposed Hawaii Administrative Rules, Title 11, Department of Health, Chapter 62, Wastewater Systems.

The irrigation pond will be designed to accommodate ample storage for effluent during periods of inclement weather.

4.17.3 Solid Waste Disposal Facilities

A. Existing Conditions

The small amount of solid waste generated on the project site is presently carried off-site by the farm helpers to transfer stations or public or private landfills.

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B. Anticipated Impacts

At full development, the on-site residents, visitors and employees will generate approximately 2.3 to 4.0 pounds per capita of refuse daily. This will equate to a maximum of 4,000 to 6,000 pounds per day (2.0 to 3.0 tons per day) of refuse. Solid waste will be collected by private collection companies and disposed of at public and private landfills. This will place a small additional demand on City and County waste disposal facilities.

C. Mitigative Measures

Recycling: Cleared trees that cannot be preserved on-site will be mulched for re-use within the project. Separation of garbage or other island-wide programs for recycling will be supported by Obayashi in the operation of recreational facilities.

Solid Waste Disposal: It is expected that City and County revenues derived from the completed project will be sufficient to finance the project's fair share of the cost for major capital improvements, such as solid waste disposal facilities. The County has constructed a solid waste transfer station in Kawailoa which is currently operating. Solid waste collected at this transfer station will be hauled either to a Windward Sanitary Landfill site for disposal, or the currently operational refuse-to-energy plant in Campbell Industrial Park.

4.17.4 Drainage Facilities

A. Existing Conditions

Public drainage facilities in the area of the project consist primarily of culverts passing underneath Kamehameha Highway. These culverts transmit waters flowing in the intermittent streams (during peak precipitation periods) into the ocean. Culverts have been installed at Kamehameha Highway for Paumalu Stream, Pakulena Stream and Kalunawaikaala Stream.

Drainage collection facilities and injection wells have been installed by the City and County of Honolulu along Ke Nui Road across from the Sunset Beach Elementary School. In the recent past, drainage from the soccer field and playground of the Sunset Beach Elementary School had contributed to flooding of areas along the Ke Nui Road area across from the school. The drainage improvements have served to alleviate some of the flooding problems in this area.

B. Anticipated Impacts

An increase in storm water runoff will be created on-site by the development of paved areas and roofs, which will be controlled on-site. Details regarding drainage impacts are discussed in Section 4.6.1.

C. Mitigative Measures

Storm Water Runoff Controls: Development of the project will not place any additional burden on public drainage facilities along Kamehameha Highway, or create any potential flood hazards for properties in the area. Control of runoff within the project will be achieved through the construction and operation of detention basins throughout the project. Storm runoff water will be detained during major storms which will effectively maintain existing runoff conditions. Any future flooding that may occur in areas adjoining the project will not be the result of the project, because runoff will be controlled on-site.

It is expected that public drainage facilities will not be affected by the project, therefore, no additional measures are proposed beyond the planned on-site detention basins.

Construction Schedule: Obayashi will endeavor to schedule the six-month road construction period to coincide with the lower precipitation period of April to October.

4.17.5 Roadways

A. Existing Conditions

Significant public roadways in the area of the project include: Kamehameha Highway (State Highway 83) and Pupukea Road. Along Kamehameha Highway are numerous direct connections to residence driveways and smaller local roads, many of which are unpaved. Ke Nui Road parallels Kamehameha Highway along the ocean front residential areas near the project, as also do Ke Waena Road and Ke Iki Road. In Pupukea Highlands, side roads off Pupukea Road extend throughout the large-lot subdivision areas. Alapio Road is a neighborhood road connecting off Pupukea Road. Within Sunset Hills, Wilinau Road connects off Alapio Road to the Haleiwa-side boundary of the project.

The condition of most roadways in the area of the project is rough pavement, and in some areas, roadways are overdue for maintenance. Most roadways have grass shoulders and are paralleled by drainage ditches. Guide rails are present along some bends in the Highway. Lighting and signage are present on the more frequently traveled routes off the Highway.

B. Anticipated Impacts

The impact of project development on local roadways will consist of construction impacts and operational impacts. The short-term effects of the project will be due to construction activities, which are not expected to be significant. Delays on Kamehameha Highway will occur due to roadway improvements for the entrance to the project and turning lane addition. Construction of water mains to be installed in Alapio Road and Wilinau Road in Pupukea Highlands and Sunset Hills will also cause some minor traffic detours and delays.

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Long-term operational impacts of the project will not cause a substantial adverse affect on roadway surface conditions. As compared to other traffic added to the area's roads by the project's completion (1997), the vehicles added by the project will represent approximately seven percent of all vehicles. This traffic volume is not expected to create a substantial additional adverse wearing effect on the roadway facilities.

C. Mitigative Measures

Roadway surfaces affected by construction of the project entrance and the water main installation will be re-paved once construction is completed. Approved traffic control plans will be followed during the construction period to avoid unnecessary delays to traffic flow. A left turn lane will be added on Kamehameha Highway for the Haleiwa-bound traffic turning into the project. This storage lane will provide better safety to avoid rear-end collisions, and will allow unimpeded flow of through-traffic towards Haleiwa. Obayashi will monitor traffic flow conditions at this intersection periodically, to assess the need for traffic signalization in the future. If and when a signal is required, Obayashi will install signals to State DOT standards.

4.17.6 Electrical Supply

A. Existing Conditions

Hawaiian Electric Company (HECO) owns and maintains the existing electrical system which serves the project area. An existing 46 kV transmission line crosses a portion of the project site.

B. Anticipated Impacts

The Lihi Lani project could require an electrical demand as high as 2,700 kVa, which may affect future plans for a third sub-transmission line to the area. Given proper coordination w/HECO, the proposed project will not have an adverse impact on electrical supply facilities.

C. Mitigative Measures

Obayashi will coordinate it's subsequent development planning efforts with HECO's planning efforts to supply power to the area. Obayashi will participate in providing necessary improvements to the electrical distribution system required to serve Lihi Lani.

4.18 PUBLIC SERVICES

Public services for education, police and fire protection, health care and recreational facilities are all addressed in this section. Existing conditions, anticipated impacts and mitigation needs were evaluated based on interviews with representatives from each of the public service entities.

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4.18.1 Schools

A. Existing Conditions

The nearest elementary school to the project is the Sunset Beach Elementary School (grades kindergarten to six) which is located adjacent to the makai section of the project site. Kahuku High/Intermediate School (grades seven to twelve) is located about eight miles from the project in Kahuku.

B. Anticipated Impacts

The proposed project includes the phased development of 120 market-priced homes on minimum one-acre lots and 180 affordable-priced homes. The current schedule anticipates that the affordable housing could be completed and occupied by 1997. The market residential lots are expected to be developed over a ten year period, after 1997. Upon completion, the project could produce an approximate enrollment of 85 to 100 students in grades kindergarten to six, 20 to 25 in grades seven and eight and 35 to 40 students in grades nine to twelve (Toguchi, State Department of Education, December 21, 1990). At least 72 percent of the school age children will be generated by the project's affordable housing.

Without the project, enrollment at the Sunset Beach Elementary School is expected to be stable in the future. The added enrollment of students generated by the project would amount to an estimated 20 percent of the existing enrollment. It is anticipated that these students will not be accommodated within the Elementary School's recently completed permanent facilities.

Kahuku High and Intermediate School is operating beyond capacity with a severe shortage of classrooms. The project is expected to have an impact on this school. The added enrollment would constitute about 3.5 percent of the existing enrollment. The project's school age children would also exceed the capacity of the school.

C. Mitigative Measures

Several measures are proposed to minimize impacts on school facilities.

Alternative Sites for Affordable Housing: Alternative sites for affordable homes will be discussed with the City and County of Honolulu with respect to availability of educational facilities.

Operational Funds: The proportion of projected State tax revenues generated by this project which will be allocated to education will more than cover any additional operational expenses.

Part Time Residences: Some country lot residences at Lihi Lani will be part-time residences. Hence, it is expected that increases to the school age population will be somewhat less than the maximum figures indicated above.

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Scholarship Trust Funds: Obayashi Hawaii will establish a trust fund for scholarships and other educational programs. Contributions would amount to \$5,000 per market lot, from initial lot sales. Contributions would hence total about \$600,000. Contributions plus interest would go to study area schools and students.

4.18.2 Police Protection

A. Existing Conditions

The project site is located in the Honolulu Police Department's District 2. The region encompasses the area marked by the following boundaries: Kaena Point along the North Shore coast to Waialeale Stream, down the Koolau Mountain Ridge to Kipapa Stream, across to Waiahole Ditch near Kunia, and up the Waianae Mountain Ridge back to Kaena Point. Police protection is provided to the project area from the Wahiawa Substation.

The beat boundaries of the second District encompass an area of approximately 190 square miles. This area is covered by 71 field officers. Response time to the Pupukea area fluctuates over time, but was recently estimated to be 2 to 2.5 minutes (personal communication, Captain William Bennett, Wahiawa Substation, December 11, 1990).

B. Anticipated Impacts

There will be occasional and sometimes unavoidable demand for police service at the project. During events which may be held at the golf courses or equestrian facilities, additional police protection could be required to control traffic and pedestrians.

C. Mitigative Measures

The applicant will be taking measures to provide security on-site during construction. In addition, private security services will be provided within the project upon completion. Besides private security measures, additional private manpower would be provided by the event sponsors, in coordination with local police officials. Tax revenues generated by the project should more than cover the costs of additional police services attributable to the development (Peat Marwick, 1991).

4.18.3 Fire Protection

A. Existing Conditions

The Sunset Beach and Kahuku Fire Stations are nearest to the project. They are able to provide ladder, engine, medical and marine rescue services. The Sunset Beach Fire Station is the closest to the proposed community, located approximately 1.5 miles from the project entrance. From this station, fire trucks are expected to be able

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to access the community in less than five minutes. Back-up fire fighting support for the area could be provided by the Kahuku Fire Station, located approximately eight miles away. (Personal communication, Captain Dan Miyashiro, Sunset Beach Fire Station, 11 December 1990.)

B. Anticipated Impacts

The planned community facilities will require fire protection from the local municipal fire department. Tax revenues generated by the project should more than cover the cost of additional services required of the fire station attributable to the development (Peat Marwick, 1991).

C. Mitigative Measures

Water lines and storage with adequate fire fighting capacity will be installed by the applicant within the project. The location of fire hydrants will be reviewed and approved by the Board of Water Supply and the Fire Department.

Buildings and facilities within the project will be designed with adequate attention to the principles of fire safety, and will also be built to follow necessary City and County fire protection standards. Safety precaution measures such as the installation of sprinkler systems and smoke detectors in buildings will also be undertaken.

The additional potential demand on fire protection services is not expected to place an unusual burden on the existing fire department or require the provision of additional facilities or equipment.

During subsequent planning phases, Obayashi will prepare a fire suppression plan to describe the proposed fire suppression accessways to the State Forest Reserve lands adjacent to the property.

4.18.4 Health Care/Hospitals

A. Existing Conditions

The nearest health care facility is the 26-bed Kahuku Hospital located approximately ten to fifteen minutes drive by car from the project site. This facility is also the site for one City and County ambulance and a helipad for medical evacuation helicopters.

The Kahuku Hospital offers comprehensive medical services on a 24-hour per day basis. Other facilities at the hospital include a private dental office and a medical office/clinic with three physicians in private practice.

B. Anticipated Impacts

The residents at the project's 300 homes that will eventually be constructed on-site, and visitors and workers at the various facilities in the project, can be expected to

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place a slight burden on the operation of the Kahuku medical facilities. The impact upon these facilities will be slight since the hospital is presently not operating at full capacity (Rikio Tanji, Administrator, Kahuku Hospital, 11 December 1990).

C. Mitigative Measures

No mitigative measures are considered necessary for health care services as a result of this project. However, Obayashi will likely continue in its support of Kahuku Hospital activities.

4.18.5 Recreational Facilities

A. Existing Conditions

There are several City and County recreational facilities and a State recreational facility located within the general area of the project. Private commercial recreational attractions are also located in the area. The beaches and ocean are the major recreational attractions in this part of Oahu.

The City and County of Honolulu has three lifeguard-protected ocean beaches located in the immediate vicinity of the project at Sunset Beach, Ehukai Beach and Ke Waena Beach. There are two major ocean beach parks, at Waimea Bay and Alii Beach, in Haleiwa. All these ocean beaches are actively utilized, and restroom, showers, park benches and picnic areas are provided at Ehukai, Waimea and Alii. Sunset Beach has historically been heavily utilized, but has few support facilities. A marina with a boat launching ramp is also located at Alii Beach Park.

Kaiaka State Park is located near Haleiwa, on the Waialua-side of town. This oceanfront park has bathing areas, showers, restrooms, and picnic facilities.

Waimea Falls and the Polynesian Cultural Center in Laie are two heavily visited commercial recreational attractions that are located in the general area of the project.

B. Anticipated Impacts

Development of the Lihi Lani Recreational Community will create new recreational facilities for golfing, tennis, horseback riding, camping and hiking. All recreational facilities within the project will be available to the public at a fee, except for the hiking trails, which will be free of charge. Additionally, the proposed community facility will provide opportunities for both active and passive recreational activities. Potential uses include, field sports, i.e. baseball and soccer, swimming, picnics, gardening and indoor activities, such as dancing, art, etc.. The new facilities at the project will have a beneficial effect on recreational availability in the area, by providing more varied types of activities than presently exist on the North Shore.

Existing recreational facilities in the area will be affected by the development of residences at the project. Approximately 650 full-time residents will live at the project at full occupancy. Besides using the new facilities for recreation at the project,

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these residents will utilize public beaches in the area. However, the addition of these people will not create a burden on these beach park facilities because of the relatively small number of residents and the fact that only a small percentage would be visiting a given facility at one time. The primary recreational interest of the residents is likely to be satisfied by the new facilities within the development.

C. Mitigative Measures

No mitigative measures are proposed because no adverse effect is expected to occur with respect to use of public recreational facilities. Overall, the project will have a positive effect on the availability of recreational opportunities on the North Shore. Pursuant to discussions with the State Department of Land & Natural Resources, Obayashi will prepare a detailed map showing the trail and public access to the State Reserve land during subsequent planning phases. The plan will be submitted to the Division of Forestry and Wildlife for review.

4.19 CUMULATIVE IMPACTS

Cumulative impacts are those associated with existing, approved, and reasonably anticipated future projects producing related or additive impacts. For most of the environmental effects of the proposed project, a reasonable list of "cumulative" or "related" projects would include existing, approved and proposed infrastructure or development projects in the vicinity of the proposed Lihi Lani project site; and primarily those development projects having additive effects on the environment and infrastructure systems in the vicinity of the project site.

Projects which have some approvals or are under construction could generate cumulative effects on the environment in the direct vicinity of the project site. Kuilima Resort Expansion, Kahuku Villages, and Kahuku residential projects qualify as projects in this category.

This cumulative analysis also considers projects which have been proposed, but for which none of the necessary government approvals have been granted. Other projects which have been discussed in at least some preliminary fashion include:

- **The Country Courses at Kahuku**
(four 18-hole golf courses)
Applicant: Estate of James Campbell
Location: Punamano (Kahuku) and Malaekahana (Laie)
Status: Filed for Development Plan amendment in 1990 which was denied; may re-file in 1991.
- **Malaekahana Golf Course**
(One 18-hole course)
Applicant: Kuilima Resort Company
Location: Malaekahana (Laie)
Status: Withdrew Development Plan amendment in 1990

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- **Bishop Estate Master Plan for Haleiwa**
(800 + acres, preliminary planning for two golf courses, affordable housing, and commercial uses)
Owner: Bishop Estate/Kamehameha Schools
Location: Haleiwa/Kawailoa
Status: Preliminary planning, no applications
- **Resort at Mokuleia**
(proposal for two hotels and two golf courses, and other uses)
Applicant: Mokuleia Land Co., Mokuleia
Location: Mokuleia
Status: Filed for Development Plan amendment in 1991 for two golf courses.

Except for those projects already granted approvals, there is no guarantee that any or all of these projects will be built as proposed. The following is an analysis of potential cumulative impacts of the Lihi Lani project, considering the fact that additional development will likely occur in some portions of the North Shore in the foreseeable future.

Ocean Water Quality: Lihi Lani will not create adverse ocean water quality impacts because extensive measures will be implemented to control erosion, storm water and chemical use on the site. Wastewater will be disposed on-site through an ecologically sensitive method which will not impact ocean water quality. Other developments in the area will be required to follow standard practices for construction site erosion control, and some developers may choose to follow a similar program of strict controls on their sites. If these types of ecologically sensitive measures are followed at other projects in the area, and no ocean outfall is created to serve the region, ocean water quality should remain at current quality levels or possibly improve because of reduced soil erosion and silt input to the ocean.

Land Use Character: Portions of the North Shore are undergoing a gradual land use change from agricultural to resort or urban-related land uses. The Lihi Lani Recreational Community, although largely recreational and community facility oriented, would contribute to this cumulative land use transformation. The country and rural qualities of the North Shore will be reflected in the low-density plan for Lihi Lani. If other future developments in the area follow a low-density approach with country-style qualities, these projects may also become acceptable. Open space is the key element of the country and rural feeling, and development of agricultural lands mauka of Kamehameha Highway will remove areas which have traditionally been recognized as open space on the North Shore.

Traffic: Kamehameha Highway will be congested with traffic during peak hours in the near future, primarily due to ambient traffic growth and approved resort growth at Kuilima. Lihi Lani would add to the area traffic, however, it will represent only five to eight percent of the 1997 traffic volumes. Future development on the North Shore would add even more vehicles to Kamehameha Highway. Roadway

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improvements will be likely be required in the near future to accommodate new growth, which will be addressed by the State DOT.

Potable Water: Lihi Lani will create a small additional demand for potable water which is within the capacity of the Waialua BWS system. Obayashi will participate in source development if required at the time of project development. Other future projects proposed for the North Shore will also require potable water. The Waialua aquifer has the capacity to accommodate growth in the area, as do aquifers in Koolauloa. Additional source development will be necessary to extract the new water for future projects.

Air Quality: Lihi Lani will unavoidably contribute to the increase in air pollutant concentrations in the area from increased motor vehicle traffic. Analysis of air quality concluded that predicted concentrations will remain within the National Ambient Air Quality Standards but occasionally may exceed the more stringent state standards. Occasional exceedance of the state standards is not unusual as they may be exceeded at many locations in the state that have even moderate traffic. Additional future growth will introduce additional air pollutants to the region. Air quality of the North Shore will not be noticeably reduced by the additional growth if roadway infrastructure is provided for individuals projects, and eventually Kamehameha highway is upgraded.

Noise: Lihi Lani will not create adverse noise impacts, except during the short-term construction phase. Added traffic in the area created by other future projects could cause additional noise along Kamehameha Highway. Residences located close to the highway will experience greater traffic noise, exceeding the 65 dBA residential guidelines during peak traffic periods.

Socio-economic characteristics: Lihi Lani will contribute to cumulative population, housing, employment and economic growth in the North Shore area. New residential, recreational and commercial projects will also add to these factors. Population growth for the North Shore must be considered, since the City Council has created a policy to retain the country and rural character of the North Shore and Koolauloa areas.

Visual Resources: The visual character of the Obayashi property will remain intact, with some changes due to an access road and project entrance. The coastal bluff will generally remain intact in terms of visual quality, once landscaping for the access road becomes established following construction. If future projects develop lands along Kamehameha Highway, this could cause additional visual impacts to the area. The City's SMA process will regulate impacts to coastal views, including the coastal bluff.

4.20 UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

The Lihi Lani Recreational Community will create limited adverse environmental impacts which cannot be fully mitigated by the measures planned to be implemented

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at the site. The following list includes those short-term and long-term impacts that are expected to be unavoidable, including those that are minor in significance.

4.20.1 Unavoidable Adverse Short-Term Impacts

1. Soils will be temporarily disturbed by grading, excavation and mounding activities at the site during construction.
2. Temporary increases in soil erosion will also result from construction operations, and minor amounts of soil will be carried off-site in surface runoff water.
3. Natural vegetation will be removed from 338 acres on the project site to allow for construction of project features and infrastructure.
4. Wildlife utilizing the site and immediate adjacent areas will be displaced by construction activities into nearby undeveloped lands. Construction operations will temporarily discourage wildlife from feeding at or migrating through the site.
5. Operation of construction equipment, trucks and worker vehicles may temporarily impede traffic in the area during the construction period.
6. Negligible releases of air contaminants will occur from construction equipment. Small amounts of dust may be generated during dry periods as a result of construction operations.
7. The visual character of the area will be affected by construction activities and by the presence and operation of construction equipment.
8. Minor increases in noise levels may result from construction activities.

4.20.2 Unavoidable Adverse Long-Term Impacts

1. Modifications to the current topography will be made at the site to accommodate project development.
2. There will no longer be the potential to use the 162 acres of prime agricultural land (occurring in many pieces) for future intensive agriculture.
3. An average of 740,000 gallons of non-potable groundwater will be utilized each day for irrigation of the golf course, landscaped common areas and country lots. An average of 190,000 gpd of potable water will be used for domestic purposes and re-used after treatment for golf course irrigation.
4. Small contributions of nitrogen compounds will enter groundwater from treated wastewater effluent irrigation and fertilizer application.

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5. Storm water runoff from the project site will contain some minor quantities of fertilizer nitrate and pesticides.
6. Sixteen archaeological sites on the project site will be altered by construction of the recreational community.
7. Vehicles associated with the community using Kamehameha Highway and other local roadways will have a minor effect on traffic flow.
8. Some additional noise will be generated by the project which will cause a very slight increase in noise levels along Kamehameha Highway.
9. Air quality at area roadways will receive a minor addition of traffic-related emissions.
10. Views of the project site will be changed to include portions of some structures and the entrance road.
11. There will be an additional two to three tons per day of refuse, maximum, generated by the project which must be accommodated by public solid waste management facilities.
12. Minor demand on public services will result from the golf course development, including police and fire protection.

4.21 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The construction and operation of the proposed recreational community will involve the irretrievable commitment of certain natural and fiscal resources. The most major resource commitment will be the 584 acres of land required for development of the project. Money, construction materials, manpower and energy will all be expended to complete construction and operate these facilities. The impact of utilizing these resources should, however, be weighed against the economic, social and recreational benefits to the residents of the region, County and State.

Approximately 584 acres of the 1,143 acres at the site will be used for the recreational community development. The remaining 559 acres will remain as open space. Future agricultural use of the site would be questionable since studies conducted for the project site have shown that agriculture is infeasible due to site conditions.

There would be a permanent commitment of private funds and resources to plan, design, construct and operate the golf course and related facilities. This will result in a permanent increase in jobs and other employment-related benefits and resources. It is expected that increased tax revenues will be generated along with increase in

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economic activity and appreciated value of the community.

Beyond the on-site improvements constructed and operated by the developer, there will be an increased usage of public facilities such as the Kamehameha Highway for project-related traffic and greater load on the City and County solid waste facilities.

The commitment of resources required to accomplish the project includes labor and materials, which are mostly unrenowable and irretrievable. The operation of the project will also include the consumption of potable water and petroleum-generated electricity which also represents irretrievable commitments of resources.

4.22 GROWTH INDUCING ASPECTS OF THE PROJECT

The project applicant requests the redesignation of portions of the site from agricultural to urban, park or other designations appropriate to the recreational and residential uses proposed. Development of the project would require the extension of water lines and electrical power to the site.

The extension of major infrastructure to an undeveloped or rural area (i.e. sewage treatment collection and treatment facilities, highway expansion, water main lines) can sometimes facilitate future development on undeveloped lands. On the North Shore, this could increase the pressure on nearby lands presently designated as agriculture, to seek changes in land use.

The proposed Lihi Lani Recreational Community will be primarily self-contained in terms of infrastructure. New facilities for roads, water and sewer will be developed only for Lihi Lani, and will not be capable of serving any adjoining lands. Solid and liquid wastes will be collected and treated with on-site facilities. Potable and non-potable water sources are currently available to meet the demands of the project. The project is of such a scale that the development of large scale infrastructure is not necessary. Lihi Lani in itself will not induce growth of the North Shore.

While the project will generate some long term employment opportunities, Lihi Lani could not be considered a major employment center that could induce significant residential growth in the area.

SECTION 5 - Alternatives

5.0 ALTERNATIVES

Four alternatives for the project have been considered which would utilize the land for several different purposes. A No-Action Alternative was considered, which would leave the project site as it is presently being used. An Agricultural Alternative was evaluated for the site, which would initiate more intensive agricultural uses. Development of the site as an Agricultural Subdivision was also considered as a potential alternative. A Recreational Alternative, adding an additional golf course to the currently proposed community recreational opportunities, was considered as a fourth alternative.

The four alternative concepts are evaluated in this section for each of the environmental factors addressed in Section 4. A comparison of each alternative with the proposed project is also included.

5.1 NO-ACTION ALTERNATIVE

The no-action alternative would involve no changes to the existing project area for the foreseeable future. The agricultural use of the site would be allowed to continue, which currently involves grazing for cattle and horses.

Access to the site would become more restricted under the no-action alternative. To avoid disturbance of agricultural grazing activities and to eliminate existing trespassing, no public access to the site would be allowed. The restricted access would also be necessary for safety reasons due to the many steeply sloped areas on the site, and to protect its existing native vegetation areas and sensitive archaeological resources. In addition, access restrictions would be important to minimize the possibility of illegal crop cultivation on the site. No community facilities would be created in this plan.

With respect to the environmental characteristics of the project site, its topography, soils, surface water, ground water, runoff, flooding, vegetation and wildlife would not change. It is possible that the rare Koolau Eugenia trees located on the State Forest Preserve lands mauka of the site would perish if selective clearing of nearby strawberry guava trees is not performed, and habitat for these plants is not carefully protected. Other factors that would not be affected under the no-action alternative would include archaeological resources, traffic, noise, air quality, population, employment, government expenditures, infrastructure and public services.

The lack of a development on the project site would not create additional employment, personal income and recreational opportunities for residents of the North Shore. The generation of property taxes by the Obayashi land would continue at the existing levels (\$104,000 per year). The no-action alternative would force the owner to continue paying property taxes (as he has since 1974) without gaining an offsetting income from the site. It is possible that the State or County could arrange

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to purchase this land for conservation purposes, however, there are no known plans for this to occur.

As compared to the proposed project, the no-action alternative would create environmental effects. Social and economic benefits, as well as recreational benefits, would not be generated by the no-action alternative.

5.2 AGRICULTURAL ALTERNATIVE

This section presents a discussion of the existing agriculture that occurs on the project site and the potential for establishing more intensive agricultural uses, instead of the proposed development. An agricultural feasibility study was prepared for the site by Frank S. Scott, Jr., Ph.D. (March 1988), and information from the report is contained in this section. The entire report is included as Appendix O.

Current agricultural activity on the site is limited to grazing land for approximately 10 horses. No crop cultivation is presently known to be undertaken within the project area.

Soil analyses for agricultural purposes have identified soils on the project site as generally deficient for agricultural purposes. Most of the area is ecologically infeasible for any type of crop production or grazing. Approximately 801 acres (71 percent) of the project area consists of soil types in very low Soil Conservation Service (SCS) capability classifications for agriculture. These areas are badly eroded and mostly consist of steep, rocky gulches.

If irrigated, there are approximately 260 acres of soils that are adaptable to crop cultivation. These areas consist of small isolated plateaus surrounded by steep eroded gulches. This configuration would present problems of economies of scale, and would increase the cost of infrastructure for crop production. An additional 200 acres could be used for tree fruit crops, truck crops and pasture land. A total area of 460 acres would be considered usable for agricultural purposes.

Existing water availability would further limit the actual agricultural potential of these areas. Because the seasonal distribution of precipitation is uneven, irrigation would be required in any month of the year. Assuming all 460 acres would be irrigated, the water system that would have to be established for this site would need to be capable of delivering 4,500 gallons per acre per day (approximately 2.1 mgd). The existing BWS Pupukea potable water supply system could only support about 25 percent of this amount. The remainder of irrigation water requirements would have to be satisfied by new project wells that would be costly to develop. Obayashi currently has two wells which could produce up to 1.0 mgd of non-potable water, however, its 250-300 ppt chloride content could not be used to irrigate many types of crops, such as some fruit trees and vegetable crops.

Existing limited market potentials for crops that are ecologically adapted to the site's soils and climate would also constrain viability of expanded agriculture in this area.

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The crops grown on this site would be at an economic disadvantage as compared to crops grown at other locations.

Anticipated Impacts

It is estimated that approximately 460 acres of the project site are ecologically adaptable to agricultural production. Impacts of agricultural use on topography could be substantial because leveling of most of the 460 acres and benching of some slopes would be required for agricultural production and construction of access roadways. This impact would be somewhat greater than that caused by the proposed project, which proposes an approximately 338 acres of cleared area for grading.

Vegetation clearing to allow for agricultural development of 460 acres would result in soil erosion over much of the project area. Total soil erosion would be substantial - much greater than would occur under the proposed development - because of the exposure of soils in agricultural activities. Suspended clay soil particles would be carried off the land by storm water runoff through intermittent streams and into the ocean.

Water use for irrigation of the 460 acres would be extensive, and development for that purpose may not be economically feasible, depending on the type of crops planted. The two existing project wells could be used to derive non-potable water would be required for the agricultural alternative, and water use would be expected to be approximately twice that required for the proposed project. Fertilizer and pesticide use would be three to four times greater for agricultural use.

Drainage conditions on the site would be affected by crop cultivation, and runoff would be increased due to the elimination of forest and ground cover vegetation over 460 acres. Drainage controls would not be as effective for the agricultural development as compared to the proposed project. Unless extensive measures would be taken to control runoff, lowland areas off-site and the ocean would be adversely affected by storm runoff. The potential effects on marine resources due to silt and nitrogen (from the use of fertilizers) contained in intermittent stream discharge waters would be significant under this alternative. The proposed project will reduce silt introduction to the ocean below existing conditions.

Vegetation clearing of 460 acres for the agricultural alternative would also eliminate wildlife habitat in those areas. Replanting of cleared areas would be done to accommodate crop production and grazing areas, and would not provide wildlife habitats. In comparison, planting of the proposed project's golf course and other development areas will be done in many areas with indigenous plant species that will enhance wildlife habitats.

Development of intensive agricultural use on the property would have to consider the preservation of existing archaeological resources, and would probably have a similar effect on archaeological resources as would the proposed development.

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With the agricultural alternative, the project entrance and access road would be located in a fashion similar to the proposed project, including an entrance onto Kamehameha Highway. Traffic impacts on Kamehameha Highway travel due to the agricultural project would be substantially less than the proposed project, because only a small worker population and several trucks would utilize the project entrance each day.

Agricultural use of the project area would require heavy equipment operation during planting and harvest periods, which would generate noise during daytime periods. Truck operations on the project site and local roads would create some long-term noise effects. As compared to the proposed project, less noise would be generated overall by the agricultural use because vehicle traffic would typically be less. Heavy equipment noise, however, could occur regularly.

Fugitive dust, crop burning smoke (possibly) and heavy equipment exhaust emissions would be created by operations required for agriculture. There would be few worker and resident vehicles added to local roadways and little related exhaust emissions as a result of the agricultural development. Air quality impacts in the vicinity of the project due to dust and (possibly) smoke would be greater for the agricultural land use than for the proposed project.

Development of agricultural uses would involve use of the entire makai section of the site. Crop cultivation in this area would drastically change the existing wooded visual character of the site along Kamehameha Highway, which would not occur under the proposed project. In addition, level areas above the bluff would be cleared to the edge of the bluff where crops could be established.

This alternative would include an access road to be constructed on the makai section of the site, as required for the proposed project. As compared to the proposal, the agricultural alternative would have a greater adverse visual effect due to the crop cultivation on the makai section of the site and lack of landscape planting for the access road across the bluff. The makai section of the site would not be used for community facilities development.

The agricultural use of the land would not increase the population of the area. It would provide employment and personal income to a relatively small number of people. The proposed project would generate more jobs and higher personal income than the agricultural development.

Few, if any, government expenditures and revenues would be involved with the agricultural development because no community services would be required. Although the proposed project would involve greater government expenditures than agricultural use, it will also generate greater revenues and produce a tax surplus. The tax surplus under agricultural use would be substantially less than that generated by the proposed project.

Some infrastructure would be required by the agricultural alternative. There could be a need for potable water supply (for irrigation) via municipal sources, however,

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irrigation water could be derived from on-site wells. Little domestic wastewater or solid waste would be generated by the agricultural development. Drainage facilities would have to be constructed to control runoff within the project and internal roadways would be created. As compared to the proposed project, less impact on infrastructure would occur as a result of agricultural use of the project area.

No impact on public services would be expected to result from the agricultural land use, as opposed to a small effect by the proposed project.

5.3 AGRICULTURAL SUBDIVISION ALTERNATIVE

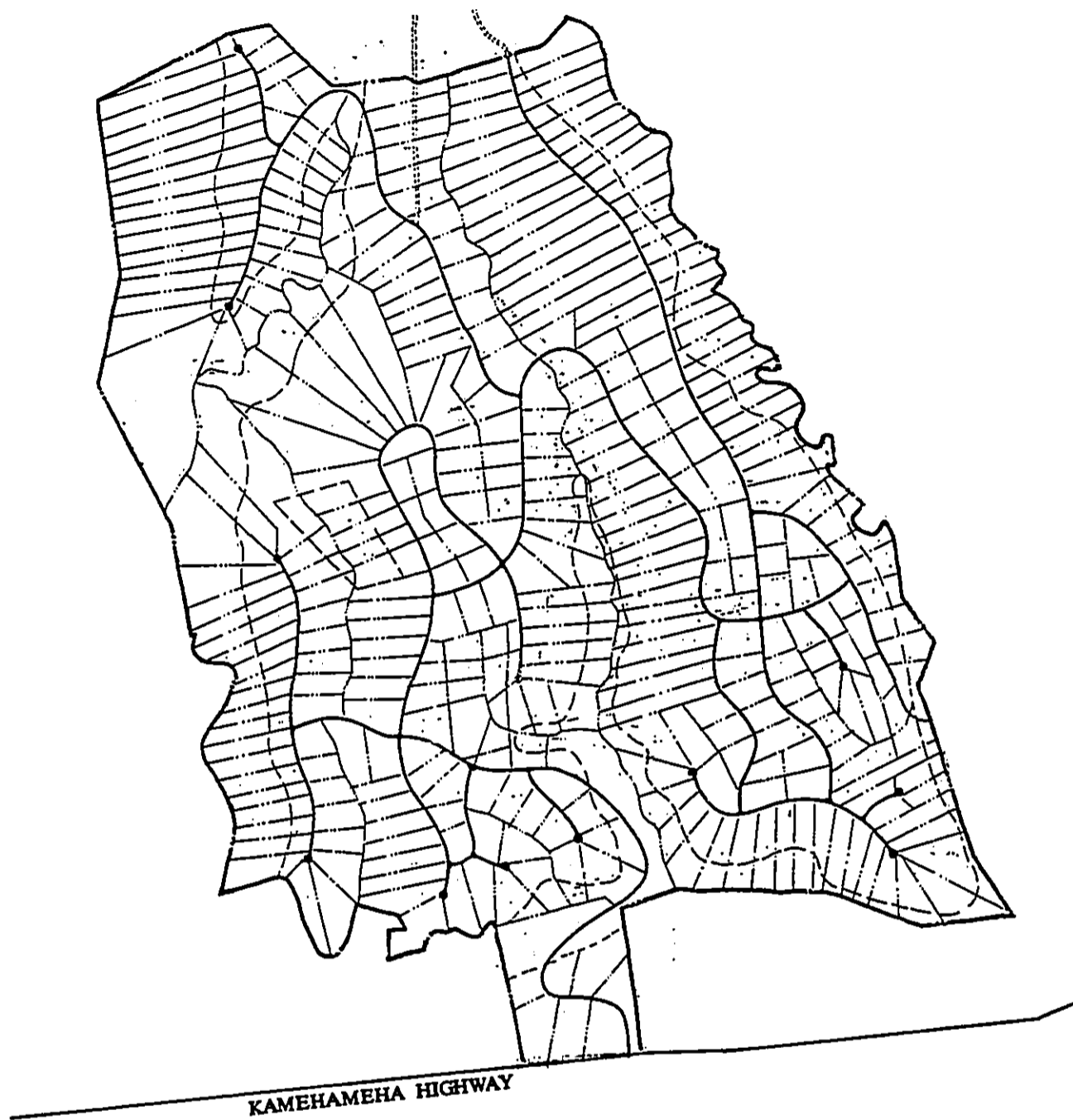
Subdivision of the project site under the existing AG-2 General Agricultural District zoning classification would involve the creation of at least 350 two-acre minimum lots. There would be a requirement for agricultural use of some type on these lots, and farm dwellings would be constructed on each lot as allowed under the City and County of Honolulu Land Use Ordinance (LUO). No zoning change would be required for this alternative development. However, several other permit approvals would be required. No community facilities would be developed in this scenario.

An evaluation of alternative development plans was prepared for this site by Belt, Collins and Associates in 1980. One plan included an agricultural subdivision of 350 lots with minimum lot sizes of two acres and minimum frontage of 150 feet, as shown in Figure 30. Each lot would have a usable portion of less than 20 percent slope. Lots would be extended down to the centerline of the site's gulches so that neither continued developer interest nor a community association would be required to own and maintain remnant parcels or open space.

In support of the agricultural subdivision development, various infrastructure features would be constructed. Approximately 68 acres of the project area would be utilized for the construction of roadways and the installation of utilities. This area includes approximately seven and one-half acres for the wastewater treatment facilities and pump stations. The wastewater treatment and disposal system to be used for this alternative would be designed to dispose effluent through land application, possibly on the makai portion of the property. Water, sewer, drainage and road systems would be designed to City and County of Honolulu standards for agricultural subdivisions. Utility infrastructure would be dedicated to the City and County for ownership and maintenance.

Anticipated Impacts

Extensive topographic modifications would be required to develop the 350 lot agricultural subdivision and its support infrastructure. Topography changes for this alternative could be greater than that required for the proposed recreational community, considering the Haleiwa-side plateau will remain largely unchanged, topographically, with the proposed project. Greater soil disturbance would occur under the agricultural subdivision plan.



**AGRICULTURAL SUBDIVISION ALTERNATIVE
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SOURCE: BELT, COLLINS & ASSOCIATES, LTD. (JANUARY 1980)

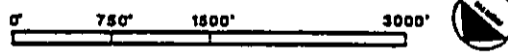


FIGURE 31

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Water resources would be affected under the alternative, including extensive potable water requirements estimated at 4,000 gpd per acre (BWS standard for agricultural lots) or potentially up to a maximum of 2.80 mgd for the entire project. A portion of this amount could be provided by on-site brackish water wells, depending on suitability for agricultural crops grown on the site. This water requirement would be greater than that required for the proposed project (190,000 gpd).

In terms of water quality, fertilizers and pesticides would be applied to individual farm lots, and storm water runoff would include some amounts of these contaminants. Because of agricultural use on these plots, fertilizer and pesticide use could be greater than for the proposed project. The 350-lot agricultural subdivision would have less control over, and knowledge about, proper pesticides and fertilizer usage at individual agricultural lots. Each of the 350 lots (covering 700 acres) in this alternative would be required to conduct some type of agriculture, and this activity would be under the control of more individual lot owners than with the proposed project.

The 350 homes in this alternative could generate approximately the same amount of wastewater as the proposed project. Wastewater treatment would require the disposal to be irrigation with treated effluent, possibly on the makai portion of the site, since large effluent irrigation areas would not be available on the mauka portion.

Runoff from the development would involve more roadways and developed surfaces than under the proposed development, and probably would have to include extensive detention facilities construction to help control runoff.

Vegetation clearing involved with this alternative would be greater than to the proposed project due to the site clearing required for residential development, agricultural areas on each lot, and extensive infrastructure development (approximately 68 acres). Wildlife effects under this alternative would also be greater than the proposed project. Irrigation disposal use of the makai section of the site would require removal of vegetation and habitat areas on this part of the site.

Archaeological resources could potentially be affected to a greater extent under this alternative, as compared to the proposed project, because of the greater number of individual lots and area (700 acres) being developed. Private ownership of valleys and bluff sides will be more conducive to the disturbance of existing archaeological remains.

Traffic generated by the agricultural subdivision is expected to be nearly equivalent to the fully-developed proposed project. Weekend peak hour vehicle trips for the alternative will be approximately 308 trips (ingress and egress), would be comparable to 328 trips (ingress and egress) for the proposed project. Because this alternative would have more full-time residents, traffic would be greater during weekday mornings and afternoons.

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Noise effects of the alternative would involve construction effects and operational effects from traffic and maintenance activities. Noise generated by the alternative would be similar to that generated by the proposed project, because of the equivalent traffic generation and similar property and infrastructure maintenance requirements. There would also be routine use of heavy equipment on the farm lots.

Air quality effects of the agricultural subdivision would involve construction and operational activities. Construction of this alternative project would be comparable to the proposed project in terms of equipment operations for clearing, grubbing, grading and building. Traffic from future operations would generate similar air quality effects as with the proposed project.

Visual resources would be affected to a greater extent under the alternative development, as compared to the proposed action. Lots with farm dwellings that would be located along the bluff in the alternative plan would not necessarily be set back from the bluff edge or have limits on vegetation clearing. Some views of homes and cleared tree areas from Kamehameha Highway could be expected under this alternative, along with the views of the access road across the bluff.

Full-time residential population of the development would be approximately 1,100 persons, which would be up to 1.5 times greater than for the proposed project. Few long-term employment opportunities would be created by this development beyond the construction phase.

Infrastructure requirements of the agricultural subdivision would be substantial and comparable to the proposed project. Internal roadway development would be greater.

Public services that would be required by the alternative development would include schools, police and fire protection, health care and recreational facilities. Because there are more homes and more full-time residents, the alternative plan would generate more school children and demand upon other public facilities and services than would the proposed project.

An agricultural subdivision would generate approximately the same annual property taxes to the City and County as that created by the proposed project. Government expenditures for this development could be greater, as compared to the proposed project, because of the larger number of households that will need to be provided with public services.

There would be no affordable housing developed at the site, as it would not be required by government. There would likely not be development of a community facilities complex on the makai portion of the property, because golf course revenues would not be created.

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In summary, the agricultural subdivision would create greater adverse impacts than the proposed project. It would not include a golf course yet it would create traffic and other comparable effects.

5.4 RECREATIONAL ALTERNATIVE

The Recreational Alternative considers the potential for developing exclusively recreational facilities within the project. The project would include similar recreational and community facility features as with the proposed project, eliminate all residential development, and add a private membership 18-hole golf course. Because no residential component would be included, this alternative would be viewed as a "stand alone" golf course project.

An extensive (and expensive) community benefits program would be required under current city guidelines for golf DP Amendments. Obayashi would be required to provide substantial community benefits, which would probably make the project unviable from the outset. The second golf course could generate substantial revenues, which could be applied to community priorities.

Anticipated Impacts: It is estimated that 586 acres of the project site would be developed to create the all recreation alternative. Impacts to topography would be greater than the proposed project, primarily due to grading of the additional golf course on the Haleiwa-side plateau.

Vegetation clearing to grade would likewise be greater than the proposed project. However, similar to the proposed project, soil erosion impacts would only be short-term, during construction. At completion of the development, soil erosion potential on the site would likely decrease.

As with the proposed project, this project would derive potable water from existing BWS Waialua water system although the estimated need for potable water would be roughly 1.5 times that of the proposed project. Similarly, ample non-potable water supplies would be available through two wells on the project site and this water would be used for irrigation of the golf courses. Anticipated impacts to the groundwater resources is expected to be minimal, assuming that effective golf course management practices are employed for both of the golf courses (see Section 4.5 Groundwater Resources for details).

Potential surface water runoff, drainage and water quality impacts would be greater than the proposed project because of the greater cleared area and turf areas.

Impacts to existing vegetation and wildlife would be greater than the proposed project, due to the added grading required. The Kooloa Eugenia trees on the State Forest Preserve adjacent to the site would still be preserved and maintained under this alternative with cooperation by Obayashi. Impacts to archaeological and historic resources would be roughly the same as for the proposed project.

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The project entrance and access road would be located in a fashion similar to the proposed project, including an entrance onto Kamehameha Highway. Traffic impacts on Kamehameha Highway due to the recreational alternative would be substantially less during the weekday morning and afternoon peak hours. Because the project would not include residential development, traffic generated during the weekend peak hour would be slightly less than the proposed project.

Air quality impacts would be somewhat less than the proposed project, following the reduction in traffic at the peak hours. Noise impacts from the either project would be slight, and possibly less due to reduced traffic.

The visual impacts of the all recreation alternative are quite similar to that of the proposed project. Long-term effects will result from the completed entrance road and the clubhouse facilities.. A second clubhouse would probably be constructed for the recreational alternative, and portions of this structure could be visible from the makai areas.

The recreational alternative would create approximately 120 operational jobs. The number of day visitors is expected to be approximately 32 percent higher than for the proposed project, due to the additional golf course.

Short-term employment opportunities can be expected during the construction phase of the project. Approximately 100 operations jobs and 70 induced jobs in other areas would be created by the recreational alternative. This is over 1.6 times as many jobs as are expected to result from the proposed project.

Compared to studies for the proposed project, short-term personal income generated as a result of the project may be lower due to economies of scale resulting from building two golf courses. Long-term personal income resulting from operational jobs may be twice as much as with the proposed project.

The all recreation alternative makes no contribution to the island-wide need for housing. Employment opportunities and attractive recreational amenities will stimulate residential growth in the North Shore, however, the alternative does not contribute to the already limited supply of housing in the area.

This project could create less net government revenues through property and sales taxes than the proposed project, however, it would still create substantial revenues. The basic water supply and wastewater facilities necessary for the proposed project would also be required for the recreational alternative. The wastewater facilities would be smaller since there would be no on-site residential population. Treated wastewater effluent will be used for irrigation of the golf courses and other landscaped areas. The roadway system would be similar in scope to the proposed project.

Due to the elimination of residential land uses in the recreational alternative, there would be very little impact on public facilities. There would be no impact on local area schools. Police and fire protection services would be needed for the project. Net

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government revenues would be sufficient to cover any additional protection required. As with the proposed project, this project would also make a significant contribution to the North Shore's recreational and community facilities.

In summary, the recreational alternative would create some advantages over the proposed project in terms of less traffic and on-site population. The project would, however, introduce a second private membership golf course and include no housing. Environmental impacts would be greater in some cases and less in others. The cost to Obayashi in required community benefits would probably create an insurmountable barrier to implementing this scenario.

SECTION 6 - Relationship to Existing Policies
and Plans for the Area

6.0 RELATIONSHIP TO EXISTING POLICIES AND PLANS FOR THE AREA

This section includes a discussion of the relationship of the project to the objectives and policies of the Hawaii State Plan, the City and County of Honolulu General Plan, the City and County North Shore Development Plan, the Hawaii Coastal Zone Management Program, and the Special Management Rules and Regulations of the City and County of Honolulu.

6.1 HAWAII STATE PLAN

This section includes an assessment of the conformity of the reclassification to the applicable goals, objectives and policies of the Hawaii State Plan, Chapter 226, HRS, and applicable priority guidelines and functional plan policies.

6.1.1 Objectives and Policies

Section 226-6: Objectives and policies for the economy - in general:

"(a)(1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people."

"(b)(10) Stimulate the development and expansion of economic activities which will benefit areas with substantial or expected employment problems."

"(b)(14) Promote and protect intangible resources in Hawaii, such as scenic beauty and the aloha spirit, which are vital to a healthy economy."

Discussion: The proposed project is expected to generate approximately 102 full-time operational jobs upon completion, which is anticipated to be about the year 2000. The North Shore has a higher than average unemployment rate at 8.4 percent (U.S. Bureau of Census, 1980 Summary Tape Files), thus the jobs expected to be generated from the construction and operation of the development should help to alleviate the current lack of jobs on the North Shore. (Refer to Section 4.16.2)

The projected average annual personal income from direct employment is estimated at \$8.5 million between 1993 and 1995, for a total of \$45.3 million by the year 2000. The income generated from the proposed development should raise the standard of living for some North Shore residents, as well as contribute to business revenues in the area. (Refer to Section 4.16.4).

Section 226-11: Objectives and policies for the physical environment - land-based, shoreline, and marine resources:

"(a)(1) Prudent use of Hawaii's land-based shoreline, and marine resources."

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"(a)(2) Effective protection of Hawaii's unique and fragile environmental resources."

"(b)(1) Exercise an overall conservation ethic in the use of Hawaii's natural resources."

"(b)(3) Take into account the physical attributes of areas when planning and designing activities."

"(b)(4) Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage."

"(b)(5) Consider multiple uses in watershed areas, provided such uses do not detrimentally affect water quality and recharge functions."

"(b)(6) Encourage the protection of rare or endangered plant and animal species and habitats native to Hawaii."

"(b)(8) Pursue compatible relationships among activities, facilities, and natural resources."

"(b)(9) Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational, and scientific purposes."

Discussion: The subject site in Pupukea has a distinct physical environment including its topography and natural resources. The project has been designed as a low intensity development with consideration of the natural features on the site and, where possible, their preservation. Development will avoid steeply sloped lands and away from intermittent streams. By maintaining 559 acres of open space, substantial preservation of the natural environment on this site will be achieved. The Koolau Eugenia trees found on the State Forest Preserve land adjacent to the site is a rare tree species that will be preserved and protected, by DLNR with cooperation by Obayashi.

One of the purposes of the development is to offer multiple recreational activities which involve the natural environment. The compatible mixture of uses and activities will provide ample opportunity for the residents and public to enjoy and learn of the natural resources of Pupukea.

Section 226-12: Objectives and policies for the physical environment - scenic, natural beauty, and historic resources:

(a) "Enhancement of Hawaii's scenic assets, natural beauty, and multi-cultural/historical resources."

"(b)(1) Promote the preservation and restoration of significant natural and historic resources."

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"(b)(2) Provide incentives to maintain and enhance historic, cultural, and scenic amenities."

"(b)(3) Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features."

"(b)(4) Protect those special areas, structures, and elements that are an integral and functional part of Hawaii's ethnic and cultural heritage."

"(b)(5) Encourage the design of developments and activities that complement the natural beauty of the islands."

Discussion: A number of sites reveal archaeological findings in the project area. Paul H. Rosendahl, Ph.D., Inc. (June 1988), has made recommendations concerning the treatment of affected archaeological sites on the site. These recommendations must be reviewed and approved by DLNR after which Obayshi will comply. Of the twenty-two sites recommended for further data collection, nine may be affected by the project. Where possible, these sites will be preserved "as is" or will be included in the project's landscaping. (Refer to Section 4.11).

The natural beauty of the islands as it exists in the Pupukea area is precisely why a low density, golf and open space oriented development is proposed. Scenic views and open space will be maintained and enhanced for the benefit of homeowners and the regional residents who will have access to the site for passive and active recreation purposes. Approximately 559 acres of open space will be preserved, a portion of which is proposed for a "conservation area". The purpose will be to preserve and enhance, as possible, the native and endemic species in the North Shore area. The developed aspects of proposed recreational community will take care to complement the aesthetics of the North Shore.

Section 226-13: Objectives and policies for the physical environment - land, air, water quality:

"(a)(1) Maintenance and pursuit of improved quality in Hawaii's land, air, and water resources."

"(a)(2) Greater public awareness and appreciation of Hawaii's environment resources."

"(b)(2) Promote the proper management of Hawaii's land and water resources."

"(b)(3) Promote effective measures to achieve desired quality in Hawaii's surface, ground, and coastal waters."

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"(b)(5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters."

"(b)(6) Encourage design and construction practices that enhance the physical qualities of Hawaii's communities."

"(b)(8) Foster recognition of the importance and value of the land, air, and water resources to Hawaii's people, their cultures and visitors."

Discussion: There will be 559 acres of open space maintained on the project site. Nine miles of improved trails will be accessible to the public for either hiking, walking or horseback riding. The improved trail system will encourage higher usage and make for a better public awareness of this natural area. Homeowners in Lihi Lani will be restricted to certain types and quantities of landscaping and will utilize non-potable water for irrigation. A xeriscape program will be incorporated in the project landscape design. Through such measures, Hawaii's residents are expected to become personally aware of the importance of water conservation.

The land and water resources of the project site will be properly managed. A host of mitigation measures will be designed and implemented to assure that land, air, and water are not significantly impacted by the project. Indeed, the project is expected to improve the quality of runoff water from the site to the ocean, since loading of suspended solids in the runoff will decrease with the full development in place. Additionally, storm water runoff will be controlled through the use of detention basins and other measures, so that the rate of runoff with the project will not exceed existing conditions. The project will not exceed the potable water resource capabilities of the aquifer. Fertilizer and pesticide application at the golf course will be professionally managed by a certified Golf Course Superintendent. An Integrated Pest Management (IPM) program will be instituted to employ strict management and overall reduced pesticide usage.

Noise and air quality levels at the project will be well within government standards. The architecture of the residential and recreational community will be a country style in recognition of the rural surroundings.

Section 226-15: Objectives and policies for facility systems - solid and liquid wastes.

"(a)(2) Provision of adequate sewerage facilities for physical and economic activities that alleviate problems in housing, employment, mobility, and other areas."

"(b)(1) Encourage the adequate development of sewerage facilities that complement planned growth."

"(b)(2) Promote re-use and recycling to reduce solid and liquid wastes and employ a conservation ethic."

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"(b)(3) Promote research to develop more efficient and economical treatment and disposals of solid and liquid wastes."

Discussion: A wastewater treatment system has been designed for the project which will adequately treat the wastewater generated by the project without reliance upon existing City and County facilities. Obayashi will employ a facultative oxidation pond and marsh treatment system which has been proven effective by Dr. Robert Gearheart. The system will generate treated wastewater effluent of a quality which will exceed State Department of Health criteria, and be diluted and re-used as irrigation water for the golf course. (Refer to Sections 2.1 and 4.5).

Section 226-16: Objective and policies for facility systems - water.

"(b)(1) Coordinate development of land use activities with existing and potential water supply."

"(b)(3) Reclaim and encourage the productive use of runoff water and waste water discharges."

"(b)(6) Promote water conservation programs and practices in government, private industry, and the general public to help ensure adequate water to meet long-term needs."

Discussion: The potable and non-potable water needs of the project are within the available capacities according to Mink (1988; 1990). Wastewater will be treated on-site and combined with non-potable groundwater for use in irrigating the golf course, thereby reclaiming the water. A water conservation program will be established for the community, including design and operational guidelines for the use of non-potable water for irrigation and the use of drought tolerant landscaping (xeriscape program). (Refer to Section 4.5).

Section 226-19: Objectives and policies for socio-cultural advancement - housing.

"(a)(1) Greater opportunities for Hawaii's people to secure reasonable prices, safe, sanitary, livable homes located in suitable environments that satisfactorily accommodate the needs and desires of families and individuals."

"(a)(2) The orderly development of residential areas sensitive to community needs and other land uses."

"(b)(1) Effectively accommodate the housing needs of Hawaii's people."

"(b)(2) Stimulate and promote feasible approaches that increase housing choices for low-income, moderate-income, and gap-group households."

"(b)(3) Increase homeownership and rental opportunities and choices in terms of quality, location, cost, densities, style, and size of housing."

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"(b)(5) Promote design and location of housing developments taking into account the physical setting, accessibility to public facilities and services, and other concerns of existing communities and surrounding areas."

"(b)(7) Foster a variety of lifestyles traditional to Hawaii through the design and maintenance of neighborhoods that reflect the cultures and values of the community."

Discussion: The choice of one-acre country lot housing for the proposed recreational community considers and reflects the density of the existing, adjacent residential communities. The provision of up to 180 units of affordable housing is in direct response to the State and County policies to increase housing availability for the people of Oahu and the State.

As a predominantly recreational community, including hiking and horse riding trails, the Lihi Lani community may foster an outdoor lifestyle consistent with the traditional lifestyle for Hawaii. The country character of the North Shore is valuable to the existing community and will be preserved in the open space oriented design of Lihi Lani.

Section 226-23: Objective and policies for socio-cultural advancement - leisure.

"(a) Planning for the State's socio-cultural advancement with regard to leisure shall be directed towards the achievement of the objective of the adequate provision of resources to accommodate diverse cultural, artistic, and recreational needs for present and future generations."

"(b)(2) Provide a wide range of activities and facilities to fulfill the cultural, artistic, and recreational needs of all diverse and special groups effectively and efficiently."

"(b)(4) Promote the recreational and educational potential of natural resources having scenic, open space, cultural, historical, geological, or biological values while ensuring that their inherent values are preserved."

"(b)(5) Ensure opportunities for everyone to use and enjoy Hawaii's recreational resources."

"(b)(6) Assure the availability of sufficient resources to provide for future cultural, artistic, and recreational needs."

Discussion: Lihi Lani is largely devoted to the fulfillment of the above objective and policies for recreation. The potential for recreation in an area of scenic, open space is maximized through the development of a golf course, an equestrian center, a tennis center and a campground on the site. Ocean and mountain views will be part of the experience at these facilities which will be available for public use. Both passive and active recreational needs are satisfied through a nine-mile system of hiking and

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horse riding trails, traversing the undeveloped, heavily vegetated, open space areas of the site. Portions of these areas will not only be preserved, but enhanced through the re-introduction of native or endemic plant species, eventually providing a valuable botanical resource.

An even wider range of activities will be served through the construction of a 10-acre community facility. Currently proposed facilities include a swimming pool, pavilion, soccer/baseball field, picnic areas and parking. Discussions are ongoing regarding the final mix of facilities. Two sites of one-acre each will be provided for future development of child care facilities and a community garden. Cultural, artistic and other leisure-time activities will be available to a diverse range of users within the greater North Shore area through the use of this facility.

6.1.2 Priority Guidelines

The purpose of the State Plan priority guidelines is to address areas of state-wide concern. The following discussion provides an assessment of how the proposed project conforms to the relevant priority guidelines.

Section 226-103: Economic Priority Guidelines:

(e)(2): *"Encourage the improvement of irrigation technology and promote the use of non-potable water for agricultural and landscaping purposes."*

Discussion: The project proposes to use up to 0.77 mgd of non-potable water at peak periods drawn from on-site wells for irrigation of the golf course and other landscaping purposes. Refer to Sections 2.1 and 4.5 and Appendix B.

Land Resource Priority Guidelines: Section 226-104

(b)(2): *"Make available marginal or non-essential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district."*

Discussion: As previously noted, this area is marginal and non-essential for agricultural use due to poor soil types, steep slopes and deep gullies that pervade most of the site (Refer to Section 4.4 and Appendix E). The proposed "urban" uses are generally low intensity and appropriate to the rural character of the area.

(b)(6): *"Seek participation from the private sector for the cost of building infrastructure and utilities, and maintaining open spaces."*

(b)(13): *"Protect and enhance Hawaii's shoreline, open spaces, and scenic resources."*

Discussion: The applicant will build necessary infrastructure such as a highway left-turn lane, on-site roadways, potable and irrigation water supply systems, a

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wastewater treatment and disposal system, and drainage and erosion control systems.

A total of 559 acres, or approximately half of the land, will be undisturbed open space, with an additional 327 acres of useable outdoor recreational land. The scenic views of and from within the site will be maintained and protected as a natural resource and asset. (Refer to Section 4.15).

6.1.3 Functional Plans

The State Functional Plans adopted April 19, 1984 and April 22, 1985, translate the broad goals and objectives of the Hawaii State Plan into detailed courses of action. The relationship of the proposed actions within the project site to the relevant State Functional Plan objectives is described below.

State Agricultural Functional Plan - Land

"B (5). POLICY: Provide greater protection to agricultural lands in accordance with the Hawaii State Constitution."

"B (5) (c). IMPLEMENTING ACTION: Until standards and criteria to conserve and protect important agricultural lands are enacted by the Legislature, important agricultural lands should be classified in the State Agricultural District and zoned for agricultural use, except where, by preponderance of the evidence presented, injustice or inequity will result, or overriding public interest exists to provide such lands for other objectives of the Hawaii State Plan."

Discussion: There is a preponderance of evidence that the lands within the project area are of minimal agricultural importance (see Section 4.4 and Appendix E). All soils classification systems (SCS, LESEA, ALISH, LSB), rate the overall quality of most of the soils on the project site as poor. In addition, a study of the site by Frank S. Scott, Jr., Ph.D., Agricultural Economist, concluded that commercial agricultural operations would be economically infeasible. As noted in Section 6.1.1, implementation of the proposed project would fulfill objectives and policies for the economy in general.

Much of the land's prime agricultural soils are proposed for horse pasture use. Potentially, all of the open space area preserved within the project would remain available for agricultural use. A portion of this area is classified by LSB as B-rated land for agriculture.

State Housing Functional Plan

"A. (2). POLICY: Stimulate and promote feasible approaches that increase housing choices for low-income, moderate-income, and gap group households."

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"A. (2) (c). IMPLEMENTING ACTION: Encourage the use of opportunities and incentives in State Land Use redistricting process to provide lands or homes for affordable or assisted housing development."

Discussion: In the spirit of such policies, the applicant has proposed the construction of 180 affordable units, on the project site.

State Recreational Functional Plan

"A(2). POLICY. Ensure that intended uses for a site respect community values and are compatible with the area's physical resources and recreation potential."

"A(3). POLICY. Emphasize the scenic and open space qualities of physical resources and recreation areas."

"B (1) POLICY. Exercise an overall conservation ethic in the use of Hawaii's resources."

"C(1) POLICY. Maintain an adequate supply of recreation facilities and programs which fulfill the needs of all recreation groups."

"D(2) POLICY. Promote the securing of public access to resources with recreational value."

Discussion: In addition to residential development, the primary purpose of the project is to provide extensive recreational facilities, including a golf course, a golf driving range, a tennis center, an equestrian ranch, a campground and about nine miles of hiking trails. All facilities will be open to the public. In addition to these facilities, the proposed project will also comply with City and County park dedication requirements. The proposed recreation facilities are designed to emphasize the inherent scenic qualities of the site.

In the spirit of land and water conservation, approximately one-half of the site will be preserved as open space and a water conservation program will be established to minimize the amount of water used for common area and residential yard landscaping.

State Transportation Functional Plan

None of the policies or implementing actions in this functional plan address specific developments such as the proposed project. The overall objective of the plan is to provide for the efficient, safe, and convenient movement of people and goods. The impacts of the proposed project on existing transportation facilities are addressed in Section 4.17.5.

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State Tourism Functional Plan

The policies and implementing actions of this functional plan deal with tourism promotion, the development of visitor promotion, the development of visitor accommodations, employment and career development, and community relations. No references to the independent provision of recreational facilities are included.

The proposed project is intended to provide recreational opportunities for both residents and visitors, without emphasizing services to any particular group. To the extent that its facilities help to attract visitors to the Kuilima Resort and other resort areas on Oahu, the project will contribute to the health and viability of the State's visitor industry.

State Health Functional Plan

The State Health Functional Plan focuses primarily on public health programs under the jurisdiction of the State Health Department. Several of the implementing actions relate to operating Department of Health permit programs to which the proposed project is subject. These include reviewing private wastewater treatment systems, discharges to the air or groundwater, new sources of drinking water, and air conditioning/mechanical ventilation systems for buildings that are used by the public. The proposed project will comply with all necessary permit requirements of the Department of Health.

State Historic Preservation Functional Plan

Almost all of the policies and implementing actions in the State Historic Preservation Functional Plan are directed at State agencies, especially the Department of Land and Natural Resources (DLNR). An archaeological survey of the project site has been conducted and the findings of the survey will be forwarded to DLNR for their review. The project proponent will comply with the recommendations in the archaeological report, pending DLNR approval of these measures (Refer to Section 4.11 and Appendix N).

State Conservation Land Functional Plan

The project site does not include any conservation lands. Consequently, the implementing actions of the State Conservation Functional Plan do not pertain to the proposed project.

State Water Resources Development Functional Plan

This functional plan primarily affects State operations. The proposed water system for this project is discussed in Section 2.2.1.

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The remaining functional plans - State Education Functional Plan, State Higher Education Functional Plan, and State Energy Functional Plan - are not directly relevant to the proposed project.

6.2 GENERAL PLAN FOR THE CITY AND COUNTY OF HONOLULU

The following discussion provides an assessment of how the proposed project conforms to and implements the objectives and policies of the General Plan.

6.2.1 Population

Objective C: "To establish a pattern of population distribution that will allow the people of Oahu to live and work in harmony."

Objective C. Policy 3: "Manage physical growth and development in the urban-fringe and rural areas so that: a. An undesirable spreading of development is prevented; and b. Their population densities are consistent with the character of development and environmental qualities desired for such areas."

Objective C. Policy 4: "Seek a year 2010 distribution of Oahu's residential population which would be in accord with the following table:

Distribution of Residential Population

<u>Location</u>	<u>% of Year 2010 Island-wide Population</u>
...	...
North Shore	1.6% - 1.8%"

Discussion: The 2010 GP Population Distribution Guidelines are part of the policy for population distribution projected for Oahu over the next twenty years. For the North Shore this Guideline is between 1.6 and 1.8 percent of the total Oahu population. The total projected Oahu population for 2010 is 1,049,500.

Lihi Lani will generate approximately 700 full-time residents to the North Shore DP Area. This amount of additional population equals 0.07 percent of the projected 2010 Oahu population, which is smaller than the smallest unit of measure used in the Guideline. Thus, the population increase associated with Lihi Lani is of too small a magnitude to materially alter the degree of consistency of the North Shore's development capacity with its Population Distribution Guideline.

This finding is further supported by the lack of precision in the available estimates of just the current (1989) population. For example, the State estimates a 1989

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population of 28,700 for the combined census tracts of the North Shore and Koolauloa, whereas the City and County estimates it to be 26,400. This is a difference of 2,300 people, or more than three times the projected population of Lihi Lani.

Added to this are differences between valid lower and upper estimates of average household size in 2010, and of the percentage of housing units which will be occupied in that year. Each of these will by themselves have a significant impact on estimates of the 2010 population for the North Shore.

Given the multiple uncertainties as to the accuracy of projections of the North Shore's development capacity under existing zoning, it cannot be argued that an addition of 700 people to that capacity will materially alter its consistency with the 2010 Population Distribution Guideline.

6.2.2 Economic Activity

Objective A: "To promote employment opportunities that will enable all the people of Oahu to attain a decent standard of living."

Objective A, Policy 1: "Encourage the growth and diversification of Oahu's economic base."

Discussion: The proposed project will generate two types of employment opportunities, those in construction and those in operations. An estimated 45 on-site operational jobs will be created by 1995, which will increase to an estimated 60 jobs by the year 2000. There will be another 33 to 42 indirect and induced jobs generated by the project by the year 2000. Construction jobs over a ten-year period should result in approximately 204 positions up to 1995, tapering off to 79 jobs between years 1996 and 2000. This employment will contribute to the overall economy through additional income and resulting taxes and spending. Refer to Section 4.16.2 and 4.16.4 of this document.

Objective B: "To maintain the viability of Oahu's visitor industry."

Objective B, Policy 8: "Preserve the well-known and widely publicized beauty of Oahu for visitors as well as residents."

Discussion: The North Shore is known world-wide for its beaches, surf, rural setting and natural beauty. The proposed development will be tucked away atop the bluffs and give those who visit spectacular views of the shoreline from Sunset Beach to Mokuleia, including the Waianae mountain range and Kaena Point. The project's hiking trails and recreational facilities will also open up the beauty of the North Shore's hills and forests to greater public enjoyment. The proposed development will emphasize low-rise, low-density improvements interspersed between large expanses of undisturbed green space and will be designed in a way that will complement the area's rural setting.

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6.2.3 Natural Environment

Objective A: "To protect and preserve the natural environment of Oahu."

Objective A, Policy 1: "Protect Oahu's natural environment, especially the shoreline, valleys, and ridges, from incompatible development."

Objective A, Policy 3: "Retain the Island's streams as scenic, aquatic, and recreation resources."

Objective A, Policy 4: "Require development projects to give due consideration to natural features such as slope, flood and erosion hazards, water-recharge areas, distinctive land forms, and existing vegetation."

Objective A, Policy 6: "Design surface drainage and flood-control systems in a manner which will help preserve their natural settings."

Objective A, Policy 8: "Protect plants, birds, and other animals that are unique to the State of Hawaii and the Island of Oahu."

Objective A, Policy 9: "Protect mature trees on public and private lands and encourage their integration into new developments."

Discussion: Approximately one-half of the project is devoted to conservation of the site. The heavily vegetated ravines and a significant portion of the plateau will be preserved or utilized as it is currently, for horse pasture. As with many open space areas of Hawaii, introduced plants comprise a significant portion of the vegetation. The project proposes to create a conservation area in which native and endemic Hawaiian plants may be re-introduced, thereby enhancing the bio-historical value of the site. The rare Koolau Eugenia trees on adjacent state land will be preserved and protected to enhance their chances for survival through a cooperative effort including DLNR and Obayashi.

Objective B: "To preserve and enhance the natural monuments and scenic views of Oahu for the benefit of both residents and visitors."

Objective B, Policy 4: "Provide opportunities for recreational and educational use and physical contact with Oahu's natural environment."

Discussion: The proposed development will offer a variety of amenities of a recreational and educational nature. Visitors to the recreational community can learn about the natural environment and spectacular scenery of the North Shore by hiking the trails. Horseback riding, hiking, camping and golf are recreational activities that will be available to the public as a result of the project and can also put one into direct contact with Oahu's natural environment.

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Objective B, Policy 8: "Protect plants, birds, and other animals that are unique to the State of Hawaii and the island of Oahu".

Discussion: Approximately 559 acres on the project site will be preserved as undisturbed open space. The Koolau Eugenia tree is a rare species found just outside the mauka boundary of the site on State Forest Preserve lands. To improve the changes for continued survival of these trees, Obayashi has entered into a cooperative management effort with DLNR to preserve and enhance the habitat of these trees.

6.2.4 Housing

Objective A: "To provide decent housing for all the people of Oahu at prices they can afford."

Objective A, Policy 10: "Promote the construction of affordable dwellings which take advantage of Oahu's year-round moderate climate."

Objective A, Policy 11: "Encourage the construction of affordable homes within established low-density communities by such means such as "ohana" units, duplex dwellings and cluster development."

Discussion: The 180 affordable homes, 60 percent of the total number of residential units proposed in Lihi Lani, will contribute to the stock of decent, affordable housing on Oahu. If the affordable homes are constructed within the Lihi Lani Recreational Community as proposed, it will serve the policy of encouraging landowners to build affordable homes in low-density areas, providing variety within the housing stock of any one area.

Objective B: "To reduce speculation in land and housing."

Objective B, Policy 3: "Seek public benefits from increases in the value of land owing to City and State developmental policies and decisions."

Discussion: The proposed Lihi Lani Recreational Community project includes public amenities and benefits, including affordable housing, which are proposed to meet the intentions of the General Plan. Appendix A of the Final EIS is the "Proposed Community Benefits Package" for the Lihi Lani Recreational Community which includes an approximate valuation of these benefits, over time. Although the valuation may be debated, the project benefits themselves are substantial and should be considered in light of the amount and intensity of development being proposed.

6.2.5 Transportation and Utilities

Objective B: "To meet the needs of the people of Oahu for an adequate supply of water and for environmentally-sound systems of waste disposal."

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Objective B, Policy 1: "Develop and maintain an adequate supply of water for both residents and visitors."

Objective B, Policy 3: Encourage the development of new technology which will reduce the cost of providing water and the cost of waste disposal."

Objective B, Policy 5: "Provide safe, efficient, and environmentally sensitive waste-collection and waste-disposal services."

Objective B, Policy 6: "Support programs to recover resources from solid-waste and recycle wastewater."

Discussion: The applicant will draw water from the Board of Water Supply's Waialua transmission/distribution system to meet the potable water needs of the proposed project. This demand can be met without adversely affecting supply to other users in the service area (Mink, December 1990).

If approved by the various regulatory agencies, wastewater from the project will be advanced secondarily-treated, diluted with brackish water and used to irrigate the golf course. This disposal technique has been proven safe and effective by the University of Hawaii. Although the process is not entirely new, further research has been promoted by this project in the area of marshland technology with respect to wastewater treatment.

6.2.6 Physical Development and Urban Design

Objective D: "To create and maintain attractive, meaningful, and stimulating environments throughout Oahu."

Objective D, Policy 5: "Require new developments in stable, established communities and rural areas to be compatible with the existing communities and areas."

Discussion: The Pupukea/Sunset Beach/Waimea neighborhoods have a rural setting, and an above-average median income level. The proposed project will be a development of a similar rural style and will maintain 559 acres of undisturbed open space, as well as 327 acres in golf course and other recreational uses. The project will be designed to complement the country environment, and will make use of the natural surroundings through its recreational activities of golf, horseback riding, tennis, camping and hiking. Refer to Section 4.16.4 of this document.

6.2.7 Culture and Recreation

Objective B: "To protect Oahu's cultural, historic, architectural, and archaeological resources."

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Objective B, Policy 1: "Encourage the restoration and preservation of early Hawaiian structures, artifacts, and landmarks."

Objective B, Policy 2: "Identify, and to the extent possible, preserve and restore buildings, sites and areas of social, cultural, historic, architectural, and archaeological significance."

Objective B, Policy 4: "Promote the interpretive and educational use of cultural, historic, architectural, and archaeological sites, buildings, and artifacts."

Discussion: A comprehensive archaeological survey of the project site has been done by a professional archaeologist. A program for data recovery, preservation and interpretive development, as approved by the State Historic Preservation Office, will be carried out. The most significant site will be preserved and possibly developed for interpretive purposes. Refer to Section 4.11 of this document.

Objective D: "To provide a wide range of recreational facilities and services that are readily available to all residents of Oahu."

Objective D, Policy 10: "Encourage the private provision of recreation and leisure-time facilities and services."

Discussion: The proposed recreational community will provide various recreational activities for the project residents, as well as for Oahu and other State residents, and for visitors. Golfing, horseback riding, tennis, and hiking will be available at different levels of access. Refer to Section 4.18.5 of this document.

6.3 CITY AND COUNTY OF HONOLULU NORTH SHORE DEVELOPMENT PLAN

The following discussion provides an assessment of how the proposed Lihi Lani Recreational Community will conform to and implement the Development Plan (DP) for the North Shore area.

6.3.1 Development Plan Common Provisions

Section 4. General Urban Design Principals and Controls:

4.1 Public Views: "The design and siting of all structures shall reflect the need to maintain and enhance available views of significant landmarks. No development shall be permitted that will block important public views."

Discussion: Views of parts of the North Shore from Sunset Beach to Mokuleia can be seen from atop the project site, and these views will now be made publicly available from the hiking trails. Homes on the Haleiwa-side plateau will be set back from the top of the bluff and will not be visible from below. The access road running across the bluff will be carefully landscaped to blend with the rest of the bluff face. Refer to Section 4.15 of this document.

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4.2 Open Space: *"The City's mountains, hills, shoreline and streams, shall be considered as major scenic, open space and recreational resources. Adequate public access to these resources shall be incorporated as part of developments adjacent to them. Existing natural stream beds and drainage-ways shall be retained wherever possible. Where further channelization must occur, materials that are harmonious with the setting, such as stone, shall be used whenever feasible."*

Discussion: The project site will set aside 559 acres of undisturbed open space consisting of mountains, valleys and intermittent streams. Views of the North Shore and the Waianae mountain range will be available from the hiking trails. This site was previously inaccessible to the public. A community center, an 18-hole golf course, a tennis center, equestrian ranch, campground and trails for hiking and horseback riding will be available to the public for recreational purposes. Existing intermittent stream beds on the site will be for the most part left in their natural state except for one road crossing. No channelization is planned. Natural materials, such as stone, will be used where enhancement of the stream bed environment is desired in connection with the development of the golf course.

4.3 Vehicular and Pedestrian Routes: *"Landscaping shall be provided along major vehicular arterials and collector streets as a means to increase the general attractiveness of the community and the enjoyment of vehicular travel for visitors and residents."*

Discussion: The entry road connecting the project with Kamehameha Highway will extend across a portion of the bluff. Terraced landscaping of the road will have an aesthetic quality that corresponds with the style and character of the surrounding community. A left-turn lane off Kamehameha Highway into the project entrance will be added. Right-turn and left-turn lanes will be developed at the project entrance for access to Kamehameha Highway. Distinctive landscaping, lighting and signing will be installed at the project entrance. Refer to Sections 4.12 and 4.15 of this document.

4.6 Existing Built-Up, Single Family Residential Areas: *"New development in existing communities shall generally be limited to that which is compatible with or enhances the desired physical and social character and lifestyle. New residential development in rural areas shall be compatible with the general rural character of the area."*

Discussion: The proposed market housing development is designed to blend in with the surrounding community's physical and social character. Spacious lots will maintain the open space and enhance the rural setting. On-site affordable housing will be designed to fit, aesthetically, with this country type of development.

Section 5. General Principles and Controls for Parks, Recreation and Preservation Areas:

5.1.b (3): Parks and Recreation Areas: "Suburban and new development areas shall include land for open space and recreation purposes at a minimum of two acres per thousand persons."

Discussion: A projected on-site resident population at the proposed project is estimated to be approximately 697 persons. Based on the above recreational land standard, about 1.4 acres would need to be provided for open space and recreational purposes. The proposed project will include approximately 886 acres of land for open space and recreation (559 acres of open space; a golf course totaling 193 acres, a 10-acre driving range, a 19-acre equestrian ranch, 78-acres of pasture, a 15-acre campground and an 14-acre tennis ranch). This represents approximately 77 percent of the total 1,143-acre project site.

Section 10. Social Impact of Development:

10.2 Social Impact Factors: "In evaluating an proposed development, the [General Plan] objectives relating to the distribution of social benefits shall be considered. The following factors shall be examined as they pertain to such objectives:

- a. **Demographic:** Whether the development will:
 - (1) Increase or decrease the residential population.
 - (2) Increase or decrease the visitor population.
 - (3) Change the character or culture of the neighborhood.

- b. **Economic:** Whether the development will affect:
 - (1) The rate and pattern of economic growth and development.
 - (2) The diversity of employment.
 - (3) The availability of jobs.
 - (4) The employment wage rate.
 - (5) The principal economic activities on Oahu.

- c. **Housing:** Whether the development will affect:
 - (1) The availability of housing.
 - (2) The quality of housing.
 - (3) Speculation in land and housing.
 - (4) Property values of existing homes.

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d. *Public Service: Whether the development will affect:*

- (1) *Medical facilities.*
- (2) *Educational facilities.*
- (3) *Recreational facilities.*
- (4) *Transportation facilities.*
- (5) *Police and fire protection.*
- (6) *Public utilities facilities.*

e. *Physical; Environmental: Whether the development will affect:*

- (1) *The natural environment.*
- (2) *Existing natural monuments, landmarks and scenic views.*
- (3) *Open space.*
- (4) *The aesthetic quality of the area."*

Discussion: The social impacts of the proposed development were studied by Community Resources, Inc. (January 1991). An economic impact study was prepared for the project by KPMG Peat Marwick (January 1991). The major findings of these studies are discussed in Section 4.16 of this report.

a. **Demographic:** Approximately 697 persons will be added to the full-time population as a result of this project. At least 72 percent of the resident population will be at the affordable housing. Including the visitor count, the total "de facto population" is estimated to be approximately 578 by 1995, and approximately 1,020 persons by 2001. There will be many part-time residents of this community, thus reducing the feeling of "invasion" into the North Shore community. The North Shore is a rural country area known for its easy-going lifestyle, scenic beauty, beaches and surfing. The influx of population and jobs due to the proposed project should not alter these existing community characteristics, as it will be designed in accordance to these values. Refer to Sections 4.16.1 and 4.16.4 of this document and Appendix T.

b. **Economic:** Lihi Lani will generate short-term employment during the construction of new facilities and long-term employment in the operation and support of those facilities. The project is expected to generate approximately 1,005 full-time equivalent direct, indirect and induced jobs on Oahu between 1993 and 2000.

Personal income paid to Hawaii residents could be expected to amount to about \$8.5 million per year during the initial construction phase (years 1993-1995) and about \$4.0 million per year between 1996 and 2000. In the ensuing years, personal income generated by the project will decline to about \$870,000 per year, as construction activity subsides and operational employment demands increase slightly. Refer to Section 4.16.2 of this document and Appendix T.

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c. **Housing:** The proposed project is not intended to be a major supplier of resident housing. Consequently, it will have little impact on the availability or quality of such housing. Its unique design (the only community on Oahu which integrates second and vacation home sites with recreational facilities) and geographic separation from existing nearby residential areas also indicate that it should have little if any impact on speculation and property values in the surrounding area. Lihi Lani will provide 180 units of affordable housing on-site.

d. **Public Services:** The effect of the development on public services in the area will be minimal, as expressed in Sections 4.16 and Section 4.18 of this document.

e. **Physical Environment:** As already discussed, the project will substantially preserve the natural environment, existing natural monuments, landmarks, scenic views, open space and aesthetic qualities of the subject area.

Section 11. Social Impact Management System:

"The objective of the social impact management system is: "to enable residents of an area who will be affected by a proposed development project to systematically examine the expected social impact of that development and, ...to identify alternative ways of managing or mitigating any expected negative social impacts."

Discussion: Early in the planning and design stage of this project, the developer contacted the community to arrange informational meetings to explain the project's intent and to get their feedback. By working with the community, over a three year period Obayashi has changed its development plans significantly to reflect community concerns. Much of the land use theme, environmental controls, and community benefit aspects in the current Obayashi proposal have resulted from the efforts of the Sunset Beach and Pupukea Highland's Joint Planning Committee. Input from the residents has changed and refined the master plan in a symbiotic planning process. Extensive community benefits programs and a community facility have been proposed in response to desires of community representatives.

6.3.2 Development Plan Special Provisions

Section 2. Urban Design Principles and Controls for the North Shore:

2.1.b Specific Urban Design Considerations - Public Views: *"In order to protect and enhance the rural attractiveness of the North Shore, broad open space views from public places of the agricultural fields, and panoramic and continuous views from public places of the coast and the sea shall be protected whenever possible. Important views to be protected include:*

- *Panoramic view of Waimea Bay to Sunset Beach from Pupukea Highlands.*
- *View of the Pali mauka of Kamehameha Highway in Sunset Beach."*

Discussion: Refer to the Common Provisions discussion of General Urban Design Principles and Controls - Public Views.

6.4 HAWAII COASTAL ZONE MANAGEMENT PROGRAM

The objectives of the Hawaii Coastal Zone Management Program, Section 205A-2, HRS, are to protect valuable and vulnerable coastal resources such as coastal ecosystems, special scenic and cultural values, and recreational opportunities. The objectives of the program are also to reduce coastal hazards and to improve the review process for activities proposed within the coastal zone.

Only a small part of the subject site (approximately 30 acres) is included in the City and County of Honolulu Special Management Area. The remaining 1,113 acres are located mauka of this parcel above the bluff. Only an entrance, community facilities access road and related utilities are currently planned on this makai section of the project site.

The following are the applicable objectives of the Hawaii Coastal Zone Management Program and an assessment of how the proposed project relates to them.

A. Historic Resources Objective

"Protect, preserve and, where desirable, restore those natural and man made historic and pre-historic resources in the coastal zone management area that are significant in Hawaiian and American history and culture."

Discussion: As noted, a comprehensive archaeological survey has been done for the project site. Recommendations for date recovery, preservations and interpretive development will be reviewed by the State Historic Preservation Office. Appropriate actions will be taken to preserve significant resources.

B. Scenic and Open Space Resources Objective

"Protect, preserve and, where desirable, restore or improve the quality of coastal scenic and open space resources."

Discussion: The Master Plan for the proposed Lihi Lani Recreational Community includes 559 acres of undisturbed open space; an 18-hole golf course, and driving range totaling 203 acres; 12 acres for a tennis center, 97 acres for an equestrian ranch and horse pasture and 15 acres for a campground. This open and outdoor recreational area represents 77 percent of the total 1,143 acre site. See also the earlier discussion of General Plan objectives and policies related to the natural environment, and to culture and recreation.

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C. Coastal Ecosystems Objective

"Protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystem."

Discussion: Storm water runoff which drains from the project site into the Pacific Ocean is currently generated only during high precipitation periods. Drainage design for the Lihi Lani Recreational Community will detain storm water runoff on the site and release runoff into streams at similar to or less than existing rates. Estimated surface runoff contaminant concentrations resulting from the developed condition were examined by Dugan (December 1990), and were determined to have little potential for creating adverse water quality effects on the ocean. The amount of sediment in runoff will actually be less than under existing conditions. Refer to Section 4.6.1 of this document, and Appendix G.

Fertilizer and pesticide contributions in runoff were also examined for this project by Murdoch and Green (December 1990). This study showed that if appropriate application procedures are followed, runoff concentrations of fertilizers and pesticides would not be detrimental to water quality in the intermittent streams and the ocean (when reached by runoff). Refer to Section 4.6.2 and Appendix H.

A marine resources assessment for this project was prepared by Marine Research Consultants (December 1990). This study involved an evaluation of the marine water quality affects potentially created by the project, and any short-term or long-term effects on the marine environment receiving runoff from the sites. This study determined that the project as proposed will create a negligible adverse effect on marine resources, although existing water quality degradation is occurring due to effluent from the area's private residential cesspool systems which currently leach into nearshore waters. Refer to Section 4.10 and Appendix K.

D. Coastal Hazards Objective

"Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion and subsidence."

Discussion: The project is located outside of the 100-year and 500-year flood hazard areas as defined by the Federal Emergency Management Agency, Flood Insurance Rate Map. Stream flooding of residential areas will not occur on the project site, nor will the site be affected by storm waves or tsunami. It is not necessary to undertake measures to avoid flood hazards at this development. Drainage improvements within the developed project will reduce the erosion of soils from the land compared to existing conditions, and will ensure that the project will not cause any stream flooding downstream. Refer to Section 4.6.1 and Appendix C.

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6.5 SPECIAL MANAGEMENT RULES AND REGULATIONS OF THE
CITY AND COUNTY OF HONOLULU

The review guidelines of Section 33-3.2 of the Revised Ordinances of Honolulu are used by the Department of Land Utilization and the City Council for the review of developments proposed in the Special Management Area. Figure 8 shows the location of the project section that lies within the Special Management Area. These guidelines are derived from Section 205A-26, HRS. The consistency of the proposed project with the guidelines are discussed below.

- "(1) All development in the special management area shall be subject to reasonable terms and conditions set by the Council in order to ensure that:
- (A) Adequate access, by dedication or other means, to publicly owned or used beaches, recreation areas, and natural reserves is provided to the extent consistent with sound conservation principles;
 - (B) Adequate and properly located public recreation areas and wildlife preserves are reserved;
 - (C) Provisions are made for solid and liquid waste treatment, disposition, and management which will minimize adverse effects upon special management area resources; and
 - (D) Alterations to existing land forms and vegetation, except crops, and construction of structures shall cause minimum adverse effect to water resources and scenic and recreational amenities and minimum danger of floods, landslides, erosion, siltation, or failure in the event of earthquake."

Discussion: The proposed project will involve roadway and drainage facilities construction and utilities installation in the 30-acre SMA. The project will generally be consistent with this policy because no public areas or wildlife preserves are affected by the project. Wastewater treatment and disposal will be conducted outside the SMA. Scenic resources will be only minimally affected by vegetation clearing for the access road development, drainage facilities construction, and utilities installation. The public will have access to the various recreational facilities on the project.

- "(2) No development shall be approved unless the Council has first found that:
- (A) The development will not have any substantial, adverse environmental or ecological effect except such as adverse effect is minimized to the extent practicable and clearly outweighed by public health and safety, or compelling public interests. Such adverse effect shall include, but not be limited to, the potential cumulative impact of individual

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developments, each one of which taken in itself might not have a substantial adverse effect, and the elimination of planning options;

- (B) *The development is consistent with the objectives and policies set forth in Section 33-3.1 and area guidelines contained in Section 205A-26, Hawaii Revised Statutes; and*
- (C) *The development is consistent with the County General Plan, development plans, zoning and subdivision codes and other applicable ordinances."*

Discussion: The activities of the project in the SMA will be limited to the roadway and drainage facilities construction and the utilities installation. Unavoidable adverse environmental effects that will occur in this area include: topography modifications, short-term soils disturbance and erosion, vegetation clearing, short-term wildlife disturbance, archaeological resources disturbance, short-term traffic disruption, short-term construction noise, short-term air quality effects (dust and exhaust emissions), and short-term visual degradation. These adverse effects will be minimized to the maximum extent practicable through the implementation of recommended mitigative measures. The project will not eliminate planning options for this part of the SMA.

The consistency of the proposed development with the objectives and policies set forth in Section 205A-2, HRS, the area guidelines set forth in Section 205A-26, HRS, the General Plan for the City and County of Honolulu, and the Development Plan the North Shore, was described earlier in this section of this document. Upon receipt of requested zone change applications and subdivision approvals, the applicant will observe the applicable regulations of the LUO subdivision codes and other applicable Ordinances.

- "(3) *The Council shall seek to minimize, where reasonable:*
- (A) *Dredging, filling or otherwise altering any bay, estuary, salt marsh, river mouth, slough or lagoon;*
 - (B) *Any development which would reduce the size of any beach or other area usable for public recreation;*
 - (C) *Any development which would reduce or impose restrictions upon public access to tidal and submerged lands, beaches, portions of rivers and streams within the special management area and the mean high tide line where there is no beach;*
 - (D) *Any development which would substantially interfere with or detract from the line of sight toward the sea from the state highway nearest the coast;*

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- (E) *Any development which would adversely affect water quality, existing areas of open water free of visible structures, existing and potential fisheries and fishing grounds, wildlife habitats, or potential or existing agricultural uses of land."*

Discussion: For the most part, these review guidelines do not apply to the proposed project. With respect to water quality effects, the project has been studied in detail for its potential surface water quality effects due to silt, nutrients and chemicals contained in storm water runoff. Storm water runoff from the project which will enter the ocean during peak precipitation periods is not expected to contain substantial concentrations of contaminants which could adversely affect surface-water quality (Dugan, December 1990; Murdoch and Green, December 1990; Marine Research Consultants, December 1990).

SECTION 7 – Unresolved Issues

7.0 SUMMARY OF UNRESOLVED ISSUES

During the open dialogue and planning process with the North Shore community, especially through the Joint Planning Committee, issues have been raised which have not yet been resolved. The review of the Final EIS and subsequent meetings within the community will allow further discussion of these issues concerning the project. Currently unresolved issues are listed below.

1. **Proposed Land Use Mix.** Although the Joint Planning Committee, the adjoining Sunset Beach and Pupukea Highlands communities, and the North Shore as a whole have been asked to consider various possible land uses for this property for over a year, there has been no consensus reached regarding the most desirable mix of land uses for Lihi Lani. Of those polled at community meetings to identify a preferred land use mix, almost half showed support for the proposed plan. Others have shown preferences for no development on this land, while others prefer only low-density residential and recreational uses without a golf course.

2. **Affordable Housing.** Existing residential development in Pupukea Highlands and Sunset Hills is typically low density (one-acre minimum lots size), while Sunset Beach typically contains smaller lots of 5,000 to 6,000 sq. ft. . Preliminary plans for the proposed affordable housing includes 6,000 sq. ft. lots, which some feel is an inappropriate residential density for the mauka areas of the North Shore. Affordable housing at Lihi Lani will also contribute significantly to the project's potable water demand, wastewater facilities capacity, full-time resident population and traffic. Some community members have suggested that Obayashi's provision of affordable housing should instead be developed at existing population centers or areas targeted for population growth on Oahu.

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SECTION 9 - Comments and Responses

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9.0 COMMENTS AND RESPONSES

Listed below are the agencies and organizations consulted in the preparation of the Draft EIS and the Final EIS. The table indicates those who submitted written comments or letters stating they have no comments. This is followed by the written comments received and responses.

	<u>Comments on N.O.P.*</u>	<u>Comments on Draft EIS</u>
A. FEDERAL AGENCIES		
U.S. Department of Agriculture, Soil Conservation Service	-	X
Department of the Navy	-	X
U.S. Department of the Interior Fish and Wildlife Service	-	X
Department of the Army, U.S. Army Corps of Engineers	-	X
B. STATE AGENCIES		
Office of State Planning	X	X
DLNR/Office of Conservation and Environmental Affairs	-	-
DLNR/Historic Preservation Division	X	X
DLNR/Division of Forestry and Wildlife	X	X
DLNR/Division of Water and Land Development	-	-
DLNR/Division of Water Resource Management	X	-
DLNR/Division of Land Management	-	X
DLNR/Division of Aquatic Resources	-	X
Department of Agriculture	X	-
Department of Education	X	-
Department of Health	-	X
Department of Transportation	X	X
Housing, Finance and Development Corp.	X	X
Dept. of Business and Economic Development	X	-
University of Hawaii, Environmental Center	X	X
Hawaii Air National Guard	X	-
State Public Works	-	X
Office of Environmental Quality Control	-	X
Department of Hawaiian Home Lands	-	X

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	<u>Comments on N.O.P.*</u>	<u>Comments on Draft EIS</u>
C. CITY AND COUNTY AGENCIES		
Department of Land Utilization	-	-
Board of Water Supply	X	X
Department of Public Works	X	X
Departments of Parks & Recreation	X	X
Department of Transportation Services	X	X
Department of Housing and Community Development	-	X
Police Department	X	X
Fire Department	-	X
Building Department	-	X
Department of General Planning	-	X
D. COMMUNITY ORGANIZATIONS		
North Shore Neighborhood Board No. 27	-	-
Sunset Beach Community Association	*	*
Sunset Hills Community Association	-	-
Pupukea Highlands Community Association	*	*
Kahuku Community Association	-	-
Haleiwa Community Association	-	-
Waialua Community Association	-	-
Mokuleia Community Association	-	-
<p>*Note: Individual members of the Sunset Beach and Pupukea Highlands Community Associations provided comments through the Joint Planning Committee for the Obayashi Property.</p>		
E. INDIVIDUALS		
Mr. Kamuela Price	X	-
Janet Ashman-Lauer, Esq.	X	-
Toni Sichler	X	-
Ms. Doy Connelly	X	-
Mr. Ed Farwell	X	-
William W. Ramos-Saunders	-	X
Joint Planning Committee for the Obayashi Property	X	X
Concerned Citizens of Sunset Beach	-	X

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	<u>Comments on N.O.P.*</u>	<u>Comments on Draft EIS</u>
F. MISCELLANEOUS		
Hawaiian Electric Company	-	X

*N.O.P. stands for Notice of Preparation

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9.1 NOTICE OF PREPARATION - COMMENTS AND RESPONSES

8763-14
3.13



OFFICE OF STATE PLANNING

Office of the Governor

STATE CAPITOL, HONOLULU, HAWAII 96813 TELEPHONE (808) 548-5893

JOHN WAIHELE, Governor

December 31, 1990

RECEIVED

JAN - 7 1991

GROUP 70
LIMITED

Mr. Jeffrey H. Overton, AICP
Group 70 Limited
924 Bethel Street
Honolulu, Hawaii 96813-4398

Dear Mr. Overton:

We have reviewed the Environmental Assessment for the Lihi Lani Recreational Community and offer the following comments.

The Environmental Impact Statement should discuss how the proposal impacts the North Shore area in relation to the other numerous golf course proposals for the area.

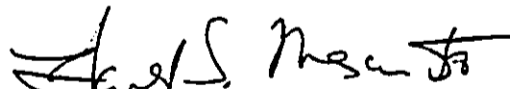
The impacts to adjacent land, particularly State land upon which the Eugenia Koolauensis trees are located, should be detailed. The location of the trees in relation to the site and the mitigative measures proposed to protect them should be explained.

Since prime agricultural land is involved, maps and detailed information should be included in the EIS. Page 41 of the assessment states that one of the alternatives considered was very similar to the proposed project "except it does not include the continued use of prime agricultural lands for agriculture." Are additional agricultural uses planned of the "prime" acreage or are the horse pastures and one-acre community gardens what is being referred to?

Other issues which we believe should be extensively documented are: groundwater and near-shore waters, drainage and erosion, the topographical alterations to the existing terrain, traffic, archaeological resources, scenic impacts, and socio-economic impacts.

Thank you for the opportunity to comment. If you should have any questions please contact the Land Use Division at 548-2066.

Sincerely,


Harold S. Masumoto
Director

cc: Department of General Planning
OEQC



GROUP 70

CONSULTANTS

Thomas S. Goff, M.A., M.P.
Christopher S. Hoop, M.A.
Debra H. Johnson, M.A., ASID
John R. Kelly, M.A., M.P.
Douglas H. Lee, M.P.

Lowell Niles, M.A., C.S.
Paul M. Aoyagi
Frank E. S. B.
John H. Berman, M.P.
Edward E. Brown
Paul F. Chorney, M.A.
Stephen E. Cook, M.A.
Dean D. Kaminaga, M.A.
George J. Scott

Jim Tuohimäki, M.A., ASID
Anne Thors, M.A., ASID
Stephen E. Gallo, CPA
Geoffrey A. Wallbridge, M.A.
John R. Bell, M.A., C.S., C.C.S.
Robert K. Marzola
George E. Allen, M.P.
Edward H. Ostrom, M.P.
Timothy F. Washimoto, M.A.
Eric John Bell, Jr., M.A.
Stephen C. S. Chang, M.A.
Richard A. Giam

12 April 1991

Mr. Harold S. Masumoto, Director
Office of State Planning, Land Use Division
Office of the Governor
State Capitol
Honolulu, Hawaii 96813

**Subject: Lihi Lani Recreational Community Environmental Assessment
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Mr. Masumoto:

Thank you for your December 31, 1991 letter regarding the above application. The Draft Environmental Impact Statement (Draft EIS) for this project was filed with the City and County of Honolulu Department of General Planning on January 22, 1991. The following responses are to your specific comments.

A. Golf Course Proposals in North Shore/Koolauloa Area

There are several known proposals for new golf courses for the North Shore/Koolauloa area, including the one golf course at the Lihi Lani Recreational Community and two golf courses proposed by the Mokuleia Land Company. Both of these projects have filed for Development Plan (DP) Land Use Amendment with the City and County for the 1991 Annual Review. There have been discussions and, in some cases, preliminary planning of other golf course projects in this area which are not currently being pursued.

There are another eight potential golf courses which have been considered in the area, including: two courses at Malaekahana (one each by the Estate of James Campbell and Kuilima Resort Company); three golf courses at Punamano (Estate of James Campbell); one or two golf courses in the Haleiwa area on land owned by Bishop Estate; and one golf course in Waialua on Castle & Cooke land. To our knowledge, the Bishop Estate plans are in a conceptual form at present, they have not been accepted by the Trustees, and are expected to be re-evaluated this year (Elaine Brown, Kamehameha Schools/Bishop Estate, March 14, 1991). Campbell Estate is planning to file for a DP Amendment with the City in the 1992 Annual Review for its four proposed golf courses at Punamano and Malaekahana (Charles Erhorn, Campbell Estate, March 14, 1991). Kuilima Resort Company also plans to file in the 1992 Annual Review for its one golf course at Malaekahana. Castle &

Letter to Office of State Planning, Land Use Division
Mr. Harold S. Masumoto, Director
12 April 1991
Page 2

Cooke has no plans to develop a golf course at this time, however, there was a proposal made several years ago for a golf course in Waialua.

Of the eleven potential golf courses listed above, including Lihi Lani and Mokuleia, there are seven courses which will probably seek approvals in the near future. Our market assessment shows that a substantial Oahu resident and visitor market exists and will continue to exist for quality daily fee golf courses in the North Shore/Koolauloa area. We believe that Lihi Lani's Nicklaus-designed golf course is timely and will fit in the current and projected market.

A detailed Market Assessment was prepared by KPMG Peat Marwick and included in the Draft EIS to evaluate the proposed golf course in light of the other numerous golf course proposals for the area. In general, the evaluation determined that with appropriate market planning, Lihi Lani and the two Kuilima courses could serve complimentary markets and support the emergence of the North Shore area of Oahu as a small golf center, with three high-quality courses for both resident and visitor golfers. Although all eleven proposed golf courses for the North Shore/Koolauloa area are not expected to be developed rapidly in the foreseeable future, we believe that the existing and projected golf market could support the Lihi Lani golf course and other golf developments in the North Shore area.

B. Impacts on State Lands and Rare Trees

The project will not impact the *Eugenia Koolauensis* trees found on the adjacent State lands. A joint effort between Obayashi and the State Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW) is being implemented to assure the continued existence of these trees and enhancement of their habitat. At the request of DLNR, Obayashi has refrained from noting the exact location of the trees in the Draft EIS.

C. Prime Agricultural Land Use

The relationship of the proposed master plan and the University of Hawaii Land Study Bureau agricultural land classifications is shown in the Draft EIS. The feasibility of these lands for productive agricultural purposes is discussed further in Section 4.4 and Appendix F. Prime agricultural soils will be primarily used for horse pasture, as well as some parts of open space, country lots, tennis center and roads. The affordable housing area is being relocated off of the prime agricultural soils. Because the feasibility of agricultural use of the site is minimal, the proposed uses will not affect agriculture on the North Shore. Portions of the land have historically been used for grazing, and therefore the planned horse pasture use of prime agriculture lands is

Letter to Office of State Planning, Land Use Division
Mr. Harold S. Masumoto, Director
12 April 1991
Page 3

consistent with past utilization. Also, these lands will remain available for agriculture in the future, should conditions become more favorable for small-scale intensive agriculture. Some small areas will be allocated to community garden use, which is consistent with the preservation of prime agricultural soils.

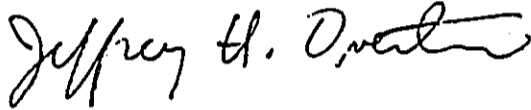
D. Other Issues Raised

Issues relating to groundwater and near-shore waters, drainage and erosion, the topographical alterations, traffic, archaeological resources, scenic impacts and socio-economic impacts are all evaluated in detail in the Draft EIS.

Thank you again for your suggestions and comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or concerns.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

JOHN WAIHEE
GOVERNOR OF HAWAII

RECEIVED

FEB 11 1991

GROUP 70
LIMITED



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

8763-14
3.13

WILLIAM W. PATY, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

KEITH W. AHUE
MANABU TAGOMORI
DAN T. KOCHI

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LAND MANAGEMENT
STATE PARKS
WATER RESOURCE MANAGEMENT

February 1, 1991

Jeffrey H. Overton
Group 70 Limited
924 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Overton:

SUBJECT: City & County of Honolulu, Application for North Shore Development
Plan Amendment and Environmental Assessment
Lihī Lani Recreational Community
Paumalu and Pupukea
Koolauloa District, O'ahu
TMK: 5-9-05: 6, por. 38, 82; 5-9-06: 1, 8, 18, 24

Thank you for your letter dated December 10, 1990, and the opportunity to review your Environmental Assessment.

A review of our files indicate the subject parcels underwent adequate archaeological survey in 1988 by Paul H. Rosendahl, Ph.D., Inc. (PHRI). This survey found 54 historic sites. Sufficient information was gathered to evaluate the significance of these sites.

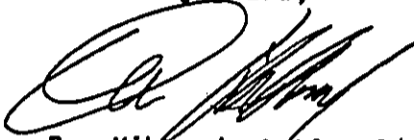
We agreed with the significance evaluations (Letters October 17, 1988 to DLNR's Office of Conservation & Environmental Affairs; November 7, 1988 to Office of State Planning). Thirty-one of the sites have been considered to be "no longer significant" because reasonable amounts of their significant information were recovered during the survey. This means that 23 significant historic sites are still in the project area. The EA on page 38 inaccurately states that only "Six of the 54 sites are significant." This inaccuracy should be corrected.

We further agreed with the mitigation commitments for the 23 significant sites -- 16 to undergo archaeological data recovery and the remaining seven sites to be preserved.

Mr. Jeffrey Overton
February 1, 1991
Page Two

We recommended that the LUC attach a condition to any approved petition which would require that "an archaeological data recovery plan and a detailed preservation plan shall be submitted to and approved by the State's Historic Sites Section" (Letter to Masumoto, Director OSP on November 7, 1988). To our knowledge, no such mitigation plans have yet been prepared. This would be the next historic preservation compliance step needed, and this point should be clear in your Draft EIS and should also become a condition for any approved development plan amendment.

Sincerely yours,



Don Hibbard, Acting Administrator
State Historic Preservation Division



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

8763-14
3.13 16.
WILLIAM W. PATY, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES
KEITH W. AHUE
MANABU TAGOMORI
RUSSELL N. FUKUMOTO

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LAND MANAGEMENT
STATE HISTORIC PRESERVATION
STATE PARKS
WATER RESOURCES MANAGEMENT

18 January '91

liliani.wfc

Mr. Jeffrey H. Overton, AICP
Group 70 Limited
924 Bethel Street
Honolulu, HI 96813

Dear Mr. Overton:

RE: Application for North Shore Development Plan Amendment and Environmental Assessment

We have reviewed the Environmental Assessment regarding the North Shore Development Plan and have the following comments:

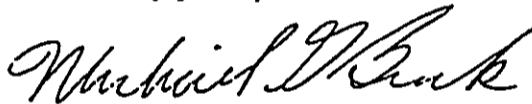
- 1) Pupukea Forest Reserve is presently a low use recreation area which is primarily used for hunting and hiking. With the adjacent development proposal, additional resources as well as the upgrading of the existing resources within the forest reserve would be needed to accommodate the anticipated increased use.
- 2) Existing resources needing upgrading would include the following:
 - a) the reconstruction of the forest reserve boundary fence adjacent to the development;
 - b) the reconstruction of internal roads for fire pre-suppression and suppression activities;
 - c) the reconstruction of existing trails and trailheads to accommodate horse travel.
- 3) Additional resources needed to accommodate additional uses would include the following:

Page 2
Mr. Jeffrey H. Overton

- a) additional loop trails and trailheads to disperse use activities such as horseback riding, mountain biking, hiking, and nature study;
 - b) provide primitive public camping facilities compatible with adjacent uses;
 - c) provide a trail maintenance trust fund for public safety;
 - d) disperse use by obtaining a right-of-way through military land to access the Koolau Summit Trail.
- 4) City and County of Honolulu Ordinance No. 4311 requires developers to provide public access to mountain areas. The forest reserve does not have adequate public access along its western boundary to allow for these expanded recreation activities. A preferred access point is indicated on the attached map. This access would provide for fire suppression and pre-suppression activities by the State as well as provide recreational opportunities for the general public and the local residents.

Thank you for allowing us to comment on your application and assessment. We would like to work with you to mitigate impacts to the Pupukea Forest Reserve. Please call Mr. Herbert H. Kikukawa, Oahu Forestry Manager, at 548-8850 and work with him directly to resolve any concerns you might have regarding this project.

Very truly yours,

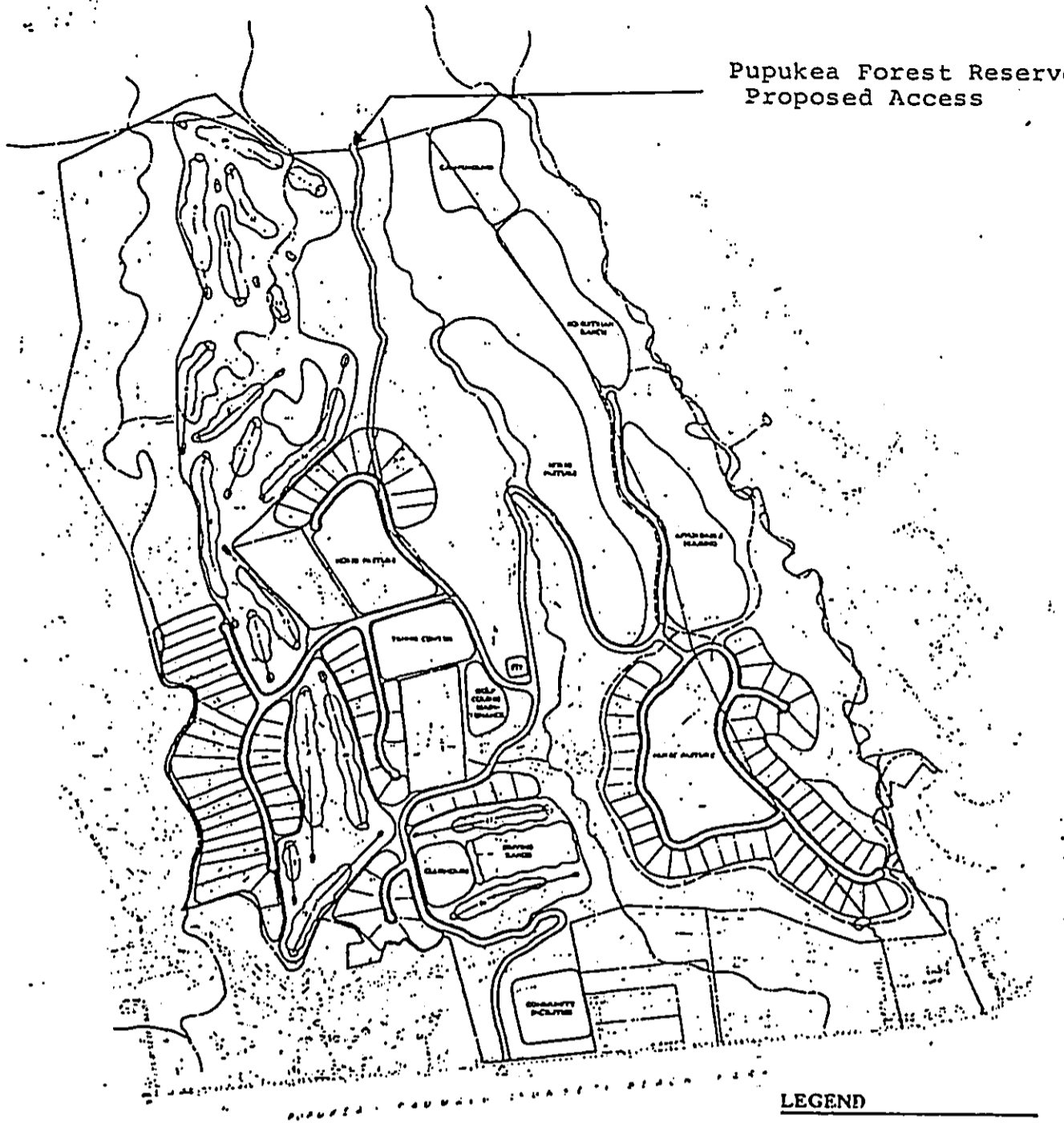


Michael G. Buck
Administrator


attachment

cc: Herbert H. Kikukawa, Oahu District
Roger Evans, OCEA

Pupukea Forest Reserve
Proposed Access



LEGEND

Golf Course	196 acres
Golf Course Maintenance Area	5 acres
Clubhouse	6 acres
Driving Range	10 acres
Tennis Center	13 acres
Equestrian Ranch	19 acres
Horse Pastures	96 acres
Compound	15 acres
Community Facilities	11 acres
Subdivision (120 Lots)	161 acres
Affordable Housing	22 acres
Roadways	44 acres
STP	1 acre
Open Space	538 acres
Total 1143 acres	
 Walking Trails / Horse Paths	(16 miles)

MASTER PLAN
LIHI LANI RECREATIONAL COMMUNITY

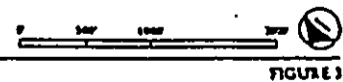


FIGURE 3

Letter to State of Hawaii, DLNR/Division of Forestry and Wildlife
Mr. Michael G. Buck, Administrator
12 April 1991
Page 2

Obayashi property in the Forest Reserve (see attached map for relationship between Koolau Summit and Kaunala Trails). A connector trail from Lihi Lani to the Kaunala Trail was proposed and initially "cut" by Dick Davis in 1989. Based upon our meeting with members of DOFAW staff, we understand that it would be desirable for Obayashi to create the above-described trail connection to the Kaunala Trail (not the Koolau Summit Trail), which would extend approximately 4,500-feet mauka from the project site. Once constructed, the State and Obayashi would maintain their respective portions of this trail.

This action may not be appropriate as a mitigative measure of the project, but may be considered as a project benefit and a condition of project approval.

E. Public Access to Mountain Areas (Item 4)

Public access to the State Forest Reserve land mauka of the Obayashi property would be via a nine-mile network of hiking and horseback riding trails, as described in Section 2.1.I of the Draft EIS. During subsequent planning phases, Obayashi will prepare a detailed trail and public access (to the State land) map for review by DOFAW. Obayashi will also prepare a separate fire suppression plan to describe the proposed fire suppression accessways.

A mitigative measure to this affect will be included in the Final EIS.

F. Other Comments

Items 2c, 3a, 3b, and 3c of your comment letter were discussed with DOFAW staff at the February 21 meeting. The landowner intends to create a nine-mile network of hiking and horseback riding trails on-site which will be open to the public free of charge. There will be no commercial "user fee" operation for public use of trails for hiking and horse riding. Upon this clarification, the aforementioned items were deemed no longer applicable to the project.

However, other action items were discussed that would be considered benefits of the Obayashi project, (should they be included in the plans or conditions of approval) as follows:

Fire Break Lines at Project Boundary, inside the Forest Reserve: Obayashi will assist the State in clearing additional fire breaks between the project and the Forest Reserve and along a former road extending mauka from the site into the Forest Reserve. There would be no off-site maintenance requirements of Obayashi of the fire break.

Horse Riding on State Reserve Property: Horseback riding is not currently permitted within the boundaries of the Pupukea-Paumalu Forest Reserve. If, however, due to the horseback riding activity within Lihi Lani Recreational Community, additional pressure to allow horseback riding within the State

Letter to State of Hawaii, DLNR/Division of Forestry and Wildlife
Mr. Michael G. Buck, Administrator
12 April 1991
Page 3

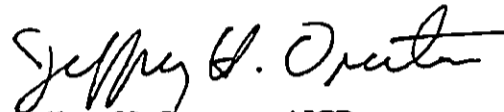
property calls for a change in that policy, Obayashi would be requested to provide ongoing maintenance funds in proportion to the amount of horseback riding activity generated by the Lihi Lani community.

Management Plan for Eugenia Tree Habitat: Obayashi will prepare a management plan for the preservation and enhancement of the habitat for the endangered Eugenia trees, for review by DOFAW. A mitigation measure to this effect is included in the Draft EIS, Section 4.8.

Thank you again for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

Attachment

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3.13

JOHN WAIHEE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF WATER RESOURCE MANAGEMENT
P. O. BOX 373
HONOLULU, HAWAII 96809

WILLIAM W. PATY, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

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Mr. Jeffrey H. Overton, AICP
Associate
Group 70 Limited
924 Bethel Street
Honolulu, Hawaii 96813-4398

FEB 15 1991
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FEB - 8 1991

GROUP 70
LIMITED

Dear Mr. Overton:

Obayashi Hawaii Corporation's Proposed
Lihi Lani Recreational Community at Pupukea

Thank you for sending us a copy of your "application for North Shore Development Plan Amendment and Environmental Assessment and asking for our comments.

In our review of you proposed development, we note that detention basins will be built to maintain existing runoff conditions. The construction of these basins may require two approvals from our Division of Water Resource Management, as follows:

- (1) Approval of the construction plans for the detention basins if their embankments are considered to be "dams" under Chapter 13-190, HAR, and
- (2) Permit for a Stream Channel Alteration for work at Pakulena Stream, as may be required under Chapter 169, HAR.

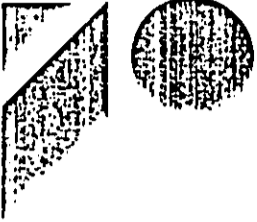
Copies of both administrative rules are enclosed. You may wish to review them to determine their applicability to your project, and identify them in your Final EIS.

Thank you for the opportunity to comment.

Sincerely,

MANABU TAGOMORI
Deputy Director

TK:bm
Enclosure



12 April 1991

State of Hawaii, DLNR/Division of Water Resource Management
Mr. Manabu Tagomori, Deputy Director
P.O. Box 373
Honolulu, HI 96809

Subject: Lihl Lani Recreational Community Environmental Assessment Paumalu and Pupukea, Koolauloa, Oahu, Hawaii

Dear Mr. Tagomori:

Thank you for your February 6, 1991 letter concerning the above application. The following is offered as a response to your specific comments.

A. Detention basins as "dams"

The detention basins proposed will not be considered "dams" as defined under Chapter 13-190, HAR. The detention basins will be less than 25 feet in height and store less than 50 acre-feet of water, maximum.

B. Permit for Stream Channel Alteration

After zoning is obtained, and prior to any construction work at Pakulena Stream, an application for a Stream Channel Alteration permit will be submitted to DOWALD.

Thank you for your comments. Please call me or Kari Kilstrom of our office if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED

Jeffrey H. Overton, AICP
Senior Planner

Attachment

- GROUP 70 LIMITED
- 1000 Kalia Road, Suite 1000, Honolulu, HI 96813
- Telephone: (808) 521-5871
- Fax: (808) 521-5872
- Telex: 980000
- Cable: 980000
- E-mail: g70@hawaii.net
- Website: www.group70.com
- 1000 Kalia Road, Suite 1000, Honolulu, HI 96813
- Telephone: (808) 521-5871
- Fax: (808) 521-5872
- Telex: 980000
- Cable: 980000
- E-mail: g70@hawaii.net
- Website: www.group70.com

JOHN WAIHEE
GOVERNOR



8763-14
3.13
YUKIO KITAGAWA
CHAIRPERSON, BOARD OF AGRICULTURE

SUZANNE D. PETERSON
DEPUTY TO THE CHAIRPERSON

FAX: 548-6100

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96823-2159

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JAN - 9 1991

GROUP 70
LIMITED

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 So. King Street
Honolulu, Hawaii 96814-2512

January 7, 1991

Mr. Jeffrey H. Overton, Associate
Group 70 Limited
924 Bethel Street
Honolulu, Hawaii 96813-4398

Dear Mr. Overton:

Subject: Application for North Shore Development Plan
Amendment and Environmental Assessment (EA)
Lihi Lani Recreational Community
Obayashi Hawaii Corporation
TMK: 5-9-05: 6, por. 38, 82
5-9-06: 1, 8, 18, 24 Pupukeya, Oahu
Area: 254 of 1,143 acres

The Department of Agriculture has reviewed the subject application and EA and offers the following comment.

The proposed project differs from the earlier petition for State land use district boundary amendment by one less golf course, 40 fewer market lots and the addition of 180 affordable housing units, community facilities, and more open space. In response to the earlier boundary amendment petition, we had expressed the hope that the subject development would substantially reduce the likelihood of further urban-related development on prime agricultural lands in the vicinity.

One question we have is why the entire development proposal is not part of the subject Development Plan request?

Thank you for the opportunity to comment.

Sincerely,

Yukio Kitagawa
YUKIO KITAGAWA
Chairperson, Board of Agriculture

c: Department of General Planning
Office of Environmental Quality Control



Letter to State of Hawaii, Dept. of Agriculture
Mr. Yukio Kitagawa, Chairperson
12 April 1991
Page 2

Further, by retaining the Agricultural DP designation and the General Agricultural District zoning over approximately 45 percent of the proposed development area, future land uses within project will be limited to the greatest extent possible. Other residential zoning designations have greater density, and their inclusion on the site would require Urban designation by the State Land Use Commission. The only situation in which this is required is the affordable housing portion of the project.

B. Prime Agricultural Lands

The current proposal for Lihi Lani is substantially changed from the 1988 version filed for a State Land Use Boundary Change from Agriculture to Urban for over 800 acres of the site. The current proposal will only involve 29 acres to be urbanized for the affordable housing area. The urbanized portion will not involve prime agricultural land. Most of the prime agricultural lands on the site will remain in State and City and County agricultural land use designations. The use of these prime lands will be partly for low-density country lots and some recreational facilities, but mostly for horse pasture use. Obayashi's change in the planning will keep prime agricultural lands intact on the site. In addition, Obayashi is interested in using these lands for a project nursery and a community garden area.

Thank you for your comments. Please call me or Kari Kilstrom of our office if you have any questions or require additional information.

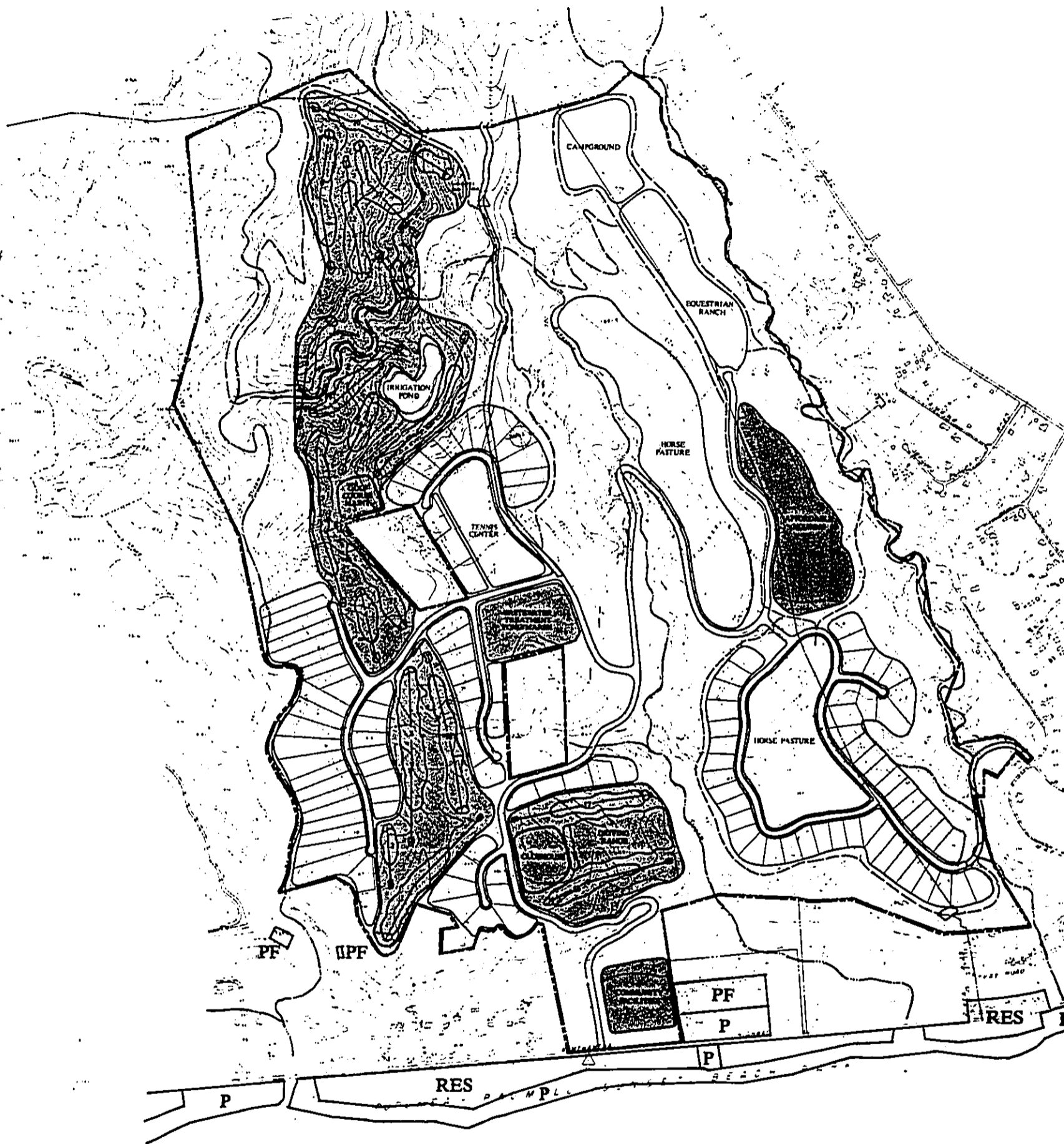
Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

Attachment

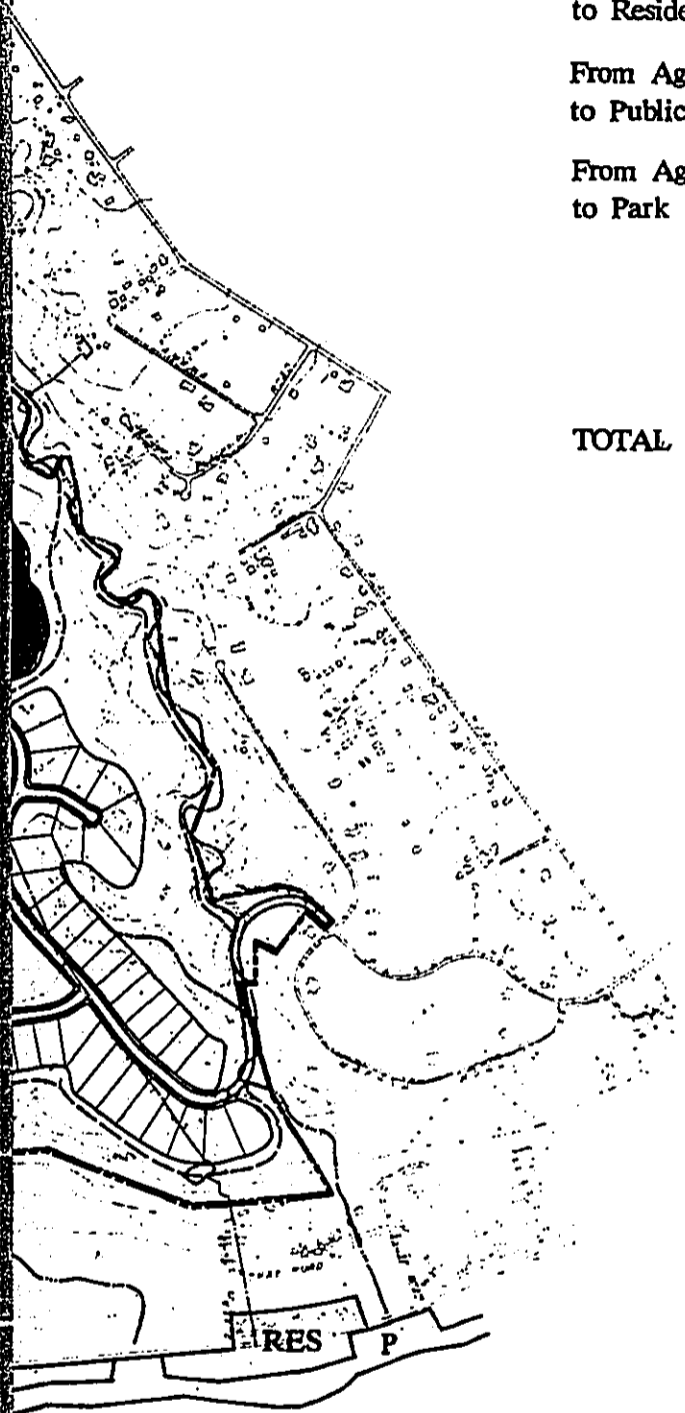


**DP AMENDMENT REQUEST AREAS
LIHI LANI RECREATIONAL COMMUNITY**

SOURCE: CITY AND COUNTY OF HONOLULU DEVELOPMENT PLAN MAP (1983)

SUMMARY OF AMENDMENT AREAS

<u>REQUEST</u>	<u>LAND USE</u>	<u>ACREAGE</u>
From Agriculture to Residential	Affordable Housing	28
From Agriculture to Public Facility	Wastewater Treatment	14
From Agriculture to Park	Golf Course	193
	Driving Range	10
	Clubhouse	6
	Maintenance Area	3
	Community Facilities	<u>10</u>
		222
TOTAL		264 ac.



LEGEND

- P PARK
- PF PUBLIC FACILITIES
- RES RESIDENTIAL



FIGURE 8

JOHN WAIHEE
GOVERNOR



STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2360
HONOLULU, HAWAII 96804

8763-10
3.13
CHARLES T. TOGUCHI
SUPERINTENDENT

JAN - 3 1991

OFFICE OF THE SUPERINTENDENT

December 21, 1990

Mr. Jeffrey H. Overton, AICP
Associate
Group 70 Limited
924 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Overton:

Subject: Environmental Impact Statement Preparation Notice
Lihi Lani Recreational Community; Honolulu, Hawaii

Our review of the subject preparation notice indicates it may have the following enrollment impact:

<u>SCHOOLS</u>	<u>GRADES</u>	<u>PROJECTED STUDENTS</u>
Sunset Beach Elementary	K-6	85-100
Kahuku Intermediate	7-8	20-25
Kahuku High	9-12	35-40

The projections are based on a proposed development of 180 affordable homes scheduled to be completed by 1997, and 120 market-priced residential lots to be developed over a ten-year period, after 1997.

Kahuku High and Intermediate School is operating beyond capacity with a severe shortage of classrooms. Sunset Elementary School will need additional classrooms to meet the enrollment increase. The Department of Education cannot assure the availability of classrooms and will require legislative appropriations to accommodate the anticipated student enrollment growth. The developer should be required to pay a fair share of the costs to build classrooms at both schools.

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

Mr. Jeffrey H. Overton

-2-

December 21, 1990

Should there be any questions, please call the Facilities Branch at 737-4743. Thank you for the opportunity to comment.

Sincerely,

Kenzo Takata
Fv Charles T. Toguchi
Superintendent

CTT:jl

cc: E. Imai
S. Loo

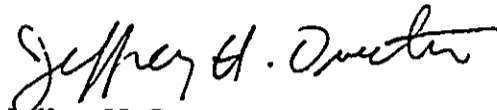
Letter to State of Hawaii, Department of Education
Mr. Charles T. Toguchi, Superintendent
12 April 1991
Page 2

of full-time residential occupancy, as provided by the KPMG Peat Marwick study and any updated study, will be considered in the enrollment projections. Enrollment trends for the local schools will also be re-assessed at that time. The developer will be required to pay a fair share of the costs to provide classrooms, if there is a need to accommodate the additional students".

Thank you for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

JOHN WAIHEE
GOVERNOR

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JAN 29 1991

GROUP 70
LIMITED



STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION

869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

January 28, 1991

8763-14 17
3.13

EDWARD Y. HIRATA
DIRECTOR

DEPUTY DIRECTORS
DAN T. KOCHI (PRIMARY)
RONALD N. HIRANO
JEANNE K. SCHULTZ
CALVIN M. TSUDA

IN REPLY REFER TO:

HWY-PS
2.5353

Mr. Jeffrey H. Overton, AICP
Associate
Group 70 Limited
924 Bethel Street
Honolulu, Hawaii 96813-4398

Dear Mr. Overton:

Lihi Lani Recreational Community, North Shore
Development Plan Land Use Map Amendment,
Obayashi Hawaii Corporation

Thank you for your letter of December 10, 1990, informing us of
the proposed plan for a recreational community at Pupukea.

We will provide our comments when the Draft EIS is circulated to
us for review. Please incorporate the updated Traffic Impact
Analysis Report in the EIS. It should include an assessment of
the accessibility onto Kamehameha Highway and any required
mitigation measures.

Very truly yours,

A handwritten signature in cursive script, appearing to read "Edward Y. Hirata".

Edward Y. Hirata
Director of Transportation

8763-14
3.13

JOHN WAIHEE
GOVERNOR



JOSEPH K. CONANT
EXECUTIVE DIRECTOR

RECEIVED

JAN - 9 1991

GROUP 70
LIMITED

STATE OF HAWAII
DEPARTMENT OF BUDGET AND FINANCE
HOUSING FINANCE AND DEVELOPMENT CORPORATION
SEVEN WATERFRONT PLAZA, SUITE 300
500 ALA MOANA BOULEVARD
HONOLULU, HAWAII 96813
FAX (808) 543-6841

IN REPLY REFER TO:

91:PLNG/108 jt

January 7, 1991

Mr. Jeffrey H. Overton, AICP
Group 70 Limited
924 Bethel Street
Honolulu, Hawaii 96813-4398

Dear Mr. Overton:

Re: Application for North Shore Development Plan Amendment and
Environmental Assessment for the Proposed Lihi Lani
Recreational Community

We have reviewed the subject application and environmental
assessment and offer the following comments.

The State Housing Functional Plan was revised in 1989. A copy of
the housing plan is enclosed for your information. Policy A(3)
seeks to ensure that (1) housing projects and (2) projects which
impact housing provide a fair share/adequate amount of affordable
homeownership opportunities. It appears that the applicant is
proposing a "fair share" of affordable housing units (180
affordable units of a total of 300 units). However, additional
information is needed to determine whether the recreational land
uses (i.e., golf course, tennis center and equestrian ranch) will
generate a need for employee housing.

Thank you for the opportunity to comment.

Sincerely,

Joseph K. Conant
Executive Director

JT:eks

Enclosure: State Housing Functional Plan



DEPARTMENT OF BUSINESS
AND ECONOMIC DEVELOPMENT

ENERGY DIVISION, 335 MERCHANT ST., RM. 110, HONOLULU, HAWAII 96813 FAX: (808) 531-5243

8763-14

3.13

JOHN WAIHEE
GOVERNOR

ROGER A. ULVELING
DIRECTOR

BARBARA KIM STANTON
DEPUTY DIRECTOR

LESLIE S. MATSUBARA
DEPUTY DIRECTOR

January 28, 1991

Jeff

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JAN 30 1991

GROUP 70
LIMITED

Mr. Roland Libby
City and County of Honolulu
Department of General Planning
Honolulu Municipal Building
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Libby:

Subject: Lihi Lani Recreational Community North Shore
Development Plan Amendment
TMK: 5-9-05:06, Por. 38, Por 82
5-9-06:01, 08, 18, 24

We wish to inform you that we have no comments to offer on the subject
environmental impact statement preparation notice.

Thank you for the opportunity to review the document.

Sincerely,

Maurice H. Kaya
Energy Program Administrator

MHK/hkeis24

cc: Office of Environmental Quality Control
Obayashi Hawaii Corporation, Quon/Yamagishi Partnership
Group 70 Limited



University of Hawaii at Manoa

JAN - 4 1991

Environmental Center
A Unit of Water Resources Research Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 956-7361

December 21, 1990
RN:0283

Department of General Planning
Attn: Mel Murakami
650 South King Street
Honolulu, Hawaii 96813

Environmental Assessment
Lihi Lani Recreational Community
Paumalu and Pupukea, Koolauloa, Oahu

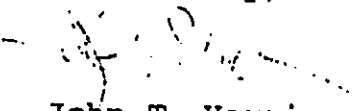
The referenced Environmental Assessment considers proposed development of an integrated recreational community including an 18-hole golf course, an equestrian ranch, a tennis center, 120 one-acre residential lots, 180 affordable housing units, hiking and horseriding trails, campground, and a community facilities complex.

We believe that the forthcoming Draft EIS should expand the discussion on the intended market and the affordable housing component. Projects with the type of amenities offered in this proposal often have difficulties meeting the affordable housing criteria.

The Kamehameha Highway, at present, is already an extremely busy thoroughfare in the vicinity of this proposal. We agree with the applicant's intension to include in the DEIS a full "Traffic Impact Study, which will address the potential cumulative impact of this and other projects proposed for the area."

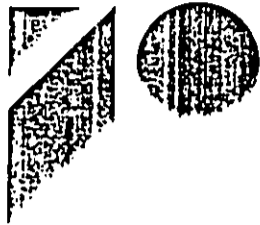
We look forward to reviewing the Draft EIS and hope that our comments will be useful in its preparation.

Yours truly,


John T. Harrison. Ph.D.
Environmental Coordinator

cc: Obayashi Hawaii Corp. ✓
c/o Ralph Portmore
Roger Fujioka
Lee Lyttle

AN EQUAL OPPORTUNITY EMPLOYER



GROUP 70

CONSULTANTS

- James S. Cole, AIA, AICP
- Jonathan A. Brown, AIA
- Charles A. Brown, AIA, ASID
- John C. E. Wager, AIA
- Don G. Gable, AIA
- John H. Nelson, AIA, LEED
- David M. Aronoff
- Joseph E. Smith
- Robert J. Tompkins, AICP
- Edward J. Gorman
- Paul P. Johnson, AICP
- Stephen H. Kohn, AIA
- Edward H. Lammiman, AIA
- Joseph L. Scott
- Bob L. Johnson, AIA, ASID
- Ann Thomas, AIA, AICP
- Stephen J. Walker, AICP
- Richard A. V. Bernal, AIA
- John R. B. H. AIA, ASID, CCS
- Robert E. Meyer, AIA
- George J. AIA, AICP
- Edward H. Gorman, AICP
- David J. Madson, AIA
- Eric Hill, AIA, LEED
- James K. Chung, AIA
- Richard A. Gorman

12 April 1991

John T. Harrison, Ph.D., Environmental Coordinator
 University of Hawaii at Manoa
 Environmental Center
 Crawford 317; 2550 Campus Road
 Honolulu, Hawaii 96822

**Subject: Lihi Lani Recreational Community Environmental Assessment
 Paumalu and Pupukea, Koolauloa, Oahu, Hawaii**

Dear Dr. Harrison:

Thank you for your December 31, 1991 letter regarding the above application. The Draft Environmental Impact Statement (Draft EIS) for this project was filed with the City and County of Honolulu Department of General Planning on January 22, 1991. The following responses are to your specific comments.

A. Market Assessment

A detailed Market Assessment of the project was prepared by KPMG Peat Marwick and included in the Draft EIS as Appendix E. Projected target markets are analyzed for the golf course, the equestrian ranch, the tennis center, the campground and both the market rate and affordable housing units. The landowner does not anticipate having difficulty meeting the County's affordable housing criteria, given the opportunity to develop the other land uses proposed. Absorption of the affordable housing units is expected to be rapid.

B. Traffic Impacts

Cumulative traffic impacts are addressed in Traffic Impact Assessment Report included as Appendix O of the Draft EIS. The relative future impact of the proposed project on the local roadway system was forecasted by (1) increasing through traffic on Kamehameha Highway using its historical growth rate; and (2) by adding traffic generated by other planned/committed developments in the area that would impact the study intersections, including Kuilima Resort Expansion, Kahuku Villages Development and Kahuku Residential Development. These projects are included in the cumulative impact analysis because they are either already under construction or have the needed government approvals to proceed on a reasonably firm schedule.

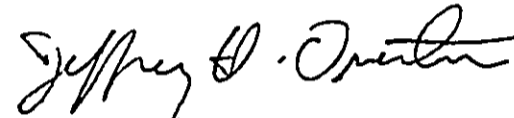
Letter to University of Hawaii, Manoa,
John T. Harrison, Ph.D., Environmental Coordinator
12 April 1991
Page 2

The build-out traffic projections indicate that the incremental addition of future traffic by the project will not significantly affect traffic flows on Kamehameha Highway. Specific mitigative measures to off-set project related impacts are recommended, such as construction of an exclusive left-turn storage lane on Kamehameha Highway to alleviate possible delays caused by vehicles turning left onto the project access road, signal warrant studies at the project intersection to measure growth of through-traffic, and installation of a traffic signal, if ever warranted.

Thank you again for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

8763-14
3.13

R E C E I V E D

FEB 01 1991

GROUP 70
LIMITED

January 29, 1991

Engineering Office

Mr. Roland Libby
City and County of Honolulu
Department of General Planning
Honolulu Municipal Bldg
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Libby:

Lihl Lani Recreational Community
North Shore, Development Plan Amendment

Thank you for providing us the opportunity to review the above subject project.

We have no comments to offer at this time regarding this project.

Sincerely,

SIGNED

Jerry M. Matsuda
Lieutenant Colonel
Hawaii Air National Guard
Contracting & Engineering Officer

cc: Mr. Craig Yamagishi,
Obayashi Hawaii Corporation
Mr. Jeffrey H. Overton, AICP
Group 70 Limited
DEOC w/EIS

JOHN WAIHEE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

8763-14
3.13
WILLIAM W. PATY, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

KEITH W. AHUE
MANABU TAGOMORI
RUSSELL N. FUKUMOTO

AQUACULTURE DEVELOPMENT
PROGRAM
AQUATIC RESOURCES
CONSERVATION AND
ENVIRONMENTAL AFFAIRS
CONSERVATION AND
RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
PROGRAM
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

REF:OCEA:JN

File No.: 91-251
Doc. No.: 9699E

JAN 31 1990

Mr. Jeffrey H. Overton, AICP
Associate
Group 70 Limited
924 Bethel Street
Honolulu, Hawaii 96813

RECEIVED

FEB 01 1991

GROUP 70
LIMITED

Dear Mr. Overton:

Subject: North Shore Development Plan Amendment &
Environmental Assessment, Lihi Lani Recreational
Community at Paumalu and Pupukea, Koolauloa District,
Oahu TMK: 5-9-05: 6, por. 38 & por. 82; 5-9-06: 1, 8,
18 & 24

Thank you for giving our Department the opportunity to comment on
this matter. We have reviewed the materials you submitted and have
the following comments.

The State of Hawaii owns a fifty foot wide road that runs along
Parcels 1 and 24 of TMK: 5-9-06 shown colored in yellow on the
attached maps labeled Exhibits A and B. This road originally came
down from the Pupukea-Paumalu Forest Reserve and was connected to
the upper portion of the Pupukea Homesteads Road.

On the attached Development map, this road will be connected to one
of the Development's roads just above the Tennis Center. We are
requesting that public access be allowed on the road leading up
from Kamehameha Highway to this State road so the public and State
officials could have access to the Pupukea-Paumalu Forest Reserve
identified as TMK: 5-9-06: 06.

Mr. Jeffrey H. Overton

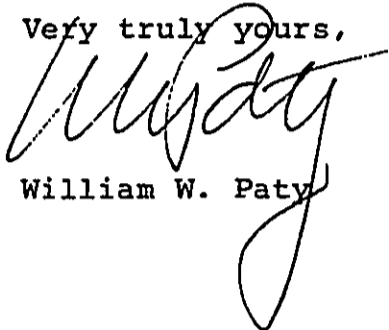
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Doc. No.: 9699E

Our Division of Forestry and Wildlife responded directly to you, per their letter, dated 18 January 1991. As was stated, they would look forward to working with you on mitigation impacts to the Pupukea Forest Reserve.

Thank you for your cooperation in this matter. Please feel free to call Bob Johnson of our Office of Conservation and Environmental Affairs, at 548-7837, if you have questions.

Very truly yours,



William W. Paty

Attachments:

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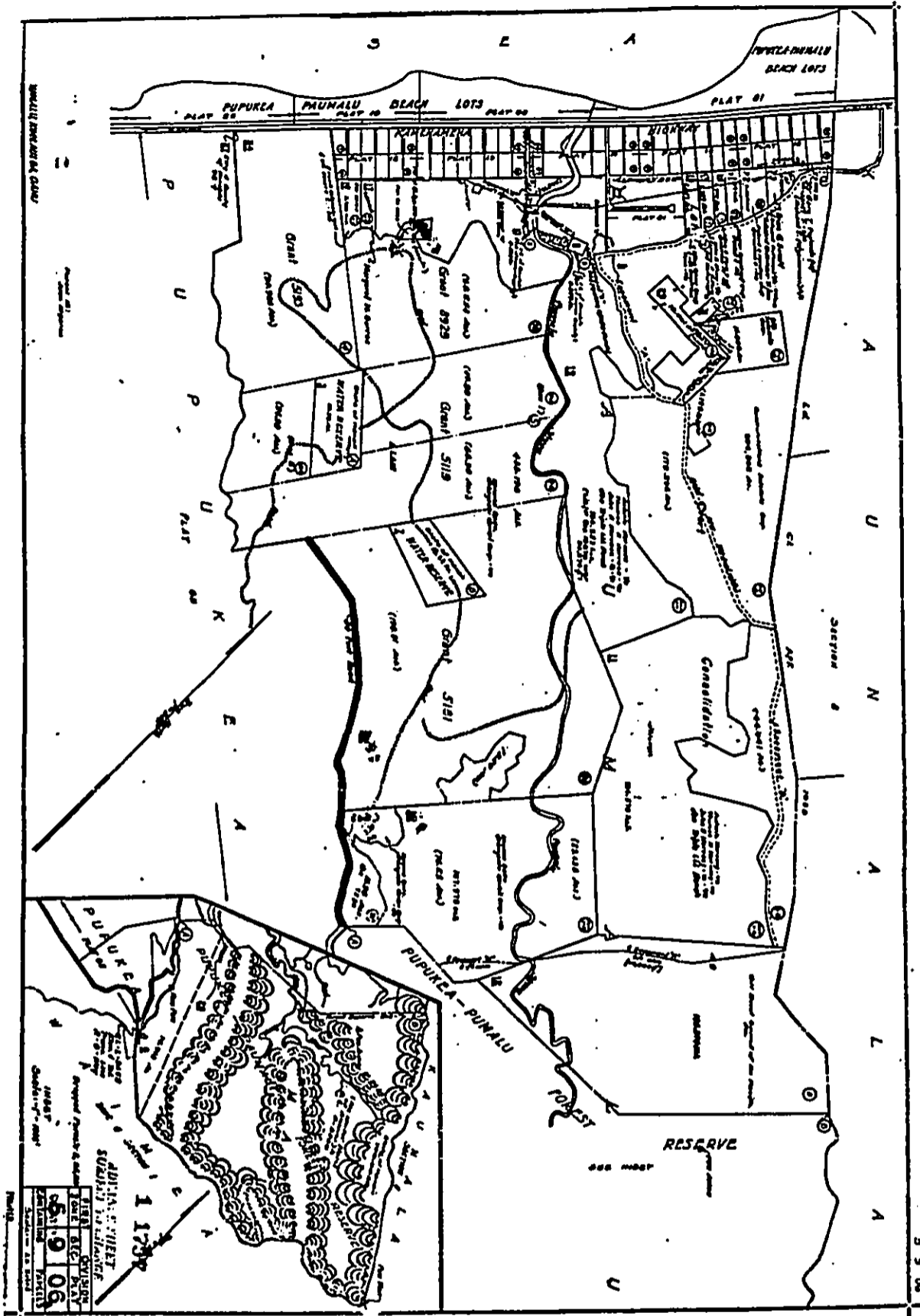


Exhibit A

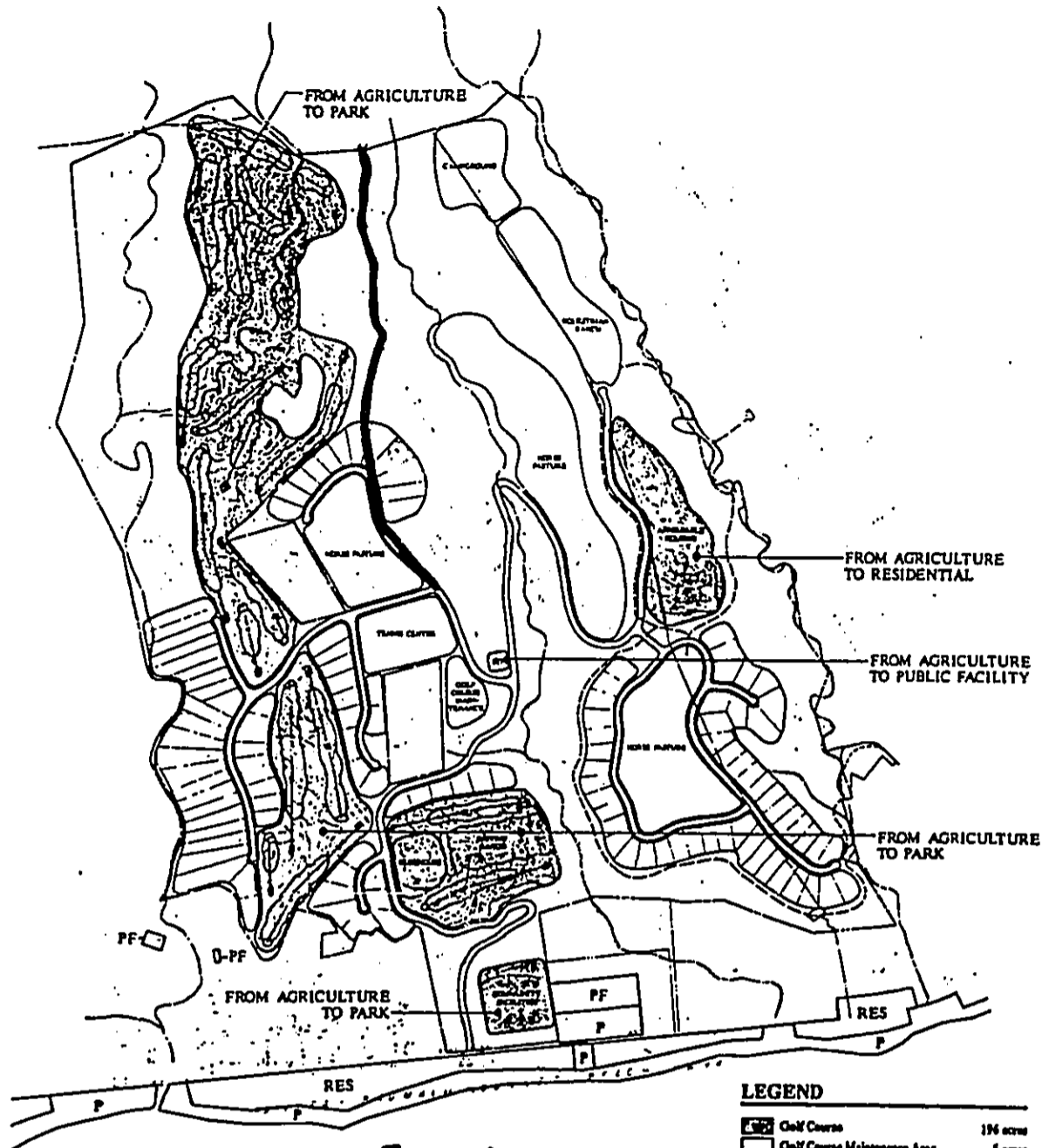


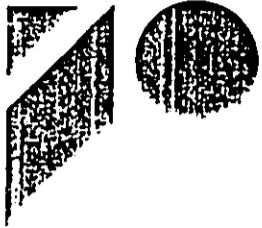
EXHIBIT B

LEGEND

	Golf Course	196 acres
	Golf Course Maintenance Area	5 acres
	Clubhouse	6 acres
	Driving Range	10 acres
	Tennis Courts	10 acres
	Swimming Beach	10 acres
	Public Facility	10 acres
	Residential	10 acres
	Public Facility	10 acres
	Public Facility	10 acres
	Public Facility	10 acres

**DP AMENDMENT REQUEST AREAS
LIHI LANI RECREATIONAL COMMUNITY**
SOURCE: City and County of Honolulu Development Plan Map 17902

FIGURE 4



GROUP 70

- James C. Cole, MA, MCP
- Norman G. Young, MA
- Shirley R. Seaman, MA, ASID
- Robert E. Young, MA
- Hiroshi Hata, MA
- Ray H. Niles, MA, CSI
- David M. Aoyagi
- David L. Sisti
- Edgar E. Portmore, MCP
- Edward J. Green
- Paul P. Chorney, MA
- Stephen H. Young, MA
- Dean H. Leuninger, MA
- Norman S. Orr
- Eric Tolo-Jimenez, ASID
- Ann Thelander, MA, ASID
- Stephen J. Gallo, CPA
- Bradford V. Walcott, MA
- Walter R. Bell, MA, CSI, CCS
- Walter L. Mendenhall
- George J. Aoy, MCP
- Edward H. O'Brien, MCP
- James I. Nishimura, MA
- Eric Chih "Doc" Lee, MA
- Joseph K. S. Young, MA
- Michael A. Gore

12 April 1991

Mr. William W. Paty
 State of Hawaii
 Department of Land and Natural Resources
 P.O. Box 621
 Honolulu, HI 96809

**Subject: Lihi Lani Recreational Community Environmental Assessment
 Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Mr. Paty:

Thank you for your January 31, 1991 letter concerning the above application. The following is offered in response to your comments.

A. Public Access to Pupukea-Paumalu Forest Reserve

Public access to the State Forest Reserve land mauka of the Obayashi property would be via a nine-mile network of hiking and horseback riding trails, as described in Section 2.1.I of the Draft EIS. During subsequent planning phases, Obayashi will prepare a detailed trail and public access (to the State land) map for review by DOFAW. Obayashi will also prepare a separate fire suppression plan to describe the proposed fire suppression accessways.

Presentation of a mitigative measure(s) will be included in the Final EIS, following further discussion with your office and the State Division of Forestry and Wildlife.

B. State Right-of-Way

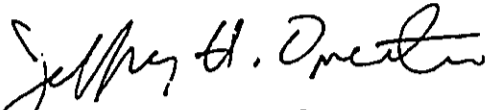
Obayashi will be requesting acquisition of the State's fifty foot right-of-way along parcels 1 and 24 of TMK: 5-9-06. We will contact Mason Young at the Division of Land Management to discuss our proposal. We intend to maintain access to the state lands by use of maintenance roads.

Letter to State of Hawaii, Department of Land and Natural Resources
Mr. William W. Paty
12 April 1991
Page 2

Thank you again for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

8763-14
3.13

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU

630 SOUTH BERETANIA STREET

HONOLULU, HAWAII 96843



FRANK F. FASI, Mayor

DONNA B. GOTH, Chairman

SISTER M. DAVILYN AH CHICK, O.S.F.,

Vice Chairman

SAM CALLEJO

EDWARD Y. HIRATA

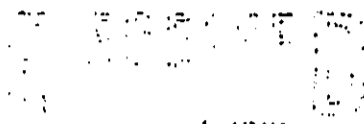
WALTER O. WATSON, JR.

MAURICE H. YAMASATO

KAZU HAYASHIDA

Manager and Chief Engineer

December 28, 1990



Mr. Jeffrey H. Overton
Group 70 Limited
924 Bethel Street
Honolulu, Hawaii 96813-4398

JAN 1 1991

GROUP 70
LIMITED

Dear Mr. Overton:

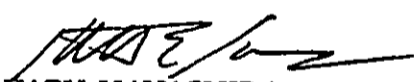
Subject: Your Letter of December 10, 1990 Regarding the Draft Environmental Impact Statement for the Proposed Lihi Lani Recreational Community Development in Pupukea, TMK: 5-9-05 and 06

Thank you for your letter regarding the proposed development.

We are still evaluating the proposed recreational community development and should be completed by January 15, 1991.

If you have any questions, please contact Bert Kuioka at 527-5235.

Very truly yours,


FOR KAZU HAYASHIDA
Manager and Chief Engineer

8763-19
3.13

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843



January 11, 1991

FRANK F. FASI, Mayor
DONNA B. GOTH, Chairman
SISTER M. DAVILYN AH CHICK, O.S.F.,
Vice Chairman
SAM CALLEJO
EDWARD Y. HIRATA
WALTER O. WATSON, JR.
MAURICE H. YAMASATO
KAZU HAYASHIDA
Manager and Chief Engineer

RECEIVED
JAN 15 1991

Mr. Jeffrey H. Overton
Group 70, Limited
924 Bethel Street
Honolulu, Hawaii 96813-4398

Dear Mr. Overton:

Subject: YOUR LETTER OF DECEMBER 10, 1990 REGARDING THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED LIHI LANI RECREATIONAL COMMUNITY DEVELOPMENT IN PUPUKEA - TMK: 5-9-05 AND 06

Thank you for your letter regarding the proposed recreational community development. We have the following comments on the Draft Environmental Impact Statement:

1. The irrigation of the golf course and other areas with the wastewater/brackish water mixture would directly affect our Sunset Beach Well which is down gradient of the development. Therefore, the adverse effects of this type of irrigation on the underlying aquifer should be coordinated with the State Department of Health. Any reduction in the sustainable yield of our Sunset Beach Well due to adverse impacts on the aquifer as a result of the use of wastewater/brackish water for golf course irrigation will need to be made up by the developer of the proposed Lihi Lani Recreational Community Development.
2. The developer should submit a water master plan showing the estimated water requirements and proposed water facilities with supporting calculations for our review and approval.
3. The developer may be required to provide a water source for the development or pay our Water Systems Facilities Charges for a source facility if water can be made available from our existing system for the proposed development. This determination will be made when the developer submits the water master plan.

If you have any questions, please contact Bert Kuiuoka at 527-5235.

Very truly yours,

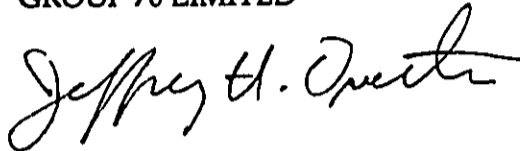
KAZU HAYASHIDA
Manager and Chief Engineer

City and County of Honolulu, Board of Water Supply
Kazu Hayashida, P.E.; Manager and Chief Engineer
12 April 1991
Page 2

Thank you again for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

8763-14
3.13

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR



SAM CALLEJO
DIRECTOR AND CHIEF ENGINEER

C. MICHAEL STREET
DEPUTY DIRECTOR

In reply refer to:
ENV 91-4(449)

RECEIVED

JAN - 8 1991

GROUP 70
LIMITED

January 2, 1991

Mr. Jeffrey H. Overton, AICP
Group 70, Ltd.
924 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Overton:

Subject: Environmental Impact Statement Preparation Notice
Lihi Lani Recreational Community
TMK: 5-9-05: 6, Por. 38, 82
5-9-06: 1, 8, 18, 24

We have reviewed the subject EISPN and have the following comments:

1. We have no objections to the proposed private wastewater treatment facility.
2. We wish to point out that the State Department of Health is the approving agency for a private wastewater treatment facility. Also, the Hawaii Revised Statutes, Chapter 340B, requires that all classified wastewater treatment plants be under the direct supervision of a certified operator.
3. A drainage report should be submitted to the Drainage Section, Division of Engineering, for review and approval.

Very truly yours,

C. Michael Street

SAM CALLEJO
Director and Chief Engineer

2723-14
3.13

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU

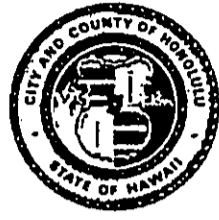
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

RECEIVED

JAN 11 1991

GROUP 70
LIMITED



WALTER M. OZAWA
DIRECTOR

ALVIN K.C. AU
DEPUTY DIRECTOR

January 9, 1991

Mr. Jeffrey H. Overton, AICP
Group 70 Limited
924 Bethel Street
Honolulu, Hawaii 96813-4398

Dear Mr. Overton:

Subject: Application for North Shore Development Plan Amendment and
Environmental Assessment for Lihī Lani Recreational Community
Tax Map Key 5-9-05: 6, portion 38, 82; 5-9-06: 1, 8, 18, 24

We have reviewed the application for the North Shore Development Plan
Amendment and Environmental Assessment for the Lihī Lani Recreational
Community and make the following comments and recommendations.

We have not been informed of the proposal to dedicate lands in the
project site to the City or to a community-based trust for a recreation
center and park. Please arrange to meet with my staff to discuss and
clarify your proposal in more detail. Any lands proposed to be dedicated
to the City for public park purposes must meet City standards and
requirements.

We would also like to be informed as to the method you propose to comply
with the City's Park Dedication Ordinance No. 4621.

Please contact Jason Yuen of our Advance Planning Branch at 527-61315 to
discuss your project.

Thank you for the opportunity to review this project.

Sincerely,

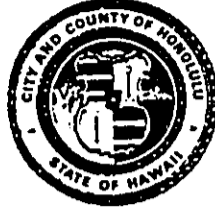
WALTER M. OZAWA, Director

WMO:s1

0763-14
3,13

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU

HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813



FRANK F. FASI
MAYOR

JOSEPH M. MAGALDI, JR.
DIRECTOR

TE-6905
PL90.1.411

January 17, 1991

Mr. Jeffrey H. Overton, AICP
Group 70 Limited
924 Bethel Street
Honolulu, Hawaii 96813-4398

Dear Mr. Overton:

Subject: Lihi Lani Recreational Community
Development Plan Amendment
Environmental Assessment
TMK: 5-9-05: 6 Por. 38; 5-9-06: 1

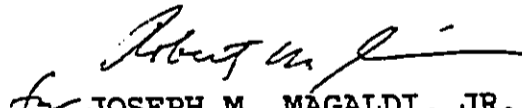
This is in response to your letter of December 10, 1990
requesting our comments on the subject planned community.

Based on our review of the documentation provided, we understand
that the proposed project will create a single formal access onto
Kamehameha Highway through the makai portion of the property.
The roadway alignments shown on the master plan strongly indicate
that the streets servicing this development will be kept private.

This being the case, we have no objections to the proposed
development. The State Department of Transportation should also
review the proposed plan since Kamehameha Highway, in the
vicinity of this project, is under their jurisdiction.

Should you have any questions, please contact Mel Hirayama of my
staff at 523-4119.

Sincerely,

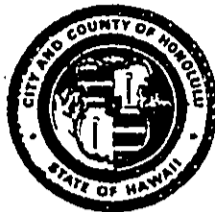

for JOSEPH M. MAGALDI, JR.
Director

8763-14
3,13

POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU

1455 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96814 - ARFA CODE (808) 943-3111

FRANK F. FASI
MAYOR



MICHAEL S. NAKAMURA
CHIEF

HAROLD M. KAWASAKI
DEPUTY CHIEF

OUR REFERENCE SG-LK

December 28, 1990

RECEIVED
JAN - 2 1991
POLICE DEPARTMENT

Mr. Jeffrey H. Overton, AICP
Associate
Group 70 Limited
924 Bethel Street
Honolulu, Hawaii 96813-4398

Dear Mr. Overton:

Subject: Lihi Lani Recreational Community
Paumalu and Pupukea, Koolauloa District, Oahu, Hawaii

We have reviewed the application and environmental assessment for the above-referenced project and would like to offer the following comments.

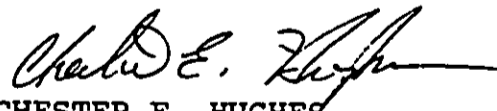
We can anticipate that as a result of this development, there will be an increase in vehicular traffic on the two-lane Kamehameha Highway. Also, since the main thoroughfare to the project will be a single access from the highway, we can expect some traffic congestion to develop. As a solution, the addition of a turning lane would be essential to alleviate any traffic problems.

Please send to us a copy of the draft EIS so that we may review the Traffic Impact Study and the cumulative impacts of this and other projects proposed for the area.

Thank you for the opportunity to provide comments.

Sincerely,

MICHAEL S. NAKAMURA
Chief of Police

By 
CHESTER E. HUGHES
Assistant Chief of Police
Support Services Bureau

8763-141
3.13

Kamuela Price
P. O. Box 721
Haleiwa, Hawaii 96712
Telephone: 638-7841 and 638-7435

RP

RECEIVED

January 2, 1991

JAN - 3 1991

GROUP 78
LIMITED

Department of General Planning
Attn: Mel Murakami
650 South King Street
Honolulu, Hawaii 96813

RE: Lihi Lani Recreational Community - Paumalu and Pupukea
TMK: 5-9-05:38 & 5-9-06:18, 24
EIS preparation

Dear Mr. Murakami:

The environmental impact statement for the above referenced project should take into account the following problems:

1. The lack of infrastructure in the neighborhood, including inadequacy of the fresh water supply, inadequacy of the wastewater treatment facilities, and inadequacy of transportation facilities.
2. If the proposed solution to the traffic congestion involves widening of Kamehameha Highway, the detrimental effect of such widening on the shoreline must be considered.
3. The possibility of pesticides and herbicides to be used in the operation of the proposed project contaminating the underground water supply, as well as the surface water in the Shark's Cove by water flowing through underground lava tubes in the area.
4. The effect of erosion and possible flooding during construction of the project.
5. The location of native Hawaiian archaeological sites in the proposed project area.

These comments are submitted by the undersigned individually as a property owner in the neighborhood; and on behalf of the Hou Hawaiians and the Church of Hawaii Nei. In addition, The Concerned Citizens of Sunset beach will probably join in these comments after they have had an opportunity to meet on February 15, 1991.

Very truly yours,


Kamuela Price

pesticides use at this project have been studied thoroughly by several experts in the field (Murdoch and Green, Mink, Dugan, Marine Research Consultants). Their reports are included in the Draft EIS. These studies also addressed the potential groundwater impacts due to pesticides use on the site. Their findings indicate that pesticides will not adversely affect ocean water quality at Sunset Beach.

D. Erosion and Flooding During Construction

The project will be required to obtain permits for grading and clearing, which will include creation and approval of an Erosion Control Plan for the construction period. The measures implemented under this Plan will ensure that no adverse off-site runoff effects will occur during construction. Detention basins and other erosion and runoff control measures will be designed to accommodate potential worst-case situations. Off-site areas will not be flooded as a result of construction because runoff will be controlled by the above described measures. Details regarding the drainage design measures and erosion control are included in the Draft EIS.

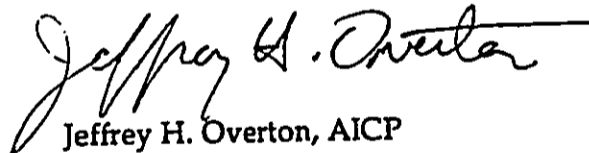
E. Archaeological Sites

The location of all archaeological sites on the Obayashi property is shown in a figure included in the Draft EIS, along with a detailed archaeological discussion and technical report (Appendix N). It is estimated that six significant sites will be directly affected by construction activities. Obayashi will coordinate their further study through Paul H. Rosendahl, Ph.D., our consulting archaeologist, in accordance with recommendations made by the State Historic Preservation Program and the Oahu Island Burial Council.

Thank you again for your suggestions and comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or concerns.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

8763-14
3.14

January 4, 1991

Obayashi HI. Corp.
c/o Ralph Portmore
Group 70, Ltd.
924 Bethel Street
Honolulu, HI 96813

RECEIVED

JAN - 9 1991

GROUP 70
LIMITED

Dear Sirs:

This letter is to comment on Obayashi HI Corporation's proposed amendment to the North Shore Development Plan Land Use Map which has been submitted to to the Department of General Planning for consideration. The issues raised here should also be considered in the writing of the Environmental Impact Statement for this development.

As adjoining landowners we are concerned about the type of changes proposed by the Obayashi HI Corporation. Many years ago when we purchased our lot we relied on the fact that the approximately 1200 acres of land next to our property was zoned agriculture. We built our house which overlooks the green valley with floor-to-ceiling windows and cathedral ceilings to appreciate the unspoiled view of low-lying shrubs, ironwood trees, and expansive ocean. The proposed plan to rezone should not permit any changes which would detract from our views and privacy. The reliance which we placed upon the integrity of City and County development plans which indicated that this area was zoned agriculture should not be breached.

Other major concerns include the dramatic increase in traffic on the North Shore expected once the development is occupied. Because residents rely on the two-lane Kamehameha Highway by which to commute to work, increasing the population has a devastating effect on the quality of our lives.

If a development project of this magnitude is approved, water use and sewage disposal problems should be adequately addressed before amendments are made and permits are issued. Environmentally sound, low-technology wastewater treatment systems which create beneficial wetlands, such as the one in Arcata, California should be considered.

Runoff from the mountainside, especially during construction, cannot be allowed to spoil the natural beauty of North Shore waters, much appreciated by visitors upon which a large percentage of our economy is based.

Originally, the Obayashi Corporation intended to have two helicopter landing and takeoff sites on their property. The entire community voiced opposition to this proposal and Obayashi agreed to dispense with it. If, after development approval, the helipads were repropoed, it would be a breach of ethics by the developers and an affront to the trust in them by the community.

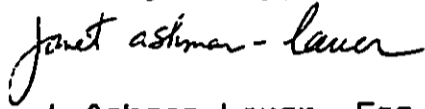
On a more subjective note, the development area runs along a stream which also cuts through our property. Development should not be allowed to degrade the water quality or decrease the water quantity of this perennial stream.

In the past, Obayashi or its lessees have bulldozed the pins marking the boundaries of our lot and have constructed barbed wire fencing across our property. We expect Obayashi to pay for the resurvey of our adjoining properties, and to demarcate our properties correctly. We also expect that our property rights will be respected in the future.

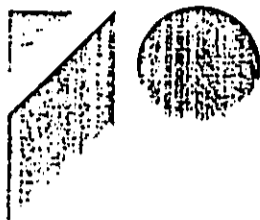
If the proposal is approved and the land is opened up to housing developments, we would expect exclusive access to the lower portion of our lot.

Your consideration and response to these comments will be appreciated.

Yours very truly;



Janet Ashman-Lauer, Esq.
59-452 Makana Road
Haleiwa, HI 96712



12 April 1991

Janet Ashman-Lauer, Esq.
59-452 Makana Road
Haleiwa, HI 96712

**Subject: Lihl Lani Recreational Community Environmental Assessment
Paumalu and Pupukeya, Koolauloa, Oahu Hawaii**

Dear Ms. Ashman-Lauer:

Thank you for your 4 January 1991 letter concerning the above application. Many of the subjects that you mention in your letter are addressed in the Draft Environmental Impact Statement, filed on January 23, 1991. The following is offered as a response to your specific comments.

A. Views and Privacy from Personal Residence

The Obayashi property of 1,143 acres has many neighbors, and we are concerned about the potential for adverse views of the project from off-site locations, and especially from residential and recreational areas. We are concerned not only with potential short-term views of construction activities, but also the potential long-term view impacts resulting from vegetation clearing and development of roadways and structures.

Your specific concerns focus on a portion of the Obayashi property which is visible from your residence. Although we have not visited your residence to assess your exact views of the site, your view probably includes portions of Kaluawaikaala Gulch and its slopes leading up to the Pupukeya-side plateau area of the property.

Our land use master plan for the property shows this area to remain as undisturbed open space. There is a plan to create a hiking and horse riding trail through this area, leading into the gulch lowlands. However, the trail will remain on the Obayashi side of the stream, and is not expected to be visible from higher areas due to the dense vegetation cover you mentioned in your letter. Vegetation along the top edge of the gulch slope will be retained in its existing condition.

You may also have views of the plateau regions on this side of the property. Our land plan for the plateau sections above the gulch slopes is to develop one-acre country lots on the makai portion and horse pasture and equestrian facilities on the mauka portion. The country lots are limited generally to the more gently sloped areas above the gulch slope. Clearing of vegetation along

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the edges of the plateau areas will be carefully regulated through our design covenants. Our intention is to allow future homeowners of these lots to have pocket views from their lots through some of the heavy vegetation on the bluff edge. It is possible that some residential lot areas or even portions of structures may be visible from your home or other residential locations in Pupukea and Sunset Hills.

B. Traffic

A Traffic Impact Assessment was prepared by Pacific Planning and Engineering, Inc. for the project and included in the Draft EIS (refer to Section 4.12). The focus of the analysis was to determine the impact of the project-generated traffic at three key intersections along Kamehameha Highway when the project is completed in 1997. Future traffic forecasts with and without the project were estimated for 1997 during weekday morning, weekday afternoon and Sunday afternoon peak hours.

The expansion of Kuilima Resort, other approved North Shore projects and projected growth on other areas of the island all contribute to an anticipated increase in traffic on Kamehameha Highway in 1997. The relative impact of the traffic generated by the Lihi Lani Recreational Community was assessed by the difference in future "service levels" at three study intersections, "with" versus "without" the project. The potential change in service levels on Kamehameha Highway resulting from full occupancy and operation of Lihi Lani is minimal. In general, the Levels of Service (LOS) at intersections with Kamehameha Highway will remain the same with or without the project. There are some exceptions, including: (1) drivers attempting left-turns from Kamehameha Highway onto Pupukea Road, during Sunday afternoon peak hours could experience slight to average delays (Levels of Service B or C); and (2) a segment of Kamehameha Highway near Haleiwa Beach Park could experience further congestion (Levels of Service D to E). There should be no dramatic increase in traffic on the North Shore as a result of Lihi Lani.

Obayashi will work with the local community and State Department of Transportation to develop solutions to the existing and future traffic problems in the area.

C. Water Use

A Water Supply Report was prepared by Engineering Concepts, Inc. and included in the Draft EIS (Section 4.17 and Appendix C). The report presents preliminary engineering information regarding existing and proposed potable and non-potable water infrastructure with respect to meeting domestic and irrigation water requirements for the project.

In pertinent part, their study has determined, that there are adequate groundwater resources available within the Waialua groundwater control area to meet the projected demands of the project. Existing Board of Water Supply (BWS) consumers in the Pupukea Highlands and Sunset Hills subdivisions will not be adversely affected by the water demand from this project. The BWS transmission and storage facilities existing in Pupukea Highlands were designed to accommodate future development of the Obayashi property.

In terms of potable water supply capacity, additional wells may be needed at Waialua at the time Obayashi comes on line. Obayashi will be required to pay a share of the water development costs if new wells are required.

D. Sewage Disposal and Wastewater Treatment

A Wastewater Management Plan was prepared by Engineering Concepts, Inc. and included in the Draft EIS (Section 4.17 and Appendix B). The plan presents preliminary engineering information for the proposed wastewater collection, treatment and disposal facilities for the project. Potential adverse impacts due to effluent disposal by irrigation of the golf course were studied, however none are anticipated. In keeping with your suggestion for an environmentally-sound, low technology wastewater treatment system, Obayashi has proposed to use a facultative stabilization ponds and marsh treatment system designed, developed and operated under the guidance of Dr. Robert Gearheart of Humbolt State University. He will employ environmentally-sensitive treatment methods, which are currently being used for municipal wastewater treatment in Arcata, California.

E. Storm Water Runoff into the Ocean

A baseline assessment of the marine environment in the vicinity of the project was conducted by Marine Research Consultants and incorporated into the Draft EIS (Section 4.10 and Appendix M). This study recommends scheduling construction which involves any exposed lands during the low precipitation months, April through October, in order to avoid soil erosion and silt in runoff. Soil erosion during construction poses the greatest potential water quality impact that the project could create. Obayashi is sensitive to this potential impact and will comply with government grading

standards and regulations, and take extensive measures to minimize erosion and excessive runoff. Detention ponds will substantially reduce the potential silt generation from the project.

Once the project is completed, silt in runoff from the site will be substantially less than under current existing conditions. Other potential water contaminants, such as fertilizers and pesticides, will be strictly controlled in use on-site. No adverse impacts to ocean water quality are expected. Obayashi will continue to periodically monitor the groundwater, intermittent stream water and ocean water at and near the project to assess the current conditions, and compare them later to "with project" conditions.

F. Helicopter Use of Site

Obayashi originally planned for one helipad site in the center of its 1,143-acre site. Any plans for regular helicopter use at Lihi Lani were dropped in 1989. The only potential for helicopter activity at the site would be for a medical emergency, and an open area such as the golf driving range could serve as the landing site. There will be no regular helicopter activity at the site.

G. Intermittent Stream Water Quality and Quantity

Three studies were prepared addressing these issues, and these reports are included in the Draft EIS (Section 4.6 and Appendices D, H and I). These studies were the basis for determining that no adverse water quality impacts will result from the project activities. In fact, water quality in Kalunawaikaala Stream could improve with the erosion control measures that will be implemented on the site.

H. Bulldozed Property Markings

Again, we put forth our sincere apologies regarding this unfortunate mistake by the bulldozer operator for the survey activities in 1989. If your property boundary markers were destroyed by this activity, our 1989 survey covered the entire property boundary, and field markers have been set showing the boundary of our properties. Please check the current position of these markers and inform us if you do not agree with their location. There has been some vandalism of the survey markers in this gulch, and it is possible that some are missing or destroyed.

I. Property Access

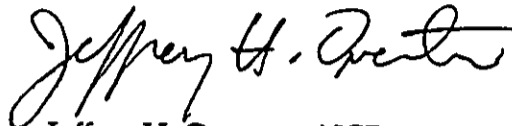
Obayashi will not interfere with the use or access to your land. The location of our proposed hiking and horse trail will be far from your boundary. If desired, Obayashi will meet with you to discuss our preliminary plans for this trail.

Letter to Janet Ashman-Lauer, Esq.
12 April 1991
Page 5

Thank you again for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

Attachment

576-14
3.14

Dear Sir:

January 7, 1991

RECEIVED
JAN 10 1991
GROUP 70
LIMITED

As a long time resident of the North Shore, I wish to express my concern over several issues in the Ithi Iani Recreational Community development.

1. The access onto Kam Hwy off the Maubka Side is near the entrance to Sunset Beach Elementary school. I'm concerned over the large volume of traffic so near the school.

2. The increase of traffic from a development of 300 more homes onto the small Kam Hwy.

3. The waste water treatment. I would like the treatment method clarified to me. I do not wish to see leaching into our subsoil.

I support the Obayashi development of affordable housing - It is badly needed, and the community facilities complex.

4. I do not wish to see any application for a helipad.

heliport.

Thank you for your time.
I would appreciate some
answers to these problems
I have mentioned

Sincerely,

Toni Sichel
59-415 Makana Rd
Haleiwa, HI 96712

PS

I would like to see a
gymnasium built for the children
of the community rather than
a pool.

CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

576--19
3.14

Dear Sir:

January 7, 1991

RECEIVED
JAN 10 1991
GROUP 70
LIMITED

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Thank you for your time.
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Sincerely,

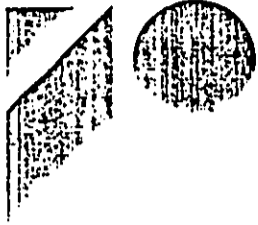
Toni Sicker

59-415 Makana kee

Halewa, HI 96712

PS

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gymnasium built for the children
of the community rather than
a pool.



PACIFIC PLANNING AND ENGINEERING, INC.

James J. Kelly, M.A., M.P.
Joseph A. Deane, M.A.
Michael J. Deane, M.A., ASID
Robert E. Young, M.A.
Dale J. Deane, M.A.
Ray H. Deane, M.A., C.E.
Dale M. Apple
Doreen E. Smith
Catherine Deane, M.P.
Elizabeth Deane
Doreen E. Smith, M.P.
Stephen H. Deane, M.A.
Michael J. Deane, M.A.
Doreen E. Smith
Doreen E. Smith, M.P., ASID
Doreen E. Smith, M.P., ASID
Doreen E. Smith, M.P., C.E.A.
Doreen E. Smith, M.P., C.E.A., M.A.
Doreen E. Smith, M.P., C.E.A., C.E.C.S.
Doreen E. Smith
George E. Deane, M.P.
Doreen E. Smith, M.P.
Doreen E. Smith, M.A.
Doreen E. Smith, M.A.
Doreen E. Smith, M.A.
Doreen E. Smith

12 April 1991

Toni Sichler
59-415 Makana Road
Haleiwa, HI 96712

Subject: **Lihi Lani Recreational Community Environmental Assessment
Paumalu and Pupukea, Koolauloa, Oahu, Hawaii**

Dear Ms. Sichler: *Toni*

Thank you for your January 7, 1991 letter concerning the above application. The following is offered as a response to your specific comments.

A. Traffic on Kamehameha Highway

A Traffic Impact Assessment was prepared by Pacific Planning and Engineering, Inc. for the project and included in the Draft EIS (refer to Section 4.12 and Appendix O). The focus of the analysis was to determine the potential impact of the project-generated traffic at three key intersections along Kamehameha Highway at peak traffic periods in the year of project completion, estimated at 1997. Future traffic forecasts with and without the project were estimated for 1997 during weekday morning, weekday afternoon and Sunday afternoon peak hours.

The expansion of Kuilima Resort, other approved North Shore projects and projected growth in other areas of the island are all expected to contribute to an anticipated increase in traffic on Kamehameha Highway in approximately 1997. The relative impact of the traffic generated by the Lihi Lani Recreational Community was assessed by comparing the future Level of Service (LOS) rating at three study intersections with and without the project-generated traffic. LOS A rating is a free-flowing traffic condition, where LOS F represents heavily congested traffic. The study concludes that the impact or change in service levels on Kamehameha Highway resulting from full occupancy of this project will be minimal. In general, segments of Kamehameha Highway and major intersections (Sunset Beach Elementary School driveway and Pupukea Road) will be the same with or without the project. Vehicles attempting left-turns from Kamehameha Highway onto Pupukea Road during Sunday afternoon peak hours may experience slight to average delays (Levels of Service B/C); a segment of Kamehameha Highway near Haleiwa Beach Park will operate at LOS D/E.

B. Wastewater Treatment and Safeguards

A Wastewater Management Plan was prepared by Engineering Concepts, Inc. and included in the Draft EIS and discussed in Section 4.17 and Appendix B. The proposed facility includes an oxidation pond and marsh polishing system to be designed by Robert Gearheart, Ph.D., P.E. of Arcata, California. Dr. Gearheart has successfully designed environmentally-sensitive wastewater systems, including a municipal treatment system for the coastal community of Arcata, California. The Wastewater Management Plan presents preliminary engineering information for the proposed wastewater collection, treatment and disposal facilities for the project.

Treated effluent from Lihi Lani will be diluted with brackish water from on-site wells and applied to sections of the golf course, approximately 4,500 feet from the closest residents in Pupukea Highlands and Sunset Hills. Adverse odors will not be generated by this facility because it will be conservatively designed with approximately twice the required pond area to treat the project's estimated wastewater load. Irrigation of the golf course helps conserve water, and is also an environmentally sound method of disposal. The quality of the groundwater and the ocean will not be adversely affected by this disposal method. We are continuing design and environmental studies to prove the safety and effectiveness of this system for government agency review prior to actual system implementation.

C. Helipad Dropped From Project

In 1989, Obayashi revised its plans and eliminated the on-site helipad. Helicopter landings will not occur at the site, except possibly during a medical emergency. A golf course fairway could be used as a landing site in the event of an emergency.

D. Community Facilities

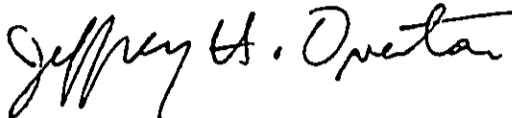
Your interest in a community gymnasium for the site has been noted. We are currently meeting with members of the community to receive input and better define the elements of the Community Benefits Package proposed by Obayashi. We encourage you to present your ideas at the upcoming community meetings, or to inform your community association representatives for Sunset Hills.

Letter to Toni Sichler
12 April 1991
Page 3

Thank you again for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

RECEIVED

JAN 10 1991

GROUP 70
LIMITED

January 7, 1991

To whom it may concern:

I have strong objections opposing granting any permits for the proposed project by Obayashi. I feel the ever increasing traffic flow on the North Shore has not been addressed adequately, as this development will only increase the problem. Also, I would like to know what roadway they are planning to use should they develop, as the use of Pupukea Road is obviously unsuitable. This is the only access emergency vehicles have and it could easily be cutoff in the event of an accident.

My major concern is with the waste water treatment plant: what is the safeguard against any overflow, the location of the existing proposed system is upwind of my home and I would like to know which agency is responsible for any possible future indemnification.

I feel there is much more information necessary before a permit should be issued.

Thank you.
Doy Connelly
Doy Connelly
Box 672
Haleiwa, HI 96712

cc R. Portmore
DEQC

8763-14
3.14

Letter to Ms. Doy Connelly
12 April 1991
Page 2

Obayashi will work with the local community and State Department of Transportation to develop solutions to the existing and future traffic problems in the area.

The project will take access from Kamehameha Highway via a new entrance road. The road will extend approximately 800 feet to the base of the bluff, then traverse the bluff slope to reach the plateau. A preliminary internal roadway system has been planned, as shown on the master plan in the Draft EIS. Pupukeya Road will not be used as an access route for the project. There will, however, be a gated emergency and utility maintenance access at the Haleiwa-side project boundary via Wilinau Road.

B. Wastewater Treatment and Safeguards

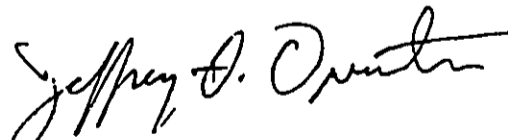
A Wastewater Management Plan was prepared by Engineering Concepts, Inc. and included in the Draft EIS and discussed in Section 4.17. The plan presents preliminary engineering information for the proposed wastewater collection, treatment and disposal facilities for the project. Potential adverse impacts due to effluent disposal by irrigation of the golf course were studied, however none are anticipated. The wastewater effluent will be treated through the use of facultative stabilization ponds and on-site marshes. This natural wastewater treatment will be designed with the assistance of Dr. Robert Gearheart of Humboldt State University, who has designed environmentally-sensitive systems in Arcata, California and elsewhere in the U.S.

The safeguards against overflow of the wastewater treatment facility are specifically addressed in the Draft EIS. Back-up control measures will assure the health and safety of the community in the case of a mechanical or electrical failure. Odor control measures are not expected to be needed due to the limited expanse of the wastewater system and the short detention times. However, contingency provisions for odor abatement will be included in the design and operating budget for the wastewater system.

Thank you for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

RECEIVED

JAN 10 1991

GROUP 70
LIMITED

8763-14
3.14

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January 7, 1991

To whom it may concern:

I cannot see how any more developments can be considered on the North Shore of Oahu before the question of our terrible transportation problems are answered. The Obayashi development should not be given an okay to proceed. Please stop any further development on the North Shore until our roads are improved.

The sewage location that Obayashi development has considered is directly opposite (upwind) of the Sunset Hills community. The foul air will not be tolerated and future lawsuits could be forthcoming. An alternative site should be considered or an alternative sewage treatment should be considered. Why should we suffer in our homes just because this location is more economically feasible to Obayashi?

Thank you.

Ed Farwell

Ed Farwell
Box 672
Haleiwa, Hi 96712

cc R. Portmore
OEQC

Letter to Mr. Ed Farwell
12 April 1991
Page 2

B. Wastewater Treatment and Safeguards

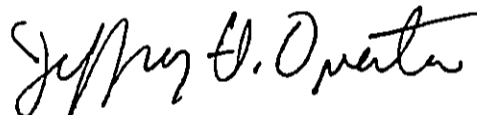
A Wastewater Management Plan was prepared by Engineering Concepts, Inc. and included in the Draft EIS and discussed in Section 4.17. The plan presents preliminary engineering information for the proposed wastewater collection, treatment and disposal facilities for the project. Potential adverse impacts due to effluent disposal by irrigation of the golf course were studied, however none are anticipated. Obayashi proposes to develop an environmentally-sensitive wastewater treatment and disposal system using facultative stabilization ponds and an on-site marsh system, which will be designed by Dr. Robert Gearheart of Arcata, California.

Odor control measures are not expected to be needed due to the limited expanse of the wastewater system and the short detention times. However, contingency provisions for odor abatement will be included in the design and operating budget for the wastewater system. The wastewater facilities will be at least 4,500 feet from the nearest residences in Pupukea Highlands and Sunset Hills.

Thank you for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

8763-14
3.13

Sunset Beach and Pupukea Highlands Community Associations'
JOINT PLANNING COMMITTEE FOR THE OHBAYASHI PROPERTY
P.O. Box 471
Haleiwa HI 96712

Mr. Ben Lee,
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 S. King Street (8th Fl.)
Honolulu HI 96813

January 5, 1991

JO
RECEIVED

JAN - 7 1991

GROUP 70
LIMITED

Re: Application of Ohbayashi Hawaii Corporation
for Development Plan Amendments to allow 300 residential
units and a golf course to be constructed on land located
above Sunset Beach

Dear Mr. Lee:

With reference to our letter of November 7, we wish to point out certain deficiencies in the above application. While some of them would doubtless be addressed and could perhaps be cured in an environmental impact statement, others are so serious on the face of the matter that, in our view, they are sufficient to justify rejecting the application.

"COMMUNITY FACILITIES PACKAGE" (Appendix A)

It is our understanding that your current policy requires a golf course developer to include in its project proposal approximately \$100 million worth of "community benefits" for each 18-hole golf course. Presumably it is in response to this policy that Ohbayashi includes in Appendix A of its application a list of alleged community benefits and assigns to it a total dollar value of \$100,057,000.

The second largest item on Ohbayashi's list of community benefits is I.A. Affordable Housing. This item represents double-counting inasmuch as the application contemplates what is primarily a residential development that would have to include affordable housing even in the absence of a golf course. Thus affordable housing should not be counted again to meet the separate and additional requirement for community benefits associated with the proposed golf course.

The other major items on Ohbayashi's list of benefits involve predicted cash flows (or equivalent) that are projected 50 years into the future. To obtain the present value of these predicted future cash flows, the applicant merely adds them together. This is mathematically convenient, but it is bad finance. True, there are several defensible ways to calculate the present value of future cash payments. But simple summation is not one of them. Future benefits must somehow be "discounted" to allow for the necessity of waiting for them.

Using an interest or "discount" rate of 8%, we calculate the total present value of these predicted future cash flows to be \$16 million instead of the \$66 million stated in Ohbayashi's application:

	<u>Ohbayashi's</u> <u>Valuation</u>	<u>JPC's</u> <u>Valuation</u>
I.B.3. Subsidy Program for Community Ctr.	6,900,000	1,688,000
I.F.2. Hiking Trails [maintenance]	2,100,000	514,000
I.G.1. Equestrian Facilities [maintenance]	680,000	166,000
I.G.2. Equestrian Facility [kamaaina fees]	1,800,000	440,000
I.H. Golf Course [kamaaina] Green Fees	51,500,000	12,600,000
I.I. Endangered Trees [maintenance]	170,000	42,000
I.J. Conservation Park [maintenance]	2,100,000	514,000
I.K. Job Training Program [after opening]	680,000	166,000
Totals	<u>65,930,000</u>	<u>16,130,000</u>
OVERVALUATION	49,800,000	

If Ohbayashi's proposed golf course is eventually approved and constructed--a result that is opposed by a majority of residents in our neighborhood--we would expect the local community to receive a significant portion of the "community benefits package." And we would want those benefits to arrive in the present or very near future--not over a period of 50 years! As Honolulu County taxpayers we urge you to discount ALL future benefits to PRESENT VALUE.

In addition to the need for discounting future benefits, we note that all future cash flows are subject to serious erosion by inflation--for which Ohbayashi's application makes no provision. Moreover, the largest item of all, *I.H. Golf Course [kamaaina] Green Fees*, unrealistically assumes that local golfers will utilize all kamaaina tee times offered, despite a high price tag of \$80 or more. Finally, the proposed golf course could go out of business in far less than 50 years--for lack of water, chemicals, and/or customers. Who among us can see 50 years ahead with enough certainty to make, much less bank on, the predictions that are the foundation of Ohbayashi's valuations? In our view, the application should not project future benefits beyond 10-20 years.

Removing the double-counted entry for affordable housing and adjusting for the overvaluation of future cash flows, we come up with a total valuation of \$25,000,000 for listed community benefits--\$75 MILLION SHORT OF THE REQUIRED \$100 MILLION. Additional discounting is necessary to allow for the uncertainties inherent in all projections of future benefits.

We also note that Ohbayashi's list of community benefits shows half of the total going to kamaaina golfers. This seems disproportionate, inasmuch as most residents of Oahu do not play golf.

GOLF COURSE

Contrary to the assumption on page 10 of the application, the "need" for new golf courses, as a matter of public policy, has yet to be established. Moreover, to say that a golf course is "open space" (p. 11 and 15) does not establish that it serves the public interest. Parking lots, highways, parks, canefields, swamps, and forest preserves are all "open spaces." Like golf courses, they may or may not be desirable in a particular location. The Ohbayashi property, moreover, already consists of woods and fields; it doesn't have to be bulldozed and replanted with fairway turf grass in order to qualify as open space.

New golf courses should be located as near as possible to the source of demand, if only to avoid worsening our present

traffic problem. But this application states that "the intended golf course market is...island-wide" (p. 33). The demand for golf on the North Shore originates and will increasingly be satisfied at or near the Turtle Bay complex. Therefore Ohbayashi's proposed course will, indeed, have to tap into much more distant markets such as Waikiki.

WATER

It is far from certain, as assumed in the application, that the proposed golf course can be irrigated indefinitely from a combination of "non-potable water drawn from onsite wells" and "diluted secondary treated [sewage] effluent" (p. 16). At least one other well in the vicinity has been abandoned as a result of increasing salinity, and the use of sewage effluent raises questions concerning health and odor which have not yet been answered. The current situation at the Hawaii Kai golf course provides an example of both problems.

WASTEWATER (SEWAGE) DISPOSAL

We feel strongly that any development in this location, directly above prime ocean beaches, should provide for tertiary treatment of sewage, not secondary as contemplated by the application (p. 35). Economical, low-energy, low-tech tertiary systems are available and known to Ohbayashi but have apparently been rejected, despite widespread community concern about sewage from the very beginning of planning for this project.

RUNOFF

We are deeply concerned about the potential impact of erosion and stormwater runoff on the coral reef at Sunset Beach and we are not convinced that a golf course will control it, as stated in the application (p. 11). Damage to this reef from chemical or silt-laden runoff would threaten the continuing attraction of Sunset Beach as one of the world's finest surfing spots. It would also damage an important North Shore fishing and diving resource.

EMPLOYMENT

Contrary to Ohbayashi's application (p. 12) the North Shore is not suffering from significant unemployment--and is not likely to in the future, with the current expansion at Turtle Bay.

The prediction of "between 100 and 140 full-time equivalent jobs upon completion" (p. 12) is misleading because it fails to bring out that this figure includes "indirect" as well as "direct" estimates. (See p. 27.)

The prediction of 70-90 "direct" jobs that appears on page 22 is too high. Moreover, it says nothing about pay scale. We would anticipate 50-60 "on-site operational" jobs averaging \$16,000/year.

OTHER NORTH SHORE DEVELOPMENTS

The application fails to take account of other developments approved or proposed for the North Shore, contrary to the requirement of section 33-3.2 (2) (A) of the Revised Ordinances of Honolulu that "cumulative" impacts be considered.

CONCLUSION

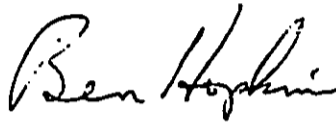
Although we find this application to be seriously lacking and suggest that you reject it, we wish to acknowledge Ohbayashi and its representatives for sharing much information with us during the past three years. They have also provided considerable logistical support for the joint effort--not yet successful--to come up with a mutually acceptable land use plan.

Despite some occasions when it has appeared to us that Ohbayashi was not being entirely forthright, we remain committed to honest communication, creative thinking, and cooperation as the best path for all concerned.

Sincerely,


Charles Merlet
President, Sunset Beach
Community Association

Chairperson, Joint Planning
Committee


Ben Hopkins
Member, Board of Directors,
Pupukea Highlands Community
Association

Member, Joint Planning
Committee

cc: Mayor Frank Fasi
All members of City Council
Ohbayashi Hawaii Corporation
Group 70
North Shore Neighborhood Board
North Shore News and other media

Consideration should also be given to the fact that the affordable housing units will be built at the site, instead of Obayashi paying into an affordable housing fund. On-site affordable housing should be viewed as an additional benefit for North Shore residents.

Local Receipt of Benefits: We would prefer that a significant portion of the community benefits package be allocated to specific North Shore concerns. The DGP has indicated that the community benefits package should apply to the entire island, and not just the North Shore. Our future discussions with the DGP, as well as your own inquiries, will provide us with further guidance on this issue.

Kama'aina Golf Rates: We frankly believe that all kama'aina tee times offered (45 of the 150 total estimated rounds per day) will be utilized. The kama'aina rate at opening is estimated to be \$39 (60 percent of the \$65 standard or "rack" rate), increasing approximately 3.5 percent every five years. Local golfers will be anxious to play this high-quality course, especially at such low and reasonable rate.

Based on the above, there will probably be a substantial revenue loss to Obayashi (approximately \$26 per kama'aina round). Projecting these costs into the future requires making assumptions and predictions of the economy. We used a very conservative approach to rate growth, and estimated the value over a 50 year period. The projection of these benefits over a shorter period would be more precise, but not reflective of the total accumulated costs to Obayashi.

B. Golf Course

Public Problem or Need: The EA attempts to describe the public and private demand as part of the overall rationale for proposing this golf course. The current overcrowded golfing conditions on Oahu is strong evidence that additional golf facilities are needed on Oahu. A recent report by the University of Hawaii Real Estate Research Center (Ordway et al, 1990) indicates a near future demand for over 27 new golf courses on Oahu, and 54 golf courses throughout Hawaii. This study used a very conservative approach in comparing Oahu golf facilities to those existing in many other areas of the United States (including resort, suburban and metropolitan areas). Places like Albany, New York, for example, have a much higher per capita availability of golf facilities than Oahu. Per capita golf demand is also very high on Oahu.

Location of Demand: Your suggestion that golf courses should be located close to the source of demand is noted. Lihi Lani is projected to serve the estimated approximately 3,000 North Shore/Koolauloa area golfers. Golfers from other locations on Oahu regularly travel island-wide to play golf. The

existing golf market, demand for facilities, and slow pace of new golf development will probably keep local golfers driving on the road to golf courses away from their neighborhood.

A detailed Market Assessment was prepared by KPMG Peat Marwick and included in the Draft EIS to evaluate the proposed golf course in light of the other numerous golf course proposals for the island and the North Shore area. In general, the evaluation determined that with appropriate market planning, Lihi Lani and the two Kuilima courses could serve complimentary markets and support the emergence of the North Shore area of Oahu as a small golf center, with three high-quality courses for both resident and visitor golfers. We have seen no indication that the development of the second Kuilima course will reduce the potential number of golf rounds at the Lihi Lani golf course. Other golf developments in the North Shore/Koolauloa area besides Lihi Lani and the two Kuilima courses should be supported by the existing and projected golf market.

Golf Course as Open Space: The City and County of Honolulu "Development Plan Special Provisions for the North Shore" outline "Specific Urban Design Considerations" within the "Urban Design Principles and Controls for the North Shore". The first urban design consideration is as follows: "(1) Open Space: The visibility, preservation, enhancement and accessibility of open space areas as defined in Section 3201.4 of the development plan common provisions, shall be given high priority in the design of adjacent and nearby developments in the North Shore." Section 32-8.2 defines "Open Space" as consisting of, but not limited to, "the ocean, beaches, parks, plazas, institutional properties with park-like grounds, streams inland bodies of water, significant land forms, golf courses, cemeteries and agricultural and preservation lands." Other statements in this section which seem applicable to Lihi Lani include, "areas ... to serve as outdoor space for public use and enjoyment." "The preservation and enhancement of areas that are well suited to perform these functions shall be given high priority". Based upon these and other similar goals and policies of either the State or the City and County, the application describes the proposed golf course as an open space use.

The golf course use also fits well within the existing rural character of the area. Visually, a golf course is not as intrusive as other land uses which involve building more structures upon the land. The vehicular traffic generated by a golf course is lower than that for residential land uses, for example. Additionally, just as the "setting" is important to the planning of hiking or horseback riding recreational uses, the ideal golf experience involves not only the game itself, but spending time out-of-doors to experience and enjoy the scenery and natural features of an area. The Lihi Lani site is an ideal setting from a recreational point of view. Just as proponents of the hiking trails are interested in taking advantage of the site's potential for walking through dense vegetation, obtaining long distance

views, and spending time out of doors in a quiet atmosphere, the same environment is desirable to persons who play golf.

Traffic Implications: A Traffic Impact Assessment for the project (Section 4.12 and Appendix O of the Draft EIS) indicate that the proposed golf course is projected to generate approximately 41 vehicles entering and 41 vehicles exiting the project during the 1997 weekend peak hour (Sunday 1:00 to 2:00 pm). This period has been determined to be the heaviest period for local traffic volumes. Compared to the projected 1997 Sunday peak hour traffic without the project, which is 1,033 vehicles passing through the project intersection with Kamehameha Highway, the golf course could add roughly 3.9 percent more vehicles to the Highway.

The typical measurement for perceptible changes in traffic is through the use of Level of Service (LOS) ratings which range from A (highest quality) to F (congested flow) for two-lane rural highways and intersections. In terms of LOS on the two-lane Kamehameha Highway, the Level of Service at the time of project build-out is expected to be LOS E. Passing is virtually impossible under these conditions and platooning becomes intense when slower vehicles or other interruptions are encountered. With the addition of the entire project, the projections indicate that the LOS remains essentially unchanged. Therefore, if the total project does not change the LOS on Kamehameha Highway and the project entrance intersection, the golf course alone, should also not change the predicted LOS rating for this Highway.

B. Water

Salinity of Irrigation Water: We project to pump brackish water for irrigation at a rate that will not cause increased salinity of the brackish water lens. If irrigation water is found (through regular testing) to become more saline during a high demand period, irrigation demand will be reduced and selective water use will begin. The frequent testing will allow Obayashi enough lead time to cut back on irrigation gradually until the high demand period has passed. The project will include extensive water conservation measures in the design of landscaping (xeriscape) for the golf course, other recreational facilities, common areas and residential lots.

C. Wastewater Disposal

Based upon continued interest on the part of adjacent landowners, the landowner is proposing to employ the use of economical, low-energy wastewater treatment systems, such as those developed in Arcata, California. Dr. Robert Gearheart of Humboldt State University will participate in the design and implementation of this facility. The proposed facilities will provide advanced-secondarily treated wastewater effluent, which will be diluted 10 to 1 (brackish water to treated effluent) and used for landscape irrigation in select areas of the project, as agreed upon by the State

Department of Health, Department of Land and Natural Resources, and Board of Water Supply.

D. Runoff

The concern appears to be that the runoff will slowly destroy the reef, affect surfing conditions and ruin a fishing and diving amenity. The Draft EIS includes extensive studies conducted to assess the potential for adverse impact. Our studies indicate that the project as designed, including extensive mitigative measures, will not cause adverse ocean water quality impacts. We will continue to monitor ocean water, stream water and groundwater at and near the site to assess baseline and future conditions. Monitoring is designed to detect changes in water chemistry at extremely low levels, and therefore, will be preventative. Any changes in the baseline water quality will be detected long before there is a problem. Should adverse water quality conditions be predicted as a result of project activities. We will work with the State Department of Health to address and eliminate the source of the problem.

E. Employment

The project is expected to provide 80 direct jobs and 60 indirect jobs upon the start of full operations. KPMG Peat Marwick estimates an on-site operational employment of 80 full-time equivalent jobs. Some positions will be part-time jobs.

For the purposes of the economic and fiscal analysis, KPMG Peat Marwick uses an average annual wage of \$17,160 (excluding tips) per full-time equivalent position. This wage is based on a weighted average of eating and drinking places, miscellaneous retail stores, personal services, real estate, and amusement and recreation services sector wages in the City and County of Honolulu.

F. Other North Shore Developments

The EA did not include a discussion of the cumulative impacts of the proposed project. However, the Draft EIS, filed on January 22, 1991, does include a discussion of potential cumulative impacts, and specifically, cumulative impacts relating to ocean water quality, land use character, traffic, potable water, air quality, noise, socio-economic characteristics and visual resources.

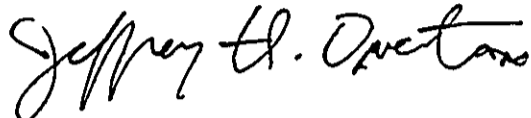
Thank you again for your comments. We look forward to continuing our positive relationship and meaningful discussions regarding the Lihi Lani project with you and the community as a whole.

Letter to Joint Planning Committee for the Obayashi Property
12 April 1991
Page 6

Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

LIHI LANI RECREATIONAL COMMUNITY
•FINAL ENVIRONMENTAL IMPACT STATEMENT•

9.2 DRAFT ENVIRONMENTAL IMPACT STATEMENT - COMMENTS AND RESPONSES

UNITED STATES
DEPARTMENT OF
AGRICULTURE

SOIL
CONSERVATION
SERVICE

P. O. BOX 50004
HONOLULU, HAWAII
96850

February 14, 1991

Mr. Roland Libby
Department of General Planning
City & County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813

RECEIVED
FEB 19 1991
GROUP 70
LIMITED

Dear Mr. Libby:

Subject: Draft Environmental Impact Statement (DEIS) -
Lihl Lani Recreational Community North Shore Development
Plan Amendment, Koolauloa, Oahu, Hawaii

We have reviewed the above-mentioned document and have no comments to offer at this time; however, we would appreciate the opportunity to review the final EIS.

Sincerely,



WARREN M. LEE
State Conservationist

cc:

Mr. Craig Yamagishi, Obayashi Hawaii Corporation, Quon/Yamagishi
Partnership, 46-387 Hololilo Street, Kaneohe, Hawaii 96744

Mr. Jeffery H. Overton, AICP, Group 70 Limited, 924 Bethel Street,
Honolulu, HI 96813



DEPARTMENT OF THE NAVY

COMMANDER
NAVAL BASE PEARL HARBOR
BOX 110
PEARL HARBOR, HAWAII 96860-5020

8763-14/3-13

IN REPLY REFER TO:

11000
Ser 00F2/0216
14 FEB 1991

RECEIVED

FEB 19 1991

GROUP 70
LIMITED

Mr. Roland Libby
Deputy Chief Planning Officer
City and County of Honolulu
Department of General Planning
Honolulu Municipal Building
650 South King Street
Honolulu, HI 96813

Dear Mr. Libby:

LIHI LANI RECREATIONAL COMMUNITY NORTH SHORE DEVELOPMENT
PLAN AMENDMENT DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)

We reviewed the subject DEIS and have no comments to offer. Since we have no further use for the DEIS, it is being returned to the Office of Environmental Quality Control.

Thank you for the opportunity to review the draft.

Sincerely,

W. K. LIU
Assistant Base Civil Engineer
By direction of
the Commander

Copy to:
Obayashi Hawaii Corporation Quon/
Yamagishi Partnership (Mr. C Yamagishi)
Group 70 Limited
(Mr. J. H. Overton, ACIP)
OEQC (w/DEIS)



United States Department of the Interior

FISH AND WILDLIFE SERVICE
PACIFIC ISLANDS OFFICE

P.O. BOX 50167
HONOLULU, HAWAII 96850

March 7, 1991

City and County of Honolulu
Department of General Planning
650 South King Street
Honolulu, Hawaii 96813

Jeff
RECEIVED
MAR 08 1991

Dear sir or madam:

GROUP 70
LIMITED

This responds to your request for our review of the proposed Lihi Lani Recreational Community, North Shore. We have completed our review of the Draft Environmental Impact Statement and have the following comments pertinent to this Service's jurisdiction:

Appendix K, Page 9: Under the heading Rare and Endangered Species, it states that Eugenia koolauensis is a Category 1 Endangered Species and will be proposed for listing as an endangered species within the next two years. Additional information regarding this plant and the specific proposed use of the site should be included in the final statement. The plants status under the Endangered Species Act must be taken into consideration prior to final construction planning. For specific information about the status of the plant, please contact Dr. Derral Herbst of this office (541-2749).

Thank you for the opportunity to comment on the project.

Sincerely yours,

William R. Kramer
Acting Field Supervisor
Pacific Islands Office

cc: C. Yamagishi, Obayashi Hawaii Corp., 46-387 Hololio Street,
Kaneohe, HI 96744
J. Overton, Group 70 Limited, 924 Bethel Street, Honolulu, HI 96813



17 April 1991

United States Department of the Interior, Fish and Wildlife Service
William R. Kramer, Acting Field Supervisor
Pacific Islands Office
P.O. Box 50167
Honolulu, Hawaii 96850

**Subject: Lihl Lani Recreational Community Draft EIS
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Mr. Kramer:

Thank you for your 8 March 1991 letter to the Department of General Planning regarding the subject Draft EIS. The following responses are to your specific comments.

A. Eugenia Koolauensis

Your letter references Appendix K of the Draft EIS, which is a Botanical Survey of the site, prepared in January 1988 by Ken Nagata. Section 4.8 of the Draft EIS discusses the results of that survey and explains that the four Koolau Eugenia trees discovered by Nagata not located on the Obayashi property, but within the boundaries of the Pupukea-Paumalu State Forest Reserve. Additional specimens of those trees have recently been identified by Bill Garnett at the same location.

However, due to the proximity of the Lihl Lani project and the Koolau Eugenia trees, Obayashi will continue to participate in a cooperative effort with botanists from the State Department of Land and Natural Resources (Division of Forestry and Wildlife), to protect and monitor these trees. This commitment is reiterated in the Draft EIS under "Mitigative Measures" in Section 4.8.

Thank you again for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED

Jeffrey H. Overton, AICP
Senior Planner

- Francis S. Oda, AIA, AICP
- Norman G. Y. Hong, AIA
- Sheryl B. Seaman, AIA, ASID
- Robert K. L. Wong, AIA
- Hitoshi Hida, AIA
- Roy H. Nihei, AIA, CSI
- Linda M. Aniya
- Derrick T. Seiki
- Ralph E. Portmore, AICP
- Edward T. Green
- Paul P. Chorney, AIA
- Stephen H. Yuen, AIA
- Dean H. Kitamura, AIA
- Norma J. Scott
- Jane Fukushima-Lee, ASID
- Anne Theiss, AIA, ASID
- Stephen E. Callo, CPA
- Bradford A. Wellstead, AIA
- Walter R. Bell, AIA, CSI, CCS
- Walter K. Muraoka
- George I. Atta, AICP
- Jeffrey H. Overton, AICP
- James I. Nishimoto, AIA
- Jen-Chih "Jack" Lee, AIA
- Spencer K.S. Chang, AIA
- Michael A. Garni



DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 230
FT. SHAFTER, HAWAII 96858-5440

February 26, 1991

REPLY TO
ATTENTION OF:

Planning Division

Mr. Roland D. Libby, Jr.
Deputy Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Libby:

We have reviewed the Draft Environmental Impact Statement for the proposed Lihi Lani Recreational Community, Paumalu and Pupukea, Koolauloa, Oahu. The following comments are offered:

a. A Department of the Army permit would be required for the placement of fill material into any waters of the U.S., which include streams and wetlands. For further information about permit requirements, please contact Operations Division at 438-9258 and refer to file number P091-076.

b. According to the Flood Insurance Rate Map, the project site lies in the following zones: Zone D (areas in which flood hazards are undetermined); and Zone X, unshaded ("Other Areas" determined to be outside of the 500-year flood plain as designated by the Federal Emergency Management Agency in September 1987).

Sincerely,

Kisuk Cheung
Director of Engineering

2/91-606

GENERAL PLANNING
C/O CHEUNG

'91 FEB 27 PM 1:29

RECEIVED



17 April 1991

Department of the Army, U.S. Army Engineer District
Kisuk Cheung, Director of Engineering
Building 230
Ft. Shafter, Hawaii 96858-5440

Attention: Planning Division

Subject: **Lihl Lani Recreational Community Environmental Assessment
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Mr. Cheung:

Thank you for your 26 February 1991 letter to Roland Libby, Department of General Planning, concerning our Draft Environmental Impact Statement which was filed on 23 January 1991.

Your comments regarding the Flood Insurance Rate Map zones are noted and will be considered as the owner pursues more detailed studies and designs for the project. The Final EIS will include a figure showing the flood zones you refer to. Should the project require placement of fill materials into waters of the U.S., an application for a Department of the Army permit will be made.

Thank you again for your suggestions and comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or concerns.

Sincerely,

GROUP 70 LIMITED

Kari Kilstrom for
Jeffrey H. Overton, AICP
Senior Planner

Francis S. Oda, AIA, AICP
Norman G.Y. Hong, AIA
Sheryl B. Seaman, AIA, ASID
Robert K.L. Wong, AIA
Hiroshi Hida, AIA

Roy H. Nihei, AIA, CSI
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Dean H. Kitamura, AIA
Norma J. Scott
June Fukushima-Lee, ASID
Anne Theiss, AIA, ASID
Stephen E. Callo, CPA
Bradford A. Wellstead, AIA
Walter R. Bell, AIA, CSI, CCS
Walter K. Muraoka
George I. Atta, AICP
Jeffrey H. Overton, AICP
James I. Nishimoto, AIA
Jen-Chih "Jack" Lee, AIA
Spencer K.S. Chang, AIA
Michael A. Garni



OFFICE OF STATE PLANNING

Office of the Governor

STATE CAPITOL, HONOLULU, HAWAII 96813 TELEPHONE (808) 548-5893

JOHN WARREN, Governor

Ref. No. P-1725

February 19, 1991

RECEIVED
FEB 25 1991

The Honorable Benjamin B. Lee
Chief Planning Engineer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

GROUP 70
LIMITED

Attention: Mr. Roland Libby

Dear Mr. Lee:

Subject: Lihi Lani Recreational Community, North Shore, Draft
Environmental Impact Statement

We have reviewed the above-referenced proposal relative to Coastal Zone Management (CZM) objectives and policies and offer the following comments and concerns.

A CZM objective is to protect and preserve natural and manmade historic and prehistoric resources. There are many archaeological sites within the property that have been identified as significant and worthy of further study. The EIS should correlate the location of these historic sites with a site plan of the proposal and describe the project phasing so the sites can be studied prior to construction. Also, if a determination is made that some or all of these sites should be preserved, the plans should be revised to incorporate a historic park within the site.

Another CZM objective is to protect coastal ecosystems from disruption and minimize adverse impacts. We have the following concerns.

1. The Hawaii Stream Assessment, September 1990, by Clifford Smith, Carol Wilcox and Sallie Edmunds, states that the upper reaches of Paumalu Stream is perennial and the lower reaches are intermittent. The Draft EIS states that this stream is intermittent. This conflict should be clarified. This report also states that wetlands may be within this area and that there is a possibility of rare plants along the stream. This should also be clarified and a discussion should be included on the impacts of the proposal on these resources.
2. The proposal includes a horse ranch and riding trails, etc. Animal wastes can have an adverse impact on water quality and the EIS should describe how these wastes will be managed in order to minimize impacts. The EIS should also list additional management practices

The Honorable Benjamin B. Lee
Page 2
February 19, 1991

that will be incorporated to minimize impacts on water quality. An example of a management practice is to establish a minimum stream setback for the ranch and horse pastures from all of the streams (intermittent and perennial) within the site. The applicant may review the Department of Health's report on "Nonpoint Source Pollution Management Plan" for additional management practices.

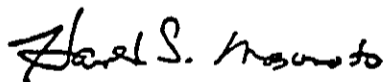
3. Page 74-81, Stormwater runoff. The Draft EIS states that detention basins and injection wells will be implemented for drainage. The proposal indicates that house lots will be situated almost to the edge of the site along the Kahuku makai side, and that the site is generally steep along the makai side of the site. The EIS should provide a description of the implementation of the detention basins along the Kahuku makai side of the site, and if any lots downslope of the site will be adversely affected by excess stormwater runoff. This section also discusses underground injection wells along Kamehameha Highway. The Department of Health should review the drainage plan and determine if an Underground Injection Control permit is required.

The EIS also indicates that storm runoff from the residential area will be directed onto the golf course and then into detention basins. However, the EIS does not investigate the cumulative impacts of pollutants coming from the residential areas. The EIS should be expanded to include 'best management practices' of urban pollutants.

4. The EIS should indicate who will be responsible on a continuous basis for management and protection of the rare and endangered plants found by the botanical study.

Thank you for the opportunity to comment on this proposal. If you have any questions, please contact Lorene Maki of our staff at 548-3961.

Sincerely,



Harold S. Masumoto
Director

cc: Obayashi Hawaii Corporation
Group 70 Limited
Office of Environmental Quality Control



17 April 1991

State Capitol, Office of the Governor
Office of State Planning, Land Use Division
Mr. Harold S. Masumoto, Director
Honolulu, Hawaii 96813

**Subject: Lihi Lani Recreational Community Draft EIS
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Mr. Masumoto:

Thank you for your 19 February 1991 letter to the Department of General Planning regarding the above application. The following responses are to your specific comments.

A. Archaeological Sites

The reconnaissance survey of the property conducted by Paul H. Rosendahl, Ph.D., Inc. (July 1988) identified numerous archaeological sites. We have included herein a figure which overlays the master plan with the archaeological sites location plan. This analysis was conducted in the preparation of the Draft EIS to determine which sites could be affected by the project, however, the results of the analysis are described in the text without the benefit of a composite figure. Most of the significant sites are planned to be preserved, and incorporation of preserve areas around unaffected sites is being considered. A follow-up study of affected sites will be conducted by PHRI, with results reviewed and approved by DLNR Historic Sites Section (HSS), to determine the best measures to be taken in preserving significant sites. Language included in the Final EIS will reflect revisions requested by DLNR-HSS in their Draft EIS comment letter, and findings from a follow-up meetings with Tom Dye, Oahu Archaeologist, on 18 March 1991.

B. Stream Resources

The stream gulches crossing the site were classified as intermittent based on information from farming tenants of the land and site investigations conducted over the last three years. During periods of high precipitation, the three stream gulches on the site carry runoff to the ocean. During low precipitation periods, these gulches are mainly dry. It was observed during dry periods that the upper portion of Paumalu Gulch contains some small standing water pools and generally wet soils.

- Francis S. Oda, AIA, AICP
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- George I. Atta, AICP
- Jeffrey H. Overton, AICP
- James I. Nishimoto, AIA
- Jen-Chih "Jack" Lee, AIA
- Spencer K.S. Chang, AIA
- Michael A. Garni

Letter to Office of State Planning, Land Use Division
Mr. Harold S. Masumoto, Director
17 April 1991
Page 2

The presence of wetlands vegetation in Paumalu Gulch was considered in the overall botanical survey of the site by Nagata (January 1988). Further assessment of this gulch and the remainder of the site for freshwater wetlands will be completed in the near future by Char & Associates, who have conducted wetlands identification for the U.S. Army Corps of Engineers. Results of this survey will be forwarded to your office when available.

In addition, Obayashi has contracted stream ecologist Anne Brasher, Ph.D. to conduct surveys of the intermittent streams on the property to investigate any potential habitat for or presence of native and exotic fish, invertebrates and insects. The findings from this survey will be presented in the Final EIS, and a copy will be forwarded to your office.

The project is not planned to directly affect areas within this gulch in construction activities, since the entire area of the gulch will remain in an open space "conservation park" area. Runoff from the developed portions of the project will not degrade the quality of Paumalu Stream, and the project will likely reduce the contribution of silt and suspended sediments to this stream.

C. Animal Wastes at Horse Ranch and Hiking/Riding Trails

To minimize impacts on water quality due to animal wastes, the project will establish a minimum setback from stream channels of 100 feet for horse pasture areas. The horse ranch area will be located on a plateau area which is over 400 feet from the closest stream channel at the closest point. Natural vegetation will be retained between the ranch and the stream channel, allowing for filtering of runoff from the ranch. Horse droppings will be collected on a regular schedule within the horse ranch area, and removed from the ranch in timely fashion. There will be no waste disposal or stockpiling at the horse ranch. The operator will either compost the wastes to create mulch material for use on-site or dispose of the wastes at a government-approved location off-site. Runoff Guidelines and recommendations presented in the Department of Health's "Non-point Source Pollution Management Plan" will be followed for additional management practices.

D. Residential Area Runoff

The 120 country lot residences and 180 affordable housing units located at the project have the potential to contribute a variety of chemicals to the surrounding ecosystem. Pesticides, fuels, cleaners and fertilizers are all used at times on residential lands, and misuse or accidental spills of these chemicals could cause some contamination of the surface runoff from these areas, as well as have the potential to leach to groundwater. Strict controls on chemical use at the 180 unit affordable housing area will be instituted if the design of this area includes common grounds maintenance throughout. The

individual country lots could pose the greatest risk for misuse or accidents, because application of chemicals cannot be regulated on these private lands. It is possible that special covenants could be placed on these lots with respect to limits on chemical use and types allowed. We are currently researching the feasibility of this type of control.

We are unable to predict the quantities of contaminants that will be released to the environment from residential areas because the introduction of these chemicals will be infrequent, resulting from chronic misuse on a single lot or an accidental spill event. It is reasonable to believe that some small quantities of chemicals will be released to the environment from residential areas. It is unrealistic to believe that chronic misuse and accidental spills will occur with any uniform frequency at these home sites.

"Best Management Practices" for urban runoff control will be considered in the design of the residential areas at Lihi Lani. Runoff from residential areas will be released through natural vegetation swales, first passing through detention basins in some locations. These measures will help to eliminate potentially adverse concentrations of chemicals through evaporation, sunlight breakdown, dilution and uptake on organic material. According to Murdoch and Green, the use of chemicals on residential lots is not expected to create adverse effects on water quality in the receiving intermittent streams and ocean waters.

E. Injection Wells for Storm Water

Injection wells are being suggested as a possible measure that could be taken to further reduce runoff water ponding in the lower portion of the property. An area of six acre-feet is required for detention of runoff from the access road and community facilities. This basin will be constructed along Kamehameha Highway on the entire frontage. Injection wells proposed would be six feet diameter and approximately 40 feet deep, to act as conduits for ponded runoff to disperse into the ground. The dispersion of runoff could be accomplished faster with the injection wells, however, it has not been determined whether or not these wells will be needed. If injection wells are proposed, Obayashi will comply with Department of Health Administrative Rules, Chapter 11-23, "Underground Injection Control" which requires UIC permits for the construction and operation of all injection wells.

F. Storm Water Runoff on Residential Lots

Detention basins will not be included on the downslope slides of lots bordering the bluff edges on the site, such as the lots bordering Paumalu Gulch. Runoff from these areas will be controlled within each lot, and the developed portions of these lots are limited to the slight and moderate slope areas on the plateau edges. Steeply sloped portions of these lots will not be developed. Storm Water runoff from the developed portions will be

Letter to Office of State Planning, Land Use Division
Mr. Harold S. Masumoto, Director
17 April 1991
Page 4

channelled by grassed swales on each lot into natural vegetation areas on the less sloped areas. Individual lots may include small sump areas to receive excess runoff, and prevent its uncontrolled release onto the gulch slope.

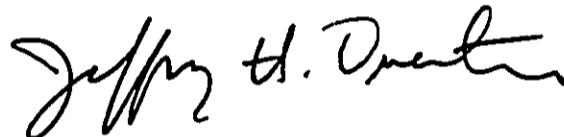
F. Management and Protection of the Koolau Eugenia Trees

Obayashi has met with representatives of the State Department of Land and Natural Resources - Division of Forestry and Wildlife (DOFAW) to establish a cooperative management plan for the protection and enhancement of the habitat for these trees. Obayashi has made a long-term commitment to participating in this endeavor, and there are plans to attempt propagation experiments elsewhere on the site. We will propose that DOFAW be the lead group for decision-making on a continuous basis, with the support of Obayashi staff. Further development of this cooperative effort will result from upcoming meetings with DOFAW and the Na Ala Hele advisory group.

Thank you again for your suggestions and comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or concerns.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

JOHN WAIHEE
GOVERNOR OF HAWAII



WILLIAM W. PATY, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

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MAR 15 1991

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

P. O. BOX 621
HONOLULU, HAWAII 96808

DEPUTIES

KEITH W. AHUE
MANABU TAGOMORI
Dan T. Kochi

AQUACULTURE DEVELOPMENT
PROGRAM
AQUATIC RESOURCES
CONSERVATION AND
ENVIRONMENTAL AFFAIRS
CONSERVATION AND
RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
PROGRAM
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

GROUP TO
LIMITED

REF:OCEA:JN

MAR 15 1991

FILE NO.: 91-304
DOCUMENT NO.: 9911E

MEMORANDUM

TO: Office of Environmental Quality Control

FROM: William W. Paty, Chairperson
Department of Land and Natural Resources

SUBJECT: Lihi Lani Recreational Community North Shore
Development Plan Amendment

Thank you for giving our Department the opportunity to comment on this matter. We have reviewed the materials you submitted and have the following comments.

Division of Land Management

After reviewing the information submitted, we found that although preliminary discussions have been held with the applicant regarding their proposed use of the State-owned lands in the area, no final decision from the Board of Land and Natural Resources has been obtained. Questions regarding whether the roads listed are in fact remnants and whether the Board would authorize the sale of these roadways remain unresolved.

With respect to the non-roadway lots (5-9-5: 6 & 5-9-6: 3 & 7), we note that under the subject proposal it appears that Legal, improved access will be provided to lots 5-9-6: 3 & 7. We wish to clarify if in fact this is true. We notice however, that no mention is made of the status of Tax Map Key 5-9-5: 6. We ask that the applicant provide us with information on what, if anything, is planned for this parcel.

Division of Aquatic Resources

Although the draft EIS is fairly comprehensive, we are concerned that inadequate attention was paid to the freshwater streams within the project area. The site is located between the Kalunawaikaala and Paumalu Streams. The Pakulena Stream runs approximately through the middle. Available data indicate there is little biological significance to these streams, and their limited watersheds suggest the streams have little aquatic resource value. However, there have been no biological reconnaissance surveys to confirm this view.

The Draft EIS simply stated that the streams are not perennial, but no evidence of a lack of standing pools that might support aquatic life was presented. Heavy storm flows in the streams were described.

We have found many intermittent streams that contain significant populations of native aquatic fish and invertebrate species, particularly in the upper reaches. In some cases the lower reaches are known to have been dry for years at a time.

Considering the size of the proposed project, we feel strongly that complete biological reconnaissance surveys of the associated streams should be performed before the EIS is accepted. These surveys should include the entire extent of the stream beds and should include aquatic insects and sampling of nearby terrestrial insects that might have some association with those particular streams or dry stream ecosystems. Even if the stream beds prove to be entirely dry with no pool retention capacity, there might be a unique native insect population associated with these conditions. It should be noted that if pools are being retained in the stream, and if these are holding native aquatic species, assurances will have to be made that the proposed groundwater pumpage will not effect dewatering of the pools.

Better knowledge of the actual nature of these streams is needed to evaluate the adequacy of any mitigation measures imposed on the project. The entire stream reaches above the project area should be included, because these habitats and particularly any diadromous species that might be present will be directly affected by any changes in conditions in lower reaches.

A second concern related to the Aquatic environment is to the potential effects of the project on inshore marine habitats. We were previously aware of reported problems associated with domestic septic tanks throughout the area, and these were in part confirmed by elevated near shore nitrate readings shown in the EIS. However, the EIS surveys found no identifiable effect on the coral reef or other biological populations. This is contrary to (scientifically unsupported) complaints that have been voiced by local residents.

Because the EIS admits that the project could increase inshore biological productivity through the input of inorganic nutrients, especially if there is mismanagement of the golf course grounds, an acceptable monitoring program based on the suggestion in the EIS (Appendix M, page 14, item 7) should be required.

Our Division of Aquatic Resources has no basic objection to the project. With the expansion of the information base they are recommending, mitigation measures can be designed to prevent unacceptable environmental damage.

Division of Forestry and Wildlife

We have reviewed the Draft EIS and have the following comments:

1. The Draft EIS addresses our concerns regarding the Koolau eugenia trees. We will continue to monitor any and all mitigative actions to be taken. The staff Botanist will be working with the Applicant on this matter.
2. On Page 6 in the first paragraph, the Koolau eugenia trees are located on the State Forest Reserve land, not Preserve land.
3. It is stated that nine miles of trails will be within the project site. There is no map showing where these nine miles of trails will be located. Because we are concerned with trails and accesses, we would like to see a map in the final EIS detailing the location of said trails.
4. Pupukeya Forest Reserve, which is directly mauka of the project site, is presently a low use recreation area which is use primarily for hunting and hiking. With this development proposal, the area will be heavily impacted especially by the residence of the development.
5. A meeting with the developers was held on February 21 and all our concerns were discussed and adequately addressed. The developers will address our concerns in the Final EIS.
6. We will continue to work with the developers as the project progresses.

Historic Preservation Division

The Draft EIS accurately reflects the significance evaluations agreed upon for the 54 historic sites located on the property, which included 16 sites significant under Hawaii Register of Historic Places criterion D (information content), 6 sites under HRHP criteria D & E (information content & cultural significance), and one site under criteria C, D, & E (excellent

example of a site type, information content, & cultural significance). Our office concurs with these significance evaluations.

The Draft EIS also accurately reflects the mitigation treatments recommended by the consulting archaeologist, but these have not been followed in the development of mitigative measures in the text of the Draft EIS. Thus, the mitigation treatments proposed in the Draft EIS's text are not acceptable in their present form.

The anticipated impacts reported in the Draft EIS have not been previously reviewed by our office and appear to be deficient, since they take into account only direct effects of the project (i.e. partial or total destruction) and do not consider indirect effects. It would appear from the project plan that construction of residential and recreational facilities will expose all of the 23 significant sites to increased access with the possibility of resulting damage. Thus, it would appear that the project will potentially have an "adverse effect" on all 23 of these sites, rather than the seven sites noted in the Draft EIS.

Additionally, we disagree with the proposed mitigation plans. For the 16 sites significant under criterion D, a determination of "no adverse effect" can be made only if the sites are planned to undergo data recovery to record and/or recover a reasonable and adequate amount of their significant information, or if they are preserved with protective measures.

Of the six sites significant under criteria D & E, which are sites including petroglyphs or burials, the consulting archaeologist recommended preservation of these sites, and we agree with this recommendation. However, the Draft EIS plans call for the partial or total destruction of two and increased access with the possibility of resulting damage for the other four.

Since these sites are significant for their cultural significance, we recommend that the plans be revised so that none of these sites will be destroyed. The single site significant under criteria C, D, and E (which contains burials and petroglyphs) is proposed for preservation through avoidance. The consulting archaeologist recommended interpretation of the petroglyph portions of this site, and we agree given the few petroglyph sites known for O'ahu. Detailed recording along with interpretive display (except for the burial areas) would be appropriate.

Until an acceptable mitigation plan is devised to treat these significant sites, we will recommend to the City and County that the project would have an "adverse effect" on the sites, including burials.

OEQC

-5-

Doc. No.: 9911E

Thank you for your cooperation in this matter. If you have any questions, please call me or Cathy Tilton at our office of Conservation and Environmental Affairs at 8-7837.



17 April 1991

Department of Land and Natural Resources
William W. Paty, Chairperson
P.O. Box 621
Honolulu, Hawaii 96809

**Subject: Lihi Lani Recreational Community Draft EIS
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Mr. Paty:

Thank you for your 15 March 1991 memorandum to the Office of Environmental Quality Control regarding the subject Draft EIS. The following responses are to your specific comments.

Division of Land Management

A. Clarify Access to Two Lots, Tax Map Key 5-9-6: 3 and 7

The parcels mentioned above are located directly mauka and adjacent to the Obayashi property. Access to these parcels has been discussed with the State Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW). In general, public access to the State Forest Reserve land mauka of the Obayashi property would be via a nine-mile network of hiking and horseback riding trails, as described in Section 2.1.I of the Draft EIS. During subsequent planning phases, Obayashi will prepare a detailed map showing the trail and public access to the State land for review by DOFAW. Obayashi will also prepare a separate fire suppression plan to describe the proposed fire suppression accessways.

A mitigative measure to this affect will be included in the Final EIS.

B. Plans for Lot, Tax Map Key 5-9-5: 6.

Tax Map Key 5-9-5:6 is a less than one-half acre parcel located in the southwest corner of the Obayashi property. The master plan for the property is described in Section 2.0 of the Draft EIS, and requests that the area in the immediate vicinity of this parcel be utilized for open space purposes; the only "improvement" proposed near this parcel is a riding and horse riding trail. Should the final alignment of the riding and hiking trail favor a route which traverses the State parcel, Obayashi will endeavor to acquire the parcel from the State.

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Hitoshi Hida, AIA

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Spencer K.S. Chang, AIA
Michael A. Garni

Letter to Dept. of Land and Natural Resources
William W. Paty, Chairperson
17 April 1991
Page 2

Division of Aquatic Resources

A. Streams

The stream gulches crossing the site were classified as intermittent based on information from farming tenants of the land and site investigations conducted over the last three years. During periods of high precipitation, the three stream gulches on the site carry runoff to the ocean. During low precipitation periods, these gulches are mainly dry. The upper portion of Paumalu Gulch (on the Obayashi property) contains occasional small standing water pools and some wet soil areas. This stream only flows during rainy periods.

Nowetlands vegetation was found on the site, including Paumalu Gulch, in the overall botanical survey of the site by Nagata (January 1988). Further assessment of this gulch for freshwater wetlands has been completed Char (March 1991), who have conducted wetlands identification for the U.S. Army Corps of Engineers. Results of this survey are included in the Final EIS. No wetlands vegetation was found on site in Char's survey of Paumalu Gulch.

In addition, Obayashi has contracted stream ecologist Anne Brasher, Ph.D. to conduct surveys of the intermittent streams on the property to investigate any potential habitat for or presence of native and exotic fish, invertebrates and insects. Her preliminary survey for Paumalu Stream showed the presence of a few amphipods and beetles, and some endemic post-larval gobies. The anadromous post-larval gobies are not likely to survive future dry periods. No adults were found in the survey. The report by Brasher is presented in the Final EIS, and a copy will be forwarded to your office.

The project is not planned to directly affect areas within this gulch in construction activities, since the entire area of the gulch will remain in an open space "conservation park" area. Runoff from the developed portions of the project will not degrade the quality of Paumalu Stream, and the project's erosion controls will reduce the contribution of silt and suspended sediments to this stream.

B. Inshore Marine Habitats

The Draft EIS, Appendix M and Section 4.10 refers to several studies conducted to assess this potential effects of the project on inshore marine habitats. The studies indicate that the project, as designed, including extensive mitigative measures, will not cause adverse ocean water quality impacts. We will continue to monitor ocean water, stream water and groundwater at and near the site to assess baseline and future conditions. Monitoring is designed to detect changes in water chemistry at extremely low levels. Changes in the baseline water quality will be detected long before there is a problem. Should adverse water quality conditions be predicted as a result of project activities, the source of the problem will be eliminated under

guidance of the State Department of Health. A specific mitigative measure which calls for "an ongoing marine environment monitoring program" requires the landowner to follow up on the baseline studies and projected impact assessment offered in the EIS.

Division of Forestry and Wildlife

A. Kooloau Eugenia Trees

Obayashi is committed to continued participation in the cooperative management effort for the protection and enhancement of the habitat for these trees.

B. State Reserve:

A correction on page 6 of the Draft EIS will be made for the Final EIS.

C. Detailed Trail Map

Public access to the open space areas within the Lihi Lani community and to State Forest Reserve land mauka of the Obayashi property would be via a nine-mile network of hiking and horseback riding trails, as described in Section 2.1.I of the Draft EIS. During subsequent planning phases, Obayashi will prepare a detailed map showing the trail and public access to the State land for review by DOFAW. Obayashi will also prepare a separate fire suppression plan to describe the proposed fire suppression accessways.

A mitigative measure to this affect will be included in the Final EIS.

D. Impacts to Pupukea-Paumalu Forest Reserve

The design of the Lihi Lani Recreational Community is such that residents will have opportunities for various types of recreation, including hiking, within the boundaries of the community. While we agree that it is likely that Lihi Lani residents will hike and, possibly, hunt within the Pupukea-Paumalu Forest Reserve, we believe that the proposed network of hiking trails within the community will service much of the resident "demand" for hiking and horseback riding.

Historic Preservation Division

A. Mitigative Measures

Our archaeologist for the project, Paul H. Rosendahl, Ph.D., Inc. (PHRI) has not yet prepared mitigation plans. As you have requested, Obayashi will have PHRI prepare an archaeological data plan and a detailed preservation plan to be submitted to and approved by the State's Historic Preservation Division

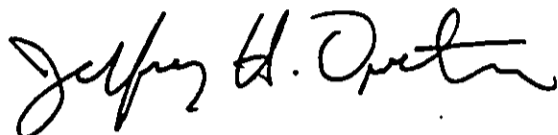
Letter to Dept. of Land and Natural Resources
William W. Paty, Chairperson
17 April 1991
Page 4

(HPD). We will make this commitment clear in the Final EIS, and Obayashi will accept this as a condition on future approvals. Revised language for the Final EIS will be forwarded to HPD prior to formal submittal of the Final EIS document.

Thank you for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

JOHN WAIHEE
GOVERNOR OF HAWAII



JOHN C. LEWIN, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HAWAII 96801

In reply, please refer to:

March 15, 1991

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MAR 1 1991

Mr. Craig Yamagishi
Obayashi Hawaii Corporation
Quon/Yamagishi Partnership
46-387 Hololilo Street
Kaneohe, HI 96744

GROUP 70
LIMITED

Dear Mr. Yamagishi:

Subject: Lihi Lani Recreational Community
Application for North Shore Development Plan
Amendment
Draft Environmental Impact Statement (DEIS),
Paumalu and Pupukea, Koolauloa, Oahu
TMK: 5-9-05: 06 Portion 38 and Portion 82
TMK: 5-9-06: 01, 08, 18 and 24

We have reviewed the material on the above subject project.
We have the following comments to offer:

Clean Water

As per 40 CFR 122.26(a)(1)(ii) and 122.26(b)(14)(x), amended December 17, 1990, the proposed construction activity involving clearing, grading and excavation activities of greater than five (5) acres of total land area shall be required to obtain a National Pollutant Discharge Elimination System (NPDES) permit for stormwater discharges. Subsequently, pursuant to 40 CFR 122.26(c)(1) and 122.26(e)(1), amended December 17, 1990, the operator of the proposed facility should submit an individual NPDES application to the Director of Health by November 18, 1991.

Drinking Water

As new sources of potable water are developed, the use of each source will require compliance with Department of Health Administrative Rules, Chapter 11-20, "Potable Water Systems."

Section 11-20-29 requires that all new sources of potable water serving a public water system be approved by the Director of Health prior to their use. Such an approval is based primarily upon the submission of a satisfactory engineering report which addresses requirements listed in Section 11-20-29.

Mr. Craig Yamagishi
March 12, 1991
Page 2

It is still unclear from the DEIS whether the proposed water system will be dedicated to the City & County of Honolulu's Board of Water Supply (BWS). Section 11-20-30 requires that new or substantially modified distribution systems for public water systems be approved by the Director. However, if the water system is under the jurisdiction of the City and County of Honolulu, the BWS will be responsible for the review and approval of the plans.

The proposed development is situated above the Department's Underground Injection Control (UIC) Line. Land areas inland of the UIC Line are generally considered to contain underground sources of drinking water. These areas should therefore be protected against all potential sources of groundwater contamination.

It is essential that all wells be properly designed and constructed to prevent the possibility of groundwater contamination. For example, each well should have a concrete well pad and full grouting to prevent seepage or flood waters from migrating down the well shaft.

According to the Department of Land and Natural Resources' October 25, 1989 Ground Water Index, one of the golf course irrigation wells (State well no. 3902-04) is located about one-half mile from an existing drinking water well (State well no. 3902-01). The same golf course irrigation well is also located approximately one mile from the BWS's Sunset Beach well (State well no. 4002-04). The operation of the golf course and these irrigation wells must not adversely affect the quality of existing drinking water wells.

The attached standard golf course conditions should apply to this project.

The potable and non-potable water systems must be carefully designed and operated to prevent cross-connections and backflow conditions. The two systems must be clearly labeled and physically separated by air gaps or reduced pressure principle backflow preventers to avoid contaminating the potable water supply.

The DEIS indicates that injection wells will be used along Kamehameha Highway and Ke Nui Road to dispose of stormwater runoff. All injection wells must comply with the Department of Health Administrative Rules, Chapter 11-23, "Underground Injection Control." Chapter 23 requires UIC permits for the construction and operation of all injection wells.

Mr. Craig Yamagishi
March 12, 1991
Page 3

Wastewater

The entire site is located within the "No Pass" Zone established by the Board of Water Supply.

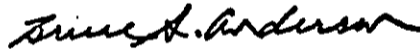
According to BWS, Pupukea would not be suitable for application of reclaimed water due to a high infiltration rate. BWS wells are down gradient of the site. Even if the application rate assured a negative water balance, the surface loading of total dissolved solids (TDS) due to evaporation and subsequent infiltration by natural precipitation events would increase the TDS of the existing groundwater, which is measured at 500 mg/l TDS presently.

The analysis presented in the subject DEIS is noticeably absent of hydrogeologic studies for the Pupukea area to support the conclusion on page 14 that "...significant adverse impacts due to effluent disposal by irrigation of the golf course are not foreseen." The suitability of a specific area proposed for application of reclaimed water should be verified with field data before final approval is granted.

The proposed wastewater treatment and disposal system does not adequately provide assurances that the aquifer used for a public water supply will not be biologically or chemically degraded.

Should you have any further questions, please feel free to contact Harold Yee of the Wastewater Branch at 543-8287.

Very truly yours,



JOHN C. LEWIN, M.D.
Director of Health

Attachment

cc: ✓ Mr. Jeffrey H. Overton, AICP
Group 70 Limited
924 Bethel Street
Honolulu, HI 96813

Office of Env. Quality Control
220 South King Street, 4th Floor
Honolulu, HI 96813



17 April 1991

John C. Lewin, M.D., Director of Health
State of Hawaii, Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

**Subject: Lihi Lani Recreational Community Draft EIS
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Dr. Lewin:

Thank you for your 15 March 1991 letter to Obayashi Hawaii Corporation concerning the subject Draft EIS. The following is offered in response to your specific comments.

A. Clean Water

Obayashi's civil engineer Engineering Concepts, Inc. (ECI) is aware of the requirement to obtain a National Pollution Discharge Elimination System (NPDES) permit for storm water discharge from the construction site. Obayashi will comply with this requirement as planning for the project progresses. ECI will contact your office on behalf of Obayashi Hawaii Corporation to discuss the application requirements for this permit.

B. Drinking Water

On-Site Wells: The on-site wells are not intended for potable water usage, instead they are planned for brackish water development to serve the irrigation needs of the project. Development of on-site potable water wells is not a present consideration. In the event that a new potable water source is developed on-site, Obayashi will conform to the applicable regulations.

Dedication of Potable Water System: It is intended that the on-site potable water system be dedicated to the City and County of Honolulu Board of Water Supply (BWS). Obayashi will comply with the required approval process for dedication of this system.

Underground Injection Control (UIC) Line: Obayashi will comply with UIC regulations. The UIC regulations permit the extension of the UIC line approximately 150 feet mauka of Kamehameha Highway at the property. Storm water injection wells proposed for the site would be makai of this line. The proposed injection wells would comply with Department of Health Administrative Rules, Chapter 11-23 requiring a UIC permit. Golf course maintenance and treated effluent disposal by irrigation is planned to occur mauka of the UIC line. These activities will include special precaution measures to prevent groundwater contamination.

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Jeffrey H. Overton, AICP
James I. Nishimoto, AIA
Jen-Chih "Jack" Lee, AIA
Spencer K.S. Chang, AIA
Michael A. Garni

On-Site Well Design and Construction: The on-site wells were constructed with a grout annulus. A concrete well pad will be constructed at the time of pump installation. All applicable regulations will be followed in establishing long-term production of brackish water from these wells.

Off-Site Potable Water Wells: According to Mink & Yuen, irrigation well operation at Lihi Lani is not projected to adversely affect the quality of potable water being drawn at off-site wells, including the BWS Sunset Beach well. The withdrawal rates predicted for the two on-site brackish water wells are not expected to cause a drawdown effect which could increase the salinity of the potable water aquifer.

Golf Course Conditions: Obayashi will comply with the mandatory conditions for groundwater monitoring at the new golf course.

Potable and Non-Potable Water Systems: Obayashi will comply with applicable regulations for the design and operation of the potable and non-potable water systems. The design will include necessary measures to prevent contamination of the potable water supply.

C Wastewater

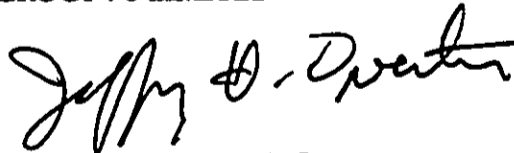
The impacts on the aquifer due to TDS loading would be due to the non-potable water contribution, rather than the contribution from reclaimed wastewater effluent. Effluent comprises only a fraction of the irrigation water. Further, TDS levels in the non-potable water will be higher than levels in wastewater effluent. According to Mink and Yuen, the irrigation use of non-potable water on the site will not cause adverse TDS levels of the underlying aquifer.

Transport of bacteria and viruses has been addressed in the Draft EIS in Appendix B (pp. 13-14). Based on studies conducted by the Water Resources Center at the University of Hawaii, biological degradation of the aquifer is not probable.

Thank you again for your suggestions and comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or concerns.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

JOHN WAIHEE
GOVERNOR



STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION

869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

March 4, 1991

RECEIVED

'91 MAR -7 P1.51

OFFICE OF ENVIRONMENTAL
QUALITY CONTROL

EDWARD Y. HIRATA
DIRECTOR

DEPUTY DIRECTORS
AL PANG
JOYCE T. OMINE
JEANNE K. SCHULTZ
CALVIN M. TSUDA

IN REPLY REFER TO:

HWY-PS
2.5830

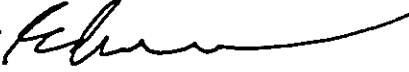
RECEIVED

MAR 12 1991

GROUP 70
LIMITED

MEMORANDUM

TO: Dr. Bruce Anderson, Acting Director
Office of Environmental Quality Control

FROM: Edward Y. Hirata, Director 

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS),
LIHI LANI RECREATIONAL COMMUNITY,
PUPUKEA, KOOLAULOA, OAHU
TMK: 5-9-05: 06, POR. 38, POR. 82;
5-9-06: 01, 08, 18, 24

Thank you for your transmittal of January 24, 1991, requesting our review of the subject DEIS.

We have the following comments:

1. The Developer should consider the use of acceleration and deceleration lanes on Kamehameha Highway at the intersection with the Project Access Road.
2. The Developer should implement the TIAR's recommended improvements for the proposed intersection and the Developer shall bear the costs of all required improvements.
3. Plans for construction work within the State highway right-of-way should be submitted to the Highways Division for review and approval.
4. The Developer should dedicate a twenty-five feet wide portion of land adjacent to the State's right-of-way for future highway widening.

Dr. Bruce Anderson
Page 2
March 4, 1991

HWY-PS 2.5830

5. The Developer should be committed to signalize the proposed access road intersection with Kamehameha Highway when traffic signal warrants are met. This is to be coordinated with the Highways Division.
6. Diversion of surface water runoff onto Kamehameha Highway is not permitted.
7. Project construction vehicle traffic should be scheduled to avoid peak traffic periods on Kamehameha Highway.



17 April 1991

State of Hawaii, Department of Transportation
Edward Y. Hirata, Director
869 Punchbowl Street
Honolulu, HI 96813-5097

**Subject: Lihi Lani Recreational Community Draft EIS
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Mr. Hirata:

Thank you for your 4 March 1991 memo to the Office of Environmental Quality Control concerning the subject Draft EIS. The following is offered in response to your specific comments.

A. Acceleration and Deceleration Lanes on Kamehameha Highway

Although acceleration and deceleration lanes on Kamehameha Highway were not among the recommended mitigative measures in the Traffic Impact Assessment Report (TIAR), the project could benefit from the construction of such lanes. The civil engineering consultant, Engineering Concepts, Inc., will help Obayashi design these lanes and implement them at the entrance intersection when necessary.

B. Implementation of Recommended Improvements

A detailed Traffic Impact Assessment Report was prepared for the project by PPE and included in the Draft EIS as Appendix O. All of the report's recommended improvements are included in the Draft EIS as recommended "Mitigative Measures" in Section 4.12. Obayashi will implement these improvements at the time they are warranted, and at their own cost.

C. Plans for Construction Work within the State Highway Submitted to Highways Division

In accordance with standard procedures, all plans for construction work within the State Highway right-of-way will be submitted to the Highways Division for review and approval.

Francis S. Oda, AIA, AICP
Norman G.Y. Hong, AIA
Sheryl B. Seaman, AIA, ASID
Robert K.L. Wong, AIA
Hitoshi Hida, AIA
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Jen-Chih "Jack" Lee, AIA
Spencer K.S. Chang, AIA
Michael A. Garni

D. Dedication of Land Adjacent to the State Highway for Future Widening.

Obayashi would like to meet with your Department to discuss the future plans for Kamehameha Highway widening. It is possible that the requested 25 feet wide right-of-way could be provided on Obayashi land, but we would like to consider the potential timing of highway widening.

E. Signalize Access Road Intersection

Section 4.12 of the Draft EIS includes recommended mitigative measures to minimize the impact of traffic generated by the Lihi Lani project. These mitigative measures require Obayashi to conduct signal warrant studies periodically at the intersection of the project access road with Kamehameha Highway. Further, Obayashi will install the traffic signals to State DOT standards if and when they are required at the project entrance. These mitigative measures are consistent with the recommendations of the TIAR.

F. Diversion of Surface Water Onto Kamehameha Highway

Diversion of surface water runoff is considered in the Draft EIS Section 4.6. Drainage design plans will be prepared by the project engineer and will avoid diversion of surface water runoff onto Kamehameha Highway.

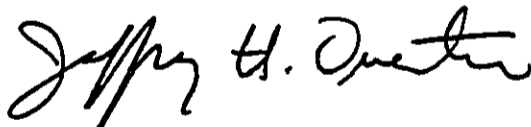
G. Off-peak Construction Traffic

In order to minimize short-term, construction vehicle traffic impacts with respect to traffic, Obayashi will work with its contractors in an effort to off-set peak construction vehicle traffic and peak commuter traffic on Kamehameha Highway. A mitigative measure to this effect will be included in the Final EIS.

Thank you for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

JOHN WAIHEE
GOVERNOR



RECEIVED
APR 11 1991

JOSEPH K. CONANT
EXECUTIVE DIRECTOR

GROUP 70
LIMITED

STATE OF HAWAII
DEPARTMENT OF BUDGET AND FINANCE
HOUSING FINANCE AND DEVELOPMENT CORPORATION
SEVEN WATERFRONT PLAZA, SUITE 300
500 ALA MOANA BOULEVARD
HONOLULU, HAWAII 96813
FAX (808) 543-8841

IN REPLY REFER TO:

91:PLNG/1434jt

March 25, 1991

TO: Mr. Roland Libby
Department of General Planning
City and County of Honolulu

FROM: *[Signature]*
Joseph K. Conant
Executive Director

SUBJECT: Draft Environmental Impact Statement for the Proposed
Lihi Lani Recreational Community

We note that the provision of affordable housing within the proposed project is listed as an unresolved issue. The statement that affordable housing will "contribute significantly to the project's potable water demand, wastewater facilities capacity, full-time resident population and traffic" is correct. However, it is expected that the applicant/developer will mitigate impacts generated by the project.

Additionally, the table of affordable sales prices and rents which is included in Appendix E overestimates affordability. The estimation of 1990 median income is much higher than that established by the U.S. Department of Housing and Urban Development. Further, the assumed down payments of 10% and 20% appears to be high. We will be glad to work with the applicant in establishing guidelines of affordability.

Thank you for the opportunity to comment.

JT:eks

c: Obayashi Hawaii Corporation
Group 70 Limited
Office of Environmental Quality Control



17 April 1991

Joseph K. Conant, Executive Director
Housing Finance and Development Corporation
Department of Budget and Finance
State of Hawaii
500 Ala Moana Boulevard
Honolulu, Hawaii 96813

**Subject: Lihi Lani Recreational Community Draft EIS
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Mr. Conant:

Thank you for your March 25 1991 letter to the Department of General Planning regarding the subject Draft EIS. The following responses are to your specific comments.

A. Mitigation of Impacts of Affordable Housing

Of the 300 residential units proposed within the Lihi Lani Recreational Community, 180 units are intended to conform to the City and County guidelines for affordability. This component of the proposal is cited as an "unresolved issue" in Section 7.0 of the Draft EIS since there have been concerns voiced within the community that affordable housing may not be "compatible" with the low density level (one acre minimum lot size) of the immediately adjacent Pupukea Highlands and Sunset Hills projects. However, there are also proponents of affordable housing for the North Shore within the community. In terms of community consensus, the issue is "unresolved". However, in terms of environmental impacts, the Draft EIS assumes that the 180 affordable homes will be constructed within the Lihi Lani Community. Water demand, wastewater facilities capacity, population and traffic all assume a "worst case" scenario for both short and long term impact analysis and include the affordable units.

B. Appendix E: Affordable Sales Prices and Rents

Appendix E of the Draft EIS is a "Market Assessment for the Proposed Lihi Lani Master Planned Community". Exhibit VII-D of that Appendix is entitled "Home Purchase and Rental Affordability for Oahu Households" prepared by KPMG Peat Marwick and is based, in part, on annual household income figures estimated by the U.S. Department of Housing and Urban Development in October, 1988. Peat Marwick has since obtained the 1990 data for median income. This data will be used to revise the exhibit for the Final

- Francis S. Oda, AIA, AICP
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- Robert K. L. Wong, AIA
- Hitoshi Hida, AIA
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- Michael A. Garni

Letter to Housing Finance and Development Corporation
Joseph K. Conant, Executive Director
17 April 1991
Page 2

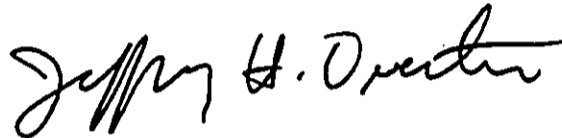
EIS, reporting median income as \$41,200 rather than \$46,496, as previously estimated. We also note that down payments of less than 10 percent may be achievable for some families who qualify for such financing programs.

Obayashi will continue to work with the State as the proposed affordable housing within Lihi Lani undergoes subsequent stages of planning and review.

Thank you again for your suggestions and comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or concerns.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner



University of Hawaii at Manoa

R E C E I V E D
MAR 12 1991

GROUP 70
LIMITED

Environmental Center
A Unit of Water Resources Research Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 956-7361

March 8, 1991
RE:0571

Mr. Mel Murakami
Department of General Planning
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Murakami:

Draft Environmental Impact Statement (EIS)
Lihi Lani Recreational Community
Paumalu and Pupukea, Koolauloa District, Oahu

The above referenced project proposes development in the areas of Paumalu and Pupukea on the North Shore of Oahu. A recreational community located on approximately 1,143 acres will consist of: 120 country residential lots (one-acre minimum), 180 affordable housing units, an 18-hole golf course, golf clubhouse, golf driving range, tennis center, equestrian ranch, campground, hiking and horse riding trails (9 miles) and community facilities. A development Plan Amendment is proposed for 264 acres of the site, including the golf course and related facilities (212 acres), affordable housing (28 acres), community facilities (10 acres), and wastewater treatment facilities (14 acres). Approximately 559 acres, or 49 percent of the land, will remain undisturbed open space, with an additional 327 acres designed for outdoor recreational land use. The applicant proposes to utilize non-potable water for irrigation of the golf course and landscaped areas on-site.

The review and subsequent comments on the aforementioned Draft EIS were prepared with the assistance of Michael Graves, Anthropology; Paul Ekern, (Emeritus) Water Resources Research Center; Reginald Young, College of Engineering; and Alex Buttaro of the Environmental Center.

Wastewater Treatment and Disposal System

Our reviewers note with interest the first proposed application of a wetlands treatment and disposal system technology in Hawaii. However, the consultants report lacked a full description of the system, particularly, useful information regarding the basis of design and the kinds of plants that will be used. The specific description of the proposed system for Lihi

AN EQUAL OPPORTUNITY EMPLOYER

Mr. Mel Murakami
March 8, 1991
Page 2

Iani on page 7 mentions only that, "Bulrushes, or a variety of similar grasslike plants will be the type of vegetation that will be used and cultured in the wetland system." Use of a full range of species endemic to Hawaii might be appropriate in this application.

With regard to the stabilization pond, the consultant determined that a pond size of 8 acres would be adequate for the development, then divided that area in two creating a series pond system. However, such a division effectively doubles the organic loading on the first pond. The original 5-day BOD design loading was about 40 lb/ac/day. Doubling the capacity would result in a loading of about 80 lb/ac/day, which will likely work, but not as well as under the conservative design allowance of 8 acres to treat the entire flow. The 4 acre primary pond, at a depth of 6 feet, will allow a retention time of 39 days which exceeds the City and County of Honolulu's Division of Waste Water Management design standard of 15-30 days.

The consultant report on Wastewater Management, Odor Abatement, page 9, states, "the detention time of the sewage in the sewer system should be relatively short, thereby minimizing the emission of odors." Other odor-mitigative options may want be advisable, because the 39-day retention time may not be adequate for odor abatement.

Our reviewers were unable to rationalize the various discrepancies between water demands (Appendix C, page 6) and wastewater flows (Appendix B, page 4).

Both the ambient ground water and the wastewater effluent for irrigation were described as having a chloride content of 100 mg/l. Our reviewers suggest that the wastewater should be assumed to have picked up some minerals, perhaps as much as 20 mg/l chloride, which eventually could have a detrimental effect on irrigation water quality.

Seven safeguards are listed in the consultant's report in the section "Wastewater Collection and treatment safeguards." Absent from this list of are provisions for holding the wastewater effluent in the event of heavy rainfall. Additionally, golf course irrigation may not be necessary during periods of heavy cyclonic rainfall. There should be some means of holding or disposing of the effluent during periods of heavy precipitation.

Climate

Cloud cover characteristics of the area are discussed in Section 4.1, page 52. A source of data supporting the cloud cover statements made in this section should be cited.

Irrigation

The irrigation requirements discussed in Section 4.5.B, page 64, and in Appendix C pages 7-8, should cite pan evaporation data listed on page 4 of Appendix I, to support the stated requirements.

Mr. Mel Murakami
March 8, 1991
Page 3

The methodology and numerical data used to calculate the salinity of the irrigation water cited in Section 4.5.B, page 64, need to be discussed somewhere in this document. How and on what basis was the salinity of the water determined to be 200-300 mg/l?

Also, the assumption of 90 percent uniformity of water application when calculating irrigation requirements (Appendix I, page 7) seems overly optimistic. Our reviewers suggest that 50-60 percent is a more realistic assumption.

The use of ponds and marshes for golf course runoff (page 85) and wastewater treatment (page 66) is proposed, yet mitigative mosquito control measures were not discussed.

In addition to the average uses per day listed in Appendix C, page 6, peak uses should be provided somewhere in this document.

Soils

In Section 4.3, page 55, the discussion of existing conditions completely lacks any mention of engineering properties of soils with regards to roadways, foundations, and bank stabilizations. We feel these parameters need to be discussed.

Social and Economic Characteristics

In discussing the relationship of the proposed project to the City and County of Honolulu general Plan, the statement is made that, "The population increase associated with Lihi Lani is of too small a magnitude (0.07 percent of the projected 2010 Oahu population) to materially alter the degree of consistency of the North Shore's development capacity with its Population Distribution Guideline." Very similar statements are made on page 7, and on page 155, Section 4.16.1.B.

Our reviewers suggest that a 0.07 percent increase in this region is significant and may have serious implications within the context of the North Shore Development Plan. Since the Plan calls for the area to remain rural, with 1.6 to 1.8 percent of Oahu's 2010 population, and the 1989 estimate cited said that the area had 1.7 percent already, a population increase of only 0.1 percent over the next 20 years is permitted in this area. The Lihi Lani development's population increase of 0.07 percent would constitute 70 percent of the population growth allowed under the Plan for the next two decades.

The combination of Lihi Lani's projected assumption of 70 percent of the planned population increase allowance and the significant relative size of the development places a great burden of responsibility on the developer to absorb expansion of the existing population of the area, and to participate in the preservation of the community character. With respect to the statement (Section 4.16.5.A), "There is a history of third and fourth generation families seeking perservation of their commuinity as a home for the next generation," given the large proportion of expansion housing Lihi

Mr. Mel Murakami
March 8, 1991
Page 4

Lani will account for in the next 20 years, how is the developer going to ensure that the needs of these people are met?

Will the developer provide administrative and managerial employment opportunities to individuals from indigenous ethnic groups that have historically been forced out of the area due to socio-economic pressures?

The Draft EIS states that in the Sunset Beach/Pupukea/Waimea area, only 35 percent of the residents were Hawaiian-born and that "Over 60 percent of the household heads surveyed in that small area were originally from the Mainland United States" (Section 4.16.1.A, page 160). Later the statement is made that, "Approximately 80 percent of the lot buyers are expected to be from Oahu or another of the Hawaiian islands; 20 percent from outside of Hawaii" (Section 4.16.3.B, page 159). How does the developer propose to ensure an 'indigenous' population of 80 percent, despite past and existing demographic trends that have made the present population predominately 'non-indigenous'?

To what extent will this development contribute to the transformation of this community from an agricultural to an urban, residential, recreational community?

What what will be the impact on the various recreational activities that currently exist in this area? For example, the surfing conditions in some areas of the development are often crowded, as the document cites: "the Banzai Pipeline and Waimea Bay, within two miles of the project site, are among the most famous surfing areas in the world" (Appendix S, pages 2-4). How will the additional 697 full-time and 193 part-time residents affect the animosity that already exists due to overcrowding in nearby surfing breaks?

In Ssection 4.16.3.A, page 159, you state that "High prices and a lack of available units help to explain why there appears to be widespread overcrowding and house sharing in the total study area." Only 50 percent of Lihi Lani country homes are expected to be occupied and the Draft EIS projects an average of 2.8 people per affordable household (504 residents/120 lots). What is the basis for the assumption that this development will not fall into this same demand category of high priced, overcrowded homes, thereby contributing to even greater population and traffic impacts than the estimates provided? To what extent will property taxes be affected, and how will this exacerbate the already over-priced and over-crowded housing market.

Traffic

Presently, you state that through-traffic along Kamehameha Highway will experience delays during peak periods with or without the project (page 6). The vehicular impact of the project is expected to increase ambient peak hour traffic from 1,260 to 2,055 vehicles per hour, representing an increase of 37 percent. Will this increase significantly affect the community character or the social economy? Will people be inclined to look for work closer to home due to an increased travel time? Might this possibly lead to

Mr. Mel Murakami
March 8, 1991
Page 5

urbanization of peripheral areas? What other mitigation measures might be implemented to reduce the impact of this significant increase in traffic?

Typographical Errors

Page 27, paragraph 2, refers to a complete report on wastewater in Appendix A. The wastewater report is actually located in Appendix B.

Section 2.3, page 36, refers to Appendix D for information on the Market Assessment Report. This report is found in Appendix E rather than D.

Thank you for the opportunity to comment on this document and we hope you will find our comments helpful.

Sincerely,



John T. Harrison, Ph.D.
Environmental Center

cc: Craig Yamagishi, Obayashi Hawaii Corporation
Jeffrey H. Overton, Group 70 Limited ✓
Paul Ekern, WRRRC
Michael Graves, Anthropology
Reginald Young, Engineering
Roger Fujioka, WRRRC
Alex Buttaro



GROUP 70
LIMITED

17 April 1991

John T. Harrison, Ph.D., Environmental Coordinator
University of Hawaii at Manoa
Environmental Center
Crawford 317; 2550 Campus Road
Honolulu, Hawaii 96822

**Subject: Lihi Lani Recreational Community Draft EIS
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Dr. Harrison:

Thank you for your March 8, 1991 letter regarding the above application. The Draft Environmental Impact Statement (Draft EIS) for this project was filed with the City and County of Honolulu Department of General Planning on January 22, 1991. The following responses are to your specific comments.

A. Wastewater Treatment and Disposal System

Dr. Robert Gearheart and Engineering Concepts, Inc. are in the conceptual stages of design for the proposed wetlands treatment and disposal system for wastewater generated by the project.

Wetland Plants: With regard to plants to be planted in the marsh system, we believe the most effective plants for this type of system will be bulrushes. We are currently evaluating the potential treatment value of many other wetland plants which are native to Hawaii, and may include those in our system. Winona Char, Consulting Botanist, will provide the engineers with some guidance to select from the candidate native species.

Stabilization Pond: We concur that the first cell of the proposed stabilization pond will result in the following characteristics:

organic loading:	80 lb BOD/acre/day
depth:	6 feet
retention time:	39 days

The City and County of Honolulu Division of Wastewater Management Design Standards (Volume 2, July 1984) has outlined design criteria guidelines for the initial cell in the multi-cell non-aerated facultative stabilization ponds (pp. 70-81):

organic loading	75-120 lb BOD/acre/day
depth:	4-8 feet
retention time:	15-30 days

The proposed design criteria for organic loading and depth are within the guidelines set by the City and County Division of Wastewater Management Design Standards. The proposed retention time of 39 days exceeds the retention time design standards; however, an adverse effect on wastewater treatment is not expected.

Odor Potential: Obayashi is aware of the public concern over wastewater odors within the project site, and odor transmission to neighboring properties. Every effort will be made to reduce the potential for odor generation. Odor abatement measures will be employed, as required. The proposed odor abatement measures may include air strippers and chemical inhibitors at sewage pump stations and aerators within the stabilization ponds.

Discrepancies Between Water Demands and Wastewater Flows: We concur that there are discrepancies between the estimated water demands and wastewater flows stated in Appendices C and B, respectively. These discrepancies are the result of utilizing agency standards. Specifically, as stated in the Appendices, water demand was based on BWS criteria while wastewater flows were based on DOH criteria. Discrepancies are especially noticeable for residential areas where water demand is based on 500 gallons per day per residential unit, and wastewater flow is based on 600 gallons per day per residential unit (3 bedroom home, 2 people per bedroom, 100 gallons per person per day).

Effluent Water Chlorides: A report which evaluates potential groundwater quality effects of the project (Mink & Yuen; Appendix G of the Draft EIS) has used a conservative approach in addressing the issue of increasing the chloride concentration of ambient groundwater due to the proposed irrigation practices. Chloride concentration of irrigation water is assumed to be 350 mg/l, using the highest measured level from analysis of on-site wells. Actual chloride concentrations vary from 200 to 350 mg/l. The resulting effect on ambient groundwater quality salinity is an average increase from 100 mg/l to 116 mg/l. This increase in salinity is considered very small, and this concentration falls well within the upper limit of 250 mg/l chlorides for potable water.

Wastewater Effluent Storage: Engineering Concepts, Inc. addresses the issue of wastewater effluent storage in Appendix C (p. 12) of the Draft EIS. The proposed irrigation pond will contain a mixture of treated wastewater effluent and non-potable water from the on-site wells. The irrigation/storage pond will be designed to provide up to ten days of effluent storage in the

event irrigation is not required due to inclement weather. Further, the stabilization pond and marsh can detain additional flows, up to 30 days.

B. Climate

The source for cloud cover characteristics of the area were: the Draft Environmental Impact Statement for the Kuilima Resort Expansion (1985); and the agricultural feasibility study prepared for the Lihi Lani project by Frank Scott, Ph.D. (1988).

C. Irrigation

Irrigation Requirements: Irrigation requirements for the golf course are very conservative, and were based on pan evaporation data provided in Murdoch and Green (1990), Appendix I of the Draft EIS. A more logical method for calculating irrigation needs is by the water balance method, which assesses the seasonal precipitation expected at the site in comparison to the typical turf irrigation requirements. During five months of the year (November through March), very little irrigation is expected to be required due to natural rainfall. During April through October, 48 million gallons of irrigation water will be required, averaging 0.23 million gallons per day (mgd). For irrigation system design purposes, peak irrigation needs were conservatively estimated at 0.54 mgd, based on the average for golf courses State-wide (Murdoch and Green, 1991). Based on BWS criteria, the peak hourly irrigation water demand will be 0.57 mgd. The revision is included in the text (Section 4.17.1.B) and appendix changes made for the Final EIS.

Salinity of Irrigation Water: Irrigation water salinity used for this study were determined from water sample analyses from the two on-site wells in 1988 and 1989. Laboratory analysis reports are enclosed in Appendix G of the Draft EIS. The analysis showed salinity to be between 200 to 350 mg/l for the two wells, using a 24-hour pump test.

Irrigation Efficiency: The 90 percent irrigation efficiency assumed by Murdoch and Green (Appendix I) is not overly optimistic, especially since the golf course will employ a computerized irrigation system. With proper operation of the system, this rate of irrigation efficiency can be achieved. Local weather conditions and soils and turf data for the site will all be analyzed by the Golf Course Superintendent and irrigation system computer in the determination of daily irrigation requirements.

D. Soils

Engineering properties of the soils found on the site are available from the Oahu Soils Survey prepared by the USDA Soils Conservation Service. This information is attached, for your review. The engineering properties of the soils with regard to roadways, foundations and bank stabilization will be

addressed by a geotechnical engineer as planning and design of the project progresses. The project has only been designed to an advanced conceptual stage, therefore, no detailed engineering analyses have been completed. There are traditional design solutions available to allow the development of the project as currently planned.

E. Social and Economic Characteristics

Population: It is estimated that Lihi Lani could add up to 960 persons to the North Shore Development Plan Area, if the City's criteria of 3.2 persons per household is used. We do not believe that Lihi Lani will have this high a resident population, and is likely to have approximately 700 residents. The addition of 960 or even 700 new residents to the area may reach or exceed the 2010 General Plan Population Distribution Guidelines for the North Shore DP area. The Department of General Planning and the City Council have created a guideline which reflects their perceived development capacity of an area at the time they created the guideline. The intent is to maintain the existing rural and low-density character of the North Shore. Guidelines regarding design and density of development, population, etc. have been provided in an effort to achieve this objective. The residential portion of the Lihi Lani project is designed at a lower density than the existing adjacent residential neighborhoods; the remainder of the project is proposed for either open space, golf course, or other outdoor, recreational uses. By design, the Lihi Lani project conforms to the spirit of the General Plan objectives for the North Shore. The North Shore will continue to be an area of low density population, even with Lihi Lani, however, it is likely that the Population Distribution Guideline will be exceeded in the near future.

Relative to the North Shore DP area's past development trends, Lihi Lani is a major residential project. The project involves only 120 country lots and 180 affordable housing units. Realizing there might be concern about excessive population growth, Obayashi hesitated at first in including the affordable housing component on-site. The decision to locate affordable housing on-site resulted after an exhaustive and unproductive search for a North Shore/Koolauloa location for the 180 affordable housing units. Limited or no infrastructure availability is the restrictive factor at all potential sites we examined. Since the required infrastructure will be installed at Lihi Lani, Obayashi proposed to locate the affordable housing on-site, which has been received enthusiastically by many within the local community.

Over 500 of the projected 700 people at Lihi Lani will be residents of the affordable housing units. If there is an over-riding concern that the population increase caused by this project is too great to be assimilated by the North Shore, the affordable housing portion could be removed from the plans. In return, Obayashi could either pay into a fund for affordable housing or construct the housing at an off-site location. The affordable housing could be directed to established urban growth areas such as Central Oahu or Ewa.

The removal of the affordable housing component from the current plan will hurt the chances for the many young people on the North Shore who cannot afford to buy a home on the North Shore. With or without the affordable housing included, Lihi Lani will be compatible the low density, country character of the area. We see the inclusion of on-site affordable housing as an attempt to meet the needs of the local people.

Employment Opportunities: The projected employment at Lihi Lani is reported in the Draft EIS. Indigenous ethnic groups will have the same opportunity as any other ethnic group (there are many on the North Shore) to get involved with job training at Lihi Lani.

Population Character: Research of the projected market for the 120 country lots, conducted by KPMG Peat Marwick (January 1991), indicates that these lots will be absorbed rapidly by the residents of Oahu and the State of Hawaii. Obayashi believes that at least 80 percent of these lots will be sold in this market. The 180 unit affordable housing component will be occupied entirely by indigenous people, meaning that they will be Hawaii residents, and most probably residents of the North Shore/Koolauloa DP Areas.

North Shore Residential and Recreational Community: We believe that Lihi Lani will provide substantial new recreational facilities and residential opportunities to current residents of the North Shore. The low density and recreational emphasis of the project is in keeping with the existing country character of the North Shore. The community facilities proposed, while seeming potentially urban in character, are badly needed in this area. Our project will perpetuate the rural character of the area through its land planning to retain major sections of undeveloped conservation area and prime agricultural soils on the site.

Surfing Crowds: The affordable housing portion of the project will probably be the residence for some surfers who either live on the North Shore at present, or travel from their home elsewhere on Oahu to surf the country. Some of the country lots may be purchased by more well-off but aging surfers. These resident surfers are not likely to add to the crowded surfing conditions that already exist on the North Shore. They would probably be surfing on the North Shore anyway, whether they live at Lihi Lani or elsewhere. Their may be some employment opportunities or job training provided to people from Oahu who surf the North Shore. Jobs provided to North Shore surfers may actually reduce the crowded line-ups by giving jobs to the less gainfully employed, keeping them out of the water more often. Face it – the crowds stink now and more people will be surfing ten years from now. Local surfers will have to learn how to share the waves better, or more of the current surfing violence trend will continue. The problem with North Shore surfing crowds is caused largely by the actions of the surf media and surf industry.

High Housing Prices and Property Taxes: There is the potential that more than 50 percent of the homes on the 120 country lots may be full-time residences. There will be no opportunity for an overcrowding condition to occur because of strict covenants enforced by the Homeowners Association that will prohibit second units and multiple residence situations on these lots. Property values for residential property adjacent to the project will not be increased since the properties don't gain a physical improvement or clear market advantage as a result (Community Resources, 1991). Additionally, studies by Dr. Michael Sklarz of Locations, Inc., indicate that island-wide forces, not local forces such as adjacent land uses, determine property values on Oahu. The affordable housing component of the project will help the current housing problem on the North Shore.

E. Traffic Impacts

Project Traffic Impact: The vehicular impact of the project includes the golf course, housing and recreational elements. As discussed in Section 4.12 of the Draft EIS and the Traffic Impact Assessment prepared by Pacific Planning and Engineering, Inc. (Appendix O), the project will add slightly to future traffic on Kamehameha Highway. The heaviest traffic associated with Lihi Lani will occur during the Sunday afternoon peak hour (1:00 pm to 2:00 pm). The project access road will have approximately 165 vehicles entering and 163 vehicles exiting. The total traffic on Kamehameha Highway at the project access road will be 2,199 vehicles. The number of vehicles and percentages of total traffic on Kamehameha Highway associated with the project include: country lots (86 vehicles; 3.9 percent), affordable housing (108 vehicles; 4.9 percent); golf course (82 vehicles; 3.7 percent); community facilities (44 vehicles; 2.0 percent); tennis center (32 vehicles; 1.5 percent); and equestrian ranch (24 vehicles; 1.1 percent). The vehicles associated with the affordable housing units and the community facilities will represent 40 percent of the total project traffic during this peak period.

Social Character and Traffic: The relationship of the predicted ambient traffic growth to local community character and social economy is a concern of ours and the community. Level of Service ratings for the local intersections are predicted to lower to LOS E (congested condition) in 1997 with or without the project. The character of the Sunset Beach community may be affected by the increase in local traffic, especially since much of the traffic will be visitors to Oahu. People who live on the North Shore have historically valued the relatively uncongested roadways and rural feeling. Over the last few years, traffic growth has been substantial during the weekday and weekend periods. Kamehameha Highway along the North Shore is expected to become especially congested due to the expansion of Kuilima Resort. As a result of increasingly congested traffic conditions, some people may feel the need to find work closer to home or move from the North Shore to be closer to their work to decrease their commuting time. The commute to more distant work destinations such as central Oahu, Pearl City, Kaneohe and Honolulu will be

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17 April 1991
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affected throughout the route by the growth in ambient traffic, not just along the North Shore. The growth in traffic is not expected to cause urbanization of the peripheral areas on the North Shore, because lack of infrastructure will limit the growth of this portion of the island.

Mitigation: Mitigative measures proposed by Obayashi in the Draft EIS will effectively minimize traffic impacts at the project entrance. These measures include: (1) creation of a left-turn storage lane on Kamehameha Highway; (2) providing turning lanes out of the project entrance; (3) conducting signal warrant studies periodically; (4) installation of traffic signals in future, if required; and (5) company truck transport of construction workers. The traffic involved with the golf course could be reduced slightly by encouraging group travel by mini-bus, especially those traveling to and from the site from resort locations.

F. Typographical Errors

We appreciate these comments and will make the necessary changes for the Final EIS.

Thank you again for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED

Kari Kilstrom, for

Jeffrey H. Overton, AICP
Senior Planner

Attachment

Table 3.—Engineering Interpretations—Continued

Soil series and map symbols	Suitability as a source of—				Soil features affecting—					Degree and kind of limitations for specific tank filter fields
	Topsoil	Road fill	Highway location	Farm ponds		Irrigation	Terraces and diversions	Grassed waterways	Foundations for low buildings	
				Reservoir areas	Embankments					
Halemaua: HLMG.....	Fair: 30 to 90 percent slopes.	Fair: 30 to 90 percent slopes.	Slopes of 30 to 90 percent.	Moderately rapid permeability; 30 to 90 percent slopes.	Slopes of 30 to 90 percent.	(?)	Slopes of 30 to 90 percent.	Slopes of 30 to 90 percent; susceptible to sliding.	Slopes of 30 to 90 percent; susceptible to sliding.	Severe on slopes of 30 to 90 percent.
Hilimano: HMMF.....	Fair: slopes of 40 to 70 percent; low fertility.	Fair: slopes of 40 to 70 percent.	Slopes of 40 to 70 percent.	Slopes of 40 to 70 percent; moderately rapid permeability.	Slopes of 40 to 70 percent.	(?)	Slopes of 40 to 70 percent; moderately rapid permeability.	Slopes of 40 to 70 percent; susceptible to sliding.	Slopes of 40 to 70 percent; susceptible to sliding.	Severe on slopes of 40 to 70 percent.
Holomua: HxA, HxB, HxB, HxC, HxC3.	Good	Good	Bedrock as stainer as 4 feet in places.	Moderate permeability; bedrock as shallow as 4 feet in places.	(?)	(?)	Susceptible to slitting.	All features favorable, except where slopes are as much as 15 percent.	All features favorable, except where slopes are as much as 15 percent.	Slight on slopes of 0 to 7 percent; moderate on slopes of 7 to 15 percent.
Honouliuli: HwC, HwD.....	Fair: low fertility.	Good	Slopes as much as 25 percent.	Moderately rapid permeability; slopes as much as 25 percent.	(?)	(?)	Slopes as much as 25 percent; other features favorable.	(?)	(?)	Moderate on slopes of 7 to 15 percent; severe on slopes of more than 15 percent.
Honouliuli: HOD, rHR... For Amala part of rHR, see Amala series.	Fair: dehydrates irreversibly; low fertility.	Poor: poor workability; high compressibility; low shrink-swell potential.	High compressibility; low capacity; slopes as much as 25 percent.	Moderately rapid permeability; slopes as much as 25 percent.	High seepage rate; high compressibility; thixotropic.	(?)	Many slopes below a depth of 3 feet; poor workability; low fertility.	Poor workability; low fertility.	High shrinkage; high compressibility; low shear strength.	Moderate on slopes of 5 to 15 percent; severe on slopes of more than 15 percent.
Honouliuli: HxA, HxB.....	Fair: very sticky and very plastic.	Poor: highly plastic; poor workability; high shrink-swell potential.	High shrink-swell potential; low shear strength.	Moderately slow permeability; high shrink-swell potential.	High shrink-swell potential; low shear strength.	(?)	Poor workability.....	Difficult to establish plants; poor workability.	Low shear strength; high shrink-swell potential.	Severe; moderately slow permeability.
Honouliuli: HxB, HxC, HxC2.	Good	Good	Slopes as much as 35 percent.	Moderate permeability; slopes as much as 35 percent.	High compacted density.	(?)	All features favorable except where slopes are more than 30 percent.	Difficult to establish plants.	Slopes as much as 35 percent.	Slight on slopes of 0 to 7 percent; severe on slopes of more than 15 percent.
Hulua: HRUD, HRUF.....	Poor: always wet; low fertility.	Poor: poor workability; always wet.	Slopes as much as 70 percent; new, seepage.	Slopes as much as 70 percent; ironstone layer at a depth of about 15 inches.	Wetness; high organic matter content to a depth of 15 inches; high compressibility.	(?)	(?)	(?)	Poorly drained; slopes as much as 70 percent; low shear strength.	Severe; shallow to ironstone layers; steep and very steep slopes; always wet.
Hydroscopic: rHT... For Troquada part of rHT, see Troquada.	Fair: dehydrates irreversibly; low fertility.	Poor: poor workability; high compressibility; low compacted density.	High compressibility; low bearing capacity; slopes as much as 25 percent.	Moderately rapid permeability; slopes as much as 25 percent.	High seepage rate; high compressibility.	(?)	Many slopes below a depth of 3 feet; poor workability; low fertility.	Poor workability; low fertility.	High shrinkage; high compressibility; low shear strength.	Moderate on slopes of 5 to 15 percent; severe on slopes of more than 15 percent.
Iao: IaA, IaB, IaB, IaC, IaC, IaC.	Fair: very sticky and very plastic.	Fair: moderate shrink-swell potential.	Subject to local flooding.	Moderately slow permeability; moderate shrink-swell potential.	Moderate shrink-swell potential; clayey.	(?)	Poor workability.....	Poor workability; difficult to establish plants.	Moderate shrink-swell potential.	Severe; moderately slow permeability.
Ia: ISD.....	Good to a depth of 20 inches; variable below 20 inches.	Fair: unstable material.	Slopes as much as 25 percent; unstable material.	Moderately rapid permeability; clayey at a depth of 20 to 40 inches; slopes as much as 25 percent.	Unstable material; high seepage rate; piping hazard.	(?)	Unstable material; depth of 20 to 40 inches.	Clayey at a depth of 20 to 40 inches.	Slopes as much as 25 percent; clayey at a depth of 20 to 40 inches.	Severe; slopes generally more than 10 percent; rapid permeability to sub-stations.

See footnote at end of table.

Note: A • precedes any Soil Series which is found on the the Lihi Lani Recreational Community project site.

Table 3.—Engineering Interpretations—Continued

Soil series and map symbols	Suitability as a source of—				Soil features affecting—					Soil features affecting— Continued				Degree and kind of limitations for septic tank filter fields	
	Topsoil	Road fill	Highway location	Farm ponds		Irrigation	Terraces and diversions	Grassed waterways	Foundations for low buildings	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways		Foundations for low buildings
				Reservoir areas	Embankments										
Iolani: loB, loC, loD, loE, loF	Fair; low fertility.	Good	Slopes as much as 35 percent.	Slopes as much as 35 percent; slow to moderately slow permeability.	(?)	Moderate to severe erosion hazard where slopes are more than 20 percent; slow to moderately slow permeability.	(?)	Slopes as much as 35 percent.	Slopes as much as 35 percent.	(?)	(?)	Slopes as much as 35 percent.	Slopes as much as 35 percent.	Severe; moderately slow to slow permeability.	
Jaucas: JAC, JIB, JAB	Poor; low available water capacity.	Poor; unstable; highly erodible.	Unstable slopes; erodible.	Randy pervious material.	Highly pervious; poor stability.	Low available water capacity; rapid intake rate.	(?)	Highly erodible; low available water capacity; low fertility.	(?)	(?)	(?)	(?)	(?)	Slight; rapid permeability.	
KC	Poor; low available water capacity; saline.	Poor; unstable; highly erodible; high water table.	Unstable slopes; erodible; high water table.	Sandy pervious material; high water table.	Highly pervious; high water table.	Low available water capacity; rapid intake rate; high water table.	(?)	Highly erodible; low available water capacity; low fertility; high water table.	(?)	(?)	(?)	(?)	(?)	Severe; high water table.	
JL For flow-out part, see flow-out land.	Fair; low fertility.	Good	Floodlike where embankments are exposed.	Rapid permeability.	Erodible; high compacted density.	Slow intake rate.	(?)	Low fertility; difficult to establish plants.	(?)	(?)	(?)	(?)	(?)	Slight; rapid permeability.	
Kamae: KaB, KaC, KaD, KaE, KaF, KaG, KaH, KaI, KaJ, KaK, KaL, KaM, KaN, KaO, KaP, KaQ, KaR, KaS, KaT, KaU, KaV, KaW, KaX, KaY, KaZ	Poor; very sticky and very plastic.	Poor; very plastic; high shrink-swell potential; poor workability; poor seepage.	High shrink-swell potential; seepage; poor workability; poor seepage; slopes as much as 35 percent.	Slow to moderately slow permeability; high shrink-swell potential; poor workability; poor seepage; slopes as much as 35 percent.	Poor workability; high shrink-swell potential; poor compaction characteristics.	Slow intake rate; poorly drained; slow permeability.	(?)	Poorly drained; poor workability.	(?)	(?)	(?)	(?)	(?)	Severe; slow permeability; seepage.	
Kahana: KBB, KBC, KBD	Good	Good	Slopes as much as 25 percent.	Moderately rapid permeability; slopes as much as 25 percent.	(?)	Slopes as much as 25 percent.	(?)	Slopes as much as 25 percent.	(?)	(?)	(?)	(?)	(?)	Slight on slopes of 0 to 7 percent; moderate on slopes of 7 to 15 percent; severe on slopes of more than 15 percent.	
Kahana: KASD, KATD	Poor; very low fertility.	Fair to good; wet in winter.	Local seepage; slopes as much as 20 percent.	Moderately rapid permeability; slopes as much as 20 percent; low seepage.	(?)	Slopes as much as 20 percent; seepage at a depth of 24 to 38 inches.	(?)	Very low fertility.	(?)	(?)	(?)	(?)	(?)	Slight on slopes of not more than 5 percent; severe on slopes of more than 5 percent; downslope seepage.	
Kaliua: KBID	Fair; dry-drains irrevocably; low fertility.	Poor; low shear strength; high compressibility; poor workability; thixotropic.	Low bearing capacity; high compressibility; poor workability; slopes as much as 25 percent.	Moderately rapid permeability; slopes as much as 25 percent.	Thixotropic; high compressibility; poor workability; low compacted density.	(?)	Poor workability.	(?)	(?)	(?)	(?)	(?)	(?)	Slight shrinkage; low shear strength; high compressibility; slopes as much as 25 percent.	
Kalua: KCXD	Poor; extremely stony; frag- mental; at a depth of less than 8 inches.	Good	Fragmentary; slopes as much as 25 percent.	Fragmentary; low permeability.	Fragmentary; low permeability.	Rapid intake rate; very low available water capacity.	(?)	Extremely stony; poor workability.	(?)	(?)	(?)	(?)	(?)	Severe; lack of filter material.	

See footnotes at end of table.

Note: A • precedes any Soil Series which is found on the the Lihi Lani Recreational Community project site.

Table 3.—Engineering Interpretations—Continued

Soil series and map symbol	Suitability as a source of—				Soil features affecting—					Degree and kind of limitations for typical tank filler fields
	Topsoil	Road fill	Highway location	Farm ponds		Irrigation	Terraces and diversions	Grassed waterways	Foundations for low buildings ¹	
				Reservoir area	Embankments					
Kaunohi: K6B, K6C, KHMC, KHME, KHMF, KHOF.	Fair: low fertility.	Good	Slopes as much as 65 percent.	Moderately rapid permeability; slopes as much as 65 percent.	(?)	(?)	All features favorable on slopes not more than 20 percent.	Slopes as much as 65 percent.	Slopes as much as 65 percent.	Slight on slopes of 3 to 8 percent; moderate on slopes of 8 to 15 percent; severe on slopes of more than 15 percent.
Kaunohi: Kh8, KhB2, KhC, KhC2.	Good	Good	(?)	Moderate permeability.	(?)	(?)	(?)	Slopes as much as 15 percent.	Slopes as much as 15 percent.	Slight on slopes of 3 to 7 percent; moderate on slopes of 7 to 15 percent.
Kaunohi: K1B, K1C, K1D, K1E, K1G.	Poor: very low fertility.	Good	Slopes as much as 100 percent.	Slopes as much as 100 percent; moderately rapid permeability.	(?)	(?)	Slopes as much as 100 percent.	Slopes as much as 100 percent.	Slopes as much as 100 percent.	Slight on slopes of 3 to 8 percent; moderate on slopes of 8 to 15 percent; severe on slopes of more than 15 percent.
Kaunohi: K1TC	Poor: very sticky and very plastic; bedrock at a depth of 20 to 36 inches; stony.	Poor: very plastic; high shrink-swell potential; poor workability; stony.	High shrink-swell potential; poor workability; stony.	High shrink-swell potential; poor workability; bedrock at a depth of 20 to 36 inches; stony.	Clayey; high shrink-swell potential; poor compaction characteristics; stony.	(?)	Poor workability; stony; bedrock at a depth of 20 to 36 inches; difficult to establish plants.	High shrink-swell potential; stony; bedrock at a depth of 20 to 36 inches.	High shrink-swell potential; stony; bedrock at a depth of 20 to 36 inches.	Severe: slow permeability.
Kaunohi: K1UD, K1VD	Poor: stony; fragmental As lava at a depth of 20 to 40 inches.	Good, except stony.	Stony; slopes as much as 25 percent.	Stony; slopes as much as 25 percent; fragmental As lava at a depth of 20 to 40 inches; high seepage rate.	Stony; limited volume of soil material.	(?)	Poor workability; stony; bedrock at a depth of 20 to 40 inches.	Stony; slopes as much as 25 percent; fragmental As lava at a depth of 20 to 40 inches.	Stony; slopes as much as 25 percent; fragmental As lava at a depth of 20 to 40 inches.	Severe: lack of filler material.
Kaunohi: K1A, K1B, K1C, K1E	Good	Good	All features favorable, except occasional local flooding.	Moderate permeability.	(?)	(?)	(?)	Slopes as much as 15 percent.	Slopes as much as 15 percent; high shear strength.	Slight on slopes of 0 to 7 percent; moderate on slopes of 7 to 15 percent.
Kaunohi: K1A, K1B	Good, except stony.	Good, except stony.	All features favorable, except occasional local flooding; stony.	Moderate permeability; stony.	Stony	(?)	Stony	Slopes as much as 15 percent; stony.	Slopes as much as 15 percent; high shear strength; stony.	Slight on slopes of 0 to 7 percent; moderate on slopes of 7 to 15 percent; stony.
Kaunohi: K1A, K1B, K1C, K1D, K1E, K1F, K1G, K1H, K1I, K1J, K1K, K1L, K1M, K1N, K1O, K1P, K1Q, K1R, K1S, K1T, K1U, K1V, K1W, K1X, K1Y, K1Z	Poor: very sticky and very plastic.	Poor: very plastic; high shrink-swell potential; poor workability.	High shrink-swell potential; high water table.	High water table; high shrink-swell potential; slow permeability.	Clayey; high shrink-swell potential; poor compaction characteristics.	(?)	Poor workability; consolidated coral sand at a depth of 20 to 30 inches.	Poorly drained; poor workability; consolidated coral sand at a depth of 20 to 30 inches.	High shrink-swell potential; high water table; low shear strength.	Severe: slow permeability; high water table.
Kaunohi: K1A, K1B, K1C, K1D, K1E, K1F, K1G, K1H, K1I, K1J, K1K, K1L, K1M, K1N, K1O, K1P, K1Q, K1R, K1S, K1T, K1U, K1V, K1W, K1X, K1Y, K1Z	Good, except stony in places.	Good, except stony in places.	Slopes as much as 25 percent.	Moderate permeability; slopes as much as 25 percent.	(?)	(?)	Susceptible to salinization.	Slopes as much as 25 percent.	Slopes as much as 25 percent.	Slight on slopes of 3 to 7 percent; moderate on slopes of 7 to 15 percent; severe on slopes of more than 15 percent.
Kaunohi: K1A, K1B, K1C, K1D, K1E, K1F, K1G, K1H, K1I, K1J, K1K, K1L, K1M, K1N, K1O, K1P, K1Q, K1R, K1S, K1T, K1U, K1V, K1W, K1X, K1Y, K1Z	Good, except stony.	Good, except stony.	Slopes as much as 25 percent; stony.	Moderate permeability; slopes as much as 25 percent; stony.	Stony	(?)	Susceptible to salinization; stony.	Slopes as much as 25 percent; stony.	Slopes as much as 25 percent; stony.	Moderate on slopes of 7 to 15 percent; severe on slopes of more than 15 percent.

See footnote at end of table.

Note: A • precedes any Soil Series which is found on the the Lihi Lani Recreational Community project site.

TABLE 3.—Engineering

Soil series and map symbols	Suitability as a source of—				Soil features affecting—	
	Topsoil	Road fill	Highway location	Farm ponds		
				Reservoir areas	Embankments	
Kwale: KMW.....	Poor; toxic salts; high water table.	Poor; high water table.	High water table; flooding hazard.	High water table; moderately rapid permeability.	Erodible; difficult to vegetate; piping hazard.	
Xewatapu: KRXD.....	Poor; stony; 12 to 30 inches of soil material.	Fair; stony; limited volume of material.	Stoniness; slopes as much as 25 percent.	Fragmental As lava at a depth of 12 to 30 inches; moderate permeability.	Limited volume of material; stoniness.	
Xetaha: KoA, KoB, KoA.....	Good.....	Good.....	(?).....	Moderate permeability.	(?).....	
KOYE.....	Good, except stony.	Good, except stony.	Extremely stony; slopes as much as 35 percent.	Stoniness; slopes as much as 35 percent.	Stoniness.....	
Kwano: KpB, KpC, KpD, KpE, KpF, KpZ. For Badland part of KpZ, see Badland.	Good.....	Good.....	Slopes as much as 70 percent.	Moderate to moderately rapid permeability; slopes as much as 70 percent.	(?).....	
Kurti: KrB, KrC, KrD.....	Good.....	Good.....	Slopes as much as 25 percent.	Moderately rapid permeability; slopes as much as 25 percent.	Pervious material below a depth of 3 feet.	
KRX, KRL..... For Badland part of KRL, see Badland.	Good, except rocky.	Good, except rocky.	Slopes as much as 60 percent; rockiness.	Slopes as much as 80 percent; rockiness.	Rockiness.....	
Koker: KSKF, KSKF.....	Fair; low fertility.	Good.....	Slopes as much as 70 percent.	Slopes as much as 70 percent; moderately rapid permeability.	(?).....	
Koko: KsB, KsC, KsD.....	Good.....	Fair; unstable slopes; erodible.	Erodible; slopes as much as 25 percent; unstable slopes.	Slopes as much as 25 percent; moderate permeability; stoniness at a depth of 20 to 30 inches.	Low compacted density; tuff or clays at a depth of 20 to 30 inches; subject to piping.	

See footnotes at end of table.

Table 3.—Continued

Soil features affecting—Continued					
Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	Foundations for low buildings ¹	Degree and kind of limitations for arable tank filter fields
Low, wet areas; high water table; flooding hazard; saline.	High water table; saline.	Subject to overflow from high water table; high water table.	High water table; saline; difficult to establish plants.	High water table; flooding hazard; subject to tidal action.	Severe: high water table; subject to tidal action. Severe: lack of filter material.
(?).....	(?).....	(?).....	Fragmental As lava at a depth of 12 to 30 inches; stoniness; difficult to establish plants.	Fragmental As lava at a depth of 12 to 30 inches; stoniness; slopes as much as 25 percent.	(?).....
(?).....	(?).....	(?).....	Stoniness; slopes as much as 35 percent; difficult to establish plants unless irrigated.	(?).....	Slight: moderate permeability.
(?).....	(?).....	(?).....	Slopes as much as 70 percent.	Slopes as much as 35 percent; stoniness.	Moderate on slopes of 0 to 10 percent; severe on slopes of more than 10 percent.
(?).....	(?).....	(?).....	All features favorable on slopes of not more than 20 percent.	Slopes as much as 70 percent.	Slight on slopes of 2 to 8 percent; moderate on slopes of 8 to 12 percent; severe on slopes of more than 12 percent.
(?).....	(?).....	(?).....	(?).....	Slopes as much as 25 percent.	Slight on slopes of 3 to 7 percent; moderate on slopes of 7 to 15 percent; severe on slopes of more than 15 percent.
(?).....	(?).....	(?).....	Rockiness; uneven topography; slopes as much as 80 percent.	Slopes as much as 80 percent; rockiness.	Slight on slopes of 3 to 7 percent; moderate on slopes of 7 to 15 percent; severe on slopes of more than 15 percent. In other than rocky areas.
(?).....	(?).....	(?).....	Slopes as much as 70 percent.	Slopes as much as 70 percent; low fertility.	Severe: slopes generally more than 10 percent.
(?).....	(?).....	(?).....	Erodible; slopes as much as 25 percent; permeability.	Tuff or clays at a depth of 20 to 30 inches; slopes as much as 25 percent.	Slight on slopes of 2 to 8 percent; moderate on slopes of 8 to 12 percent; severe on slopes of more than 12 percent.

Note: A • precedes any Soil Series which is found on the the Lihili Lani Recreational Community project site.

TABLE 3.—Engineering Interpretations—Continued

Soil series and map symbols	Suitability as a source of—					Soil features affecting—					Permeability and kind of limitations for specific tank filter fields	
	Topsoil	Road fill	Highway location	Reservoir areas	Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	Foundations for low buildings		
Mauna: M X C	Good, except stony in places.	Fair; erodible; unstable slopes; stony in places.	Erodible; unstable slopes; stony in places.	Moderately rapid permeability.	Poor stability; poor compactibility; erodible; piping hazard; stony in places.	(?)	Complex slopes; stony; susceptible to wind erosion; erodible.	Stony in places; complex slopes; susceptible to wind erosion; erodible.	Highly erodible; stony in places; susceptible to siltation of channels; difficult to plant; slopes as much as 15 percent.	Slopes as much as 15 percent.	Moderate on slopes of 3 to 15 percent; stony in places.	
Makiki: MIA, MIA	Fair; very sticky and very plastic; stony in places.	Fair; very sticky and very plastic; moderate shrink-swell potential; stony in places.	Very sticky and very plastic; moderate shrink-swell potential; stony in places.	Moderate shrink-swell potential; moderate permeability; stony in places.	Moderate shrink-swell potential; moderate permeability; stony in places.	(?)	(?)	(?)	(?)	Moderate shrink-swell potential; moderate shear strength; stony in places.	Slight; moderately rapid permeability.	
Mala: Mm A, Mm B	Good	Good	Subject to flooding on 0 to 3 percent slopes.	Subject to flooding on 0 to 3 percent slopes; moderate permeability.	(?)	(?)	(?)	(?)	(?)	Subject to flooding on 0 to 3 percent slopes; high shear strength.	Slight; except where subject to flooding.	
Malama: MYD	Poor; extremely stony; low to 10 inches to fragmental Aa lava.	Good; fragmental Aa lava at a depth of less than 10 inches.	Fragmental Aa lava.	Very rapidly permeable; fragmental Aa lava.	Fragmental Aa lava at a depth of less than 10 inches.	(?)	Slopes as much as 7 percent; moderate permeability.	Susceptible to siltation.	Susceptible to siltation of channels; difficult to establish plants.	Extremely stony; fragmental Aa lava at a depth of less than 10 inches.	Severe; lack of filter material; may pollute underground water.	
Mamala: Mm C	Poor; coral below a depth of 8 to 20 inches.	Poor; less than 20 inches deep over coral; stony.	Coral at a depth of less than 20 inches; stony.	Coral at a depth of less than 20 inches; moderate permeability.	Limited volume of material; stony; coral at a depth of less than 20 inches.	(?)	Coral at a depth of less than 20 inches; stony; slopes as much as 12 percent.	Coral at a depth of less than 20 inches; stony.	Coral at a depth of less than 20 inches; slopes as much as 12 percent; difficult to establish plants.	Coral at a depth of less than 20 inches; slopes as much as 12 percent; stony.	Severe; coral at a depth of less than 20 inches.	
Manana: Mo B, Mo C, Mo D, Mm B, Mm C, Mm D, Mm E, Mm F	Good	Good	Slopes as much as 40 percent.	Slopes as much as 40 percent; moderate permeability.	Slopes as much as 40 percent.	(?)	Slopes as much as 40 percent; thin pebbly layer at a depth of 15 to 50 inches.	All features favorable where slopes are not more than 20 percent.	Slopes as much as 40 percent.	Slopes as much as 40 percent; high shear strength.	Slight on slopes of 2 to 5 percent; moderate on slopes of 6 to 15 percent; severe on slopes of more than 15 percent.	
Makalea: Mm, Mm, Mm, Mm	Good to a depth of 20 inches; fair below 20 inches.	Good to a depth of 20 inches; fair below 20 inches; unstable; erodible.	Loose sand at a depth of 20 inches.	Rapid permeability below a depth of 20 inches.	Unstable; erodible material below a depth of 20 inches; poor compaction characteristics.	(?)	Rapid permeability and low available water capacity below a depth of 20 inches.	Sand at a depth of less than 20 inches; erodible below a depth of 20 inches.	Sand at a depth of less than 20 inches; erodible below a depth of 20 inches.	Sand at a depth of less than 20 inches; low shrink-swell potential below a depth of 20 inches.	Slight; rapid permeability below a depth of 20 inches.	
Mia	Fair; high water table.	Poor; high water table.	High water table.	High water table.	High water table; material below a depth of 20 inches; poor compaction characteristics.	(?)	High water table; needs drainage.	High water table; sand at a depth of less than 20 inches.	High water table; sand at a depth of less than 20 inches.	High water table; sand at a depth of less than 20 inches.	Severe; poorly drained.	

See backsheet at end of table.

Note: A • precedes any Soil Series which is found on the the Lihl Lanl Recreational Community project site.

Table 3.—Engineers' Interpretations—Continued

Soil series and map symbols	Soil features affecting —				Soil features affecting — (Continued)				
	Multifarious as a source of —		Farm ponds		Irrigation	Terraces and diversions	Timber waterways	Foundations for low buildings	Influence and kind of limitations for deep-tank filler fields
	Topsoil	Road fill	Highway location	Reservoir areas					
Oha: OFC	Fair: low fertility.	Good: high shear strength; good compaction characteristics.	Slopes as much as 15 percent; high bearing capacity.	Slopes as much as 15 percent; moderate rapid permeability.	(?)	(?)	Slopes as much as 15 percent.	Slopes as much as 15 percent; high shear strength.	Moderate; slopes generally more than 7 percent.
Ohi: OI, OMB, OME, OMI	Fair: low fertility.	Fair: erodible; unstable on steep slopes.	Slopes as much as 70 percent; moderate rapid permeability.	Slopes as much as 70 percent; moderate rapid permeability.	Poor stability; poor compaction characteristics; erodible; subject to piping.	(?)	Slopes as much as 40 percent; erodible; subject to slippage.	Slopes as much as 70 percent.	Moderate on slopes of 3 to 10 percent; severe on slopes of more than 10 percent.
Ohia: ONC, OND, ONE	Good	Fair: high organic matter content; fair compaction characteristics.	Slopes as much as 40 percent; low shear strength; moderate compaction characteristics.	Slopes as much as 40 percent; moderate rapid permeability.	Low shear strength; low compaction characteristics; moderate compressibility.	(?)	Slopes as much as 40 percent; erodible.	Slopes as much as 40 percent; moderate strength.	Moderate on slopes of 4 to 12 percent; severe on slopes of more than 12 percent.
Okouli: OOE	Poor: always wet; very low fertility.	Poor: poor compaction.	Wetness; low bearing capacity; subject to slippage.	Wetness; high average rate.	Poor compaction characteristics; low shear strength.	(?)	(?)	(?)	Severe; always wet; poorly drained; subject to slippage.
Ovilihan: OPD	Poor: bedrock at a depth of less than 10 inches; extremely rocky.	Poor: organic material; bedrock at a depth of less than 10 inches.	Bedrock at a depth of less than 10 inches.	Bedrock at a depth of less than 10 inches.	(?)	(?)	(?)	Bedrock at a depth of less than 10 inches.	Severe: less than 10 inches of soil under bedrock.
Pualani: PGE, PGF	Fair: low fertility.	Fair: unstable on steep slopes; erodible.	Slopes as much as 70 percent.	Moderately rapid permeability; slopes as much as 70 percent.	Poor stability; erodible; subject to piping.	(?)	Slopes as much as 70 percent; erodible.	Slopes as much as 70 percent; erodible on steep slopes.	Severe: slopes generally more than 10 percent.
Pualani: PaC, PaC	Fair: low fertility.	Good	(?)	Moderately rapid permeability; slopes as much as 12 percent.	(?)	(?)	Slopes as much as 12 percent.	Slopes as much as 12 percent.	Moderate; slopes generally 5 to 10 percent.
Pala: PaB, PaC, PaC2	Good	Good	Slopes as much as 15 percent.	Moderate permeability; slopes as much as 15 percent.	(?)	(?)	Slopes as much as 15 percent.	Slopes as much as 15 percent.	Slight on slopes of 3 to 7 percent; moderate on slopes of 7 to 15 percent.
Pakala: PaA, PaC	Good	Good	Subject to local flooding.	Moderate permeability; slopes as much as 10 percent.	Erodible where exposed.	(?)	Subject to local flooding; high bearing capacity; slopes as much as 10 percent.	Subject to local flooding; high bearing capacity; slopes as much as 10 percent.	Slight on slopes of 0 to 2 percent; moderate on slopes of 2 to 10 percent.
PHKC	Good, except stony.	Good, except stony.	Subject to local flooding; stoniness.	Moderate permeability; stoniness.	Stoniness; erodible where exposed.	(?)	Stoniness; difficult to establish plants; slopes as much as 12 percent.	Stoniness; subject to local flooding; slopes as much as 12 percent.	Moderate; slopes generally more than 5 percent; stoniness.
Pama: PID, PID2, PJD2	Fair: very stony and very plastic.	Poor: highly plastic; poor stability; high shrink-swell potential.	High shrink-swell potential; low shear strength; slopes as much as 20 percent.	High shrink-swell potential; moderate slow permeability.	High shrink-swell potential; low shear strength; poor workability.	(?)	Poor workability; slopes as much as 20 percent; difficult to establish plants.	High shrink-swell potential; low shear strength; slopes as much as 20 percent.	Severe: moderate to slow permeability in subsoil; slopes generally more than 10 percent.
Pana: PXD	Good	Fair: low compaction; moderate compressibility.	Slopes as much as 25 percent; moderate compressibility.	Slopes as much as 25 percent; moderate rapid permeability.	Low compaction density; moderate shear strength.	(?)	Slopes as much as 25 percent.	Moderate compressibility; moderate shear strength; slopes as much as 25 percent.	Severe: slopes generally more than 10 percent.

See footnote at end of table.

Note: A • precedes any Soil Series which is found on the the Lihli Lani Recreational Community project site.

TABLE 3.—Engineering Interpretations—Continued

Soil series and map symbols	Suitability as a source of—				Soil features affecting—						Degree and kind of limitations for specific tank filter fields
	Topsoil	Road fill	Highway location	Farm ponds	Agricultural drainage	Irrigation	Terrace and diversions	Grassed waterways	Foundations for low buildings ¹		
Papaa: P.YD, P.YE, P.YF, P.YG, P.YH, P.YI, P.YJ, P.YK, P.YL, P.YM, P.YN, P.YO, P.YP, P.YQ, P.YR, P.YS, P.YT, P.YU, P.YV, P.YW, P.YX, P.YY, P.YZ, P.YAA, P.YAB, P.YAC, P.YAD, P.YAE, P.YAF, P.YAG, P.YAH, P.YAI, P.YAJ, P.YAK, P.YAL, P.YAM, P.YAN, P.YAO, P.YAP, P.YAQ, P.YAR, P.YAS, P.YAT, P.YAU, P.YAV, P.YAW, P.YAX, P.YAY, P.YAZ, P.YBA, P.YBB, P.YBC, P.YBD, P.YBE, P.YBF, P.YBG, P.YBH, P.YBI, P.YBJ, P.YBK, P.YBL, P.YBM, P.YBN, P.YBO, P.YBP, P.YBQ, P.YBR, P.YBS, P.YBT, P.YBU, P.YBV, P.YBW, P.YBX, P.YBY, P.YBZ, P.YCA, P.YCB, P.YCC, P.YCD, P.YCE, P.YCF, P.YCG, P.YCH, P.YCI, P.YCJ, P.YCK, P.YCL, P.YCM, P.YCN, P.YCO, P.YCP, P.YCQ, P.YCR, P.YCS, P.YCT, P.YCU, P.YCV, P.YCW, P.YCX, P.YCY, P.YCZ, P.YDA, P.YDB, P.YDC, P.YDD, P.YDE, P.YDF, P.YDG, P.YDH, P.YDI, P.YDJ, P.YDK, P.YDL, P.YDM, P.YDN, P.YDO, P.YDP, P.YDQ, P.YDR, P.YDS, P.YDT, P.YDU, P.YDV, P.YDW, P.YDX, P.YDY, P.YDZ, P.YEA, P.YEB, P.YEC, P.YED, P.YEE, P.YEF, P.YEG, P.YEH, P.YEI, P.YEJ, P.YEK, P.YEL, P.YEM, P.YEN, P.YEO, P.YEP, P.YEQ, P.YER, P.YES, P.YET, P.YEU, P.YEV, P.YEW, P.YEX, P.YEY, P.YEZ, P.YFA, P.YFB, P.YFC, P.YFD, P.YFE, P.YFF, P.YFG, P.YFH, P.YFI, P.YFJ, P.YFK, P.YFL, P.YFM, P.YFN, P.YFO, P.YFP, P.YFQ, P.YFR, P.YFS, P.YFT, P.YFU, P.YFV, P.YFW, P.YFX, P.YFY, P.YFZ, P.YGA, P.YGB, P.YGC, P.YGD, P.YGE, P.YGF, P.YGG, P.YGH, P.YGI, P.YGJ, P.YGK, P.YGL, P.YGM, P.YGN, P.YGO, P.YGP, P.YGQ, P.YGR, P.YGS, P.YGT, P.YGU, P.YGV, P.YGW, P.YGX, P.YGY, P.YGZ, P.YHA, P.YHB, P.YHC, P.YHD, P.YHE, P.YHF, P.YHG, P.YHH, P.YHI, P.YHJ, P.YHK, P.YHL, P.YHM, P.YHN, P.YHO, P.YHP, P.YHQ, P.YHR, P.YHS, P.YHT, P.YHU, P.YHV, P.YHW, P.YHX, P.YHY, P.YHZ, P.YIA, P.YIB, P.YIC, P.YID, P.YIE, P.YIF, P.YIG, P.YIH, P.YII, P.YIJ, P.YIK, P.YIL, P.YIM, P.YIN, P.YIO, P.YIP, P.YIQ, P.YIR, P.YIS, P.YIT, P.YIU, P.YIV, P.YIW, P.YIX, P.YIY, P.YIZ, P.YJA, P.YJB, P.YJC, P.YJD, P.YJE, P.YJF, P.YJG, P.YJH, P.YJI, P.YJJ, P.YJK, P.YJL, P.YJM, P.YJN, P.YJO, P.YJP, P.YJQ, P.YJR, P.YJS, P.YJT, P.YJU, P.YJV, P.YJW, P.YJX, P.YJY, P.YJZ, P.YKA, P.YKB, P.YKC, P.YKD, P.YKE, P.YKF, P.YKG, P.YKH, P.YKI, P.YKJ, P.YKK, P.YKL, P.YKM, P.YKN, P.YKO, P.YKP, P.YKQ, P.YKR, P.YKS, P.YKT, P.YKU, P.YKV, P.YKW, P.YKX, P.YKY, P.YKZ, P.YLA, P.YLB, P.YLC, P.YLD, P.YLE, P.YLF, P.YLG, P.YLH, P.YLI, P.YLJ, P.YLK, P.YLL, P.YLM, P.YLN, P.YLO, P.YLP, P.YLQ, P.YLR, P.YLS, P.YLT, P.YLU, P.YLV, P.YLW, P.YLX, P.YLY, P.YLZ, P.YMA, P.YMB, P.YMC, P.YMD, P.YME, P.YMF, P.YMG, P.YMH, P.YMI, P.YMJ, P.YMK, P.YML, P.YMM, P.YMN, P.YMO, P.YMP, P.YMQ, P.YMR, P.YMS, P.YMT, P.YMU, P.YMV, P.YMW, P.YMX, P.YMY, P.YMZ, P.YNA, P.YNB, P.YNC, P.YND, P.YNE, P.YNF, P.YNG, P.YNH, P.YNI, P.YNJ, P.YNK, P.YNL, P.YNM, P.YNN, P.YNO, P.YNP, P.YNQ, P.YNR, P.YNS, P.YNT, P.YNU, P.YNV, P.YNW, P.YNX, P.YNY, P.YNZ, P.YOA, P.YOB, P.YOC, P.YOD, P.YOE, P.YOF, P.YOG, P.YOH, P.YOI, P.YOJ, P.YOK, P.YOL, P.YOM, P.YON, P.YOO, P.YOP, P.YOQ, P.YOR, P.YOS, P.YOT, P.YOU, P.YOV, P.YOW, P.YOX, P.YOY, P.YOZ, P.YPA, P.YPB, P.YPC, P.YPD, P.YPE, P.YPF, P.YPG, P.YPH, P.YPI, P.YPJ, P.YPK, P.YPL, P.YPM, P.YPN, P.YPO, P.YPP, P.YPQ, P.YPR, P.YPS, P.YPT, P.YPU, P.YPV, P.YPW, P.YPX, P.YPY, P.YPZ, P.YQA, P.YQB, P.YQC, P.YQD, P.YQE, P.YQF, P.YQG, P.YQH, P.YQI, P.YQJ, P.YQK, P.YQL, P.YQM, P.YQN, P.YQO, P.YQP, P.YQQ, P.YQR, P.YQS, P.YQT, P.YQU, P.YQV, P.YQW, P.YQX, P.YQY, P.YQZ, P.YRA, P.YRB, P.YRC, P.YRD, P.YRE, P.YRF, P.YRG, P.YRH, P.YRI, P.YRJ, P.YRK, P.YRL, P.YRM, P.YRN, P.YRO, P.YRP, P.YRQ, P.YRR, P.YRS, P.YRT, P.YRU, P.YRV, P.YRW, P.YRX, P.YRY, P.YRZ, P.YSA, P.YSB, P.YSC, P.YSD, P.YSE, P.YSF, P.YSG, P.YSH, P.YSI, P.YSJ, P.YSK, P.YSL, P.YSM, P.YSN, P.YSO, P.YSP, P.YSQ, P.YSR, P.YSS, P.YST, P.YSU, P.YSV, P.YSW, P.YSX, P.YSY, P.YSZ, P.YTA, P.YTB, P.YTC, P.YTD, P.YTE, P.YTF, P.YTG, P.YTH, P.YTI, P.YTJ, P.YTK, P.YTL, P.YTM, P.YTN, P.YTO, P.YTP, P.YTQ, P.YTR, P.YTS, P.YTT, P.YTU, P.YTV, P.YTW, P.YTX, P.YTY, P.YTZ, P.YUA, P.YUB, P.YUC, P.YUD, P.YUE, P.YUF, P.YUG, P.YUH, P.YUI, P.YUJ, P.YUK, P.YUL, P.YUM, P.YUN, P.YUO, P.YUP, P.YUQ, P.YUR, P.YUS, P.YUT, P.YUU, P.YUV, P.YUW, P.YUX, P.YUY, P.YUZ, P.YVA, P.YVB, P.YVC, P.YVD, P.YVE, P.YVF, P.YVG, P.YVH, P.YVI, P.YVJ, P.YVK, P.YVL, P.YVM, P.YVN, P.YVO, P.YVP, P.YVQ, P.YVR, P.YVS, P.YVT, P.YVU, P.YVV, P.YVW, P.YVX, P.YVY, P.YVZ, P.YWA, P.YWB, P.YWC, P.YWD, P.YWE, P.YWF, P.YWG, P.YWH, P.YWI, P.YWJ, P.YWK, P.YWL, P.YWM, P.YWN, P.YWO, P.YWP, P.YWQ, P.YWR, P.YWS, P.YWT, P.YWU, P.YWV, P.YWW, P.YWX, P.YWY, P.YWZ, P.YXA, P.YXB, P.YXC, P.YXD, P.YXE, P.YXF, P.YXG, P.YXH, P.YXI, P.YXJ, P.YXK, P.YXL, P.YXM, P.YXN, P.YXO, P.YXP, P.YXQ, P.YXR, P.YXS, P.YXT, P.YXU, P.YXV, P.YXW, P.YXX, P.YXY, P.YXZ, P.YYA, P.YYB, P.YYC, P.YYD, P.YYE, P.YYF, P.YYG, P.YYH, P.YYI, P.YYJ, P.YYK, P.YYL, P.YYM, P.YYN, P.YYO, P.YYp, P.YYQ, P.YYR, P.YYS, P.YYT, P.YYU, P.YYV, P.YYW, P.YYX, P.YYY, P.YYZ, P.YZA, P.YZB, P.YZC, P.YZD, P.YZE, P.YZF, P.YZG, P.YZH, P.YZI, P.YZJ, P.YZK, P.YZL, P.YZM, P.YZN, P.YZO, P.YZP, P.YZQ, P.YZR, P.YZS, P.YZT, P.YZU, P.YZV, P.YZW, P.YZX, P.YZY, P.YZZ	<p>Poor; very plastic; high shrink-swell potential.</p> <p>Good</p> <p>Good</p> <p>Poor; very sticky and very plastic.</p> <p>Good</p> <p>Good</p> <p>Poor; low fertility.</p> <p>Good, except stony.</p>	<p>Very plastic; high shrink-swell potential; slopes as much as 70 percent.</p> <p>Slopes as much as 70 percent.</p> <p>Slopes as much as 25 percent.</p> <p>High shrink-swell potential; very poorly drained; low bearing capacity.</p> <p>Slopes as much as 15 percent.</p> <p>Slopes as much as 40 percent.</p> <p>Slopes as much as 40 percent.</p> <p>Subject to flooding in low areas.</p> <p>Subject to flooding in low areas.</p>	<p>High shrink-swell potential; low permeability; slopes as much as 70 percent.</p> <p>Moderately rapid permeability; slopes as much as 70 percent.</p> <p>Moderately rapid permeability; slopes as much as 25 percent.</p> <p>Very poorly drained; low permeability; high water table.</p> <p>Moderately rapid permeability; slopes as much as 15 percent.</p> <p>Moderately rapid permeability; slopes as much as 40 percent.</p> <p>Moderately rapid permeability; slopes as much as 40 percent.</p> <p>Moderate permeability; subject to flooding in low areas.</p> <p>Moderate permeability; subject to flooding in low areas.</p>	<p>Farm ponds</p> <p>Embankments</p> <p>Low shear strength; high shrink-swell potential.</p>	<p>Poor workability; high shrink-swell potential; slopes as much as 70 percent.</p> <p>Slopes as much as 70 percent.</p> <p>Clayey; slopes as much as 45 percent.</p> <p>High water table; high shrink-swell potential; low bearing capacity.</p> <p>Slopes as much as 15 percent.</p> <p>Slopes as much as 40 percent.</p> <p>Slopes as much as 40 percent.</p> <p>Subject to stream overflow in low areas.</p> <p>Subject to stream overflow in low areas; stoniness.</p>	<p>Poor workability; slopes as much as 70 percent.</p> <p>Slopes as much as 70 percent.</p> <p>Clayey; slopes as much as 45 percent.</p> <p>High water table; poor workability; high shrink-swell potential.</p> <p>Slopes as much as 15 percent.</p> <p>Slopes as much as 40 percent; low fertility.</p> <p>Slopes as much as 40 percent.</p> <p>Slopes as much as 7 percent.</p> <p>Slopes as much as 12 percent; stoniness.</p>	<p>High shrink-swell potential; low permeability; slopes as much as 70 percent; susceptible to sliding where slopes are more than 15 percent.</p> <p>Slopes as much as 70 percent; moderate shrink-swell potential in surface layer.</p> <p>Slopes as much as 25 percent.</p> <p>High water table; high shrink-swell potential; low bearing capacity.</p> <p>High shear strength; slopes as much as 15 percent.</p> <p>Slopes as much as 40 percent.</p> <p>High shear strength; subject to flooding in low areas.</p> <p>High shear strength; subject to flooding in low areas; stoniness.</p>	<p>Severe; slow permeability; slopes generally more than 10 percent.</p> <p>Slight on slopes of 3 to 8 percent; moderate on slopes of 8 to 15 percent; severe on slopes of more than 15 percent.</p> <p>Slight on slopes of 0 to 7 percent; moderate on slopes of 7 to 15 percent; severe on slopes of more than 15 percent.</p> <p>Severe; very poorly drained; very low permeability.</p> <p>Slight on slopes of 0 to 8 percent; moderate on slopes of 8 to 15 percent.</p> <p>Slight on slopes of 0 to 8 percent; moderate on slopes of 8 to 15 percent; severe on slopes of more than 15 percent.</p> <p>Slight on slopes of 0 to 7 percent; moderate on slopes of 7 to 15 percent; severe on slopes of more than 15 percent.</p> <p>Slight on slopes of 0 to 7 percent; moderate on slopes of 7 to 15 percent; severe on slopes of more than 15 percent.</p>			

See footnote at end of table.

Note: A • precedes any Soil Series which is found on the the Lihī Lani Recreational Community project site.

TABLE 3.—Engineering Interpretations—Continued

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	Road fill	Highway location	Reservoir areas	Farm ponds
Wahiana: WaA, WaB, WaC, WaD2	Good	Good	All features favorable, except where slopes are as much as 25 percent.	Moderately rapid permeability; slopes as much as 25 percent.	(f)
Wahituli: WbB, WcB	Fair to good; stony in places; bedrock at a depth of 20 to 40 inches.	Fair to good; stony in places; bedrock at a depth of 20 to 40 inches.	Bedrock at a depth of 20 to 40 inches; slopes as much as 15 percent.	Moderate permeability; slopes as much as 15 percent; stoniness in places.	Bedrock at a depth of 20 to 40 inches; slopes as much as 15 percent; stoniness in places.
Wakoko: WcB, WcC, WbB, WbC, WbD2	Good, except cobbly or stony in places.	Good, except cobbly or stony in places.	Bedrock at a depth of 20 to 40 inches; slopes as much as 25 percent; cobbly or stony in places.	Moderate permeability; slopes as much as 25 percent; bedrock at a depth of 20 to 40 inches.	Poor stability; piping hazard; bedrock at a depth of 20 to 40 inches.
Waihele: WAF	Poor; always wet; apron below a depth of 10 to 22 inches.	Poor; always wet; low shear strength; low bearing capacity.	Wetness; low shear strength; slopes as much as 70 percent.	Slopes of 30 to 70 percent; high seepage rate.	Wetness; poor compaction characteristics; low shear strength.
Waiuku: WkA, WkB, WbB, WbC, WbD, WbE	Fair; very sticky and very plastic; stony in places.	Poor; very sticky and very plastic; moderate shrink-swell potential; stony in places.	Moderate shrink-swell potential; low shear strength; slopes as much as 30 percent; stony in places.	Moderate permeability; moderate shrink-swell potential; slopes as much as 30 percent.	Moderate shrink-swell potential; moderate strength; stoniness in places.
Waiwa: WJF	Very poor; very plastic; rocky; low shear strength.	Very poor; very plastic; rocky; bedrock at a depth of less than 20 inches.	Slopes 30 to 80 percent; bedrock at a depth of less than 20 inches; high shrink-swell potential; rocky.	(f)	High shrink-swell potential; limited material; rocky; low shear strength.
Waiwaha: WwA, WwB, WwC, WwD, WwE	Poor; very sticky and very plastic.	Poor; high shrink-swell potential; very plastic; and very stony.	High shrink-swell potential; slopes as much as 25 percent; moderate strength.	High shrink-swell potential; slopes as much as 25 percent; moderate permeability.	High shrink-swell potential; clayey; low shear strength; clayey.
Waiwaha: WwB, WwC, WwD, WwE	Fair; low fertility; stony in places.	Good	Slopes as much as 70 percent; stony in places.	Slopes as much as 70 percent; moderate permeability.	(f)

See footnotes at end of table.

Interpretations—Continued

Degree and kind of limitations for apple tank filler fields	Soil features affecting—Continued				
	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	Foundations for low buildings
Slight on slopes of 0 to 8 percent; moderate on slopes of 8 to 15 percent; severe on slopes of more than 15 percent.	Moderately rapid permeability; slopes as much as 25 percent.	All features favorable where slopes are less than 20 percent.	Slopes as much as 25 percent.	Slopes as much as 25 percent.	Slopes as much as 25 percent; high shear strength.
Severe; bedrock at a depth of less than 40 inches.	Moderate permeability; slopes as much as 15 percent; stoniness in places.	Bedrock at a depth of 20 to 40 inches; stoniness in places.	Bedrock at a depth of 20 to 40 inches; slopes as much as 15 percent; stoniness in places.	Bedrock at a depth of 20 to 40 inches; slopes as much as 15 percent; stoniness in places.	Bedrock at a depth of 20 to 40 inches; slopes as much as 15 percent; stoniness in places.
Severe; bedrock at a depth of 20 to 40 inches.	Excellent; slopes as much as 25 percent; bedrock at a depth of 20 to 40 inches.	Susceptible to siltation; bedrock at a depth of 20 to 40 inches; rocky or stony in places.	Susceptible to siltation of channels; difficult to establish plants; slopes as much as 25 percent; cobbly or stony in places.	Slopes as much as 25 percent; wetness.	Slopes as much as 25 percent; bedrock at a depth of 20 to 40 inches.
Severe; slopes 30 to 70 percent; always wet; seepage at a depth of 10 to 22 inches.	(f)	Slopes of 30 to 70 percent; wetness.	Slopes of 30 to 70 percent; wetness.	Slopes of 30 to 70 percent; wetness.	Slopes of 30 to 70 percent; wetness; low shear strength; susceptible to sliding.
Slight on slopes of 0 to 15 percent; moderate to severe on slopes of 15 to 30 percent; severe on slopes of more than 30 percent.	Moderate permeability; slopes as much as 30 percent; stoniness in places.	Moderate shrink-swell potential; clayey; stoniness in places.	Slopes as much as 30 percent; stoniness in places.	Slopes as much as 30 percent; stoniness in places.	Moderate shrink-swell potential; low shear strength; stoniness in places.
Severe; bedrock at a depth of less than 20 inches; slopes of 30 to 80 percent; rootiness; low shear strength.	(f)	(f)	(f)	(f)	High shrink-swell potential; susceptible to sliding; slopes of 30 to 80 percent; rootiness; low shear strength.
Severe; moderately slow permeability.	Slow intake rate; slopes as much as 25 percent; moderately slow permeability.	Clayey; high shrink-swell potential; slopes as much as 25 percent.	Clayey; slopes as much as 25 percent.	Clayey; slopes as much as 25 percent.	High shrink-swell potential; low shear strength; slopes as much as 25 percent.
Slight on slopes of 3 to 8 percent; moderate on slopes of 8 to 15 percent; severe on slopes of more than 15 percent.	(f)	All features favorable where slopes are less than 20 percent.	Slopes as much as 70 percent.	Slopes as much as 70 percent.	Slopes as much as 70 percent.

Note: A • precedes any Soil Series which is found on the the Lihī Lani Recreational Community project site.

8763-14
3.13

Jeff
R E C E I V E D
FEB 04 1991

GROUP 70
LIMITED

(P)1080.1

IAN 30 1991

City and County of Honolulu
Department of General Planning
650 South King Street
Honolulu, Hawaii 96813

Attention: Mr. Roland Libby


Gentlemen:

Subject: Lihi Lani Recreational Community
North Shore Development Plan Amendment
Draft EIS

Thank you for the opportunity to review the subject document. We have no comments to offer.

Should there be any questions, please contact Mr. Ralph Yukumoto of the Planning Branch at 548-7192.

Very truly yours,


TEUANE TOMINGA
State Public Works Engineer

RY:jk
cc: Obayashi Hawaii Corporation
Group 70 Limited
OEQC

2/91-225 8763-1 +
3.23

JOHN WAIHEE
GOVERNOR



Bruce S. Anderson, Ph.D.
Acting Director

TELEPHONE NO.
548-6915

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
485 SOUTH KING STREET, ROOM 104
HONOLULU, HAWAII 96813

February 15, 1991

Mr. Mel Murakami
City and County of Honolulu
Department of General Planning
650 South King Street
Honolulu, HI 96813

Dear Mr. Murakami:

SUBJECT: Draft Environmental Impact Statement for the Lihī
Lani Recreational Community.

We have reviewed the document listed above and have no
comments to offer at this time.

Thank you for the opportunity to submit comments on this
project.

Sincerely,

Bruce S. Anderson
for Bruce S. Anderson, Ph.D.

GENERAL PLANNING
C & CHRONICLE

'91 FEB 25 AM 8:25

RECEIVED

JOHN WAIHEE
GOVERNOR
STATE OF HAWAII



HOALIKU L. DRAKE
CHAIRMAN
HAWAIIAN HOMES COMMISSION

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1878
HONOLULU, HAWAII 96808

March 6, 1991

Jeff
RECEIVED
MAR 07 1991

Mr. Roland Libby
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

GROUP 70
LIMITED

Dear Mr. Libby:

Lihi Lani Recreational Community
Development Plan Amendment
Koolauloa, O'ahu

Thank you for the opportunity to comment on this proposed
Development Plan Amendment. The project does not impact
Hawaiian Home Lands. We have no comments.

Warmest aloha,

Hoaliku L. Drake
Hoaliku L. Drake, Chairman
Hawaiian Homes Commission

HLD:ci

cc: Obayashi Hawaii Corporation
✓ Group 70 Limited



COPY

February 26, 1991

Jeff
RECEIVED
FEB 28 1991

GROUP 70
LIMITED

TO: BENJAMIN B. LEE, DIRECTOR
DEPARTMENT OF GENERAL PLANNING

ATTN: ROLAND LIBBY, JR.

FROM: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED
LIHI LANI RECREATIONAL COMMUNITY DEVELOPMENT, TMK: 5-9-05
AND 06, NORTH SHORE DEVELOPMENT PLAN AMENDMENT

Thank you for the opportunity to comment on the proposed Lihi Lani Recreational Community Development. We have the following comments on the Draft Environmental Impact Statement:

1. The irrigation of the golf course and other areas with the wastewater/brackish water mixture on the underlying aquifer should be coordinated with the State Department of Health. Any reduction in the sustainable yield of our Sunset Beach Well due to adverse impacts on the aquifer as a result of the use of wastewater/brackish water for the golf course irrigation will need to be made up by the developer of the proposed Lihi Lani Recreational Community Development.
2. The developer should submit a water master plan for our review and approval, showing the estimated water requirements and proposed water facilities with supporting calculations for peak hour pressures and fire flows at maximum day demand.
3. The developer may be required to provide a water source for the development or pay our Water System Facilities Charges for a source facility if water can be made available from our existing system for the proposed development. This determination will be made when the developer submits the water master plan.



COPY

Mr. Benjamin B. Lee
Page 2
February 26, 1991

4. The development will be subject to the BWS cross-connection and backflow prevention control requirements due to the use of a dual water system. BWS approved backflow prevention devices will be required immediately after all potable water meters serving lots containing a non-potable system.

If you have any questions, please contact Bert Kuioka at 527-5235.

cc: Office of Environmental Quality Control
Obayashi Hawaii Corp.
✓ Group 70, Limited

16 April 1991

City and County of Honolulu, Board of Water Supply
Kazu Hayashida, P.E., Manager and Chief Engineer
630 South Beretania Street
Honolulu, Hawaii 96813

**Subject: Lihi Lani Recreational Community Draft EIS
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Mr. Hayashida:

Thank you for your 26 February 1991 memo to the Department of General Planning concerning the above application. The following is offered in response to your specific comments.

A. Impact to BWS Sunset Beach Well or Underlying Aquifer due to Irrigation of Golf Course

In response to your concern, an additional mitigation measure will be added to Section 4.5 of the Final EIS as follows: "The use of a wastewater effluent and brackish water mixture for landscape irrigation will be coordinated with the State Department of Health. Irrigation areas will be carefully selected to avoid potential adverse effects upon the BWS Sunset Beach Well. If there is any resulting degradation of the Sunset Beach Well which is attributable to Lihi Lani, Obayashi will make up the difference in supply from another source".

Studies conducted by Mink & Yuen for this project do not indicate the potential for adverse effects on the quality of water being drawn from the Sunset Beach Well. We are undertaking further detailed studies to confirm our preliminary findings. These follow-up studies will be coordinated with the State Department of Health. Prior to and following development of the project, monitoring of the existing BWS wells and monitoring wells to be installed by Obayashi will be conducted, in coordination with the State.

B. Water Master Plan, Source Development and Facilities Charges

The developer will submit a Water Master Plan as you describe, at the appropriate later phase of the planning process. Water source development requirements or Water Systems Facilities Charges will be determined when the developer submits the Water Master Plan.

Letter to Board of Water Supply, Kazu Hayashida
18 April 1991
Page 2

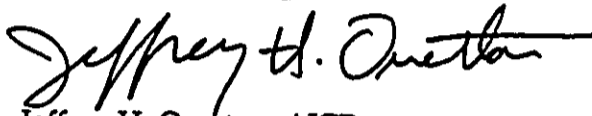
C. BWS Cross-Connection and Backflow Prevention Control Requirements

Your comment concerning the applicability of cross-connection and backflow prevention and control requirements due to the use of a dual water system is noted. Obayashi's engineering consultants will take appropriate measures in the project design to include these requirements.

Thank you for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED



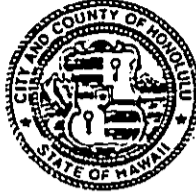
Jeffrey H. Overton, AICP
Senior Planner

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

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3.13
RECEIVED

FEB 14 1991

FRANK F. FASI
MAYOR



GROUP 70
SAM CALLEJO
DIRECTOR AND CHIEF ENGINEER

C. MICHAEL STREET
DEPUTY DIRECTOR
In reply refer to:
ENV 91-37(449)

February 11, 1991

MEMORANDUM

TO: BENJAMIN B. LEE, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: SAM CALLEJO, DIRECTOR AND CHIEF ENGINEER

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
LIHI LANI RECREATIONAL COMMUNITY
TMK: 5-9-05: 06, POR. 38, AND POR. 82
5-9-06: 01, 08, 18 AND 24

We have reviewed the subject DEIS and have the following comments:

1. Preliminary drainage study appears acceptable.
2. A drainage master plan will be required if changes in land use and zoning classification are granted.
3. We do not have additional comments on waste disposal at this time.

Sam Callejo
SAM CALLEJO
Director and Chief Engineer

cc: Obayashi Hawaii Corporation
Group 70 Limited
OEQC



18 April 1991

Sam Callejo, Director and Chief Engineer
City and County of Honolulu
Department of Public Works
650 South King Street
Honolulu, Hawaii 96813

**Subject: Lihi Lani Recreational Community Draft EIS
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Mr. Callejo:

Thank you for your 11 February 1991 memo to the Department of General Planning concerning the above application. Obayashi will prepare a Drainage Master Plan and submit same for your review at the appropriate later stage in project planning.

Thank you for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED

A handwritten signature in cursive script that reads "Jeffrey H. Overton".

Jeffrey H. Overton, AICP
Senior Planner

Francis S. Oda, AIA, AICP
Norman G. Y. Hong, AIA
Sheryl B. Seaman, AIA, ASID
Robert K. L. Wong, AIA
Hiroshi Hida, AIA

Ray H. Nihei, AIA, CSI
Linda M. Aniya
Derrick T. Seiki
Ralph E. Portmore, AICP
Edward T. Green
Paul P. Chorney, AIA
Stephen H. Yuen, AIA
Dean H. Kitamura, AIA
Norma J. Scott
June Fukushima-Lee, ASID
Anne Theiss, AIA, ASID
Stephen E. Callo, CPA
Bradford A. Wellstead, AIA
Walter R. Bell, AIA, CSI, CCS
Walter K. Muraoka
George I. Atta, AICP
Jeffrey H. Overton, AICP
James I. Nishimoto, AIA
Jen-Chih "Jack" Lee, AIA
Spencer K.S. Chang, AIA
Michael A. Garni

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DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813



FRANK F. FASI
MAYOR

RECEIVED
FEB 28 1991

WALTER M. OZAWA
DIRECTOR
ALVIN K.C. AU
DEPUTY DIRECTOR

February 28, 1991

GROUP 70
LIMITED

TO: BENJAMIN B. LEE, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

ATTN: ROLAND LIBBY, DEPUTY CHIEF PLANNING OFFICER

FROM: WALTER M. OZAWA, DIRECTOR

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT (EIS)
LIHI LANI RECREATIONAL COMMUNITY - KOOLAULOA
TAX MAP KEY 5-9-05 AND 5-9-06

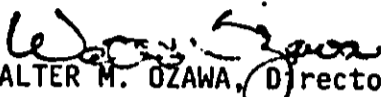
We have reviewed the EIS for the proposed Lihi Lani Recreational Community Development in Koolauloa and make the following comments and recommendation.

Our concerns as expressed in our earlier review of the project's Environmental Assessment regarding recreational facilities have not been addressed in this EIS. We have been waiting for a meeting with the applicant to discuss in detail the City's involvement, if any, relative to the various recreational elements proposed in their master plan.

The method, which will be used for the affordable housing to comply with the City's Park Dedication Ordinance No. 4621, needs to be discussed. All future applications submitted to the City under the planning process cannot be approved by our department until these matters are settled.

MEMO TO: BENJAMIN B. LEE
ATTN: ROLAND LIBBY
February 28, 1991
Page 2

Please have the applicant contact Jason Yuen of our Advance Planning Branch at 527-6315 to discuss the project in detail.


WALTER M. OZAWA, Director

WMO:s1

Attachment: 1/9/91 letter

cc: Obayashi, Attn: Craig Yamagishi
✓ Group 70 Limited, Attn: Jeffrey H. Overton, AICP



18 April 1991

Walter M. Ozawa, Director
City and County of Honolulu
Department of Parks and Recreation
650 South King Street
Honolulu, Hawaii 96813

**Subject: Lihi Lani Recreational Community Draft EIS
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Mr. Ozawa:

Thank you for your 28 February 1991 memo to the Department of General Planning concerning the above application. The following is offered in response to your specific comments.

A. City's Relationship to the Proposed Recreational Elements of Lihi Lani

All of the proposed recreational facilities within the Lihi Lani community are currently proposed for private ownership and operation, including the community facilities near the project entrance as shown in the Draft EIS, Figure 3. Any proposals for dedication of land or facilities to the City and County for recreational purposes would be discussed with the Department of Parks and Recreation, should these intentions change.

B. Compliance with City Park Dedication Ordinance 4621

Based upon our discussions with your staff, we understand that it is not necessary to delineate the local public park during the environmental review process and Development Plan Amendment process. Obayashi intends to comply with Ordinance 4621, and they will define the size and location of the requisite local park during subsequent stages of the planning process.

Thank you again for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED

Jeffrey H. Overton, AICP
Senior Planner

Francis S. Oda, AIA, AICP
Norman G. Y. Hong, AIA
Sheryl B. Seaman, AIA, ASID
Robert K. L. Wong, AIA
Hitoshi Hida, AIA
Roy H. Nihel, AIA, CSI
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Ralph E. Portmore, AICP
Edward T. Green
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Stephen H. Yuen, AIA
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Walter K. Muraoka
George I. Atta, AICP
Jeffrey H. Overton, AICP
James I. Nishimoto, AIA
Jen-Chih "Jack" Lee, AIA
Spencer K. S. Chang, AIA
Michael A. Garni

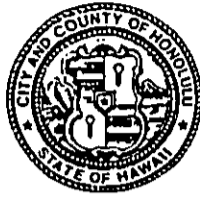
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DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU

HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

JO
RECEIVED
FEB 12 1991



JOSEPH M. MAGALDI, JR.
DIRECTOR

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GROUP 70
LIMITED

February 8, 1991

MEMORANDUM

TO: BENJAMIN B. LEE, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

ATTENTION: ROLAND LIBBY

FROM: JOSEPH M. MAGALDI, JR., DIRECTOR

SUBJECT: LIHI LANI RECREATION COMMUNITY
DEVELOPMENT PLAN AMENDMENT
ENVIRONMENTAL IMPACT STATEMENT (EIS)
TMK: 5-9-05: 06, PORTION 38, PORTION 82; 5-9-06: 01

This is in response to a transmittal from the State of Hawaii Office of Environmental Quality Control received on January 25, 1991 requesting our review and comments on the subject planned community.

Based on our review of the EIS, we understand that all interior roadways will be privately owned and maintained by a property owners' association. If this is the case, we have no objections to the proposed development.

Should you have any questions, please contact Mel Hirayama of my staff at Local 4119.

h JOSEPH M. MAGALDI, JR.

cc: Obayashi Hawaii Corporation
Group 70 Limited
Office of Environmental Quality Control



18 April 1991

Joseph M. Magaldi, Jr., Director
City and County of Honolulu
Department of Transportation Services
650 South King Street
Honolulu, HI 96813

**Subject: Lihi Lani Recreational Community Draft EIS
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Mr. Magaldi:

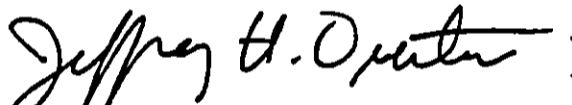
Thank you for your February 8, 1991 memo to the Department of General Planning concerning the above application.

Lihi Lani will create a single formal access onto Kamehameha Highway and that the roadways within the project will be privately owned and maintained. We understand that you have no objections to the proposed development, given these circumstances.

Thank you for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or concerns.

Sincerely,

GROUP 70 LIMITED


Jeffrey H. Overton, AICP
Senior Planner

Francis S. Oda, AIA, AICP
Norman G. Y. Hong, AIA
Sheryl B. Seaman, AIA, ASID
Robert K.L. Wong, AIA
Hitoshi Hida, AIA
Roy H. Nihei, AIA, CSI
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Walter K. Muraoka
George I. Atta, AICP
Jeffrey H. Overton, AICP
James I. Nishimoto, AIA
Jen-Chih "Jack" Lee, AIA
Spencer K.S. Chang, AIA
Michael A. Garni

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 5TH FLOOR
HONOLULU, HAWAII 96813
PHONE: 523-4427 • FAX 527-5498

FRANK F. FASI
MAYOR

RECEIVED
MAR 25 1991



MICHAEL N. SCARFONE
DIRECTOR

Gail M. Kaito
DEPUTY DIRECTOR

GROUP 70
LIMITED

March 13, 1991

MEMORANDUM

TO: Benjamin B. Lee, Chief Planning Officer
Department of General Planning

FROM: Michael N. Scarfone

SUBJECT: Lihi Lani Recreational Community
Draft Environmental Impact Statement (DEIS)

We have reviewed the subject DEIS and note that the developer is proposing that the residential element of the Lihi Lani Recreational Community will include 300 residential units; 120 country lots at market prices and 180 affordable units at price ranges "in keeping with the requirements for affordability as set forth by the City and County of Honolulu." For your information, the Department's policy is to recommend that the units be targetted as follows:

- 10% for households earning incomes that do not exceed 80% of median income;
- 20% for households earning incomes between 81% and 120% of median income; and
- 30% for households earning incomes between 121% and 140% of median income.

A schedule of current income limits for these categories is attached for reference.

Thank you for the opportunity to comment.

Handwritten signature of Michael N. Scarfone in cursive.

MICHAEL N. SCARFONE
Director

Attachment

INCOME LIMITS

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
Very Low Income (50%)	\$14,400	16,500	18,550	20,600	22,250	23,900	25,550	27,200
Lower Income (80%)	\$23,050	26,350	29,650	32,950	35,000	37,050	39,150	41,200
Median Income (100%)	\$28,800	33,000	37,100	41,200	44,500	47,800	51,100	54,400
Gap Income (120%)	\$34,560	39,600	44,400	49,440	53,400	57,360	61,320	65,280
(140%)	\$40,320	46,200	51,940	57,680	62,300	66,920	71,540	76,160

New Fair Market Rents (10/1/89)

Bedroom Size	0 BR	1 BR	2 BR	3 BR	4 BR
Fair Market Rent (Certificate)	\$454	\$552	\$649	\$817	\$915
Utility Allowance (all electric)	36*	42*	47*	52*	58*
	37	47	70	93	116
	21**	24**	27**	35**	44**
Payment Standard (Voucher Only)	416	506	595	748	835

Bedroom Size Guidelines	No. of Bedrooms	Minimum	Maximum
	0	1	2
	1	1	3
	2	2	5
	3	3	7
	4	4	9
<hr/>			
	5	8	11
	6	10	13

* Gas heater and stove
 ** Electricity--lights only

(Prepared by Housing Division)

INCOME LIMITS/U
 (Revised 02/16/90)



18 April 1991

Michael N. Scarfone, Director
Department of Housing and Community Development
City and County of Honolulu
650 South King Street, 5th Floor
Honolulu, Hawaii 96813

**Subject: Lihi Lani Recreational Community Draft EIS
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Mr. Scarfone:

Thank you for your 13 March 1991 memorandum to the Department of General Planning regarding the subject Draft EIS. The following responses are to your specific comment.

The Draft EIS describes Obayashi's request to construct 300 residential units within the proposed recreational community, 60 percent of which are proposed to meet the City and County's affordability requirements. The 10 to 30 percent breakdown of target income levels which were provided in your comment letter will be included in the Final EIS, to more accurately describe HCD's policy.

Thank you again for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED

Jeffrey H. Overton, AICP
Senior Planner

Francis S. Oda, AIA, AICP
Norman G. Y. Hong, AIA
Sheryl B. Seaman, AIA, ASID
Robert K. L. Wong, AIA
Hitoshi Hida, AIA

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Jeffrey H. Overton, AICP
James I. Nishimoto, AIA
Jen-Chih "Jack" Lee, AIA
Spencer K. S. Chang, AIA
Michael A. Garm

POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU

1455 SOUTH BEREYANIA STREET
HONOLULU HAWAII 96814 - AREA CODE 808/943-3111

FRANK F. FASI
MAYOR



MICHAEL S. NAKAMURA
CHIEF

HAROLD M. KAWASAKI
DEPUTY CHIEF

OUR REFERENCE SG:LK

JO
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MAR 08 1991

March 5, 1991

GROUP 70
LIMITED

TO: ROLAND D. LIBBY, JR., DEPUTY CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: MICHAEL S. NAKAMURA, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT

SUBJECT: DRAFT ENVIRONMENT IMPACT STATEMENT (EIS) FOR LIHI LANI
RECREATIONAL COMMUNITY NORTH SHORE DEVELOPMENT PLAN
AMENDMENT, KOOLAULOA, OAHU, TMK: 5-9-05:06, POR. 38,
POR. 82 AND 5-9-06:01, 08, 18, 24

We have reviewed the draft EIS for the above-proposed project and offer the following comments.

As stated in our response to the environmental assessment, we can expect some traffic congestion to occur as a result of additional homes being built and the use of the recreational facilities.

During the construction phases of the project, we recommend that the use of special duty officers be considered to assist in directing traffic and the movement of heavy equipment and supplies. Upon completion of the project, as stated in your report, the installation of storage lanes on Kamehameha Highway and turning lanes out of the project should alleviate some of the traffic congestion. However, we believe additional mitigative measures may be required; therefore, a continual monitoring of this intersection will be needed after construction.

The development of 300 additional homes and the recreational center will require, at a minimum, a creation of one additional police beat. A rise in criminal activity can also be expected as a result of any development, and officers would be needed to monitor the area for possible residence burglaries, auto thefts and other crimes. As a result, manpower needs to be increased by approximately six (6) police officers and one (1) sergeant to adequately service this community.

Roland D. Libby, Jr.

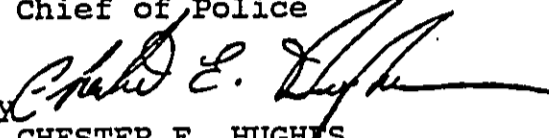
-2-

March 5, 1991

Our department will be able to accommodate the needs of this community development project upon receiving additional funding and manpower allocations.

Thank you for the opportunity to provide comments.

MICHAEL S. NAKAMURA
Chief of Police

BY 
CHESTER E. HUGHES
Assistant Chief of Police
Support Services Bureau

cc: Obayashi Hawaii Corporation
Group 70 Limited
Office of Environmental Quality Control



18 April 1991

City and County of Honolulu, Police Department
Michael S. Nakamura, Chief of Police
1455 South Beretania Street
Honolulu, Hawaii 96814

**Subject: Lihi Lani Recreational Community Draft EIS
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Mr. Nakamura:

Thank you for your 5 March 1991 memo to the Department of General Planning concerning the above Draft EIS. The following is offered in response to your specific comments.

A. Traffic During Construction Phase

Section 4.12 of the Draft EIS proposes several mitigative measures to minimize the impact of traffic generated by the proposed project. Per your recommendation, one additional mitigative measure will be added to the EIS, as follows: "During construction phases of the project, special duty police officers shall be employed to assist in directing traffic and the movement of heavy equipment and supplies at the intersection of the project access road and Kamehameha Highway".

B. Monitoring of Kamehameha Intersection after Construction

A Traffic Impact Assessment was prepared for the project by Pacific Planning and Engineering, Inc. and included in the Draft EIS as Appendix O. The only additional mitigative measure anticipated for the project intersection with Kamehameha Highway is signalization. In order to plan for this possible eventuality, one of the mitigative measures recommended in the Draft EIS, Section 4.12, requires that Obayashi "conduct a signal warrant study periodically at the intersection of the project access road with Kamehameha Highway". The warrant study is required by the State Department of Transportation prior to installation of traffic signals at an intersection. This measure should achieve the "continual monitoring" of the intersection recommended in your memo.

C. Need for an Additional Police Beat

Although the Lihi Lani community will provide private security services within the project, your comments indicate that the additional 300 homes

Francis S. Oda, AIA, AICP
Norman G. Y. Hong, AIA
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Hitoshi Hida, AIA

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Jeffrey H. Overton, AICP
James I. Nishimoto, AIA
Jen-Chih "Jack" Lee, AIA
Spencer K. S. Chang, AIA
Michael A. Garni

Letter to Honolulu Police Dept., Michael S. Nakamura
18 April 1991
Page 2

and the recreational "center" will require an additional police beat. This information will be included in the Final EIS.

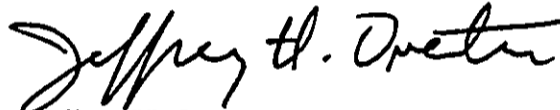
We understand the current manpower allocation for the North Shore (from Kaena Point to Crawfords Home) is only four patrol officers. For the area between Waimea Bay and Crawford's Home (including Pupukea Highlands) only one patrol officer is currently assigned. Obayashi has been informed by the local community that they are not comfortable with the presently insufficient police beat coverage. We understand how our project could add to the current patrol area, even though private security services will be in place. The forecasted increase in property tax revenues generated by the project should be more than adequate to support an expansion of service. It is difficult for us to understand, however, why your office believes that Lihi Lani will require a seven-fold increase in manpower.

Our Draft EIS includes an Economic and Fiscal Impact Assessment (Appendix T) which presents project costs and revenue comparisons at both the City and County and State levels of government.

Thank you for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

FIRE DEPARTMENT
CITY AND COUNTY OF HONOLULU

1455 SOUTH BERETANIA STREET, ROOM 305
HONOLULU, HAWAII 96814

FRANK F. FASI
MAYOR



LIONEL E. CAMARA
FIRE CHIEF

DONALD S.M. CHANG
DEPUTY FIRE CHIEF

February 22, 1991

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FEB 25 1991

GROUP 70
LIMITED

Mr. Jeffrey H. Overton, AICP
Associate
Group 70 Limited
924 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Overton:

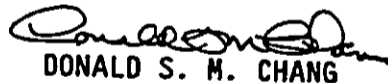
SUBJECT: Lahi Lani Recreational Community

We have reviewed the subject material provided and foresee no adverse impact in Fire Department facilities or services.

Access for fire apparatus, water supply and building construction shall be in conformance to existing codes and standards.

Should you have any questions, please contact Battalion Chief Attilio Leonardi of our Administrative Services Bureau at 943-3838.

Very truly yours,


DONALD S. M. CHANG
Acting Fire Chief

AKL:ny



18 April 1991

City and County of Honolulu, Fire Department
Donald S. M. Chang, Acting Fire Chief
1455 South Beretania Street, Room 305
Honolulu, Hawaii 96814

**Subject: Lihi Lani Recreational Community Draft EIS
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Chief Chang:

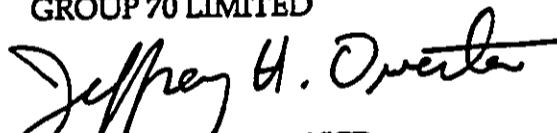
Thank you for your 22 February 1991 letter concerning the above application. The following is offered in response to your specific comments.

Access for fire apparatus, water supply and building construction will be designed in conformance to all City and County codes and standards. Additionally, at the request of the State DLNR Division of Forestry and Wildlife, Obayashi will prepare a detailed map showing the trail and public access to the State land for review by DOFAW. Obayashi will also prepare a separate fire suppression plan to describe the proposed fire suppression accessways. A mitigative measure to this affect will be included in the Final EIS.

Thank you again for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED


Jeffrey H. Overton, AICP
Senior Planner

- Francis S. Oda, AIA, AICP
- Norman G. Y. Hong, AIA
- Sheryl B. Seaman, AIA, ASID
- Robert K.L. Wong, AIA
- Hiroshi Hida, AIA
- Roy H. Nihei, AIA, CSI
- Linda M. Anya
- Derrick T. Seiki
- Ralph E. Portmore, AICP
- Edward T. Green
- Paul P. Chorney, AIA
- Stephen H. Yuen, AIA
- Dean H. Kitamura, AIA
- Norma J. Scott
- June Fukushima-Lee, ASID
- Anne Theiss, AIA, ASID
- Stephen E. Callo, CPA
- Bradford A. Wellstead, AIA
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- Walter K. Muraoka
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- James I. Nishimoto, AIA
- Jen-Chih "Jack" Lee, AIA
- Spencer K.S. Chang, AIA
- Michael A. Garni

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FEB - 7 1991

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PB 91-101

February 5, 1991

MEMO TO: BENJAMIN LEE, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: HERBERT K. MURAOKA
DIRECTOR AND BUILDING SUPERINTENDENT

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT (EIS)
LIHI LANI RECREATIONAL COMMUNITY
NORTH SHORE DEVELOPMENT PLAN AMENDMENT

We have reviewed the EIS for the subject project and have no comments to offer. Thank you for the opportunity to review the document.



HERBERT K. MURAOKA
Director and Building Superintendent

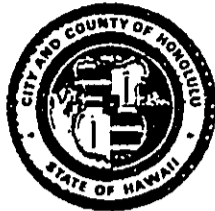
JH:jo
cc: Obayashi Hawaii Corp.
Group 70 Ltd.
Office of Environmental Quality Commission
J. Harada

DEPARTMENT OF GENERAL PLANNING
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

RECEIVED
MAR 13 1991



BENJAMIN B. LEE
CHIEF PLANNING OFFICER
ROLAND D. LIBBY, JR.
DEPUTY CHIEF PLANNING OFFICER

MM

GROUP 70
LIMITED

March 11, 1991

Mr. Jeffrey H. Overton
Group 70 Limited
924 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Overton:

Draft Environmental Impact Statement (DEIS) for
the Lihi Lani Recreational Community at Pupukea, Koolaupoko
Tax Map Keys 5-9-5: 6, 38, 82 and 5-9-6: 1, 8, 18 and 24

We have reviewed the Lihi Lani Recreational Community DEIS
and have the following comments:

1. It is unclear whether the community facilities complex includes the day care (1 acre) and community garden (1 acre) sites. Table 2(e) on page 24 indicates that these facilities are part of the 10 acres, while on page 26 it is stated that they are outside this area. Control and ownership of these facilities should also be indicated.
2. The General Plan's housing policies need to be more fully addressed. While community benefits are discussed in the DEIS, there should also be a discussion of how these proposed benefits are commensurate with the impacts of the golf course development.
3. The disposition of the 180 affordable housing units should be clarified, particularly in regards to ownership upon completion, sales and distribution of proceeds.

Mr. Jeffrey H. Overton
Group 70 Limited
March 11, 1991
Page 2

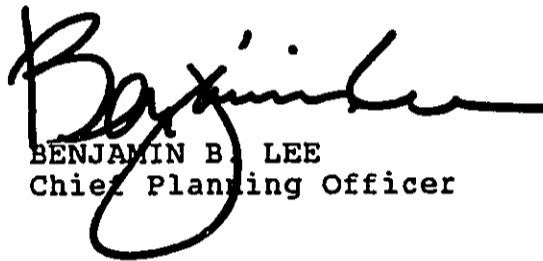
4. Section 11-200-17 (p) of Chapter 200 of Title 11, Administrative Rules ("Environmental Impact Statement Rules"), states:

"The draft EIS shall contain reproductions of all substantive comments and responses made during the consultation process. A list of those who had no comment shall be included in the draft EIS."

Our review of the draft EIS reveals that comment letters/responses were not reproduced in the draft EIS. An addendum for comment letters/responses must be resubmitted to OEQC, the Accepting Authority (Department of General Planning) and all applicable consulted parties in accordance with the requirements of Chapter 343, Hawaii Revised Statutes.

Thank you for the opportunity to comment on this matter.

Sincerely,



BENJAMIN B. LEE
Chief Planning Officer

BBL:lh



18 April 1991

City and County of Honolulu, Department of General Planning
Benjamin B. Lee, Chief Planning Officer
850 South King Street
Honolulu, Hawaii 96813

**Subject: Lihi Lani Recreational Community Draft EIS
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Mr. Lee:

Thank you for your 11 March 1991 letter concerning the above application. The following is offered in response to your specific comments.

A. Location of Proposed Community Garden; Proposed Ownership

As stated in Section 2, page 26 of the Draft EIS, Obayashi intends to provide up to two-acres of land in the makai portion of the site for a day care center and a community garden, outside of the 10-acres proposed for other community facilities uses. Table 2(e) will be corrected for the Final EIS. It is currently proposed that all of the recreational and community facilities be privately owned and maintained.

B. Housing Policies of the City and County General Plan

Section 6.0 of the Draft EIS provides an assessment of proposed project's conformance with the objectives and policies set forth in the General Plan for the City and County of Honolulu. Most of the policies speak to State and County planners and regulators regarding the promotion of decent, affordable housing. Certain of the objectives or policies may be achieved if the proposed project is approved, as follows:

"Objective A: To provide decent housing for all the people of Oahu at prices they can afford."

"Policy 10: Promote the construction of affordable dwellings which take advantage of Oahu's year-round moderate climate."

"Policy 11: Encourage the construction of affordable homes within established low-density communities by such means as "ohana" units, duplex dwellings and cluster development."

Francis S. Oda, AIA, AICP
Norman G. Y. Hong, AIA
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Robert K. L. Wong, AIA
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Jeffrey H. Overton, AICP
James I. Nishimoto, AIA
Jen-Chih "Jack" Lee, AIA
Spencer K. S. Chang, AIA
Michael A. Garni

The 180 affordable homes, 60 percent of the total number of residential units proposed in Lihi Lani, will contribute to the stock of decent, affordable housing on Oahu. If the affordable homes are constructed within the Lihi Lani Recreational Community as proposed, it will serve the policy of encouraging landowners to build affordable homes in low-density areas, providing variety within the housing stock of any one area.

"Objective B: To reduce speculation in land and housing."

"Policy 3: Seek public benefits from increases in the value of land owing to City and State developmental policies and decisions."

The proposed Lihi Lani Recreational Community project includes public amenities and benefits, including affordable housing, which are proposed to meet the intentions of the General Plan. Appendix A of the Draft EIS is the "Proposed Community Benefits Package" for the Lihi Lani Recreational Community which includes an approximate valuation of these benefits, over time. Although the valuation may be debated, the project benefits themselves are substantial and should be considered in light of the amount and intensity of development being proposed.

C Disposition of the 180 Affordable Homes

The 180 affordable homes will be developed on a 28-acre site on the Haweiwa-side plateau. Although no definitive plans have been made regarding building types, both attached and detached single-family homes are being considered. Ownership upon completion, distribution of sales proceeds and joint public-private development opportunities are all issues for further discussion. Obayashi remains available and open to discussion of these issues with you or your staff.

D. Addendum for NOP Comments/Responses

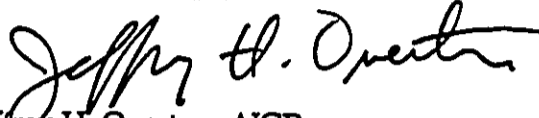
An addendum for comment and response letters was recently delivered to your office. Copies were mailed to the Accepting Authority (Department of General Planning) and all applicable consulted parties. The list of consulted parties is attached, for your information.

Letter to Dept. of General Planning, Benjamin B. Lee
18 April 1991
Page 3

Thank you again for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

Attachment: List of Consulted Parties

**Bickerton
Ramos-Saunders
& Dang**

Attorneys at Law

Five Waterfront Plaza, 500 Ala Moana Blvd., Suite 550, Honolulu, Hawaii 96813, Phone: (808) 599-3811, FAX: 533-2467

James J. Bickerton
William W. Ramos-Saunders
Charles H. Y. Dang

March 9, 1991

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MAR 13 1991

City Department of General Planning
Attention: Mel Murakami
650 S. King Street
Honolulu, Hawaii 96813

GROUP 70
LIMITED

Re: Proposed Development of "Lihi Lani"
Recreational Community at Koolauloa,
Oahu, TMK # 5-9-05:06, 38, 82 and
5-9-06:01, 08, 18, 14

Dear General Planning Department:

I am a resident of the North Shore of Oahu and a frequent and long-time user of the mountain, coastal and ocean resources located there. My home is located at 59-383 Alapi'o Road, just a few hundred yards from the proposed development referred to above. This letter contains my comments on the draft Environmental Impact Statement submitted on behalf of Obayashi Hawaii Corporation concerning its proposed development.

First of all, I refer you to the comments on the draft EIS which were submitted by the Joint Planning Committee on which members of the Pupukea Highlands Community Association serve. I am a member of that Association. Rather than repeating all of the Joint Planning Committee's insightful comments and observations here, I will simply incorporate them by reference. I am in agreement with the comments they have made and am also concerned about the points they have raised regarding the inadequacy of various aspects of the Environmental Impact Statement. For purposes of your review of this EIS under applicable Hawaii law, please consider those comments as my own, as well as Joint Planning Committee's. In addition, I offer the following further comments:

1. Failure to Assess Impacts
Beyond the Project Area.

The environment of the Pupukea area is not an isolated or enclosed capsule. It affects and is affected by activities in adjacent areas and even distant areas. The impact statement's references to environment impacts are confined primarily to the boundaries of the project area. For example, the discussion on traffic is limited mainly to roads in and out of the immediate area. It does not contain an adequate discussion of the impact on circle-island traffic on Kamehameha Highway and neither does it adequately discuss the serious existing traffic problems in Hale'iwa and the North Shore in general. This is especially important in view of the numerous large developments already proposed or actually underway.

The failure to adequately address impacts beyond the project area pervades many aspects of the impact statement. I believe this is significant and violates the rules concerning EIS content requirements.

2. Failure to Discuss
Cumulative and Secondary Impacts.

The statement also fails in almost every aspect to meet the requirement that it discuss the cumulative impact this and other similar projects will have. There is little meaningful discussion of the impacts of the new Kawela Bay Resort Development or of other existing or potential resorts such as the ones planned at Kawaihoa by Bishop Estate and by Sankyo Tsusho at Mokuleia. Impacts on the lifestyle of rural Oahu are mentioned only briefly, notwithstanding the fact that the cumulative resort and golf course development plans for the North Shore will entirely change living conditions. The "secondary effects" of a domino trend this project may stimulate or encourage should be addressed.

3. Failure to Present Responsible Opposing Views.

Under Environmental Counsel Rule §11-200-17, the impact statement must include a serious discussion of

responsible opposing views. The statement fails to do this on almost every controversial substantive point, as discussed more fully below.

4. Failure to Discuss Reasonable Alternatives.

The statement does not discuss with any depth or credibility the possibilities of alternative uses of the project lands for profitable activities which are more consistent with the existing land use designations and rural atmosphere. What about an agricultural or purely residential subdivision with affordable prices? What about aquaculture? These and other alternatives should be fully evaluated in the final statement, including the alternative of no development.

There is no question that the primary development need in Hawaii today is affordable housing for existing residents. The proposed project seeks to meet this need only as an afterthought. The primary thrust of the project seems to be to create demand for activities which will be more profitable for the developer. The reasonable alternative of developing a project which meets the overwhelming existing demand for reasonably priced lots and/or homes should be considered. There is a high likelihood that such a project would be profitable to Obayashi, though perhaps not as profitable as attempting to lure more wealthy residents to an already crowded island.

6. Golf Course Chemical and Run-off Impacts.

Recent findings by the State Department of Health indicate that the proliferation of golf courses in the islands has resulted in unacceptable levels of fertilizer run-off which leads to abnormal amounts of harmful algae in the affected near-shore waters. This has resulted in an increased incidence of ciguatera poisoning from consuming reef fish. The final impact statement should contain a complete discussion of this newly identified problem. This is especially so in view of the numerous golf courses proposed or already under construction on the North Shore.

City Department of General Planning
Attention: Mel Murakami
Page 4

There is also mounting evidence that pesticide residues accumulate in fish and, in sufficient quantities, may pose a biocumulative condition in humans. No mention of this was made in any of the portions of the EIS dealing with chemicals or run-off.

The statement does not adequately discuss the actual impacts of golf course run-off on fresh and salt water quality in the area. The result of increased nutrients and chemicals in the sea and drainage basin should be more fully evaluated and appropriate mitigation measures identified with greater detail. The draft statement contains only a few broad, unsupported and conclusory statements about the effect of run-off on near-shore waters and marine life and does not provide meaningful data or statistical analysis on that subject. The assumption that "turbulent near-shore waters" will dilute chemical and erosion residue is flawed at least half the year from April to October when the sea is very calm at the mouth of Paumalu Stream. In addition, the study fails to adequately consider the cumulative water quality impacts of other golf courses and resorts.

I note that the EIS made no independent study of the components of golf course run-off and instead used assumptions based on data from residential areas. I believe this is inappropriate in that the nature of chemicals, amount of use and manner of use differ significantly.

Although the impact statement discusses "innovative pest management", there is also not enough critical discussion or analysis concerning health and possible environmental effects of the chemicals this project will drain off. The actual quantitative impact on groundwater and the amount of drift to the nearby residential areas in Pupukea deserve more study. Given the strong prevailing tradewinds which would carry any pesticide residue from the golf course directly to the existing Pupukea residences, including my home, I am very concerned about this. There has been no honest disclosure of the worst case scenarios which are possible. The conclusory statement that "there will be no significant adverse impacts" is not sufficiently supported by data or detailed analysis. This is not acceptable.

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The citizens of Pupukea do not want to be guinea pigs. Accordingly, it is imperative that there be a full disclosure, and a less one-sided discussion, of the known and suspected health and environmental effects of all pesticides Obayashi would use under this pest management program.

I believe there is research which demonstrates an increased incidence of health problems among persons living adjacent to golf courses which has been statistically linked to the chemicals used thereon. I would like to see a more full discussion of this evidence in the final impact statement.

The long-term impact of exposure to pesticides is an understudied area. So frequently chemicals are permitted for a number of years and then determined to be dangerous, only after their harmful effects have become known by way of illness and/or birth defects. We cannot assume that a pesticide is safe just because it is permitted by the EPA. Many pesticides which were previously approved by the EPA have subsequently been withdrawn when their danger becomes known. In addition, assumptions concerning a pesticide's ability to move through soil to the water table are frequently in error. Look at all the chemicals that are now turning up in Oahu wells which were previously thought to bind to the soil and unable to percolate to the water table. The discussion on the impact of golf course chemicals seems to be a blatant attempt to down-play the risks associated with chemical contamination in the environment. Statements to the effect that traces of toxic chemicals leaching into the groundwater are "not necessarily harmful" and are "acceptable" are extremely irresponsible.

The appropriate inquiry in this respect is whether chemicals in our groundwater are "necessarily safe". Just because the evidence is not all in yet concerning the danger of contaminated water supplies does not mean it is "acceptable" to continue to contaminate them. In addition, there is no in-depth discussion in the EIS of the nature and extent of groundwater contamination elsewhere on Oahu. Assessing the cumulative impact of numerous sources of

contamination is essential to allow government decision-makers to fully assess the added risk posed by this development.

There is no discussion of responsible opposing viewpoints on this issue, nor is there any mention of the more conservation-oriented body of scientific study which recognizes the dangers of the ever-increasing accumulation of man-made toxic substances in the environment.

Congress has recently adopted a "prudent avoidance" policy with respect to certain environmental hazards. Under that policy, planners and other governmental authorities are urged to avoid or minimize public exposure to suspected health hazards, such as toxic chemicals, even if evidence concerning the extent of the hazard is equivocal. The EIS is seriously flawed in failing to disclose the growing body of respected scientific thought which opposes the myopic view evident in the EIS that chemicals are "safe" until proven otherwise through actual human disease or mutation. Examples of this dangerous folly are all too common: DES, DDT, Thalidomide, Agent Orange, Chlordane, radiation exposure by servicemen, etc. The EIS is simply a whitewash concerning the question of chemical hazards.

There is also no meaningful discussion concerning the alternative of not using any pesticides or fertilizers. There are golf courses in this country which are operated in such a way as to be almost totally "organic". I believe Obayashi has a duty under State law to fully investigate the possibility of cultivating the golf course with no chemicals whatsoever.

In short, the EIS is one-sided in its treatment of the impacts of the proposed golf course, both as to run-off to the ocean and chemical contamination of the environment.

7. Sewage Treatment Facilities.

Again, my home is directly down-wind of the proposed project. Under prevailing weather conditions, my neighbors and I will be subject to any odors which are created on the project site. I don't believe there has been an adequate

discussion of the impact of odor on residents of the neighboring Pupukea Highlands community. There is simply a conclusory statement to the effect that odor will not be a problem because of "the limited expanse of the sewage system and the short detention times". It is hard to believe this unsupported conclusion. There is also no discussion of "worst-case" conditions which would occur in the event of a failure in the sewage treatment facility. In view of the numerous recent sewage treatment malfunction incidents which have plagued this island, every effort should be made in the final EIS to fully analyze and discuss the odor problem by way of reference to similar projects elsewhere. There is no data or even mention of the experiences of persons living in the vicinity of such facilities on the mainland. Why not?

In addition, there is no discussion of the nature of the referenced "odor abatement facilities" which will be included as a contingency provision "should the need arise." What does this mean? How quickly will the odor abatement be implemented and how effective will it be? Residents of Pupukea will not tolerate odor problems and the measures Obayashi proposes to address those problems should be specifically identified and discussed in great detail.

While I support the notion of open pond treatment as opposed to some sort of outfall, the odor impacts need to be fully documented. It does not appear that any credible analysis has been included in the impact statement concerning the sewage impacts on neighbors. Again, the EIS seem to be a conclusory whitewash designed to distract concerned neighbors from the most disturbing impacts of the proposed project.

8. Construction Effects.

Not enough specific information has been included concerning the various phases of construction and how the environment and neighbors will be impacted during each phase. Construction itself may be one of the most severe impacts on the area with increased dust, noise, water pollution, heavy truck traffic, wildlife disruption, etc. The EIS contains only vague reassurances concerning mitigation. In addition, it contains strange justifications such as the pretention that

the construction impact will not be significant because most people will be away during weekdays. This type of doubletalk is not needed in a credible EIS. What is needed is more attention to the specifics of this aspect of the proposed project, including a detailed mitigation plan.

Again, those of us who are down-wind are especially concerned about wind erosion and the effects of increased dust, smoke, and other air pollution.

9. Potable Water Impacts

The EIS does not contain enough discussion about the overall water situation on Oahu. Water shortages are now common during the summer months, but there is no honest acknowledgement of this serious situation or nor adequate discussion of the various North Shore projects' impact on the more global island water situation. There is also no responsible discussion concerning the wisdom of inducing more "part-time residents" to come live on the island via a project like this when water resources for existing residents are already in question.

In addition, the actual size and yield of the target aquifer have not been identified and it is possible that sustained pumping (beyond the 52 and 76 hours noted in the studies) would result in saltwater intrusion and/or other adverse effect on connected groundwater deposits. Given the weak nature of the caprock in the area, more concern is warranted.

10. Conclusion

Based on all of the above, it seems that the draft Environmental Impact Statement is more of an attempt to "sell" the proposed resort project than a serious and candid discussion of the environmental impacts involved. I believe the final impact statement should be much more detailed and objective and should more honestly disclose the effects of such development on the existing neighbors in Pupukea Highlands and on the North Shore in general.

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Thank you for the opportunity to comment on this document. I look forward to your response.

Very truly yours,


William W. Ramos-Saunders

cc: Obayashi Hawaii Corporation
c/o Jeffrey Overton

Office of Environmental Quality Control



17 April 1991

William W. Ramos-Saunders, Esq.
Bickerton, Ramos-Saunders & Dang
Five Waterfront Plaza
500 Ala Moana Boulevard, Suite 550
Honolulu, Hawaii 96813

**Subject: Lihi Lani Recreational Community Draft EIS
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Mr. Ramos-Saunders:

Thank you for your 9 March 1991 letter regarding the above application. Please consider the following responses.

A. Comments on Draft EIS from Joint Planning Committee

We have appreciated the efforts made by the Joint Planning Committee in the development of project guidelines, evaluation of land use alternatives and analysis of the Draft EIS and community benefits package. For your information, we have enclosed a copy of our response to comments on the Draft EIS made by the Joint Planning Committee.

B. Assessment of Impacts Beyond the Project Area

The Draft EIS is required to contain an analysis of the project in the context of its environmental setting. For the primary study area, we have focused on the surrounding lands of Sunset Beach and Pupukea Highlands. A secondary study area, consisting of the North Shore and Koolauloa Development Plan areas, was also considered in the evaluation of many environmental factors. Traffic impact analysis, for example, included island-wide traffic as well as local traffic. The traffic analysis also included traffic which will be generated by known projects under construction or those currently involved in the regulatory review process. The assessment of existing traffic problems and the impact of this project were considered for both the immediate area and the region. In addition, the analyses of potential impacts to water supply, population, housing, and educational facilities due to the project also consider the development of the larger region, and not just the primary study area.

C. Discussion of Cumulative and Secondary Impacts

As far as we have seen, there are no proposed projects on the North Shore which are similar to Lihi Lani. As stated in the above response, the Draft EIS

considers the potential cumulative impacts of the project on ocean water quality, land use character, traffic, potable water, air quality, noise, socio-economics (population, housing and employment) and visual resources. The impacts on traffic conditions, for example, does include the projected traffic generated by Kuilima Resort, as well as several other known future projects. Bishop Estate's plans for Kawailoa are presently in a preliminary form which will be reconsidered again in the near future. Their latest conceptual plan will not be moved forward in the foreseeable future, and therefore it was not addressed in this analysis. The Mokuleia Land Company's plans for golf course development are somewhat remote from our site in Paumalu and Pupukea. Traffic involved with their potential project will not affect the same roadway system as the traffic generated by Lihi Lani, except possibly at Weed Junction.

As far as potential impacts on the lifestyle of rural Oahu residents, the Draft EIS does make mention of the possible change in certain individuals perception of their lifestyle which the project might contribute to. Some individuals feel strongly that the project will be a significant improvement to the area. Many people look forward to the new access being provided to the land for hiking and horse riding. Affordable housing is also appealing to many who have reviewed our most recent plans. On the other side, some people feel that any type of development on this land will degrade their lifestyle. We have always viewed the project as a recreational community, which will serve to enhance recreational opportunities on the North Shore while maintaining a low density, country type of environment.

Secondary impact such as growth inducement was also covered as a potential impact of the project. A project which introduces new public infrastructure capacity (roads, sewers, water lines, etc.) to an area with developable land could induce growth. However, Lihi Lani will be quite self-contained, with its own irrigation water supply and wastewater treatment and disposal. The only required off-site improvements will be an extension to the water supply system in Pupukea Highlands. There is no growth inducement expected caused by the project.

D. Presentation of Responsible Opposing Views

In the planning phase leading up to Obayashi creating its latest master plan for Lihi Lani, the Joint Planning Committee and the community at large were given the opportunity to comment on and contribute to the ideas being put forward. It is clearly stated in the Draft EIS that Obayashi decided to move ahead with their planning utilizing the results of the public process, yet without community consensus being achieved in the selection of a mix of land uses for the site. This is possibly the most controversial issue involved, and yet the current master plan has land use elements which are desired by many community members. We have attempted to provide a brief history in the main text of the Draft EIS, however, the report by Community Resources,

Inc. included as Appendix S addresses a wide range of positions voiced in interviews with community representatives. This level of research and disclosure is not a requirement for inclusion in the Draft EIS. Nevertheless, we presented several opposing views on the project. It would be impossible to report and discuss the position of every group or person.

In terms of the specific impacts of the project, we have attempted to be responsive to the concerns of the community in the presentation of existing conditions, anticipated impacts and plans for mitigation which are discussed in the Draft EIS. The thoroughness in which these issues are evaluated and the effort placed on reducing potential impacts to a minimum clearly demonstrates the attention Obayashi has given to controversial points raised as issues and concerns with project over the last three years. We will continue to pay close attention to the community's concerns about specific potential impacts.

E. Discussion of Reasonable Alternatives

The Draft EIS is quite explicit in evaluating three scenarios which would be allowed under current zoning for the property, including no action, intensive agricultural use and agricultural subdivision use. The agricultural subdivision would actually create 350 single family lots for development, and could be considered as a purely residential project. Any project which would create more than 350 units would be met with some strong resistance from the community. As for affordable prices, Obayashi could not create an entirely affordable project without it being subsidized from another source of income such as market housing or golf course revenues. Aquaculture was not considered because of the difficulties seen at existing aquaculture operations, and due to the lack of flat land necessary for an economically feasible operation.

F. Affordable Housing Versus Market Housing

Obayashi is addressing the concern for affordable housing in this area by providing a 40/60 market to affordable ratio in their plans. This decision is by no means an afterthought. Obayashi has faced the affordable housing question for the last three years, and originally intended to participate in the government's funding pool for affordable housing, or build the housing at an off-site location. Many people in the community have stated their interest in having affordable housing on the site. After a thorough search of available lands on the North Shore, Obayashi determined that the most feasible approach to follow for the present would be to propose constructing 180 affordable housing units following the 40/60 market to affordable ratio.

We recognize that there is an overwhelming existing demand for reasonably priced lots and/or homes on the North Shore and Oahu as a whole, and our 180 units of housing will potentially serve some within this group. Since the

project now has a total of 300 housing units, we feel that a larger residential project at higher density would not be in keeping with the country character of the North Shore, nor would it be acceptable to the community.

G. Golf Course Chemicals and Runoff

A very extensive effort was given to the scientific analysis of potential impacts to the environment from runoff containing golf course chemicals, and this analysis process is still underway. Technical reports prepared to date by Murdoch and Green, Dugan and Marine Research Consultants all specifically addressed the expected golf course chemicals which could leave the site and enter the intermittent streams and potentially enter the ocean.

We are not aware of any findings by the State Department of Health with regard to golf course fertilizers in storm runoff causing ciguatera poisoning of fish. In fact, the State DOH study to which you refer finds no connection between fertilizer runoff and ciguatera (see enclosed report). We believe that your source (The Honolulu Advertiser article by Bruce Dunford) misquoted Deputy Director of Health Bruce Anderson, Ph.D. We invite you to call Dr. Anderson regarding this matter at 541-4135.

Dr. Yoshitsugi Hokama at the University of Hawaii School of Medicine has conducted extensive research about ciguatera in Hawaii, and believes the algal blooms could be caused by urban sewage, runoff and sedimentation. There is still much to be learned about the causes of the algal blooms, and the measures to be taken to prevent creating more toxic algae contamination of coastal fish. Golf courses have not been shown to have any link to the ciguatera problem.

To our knowledge, all studies completed to date in Hawaii have shown that golf courses do not lead to substantial fertilizer nutrient enrichment of coastal waters to an extent where negative impacts could result. (See enclosed article from "Sea Grant Newsletter").

Lihi Lani will decrease sedimentation to the ocean as a result of erosion controls on the property. Wastewater will be treated on-site through oxidation ponds and polishing marshes to eliminate much of the nitrogen. Effluent will be diluted and carefully used for turf irrigation which will naturally remove most of the nitrogen in the wastewater. Runoff from the golf course will contain very little nitrogen because of the use of slow-release fertilizers, and routing of runoff through grassy swales to encourage further nitrogen uptake.

The studies cited above also considered the potential movement of pesticides from the golf course to surface runoff. Pesticides will be used in carefully controlled amounts on the golf course, and possibly on some of the residential lots. An Integrated Pest Management (IPM) program will be

implemented at the golf course and common areas of the project to ensure that chemicals will be used with extreme care along with biological and other management controls. It is likely that pesticides use will be extremely low due to the innovative turf types and landscaping technology that will be applied for this project. In addition, Obayashi is investigating using a lining technique which will trap leached chemicals at potential high application areas such as tees and greens, further minimizing potential contributions to the groundwater and the ocean. The consultants who studied the potential for pesticide impacts in the ocean found no evidence that lead them to believe that pesticides will accumulate in fish living off this coast. For this reason, bioaccumulation was not presented as a potential impact, nor has it been shown to result at other locations where golf courses have existed directly on the coast for many years.

Ocean mixing is the prime reason that the water quality on the North Shore is very high, and mixing is occurring constantly, even during very small surf conditions. Although nitrate from residential cesspools has been detected in the shorebreak zone, these concentrations were measured during the worst-case scenario of absolutely no surf and light winds. Cesspool nitrate contributions are probably not detectable in these waters under anything more the completely flat surf conditions. Cesspool nitrate was not detected in samples taken outside the shorebreak area, showing its rapid dilution and utilization in the nearshore area in flat conditions. The presence of this nutrient subsidy to nearshore waters has apparently not caused changes to the coastal water quality and coastal reef ecology at Sunset Beach. A subsidy of ten times the current cesspool nutrient load would probably be required to cause a noticeable effect on water quality and reef communities.

Even during the seasonal low surf period, mixing is constantly occurring on this open ocean coastline from normal wind-driven currents, and small background swells and trade wind chop breaking on the beach. Residence time for waters along the coast at Sunset Beach is very short – not anything like Pearl Harbor or Kawela Bay or even Kaneohe Bay. In addition, nutrients are constantly being added to the coastal waters off Sunset Beach from natural groundwater discharges with no apparent deleterious effect on marine water quality or the coastal reef ecology. These naturally introduced nutrients are mixed to background levels and do not reside at concentrations which could cause algal blooms. For the same reasons, normal ocean mixing will reduce concentrations of any potential small amounts of nutrients introduced as a result of the use of fertilizers on the golf course at Lihi Lani.

Periodic stream and ocean water monitoring will be continued during the pre-construction phase as well as during construction and operation of the golf course, to assess whether the golf course is causing changes in chemical concentrations in coastal ocean water. Should a contaminant be identified which is linked to the new development, actions will be taken by Obayashi to eliminate the source of the problem. In such an instance, the State

Department of Health would be involved in reviewing monitoring results and plans to mitigate the problem.

H Quantitative Impact of Chemicals on Groundwater

The study of potential chemical contributions to groundwater at Lihi Lani has begun with the analysis presented by Murdoch and Green, and Mink. Their findings indicate that some chemicals from the golf course may leach into groundwater, but in concentrations which pose no risk to human health. Even though these experts have taken this position, we are currently investigating a much more rigorous groundwater modeling effort to assess this potential impact. It is our belief that the parameters which have previously been discussed qualitatively as factors which diminish the potential for harmful chemical concentrations developing will be validated by the analytical model results.

I Wind Drift of Pesticides Applications

Wind drift of pesticides from application equipment presents a potential risk to people located directly downdrift. Because of the high wind conditions experiences at the site, it is expected that spray hoods will be used for applications during any significant wind conditions. The spray hood essentially encloses the application area, allowing for virtually no drift of chemicals being applied. The spray hood also allows for a more effective application and less waste. Although there will be some residents in Pupukea which are located downdrift of the golf course (the closest being 4,500 feet away in Sunset Hills), they will not be affected by drifting chemicals.

Obayashi does not want to contaminate its neighbors through pesticides in air drift. We will do all that is realistically possible to insure that no chemicals will leave our lands.

J Pesticides and Health Risk

Our project will be staffed by individuals who will be extensively trained in the proper use of chemicals. Chemical use will be carefully controlled and minimized to the greatest extent possible through the IPM program, which has been a proven method for reducing pesticides use in agriculture and on golf courses. You should also understand that the chemicals being proposed for use on this golf course are less toxic than some chemicals available for domestic use.

Experts in this field have stated that Lihi Lani will not contaminate the drinking water aquifer. We do not have any evidence of golf courses causing contamination of underlying aquifers with pesticides from Hawaii or elsewhere in the United States. Our research proved otherwise. A Cape Cod, Massachusetts study by Cohen showed no groundwater contamination from

golf course pesticides (and no IPM program) with only 10 to 20 feet of leaching zone depth to groundwater.

K. No Use of Pesticides and Fertilizers

There are many measures which can be taken to minimize the use of fertilizers and pesticides on a golf course. The Lihi Lani golf course will not be operated without chemicals, however, the sensitive management of the golf course will serve to minimize chemical use and follow prudent application methods to nearly eliminate chemical loss to air, runoff water and groundwater. We will continue to investigate techniques which will allow this golf course to be maintained at a high level of quality without use of toxic chemicals.

L. Wastewater Treatment Facilities

The wastewater facility planned for Lihi Lani will employ an extremely simple and effective technique through an oxidation pond and polishing marsh system. The system is being designed by Dr. Robert Gearheart of Arcata, California, who has extensive experience in this type of environmentally-sensitive treatment process. In brief, the wetland treatment marsh will be planted with a hardstem bulrush found commonly on Oahu. The plant can be found locally at the marsh in Haleiwa, in Waimea stream and other wetland sites on the North Shore of Oahu. These plants pump oxygen into the water via their stems and tubers. They also serve as attachment sites for microorganisms that transform and degrade certain compounds in wastewater, improving its quality as a reclaimed effluent. These compounds include BOD, suspended solids, nitrogen, phosphorus, fecal and total coliform, and others.

Not only will the wastewater be effectively processed to better than the required secondary treatment levels, the system will create an artificial habitat which will introduce new wildlife habitat to the site. These constructed wetlands will be approximately 1.5 to 2.0 feet deep with four to five feet of free board. If necessary, the wetland could be flooded on a temporary basis, to store reclaimed wastewater.

Mainland examples of people living near oxidation ponds are available and indicate that the proximities proposed by the Lihi Lani master plan will not pose an odor problem to existing or future residents. This type of system does not present odor problems due to the presence of an oxygenated layer of surface water which inhibits the odoriferous gases from being released into the atmosphere. The distance from the effluent treatment facility to the closest residences in Pupukea Highlands is approximately 4,500 feet, which will also minimize the potential for residents being affected by any odors from the treatment facility. All the future residents at Lihi Lani will be located much closer to the treatment facilities than residents in Pupukea

Highlands. These people living at Lihi Lani will be acutely interested in keeping this facility from creating any odor problem. Their Homeowner Association will pay close attention to controlling any nuisance odors of the system.

One of the keys to minimizing odors is the area of pond per unit of raw waste. At BOD loading between 60 and 80 mg/l, a pond system composed of three cells will give the operational flexibility to control odors. The first of the three ponds are designed to be deeper at the effluent end (8 to 10 feet) to allow for solids storage and digestion. The three pond system will be plumbed to allow for raw introduction to the second and third pump as an immediate response to any potential overloading and potential odors in the first cell. Odor abatement measures which may be incorporated in the facility include air scrubbing systems and chemical inhibitors at the pump stations and aeration devices and recirculation of effluent for the ponds.

Failure of some municipal wastewater treatment facilities on Oahu and elsewhere in the State has been publicized extensively. The State Department of Health will require back-up measures included in the design of the wastewater handling and treatment system at Lihi Lani. This treatment facility will be privately operated. The system will be much less mechanized than a traditional sewage treatment facility, which could reduce the potential for a failure. Back-up measures include the provision of additional storage capacity in the treatment for up to 30 days retention of treated wastewater during a high precipitation period. Back-up pumps and generators will be required in the system, as well as duplicate facilities for collection lines and lift stations. The system will be carefully designed considering the possibility of system failure.

M. Construction Effects

Construction of the project represents the greatest potential for noticeable impacts you mentioned in your comments, such as dust, noise, water pollution, heavy truck traffic and wildlife disruption. Obayashi intends to mitigate these potential construction impacts to the fullest extent that is reasonable and practical, as outlined in the Draft EIS. This is not doubletalk, it is the preliminary statement about the measures to be implemented. Because the project is in a very preliminary stage, we do not have the engineering information to provide more specific plans at this time. These plans must be created later in the process when plans become more definitive. Obayashi must follow through with the mitigative measures they have proposed or be stopped by government construction inspectors in the middle of construction activity. We have briefly summarized mitigation efforts for each of your concerns below.

Dust: Regular and thorough watering of construction roadways will essentially eliminate dust generation. This measure is required by government and we will comply with this requirement.

Noise: Noises will be noticeable from some construction activities at some adjacent locations. There are strict noise regulations which cannot be violated, therefore, we will comply with these requirements.

Water Quality: Construction impacts on water quality concern mainly erosion of sediments from the site. Before Obayashi can build anything on this site, they must get an Erosion Control Plan approved by the City and County Department of Public Works. This plan cannot be designed until the project planning proceeds further into design. At this preliminary stage, Obayashi can only state that they will comply with the requirement to obtain an approved Erosion Control Plan. Measures that will be implemented in this plan are soil stockpiling, diversion ditches, desilting basins (detention ponds), temporary ground cover, etc.

Heavy Truck Traffic: Trucks will use local roadways during off-peak hours, and efforts will be made to minimize the total number of truck trips required. The presence of large trucks on Kamehameha Highway will be a temporary inconvenience, mostly during the road building period of two weeks per phase. The State Department of Transportation and the local community association representatives will be consulted in the planning for mitigating construction truck traffic. At this point, construction planning is several years ahead, the information needed to create more specific plans is not yet available.

Wildlife Disruption: Wildlife utilizing the site as habitat will inevitably be disrupted by construction activities. The plans developed by Obayashi for this site incorporate substantial undisturbed open space areas (approximately 559 acres) in sloped areas, gulches, areas between development areas and inaccessible corners of the site. These open areas will provide suitable habitat for many species utilizing the land as their home. Our wildlife consultant has not identified any threatened or endangered species existing on this site. The extensive landscaping program and establishment of new wetland habitat are two other ways that Obayashi will mitigate this potential impact.

N. Potable Water Impacts

For the project area, there is no knowledge of serious potable water shortages. Potable water supply to the BWS Pupukea Highlands from the Haleiwa and Waialua well field has not experienced water supply problems in recent times. New water mains have been extended recently in Pupukea Highlands to provide additional fire protection supply and fire hydrants. The BWS Sunset Beach system has historically experienced some supply problems due to the limited transmission capacity of the small six-inch diameter water

main serving this zone. In the Draft EIS, there is discussion about the projected sustainable yield of the Waialua aquifer, and how Lihi Lani's demand on this aquifer will affect the supply of water to residents of the North Shore. A report by Mink (1988) included as Appendix G in the Draft EIS discusses this concern.

The groundwater underneath the project site will be utilized at average rates which will be well within the sustainable yield of the supply aquifer, as reported in Mink (1990). The maximum sustainable yield for this aquifer used in the analysis has been calculated at 3.5 mgd, and confirmed with State estimates for this aquifer. Analysis of potential impacts of brackish water withdrawal by Lihi Lani for irrigation show only slight potential for increasing the salinity of the non-potable aquifer. The aquifer will not be adversely affected by periodic high withdrawal periods, which may occur during low precipitation periods. A prolonged (multi-month) withdrawal in excess of sustainable yield could cause an increase in brackish aquifer water salinity, however, the well and pump sizes proposed for Lihi Lani will not have the capacity draw this great a volume of irrigation water. The integrity of the caprock layer will not be violated because of strict well installation requirements placed by the State.

O. Conclusion

Lihi Lani is not a resort project -- it is a recreational community including a golf course and residential development. The target market group for the 120 country lots is generally Hawaii residents. Our experience with other residential communities of this quality indicates that there will be an exceptionally high demand for these lots in the Hawaii real estate market. We expect only a small percentage of the lots will be purchased by out-of-state residents. The affordable housing will be fully occupied by Oahu residents.

We appreciate your comments and invite you to meet with us in the near future to discuss your concerns. Our technical consultants are also available to answer specific questions that you have raised. Please feel free to call either me or Kari Kilstrom (523-5866) to arrange a meeting, or if you have any questions or concerns.

Sincerely,

GROUP 70 LIMITED

Kari Kilstrom for
Jeffrey H. Overton, AICP
Senior Planner

Attachments

INTERIM REPORT ON COASTAL WATER QUALITY
AND
CIGUATOXIN FISH SURVEY IN WEST HAWAII

DEPARTMENT OF HEALTH
Clean Water Branch
December 1990

Introduction

The number of human poisoning cases caused by ciguatera in Hawaii has grown since 1984. Department of Health (DOH) data from 1984 through 1988 indicated a population incident rate of 8.7 per 100,000. This figure is compared with the years 1975 through 1981 when only 3 incidents per 100,000 were recorded (Gallop & Pon). Recent data show some indication of levelling off, but the trend is unclear at this point. There were 36 incidents recorded between January 1989 and August 1990. This is nearly the same number of outbreaks recorded by the DOH in 1988. Among the statewide incidents last year, West Hawaii had the highest level with eleven incidents. The incident rate on the island of Hawaii has shown a consistent rise each year since 1984.

Ciguatoxins are produced by a dinoflagellate, Gambierdiscus toxicus, that attaches to the surface of red and brown macroalgae. Herbivorous fish, that feed on the algae, concentrate the toxins in gut and muscle tissues. Ciguatoxins accumulate through the food chain and are consequently found in larger carnivorous fish. Consumption of toxic reef fishes is responsible for ciguatera poisoning among humans. The symptoms of human intoxication are gastrointestinal and neurological and could be fatal.

A frequently raised question is whether natural conditions or pollution caused by human activities is responsible. Adverse impacts on water quality are known to cause biological responses to the benthic environment. Marine construction activity not only destroys coral, but alters water quality by contributing to suspended material, creating sediment traps and increasing available nutrients in the nearshore ecosystem. Coral destruction is known to create ideal habitat for host substrate, which in turn may cause the proliferation of resident population of G. toxicus, including other marine toxin-producing organisms. The phenomenon of sudden ciguatera outbreaks after certain environmental changes remains unanswered, however. ←

In attempts to elucidate ecological factors that may influence ciguatera outbreaks, Yasumoto et al. (1980) conducted water quality studies in the French Polynesia. Although nutrients and other growth factors were not identified with the abundance of G. toxicus population, Yasumoto suggested that further study of the cause should be focused on the benthic community. To date, no specific factors are identified with dinoflagellate blooms, in spite of frequent speculations associated with alterations of coral reef ecosystems. If predictable factors of ciguatera can be identified with water quality changes following environmental perturbations, such information and data will be of considerable value to regulatory agencies. Agencies responsible for shoreline

and coastal water protection will be able to set standards and make more effective management decisions affecting the marine environment. Of greater benefit to society will be the economic value and the prevention of human illness suffered by consumers of toxic fish. Regardless of the cause, there is serious concern among the local fishing community that widespread exposure to biotoxins in the coral reef environment is a growing problem in Hawaii.

Project Description

During 1989-90 the Department of Health conducted a survey on the coastal water chemistry in West Hawaii where incidents of ciguatera poisoning are the highest in the State. The purpose of the study were as follows: (1) To establish a water quality baseline of the nearshore reef environment, and (2) To assess the relative number of toxic fish in target areas. The latter coincides with an on-going marine toxin research conducted by Hokama, et al., at the University of Hawaii (UH). Water quality data provide a benchmark to compare changes due to natural variations or human activities. In addition, the data can identify physical, chemical, or biological changes that are useful indicators of pollution. This activity presented a first time opportunity for the Department of Health to conduct a toxic fish survey together with a study on water quality. It was not within the scope of this survey to expect to find immediate links between ciguatera and the measured parameters. However, the survey provided the initial groundwork for comprehensive monitoring of coral reef environments prone to have high risks for ciguatera outbreaks.

Water quality data were collected to determine if nutrients and other chemical parameters in nearshore waters influenced the growth of macroalgae and the occurrence of G. toxicus. Common host species of macroalgae and bottom substrate were collected and examined to determine population densities of G. toxicus. Reef fish were caught and tested to determine the relative number of toxic reef fish affected by ciguatoxin. The fishes were identified and ciguatoxin assayed in the laboratory by the Department of Pathology at the University of Hawaii School of Medicine.

Reef fish tested for ciguatoxin by a "stick test" method or stick-enzyme immunoassay was originally developed at the University of Hawaii (Hokama, et al, 1987). The technique used routinely by the UH laboratory for ciguatoxin screening was also used in the field on fish collected by the DOH for the survey. The test procedure is relatively simple and has proven to be a rapid method useful in the survey as a monitoring tool.

Survey Sites and Sampling Period. Six sampling sites were selected from an original eight candidate sites in West Hawaii. These included: Puako Reefs, Lahuipuaa (Mauna Lani), Waiulua Bay, Kiholo Bay, Kukio Bay and Kohanaiki. Field sampling began with Puako Reefs and Lahuipuaa in early December 1989 and continued at Waiulua Bay and Kiholo Bay in mid-January. Kukio Bay and Kohanaiki sites were completed in mid-February. A follow-up work for additional sampling of fish and algae occurred in late June 1990.

Methodology

Water Quality. In situ measurements on physico-chemical properties were done by the Hydrolab Surveyer II. These parameters included: pH, temperature, salinity, conductivity, dissolved oxygen and redox potential.

The Natural Energy Laboratory of Hawaii performed all water chemistry analyses on nutrients. The water quality parameters included: ortho-phosphate, total dissolved phosphorus, ammonia nitrogen, nitrate-nitrite nitrogen, total dissolved nitrogen and dissolved silicate. All analytical procedures for seawater were performed according to methods specified in Standard Methods of the 17th Edition.

Samples of near coastal waters were collected approximately 400 meters beyond the surf line. Sample collection included shoreline sites where groundwater sources contributed nutrients to nearshore waters. In addition to offshore waters, a brackish water pond at Mauna Lani Resort was also tested.

Biological Assessment. Qualitative assessments were made on assemblages of benthic macroalgae within the limits of the coral reef by divers using snorkeling gear. Visual observations of host algae distribution were noted, and representative samples were collected for later identification of G. toxicus. Samples of algae were kept in plastic bags filled with seawater and chilled in ice packs during storage. The samples were labelled according to the algal species, date and location. Included in the Appendix is a discussion on the assay procedure used in the cell counts.

Nearly all reef fish were caught by spear fishing and netting. Fish samples were grouped according to the same reef areas where water samples were collected. Each sample was identified, weighed and sized according to fork length and kept frozen in polyethylene bags until shipment to the UH Department of Pathology laboratory for ciguatoxin analysis. The stick-enzyme immunoassay was performed by the Department of Pathology, University of Hawaii at Manoa. The procedures of the test are given in the Appendix.

Results and Discussion

Available Nutrients. Inorganic nutrients in the water column directly affect phytoplankton productivity, including bloom forming dinoflagellates, e.g., sewage dumping causing red tide in Pearl Harbor. The immediate sources of nutrient responsible for stimulating or inhibiting algal growth are the soluble forms of ammonia, nitrite, nitrate and orthophosphate. The nearshore waters within the coral reef environment and the offshore coastal waters of West Hawaii are primarily nitrogen deficient. This means that nitrogen is the critical limiting factor to algal growth. The ratio between inorganic nitrogen and phosphorus in this case are approximately 11 to 1 for both inshore and offshore waters; the average N:P ratio in coastal waters is approximately 15 to 1.

The relative absence of marine macroalgae and G. toxicus in West Hawaii may be partially explained by the occurrence of growth-inhibiting factors

How many samples
← This distance is too far from shore to see anything

also in plank

← what are they?
groundwater high in N, P

(groundwater) or lack of growth-stimulating nutrients in the reef environment. Yasumoto found in laboratory cultures that light intensity and low salinity inhibited the growth of the dinoflagellate. While G. toxicus cannot be ruled out due to their unpredictable and variable growth patterns (Cooper, 1964), the search for other causative organisms should not be overlooked. In view of the apparent lack of host algae and G. toxicus during this survey, the question arises as to whether other marine organisms or toxin producing bacteria, in addition, may account for the relatively large number of toxic fish in the area. The seasonal variations of the coral reef ecology and year round monitoring of G. toxicus should be studied further.

Because of a very limited amount algal samples available at the time of collection, the work on G. toxicus was only cursory at best. The cell counts on population densities are briefly summarized in a separate section (See Appendix).

Nearshore Versus Offshore Water Quality. Nutrient levels in general were considerably higher and showed wider variations in nearshore than in offshore waters. Variations in water quality are site-specific due to effluxes of groundwater. As a result, the data for certain sampling stations are not comparable with ambient conditions. A compromise on the number of sampling stations was necessary in certain cases in order to selectively locate groundwater sources. The tradeoff allowed for better characterization of the shoreline impacts from groundwater sources. Although site-specific differences in water quality were observed, the reef flats are well mixed due to strong tidal and wave action. In contrast, water quality of embayments displayed broader spatial differences due to less mixing and flushing. (e.g., lagoon at the Hyatt Regency Hotel).

The most prominent nutrients in nearshore waters are dissolved silica and nitrate-nitrogen. With the exception of Kohanaiki, the large supply of nitrogen at other nearshore sites can be traced to groundwater. The scatter plots given in the Appendix show a remarkably close correlations between dissolved silica, conductivity and salinity. The statistical correlations strongly suggest nutrients originating from inland sources. Similar associations have been demonstrated by models used in studies on nearshore marine waters for West Hawaii (Dollar & Smith, 1988; Brock, 1990).

Table 1 is a summary on the levels of inshore and offshore water quality data collected during the survey. Exceptionally high levels of silica and inorganic nitrogen from groundwater are observed at Puako Reefs, Mauna Lani, Waiulua Bay and Kukio Bay. This characteristic was particularly noted at Waiulua Bay where large freshets of groundwater predominated at several areas within the embayment and lagoon waters. Unlike other survey sites, nutrient levels at Kohanaiki were the lowest.

Figures 1 and 2 show the distribution of mean values (95% C.L.) for nitrate-nitrite nitrogen and total dissolved phosphorus at each survey site. Inorganic phosphorus is a major component of phosphorus at most offshore sites. However, in the case with Puako Reefs and Mauna Lani the organic rather than inorganic form of phosphorus represents the larger fraction. The lack of association with groundwater components (silica, salinity or conductivity) suggests the organic phosphorus levels are related to phytoplankton and other

palegic sources. DOH monitoring data for Keahole Point also reflected similar patterns on offshore water quality.

Ciguatoxin Assay Results. Approximately 680 reef fishes were collected by Department of Health for testing by the University of Hawaii. The total consisted of 340 herbivores, 110 carnivores and 232 omnivores among 74 different species. A distribution of the number of fish species caught at each survey site is listed in the Appendix.

Nearly 50 percent of all the reef fishes collected for the survey were either positive or borderline. The carnivores in general yielded the highest rate of detection at 52.7 percent, followed closely by omnivores (48.7%) and herbivores (48.2%). A similar pattern is also shown among fishes that tested positive. Table 2 summarizes the results of the test using S-EIA method for toxin detection.

TABLE 2. S-EIA RESULTS ON TOXIN DETECTION

Number	Herbivore	Carnivore	Omnivore	Percent	Total
Total	340	110	232		682
Species	20	23	31		74
Positive	41	16	31	12.9	88
+/-	123	42	82	36.2	274
Negative	176	52	119	50.9	347
Pct. Pos.	12.1	14.5	13.4		
Pct. Suspect	48.2	52.7	48.7		

+/- (Borderline)

The fish with the most frequent occurrence of toxin were the Scarus spp. (Uhu). They recorded either positive (52.9%) or borderline (47.1%) in every case. The results may be more than a coincidence that the Scarus sp. are highly toxic. The Scaridae family (herbivores) are known for their distinct feeding habit of grazing heavily off corals. The origin of toxins, as suggested in the study on S. gibbus by Yasumoto et al. (1977), may be shown in the diet of the fish endemic to the area. A study on ciguatera at Midway Island by Wilson and Jokial (1986), using a stick test method developed by Hokama, have also found S. perspicillatus to be extremely toxic. Further examination should be carried out on the fish's diet and gut-contents of ciguatoxic and non-ciguatoxic fish.

The next highest rate was among species of Kuhlia sandvicensis (Aholehole) of which 65 percent of the fishes were either positive or suspected of contamination. Ctenochaetus strigosus (Kole) had 59 percent of fishes affected and followed by Acanthurus sandvicensis (Manini) at nearly 40 percent. One-half of Caranx melampygus (Papio) were tested borderline only and the remainder was negative.

TABLE 3. PERCENT DETECTION OF TOXIC FISH ACCORDING TO SPECIES

Species*	No. Samples	Percent		
		Positive	+/-	Negative
(Carnivores)				
<u>Kuhlia sandvicensis</u>	40	15	50	35
<u>Caranx melampygus</u>	16	0	50	50
<u>T. crumenophthalmus</u>	14	0	7.1	92.9
(Omnivores)				
<u>Neomyxus chaptalli</u>	60	28.3	55	16.7
<u>Mulloidichthys sp.</u>	32	0	43.8	56.2
<u>Mugil cephalus</u>	16	0	37.5	62.5
<u>Abudefduf abdominalis</u>	14	0	0	100
<u>Parupeneus multifasciatus</u>	7	0	0	100
(Herbivores)				
<u>Scarus sp.</u>	17	52.9	47.1	0
<u>Ctenochaetus strigosus</u>	59	22	37.3	40.7
<u>Acanthurus sandvicensis</u>	184	8.2	31.5	60.3
<u>Acanthurus achilles</u>	19	0	57.9	42.1
<u>Acanthurus nigroris</u>	11	0	0	100
<u>Naso unicornis</u>	8	0	0	100

* Seven or more samples.

Frequency distribution (probability) plots for the stick-enzyme immunoassay results are also included in the Appendix. With the exception of the results for Mauna Lani collected on December 7, 1989 and Waiulua Bay on June 27, 1990, the distribution of data is relatively symmetrical, indicating a statistically normal distribution. The distribution of data for the Mauna Lani A and Waiulua Bay B samples are skewed negatively (-0.747) and positively (0.759) for their respective locations. The upper, lower quartiles and median levels on the S-EIA results for each sampling site are plotted on the statistical summary charts (Figures 3 & 4). Fishes caught at Mauna Lani on June 27, 1990 recorded the highest median level at 1.67 S-EIA units. The ciguatoxin value is considered to be a borderline level. The same test results for Mauna Lani also show that nearly one-half of the reef fish population were suspected of toxin contamination (between 1.25 and 2.0 S-EIA units). S-EIA units at 2.0 and above are considered positive. The highest individual measurement of 3.0 units was recorded on a Black Damsel fish (Chromis verator) caught at Waiulua Bay. Reef fishes at Konhanaiki and Kukio Bay recorded the lowest median value (0.83 S-EIA units).

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(Attachment to Ramos-Saunders Response)

A P P E N D I X

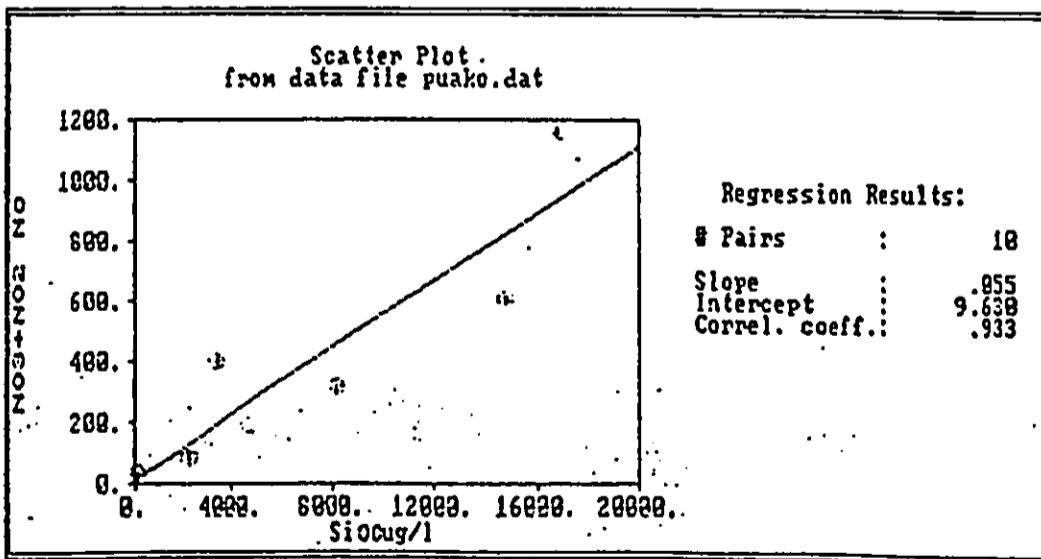
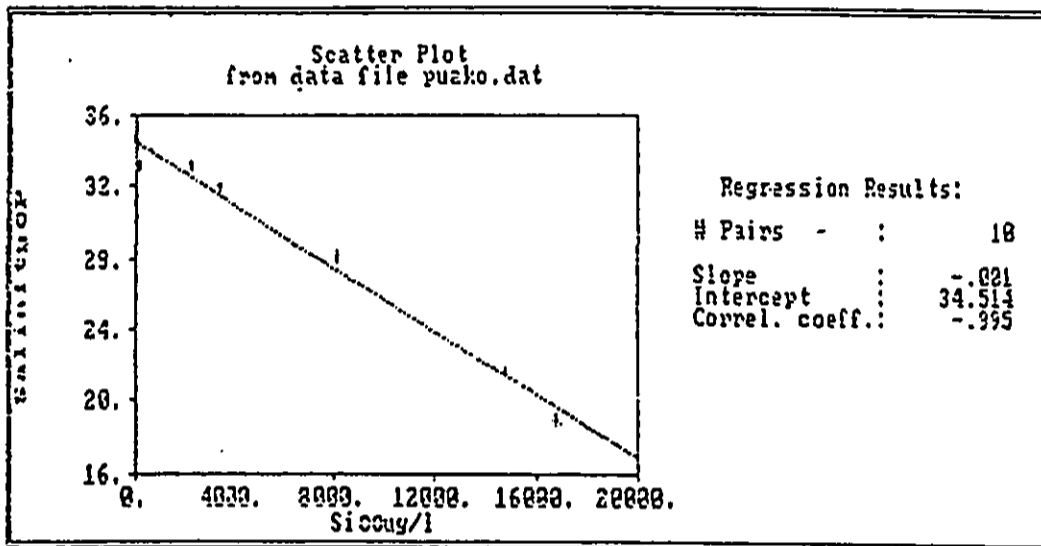
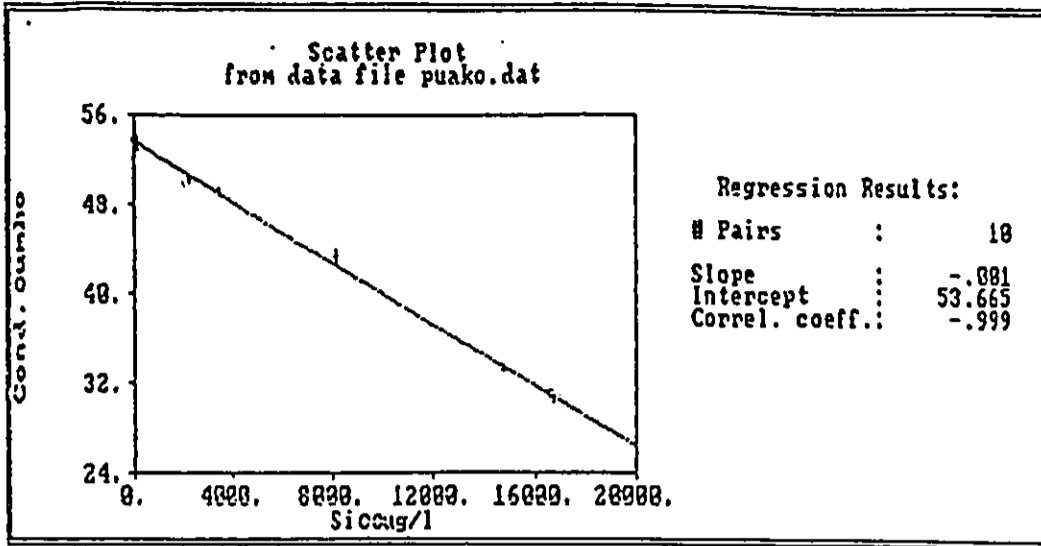
(Attachment to Ramos-Saunders Response)

TABLE 1
WEST HAWAII WATER QUALITY DATA SUMMARY

Location	Salinity (ppt)	NO3+NO2* (ug M/L)	O-PO4* (ug P/L)	NH3* (ug M/L)	Si* (ug Si/L)	TON* (ug N/L)	TDP* (ug P/L)	Temp (deg C)	Cond (umho/cm)	DO (mg/L)	pH	ORP* (mV)
INSHORE												
Mauna Lani	34.2	66.0	13.4	3.2	1395.4	134.7	25.4	25.2	50.5	7.2	8.1	0.101
Puako Reefs	26.4	364.5	31.4	4.4	6830.9	470.5	42.2	27.1	41.0	8.1	8.2	0.153
Kiholo	26.6	200.8	21.6	2.9	6391.2	247.5	33.8	22.7	42.0	7.6	8.0	0.173
Waipulua Bay	30.1	107.6	16.3	1.0	2173.1	205.5	35.5	24.2	53.5	6.4	8.1	0.197
Kukio Bay	30.1	71.9	10.4	1.9	1245.8	212.0	28.3	24.5	45.6	7.9	8.0	0.124
Kohanaiki	32.3	9.9	9.8	2.0	195.7	61.7	21.1	25.0	49.4	7.8	8.1	0.142
Maximum	34.2	364.5	31.4	4.4	6830.9	470.5	42.2	27.1	53.5	8.1	8.2	0.197
Minimum	26.4	9.9	9.8	1.0	195.7	61.7	21.1	22.7	41.0	6.4	8.0	0.101
Mean	30.0	136.8	17.2	2.6	3038.7	222.0	31.1	24.8	47.0	7.5	8.1	0.148
OFFSHORE												
Mauna Lani	34.3	3.2	6.5	1.2	62.6	54.0	85.2	25.6	53.5	6.5	8.1	0.133
Puako Reefs	34.2	6.7	5.7	3.3	51.4	69.5	81.9	25.8	53.5	6.4	8.1	0.226
Kiholo	34.3	7.8	8.6	0.9	228.4	36.6	18.0	24.0	53.4	6.5	8.1	0.180
Waipulua Bay	34.6	7.5	8.4	0.4	235.4	43.4	19.6	24.3	53.5	6.6	8.1	0.200
Kukio Bay	32.6	7.7	10.1	1.4	93.1	52.8	24.9	24.3	48.8	6.6	8.1	0.153
Kohanaiki	32.7	7.5	10.0	0.7	104.1	51.5	22.1	24.5	49.9	6.8	8.2	0.152
Maximum	34.6	7.8	10.1	3.3	235.4	69.5	85.2	25.8	53.5	6.8	8.2	0.226
Minimum	32.6	3.2	5.7	0.4	51.4	36.6	18.0	24.0	48.8	6.4	8.1	0.133
Mean	33.8	6.7	8.2	1.3	129.2	51.3	42.0	24.8	52.1	6.6	8.1	0.174

* = Log Mean

(Attachment to Ramos-Saunders Response)



(Attachment to Ramos-Saunders Response)

Fig. 1. 95% Confidence Limits for Mean (Log) Values of Nitrate-Nitrite Nitrogen

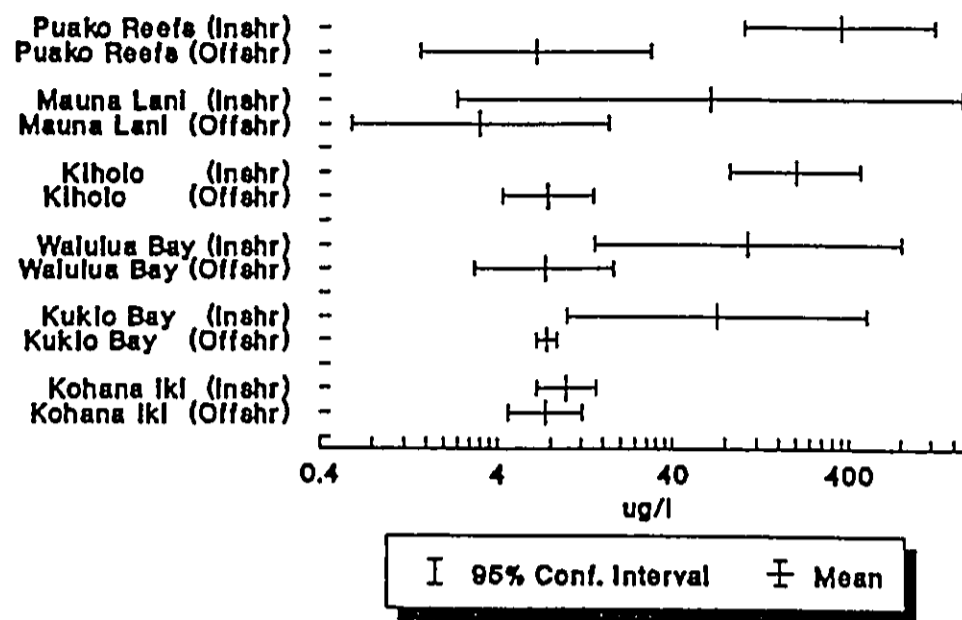
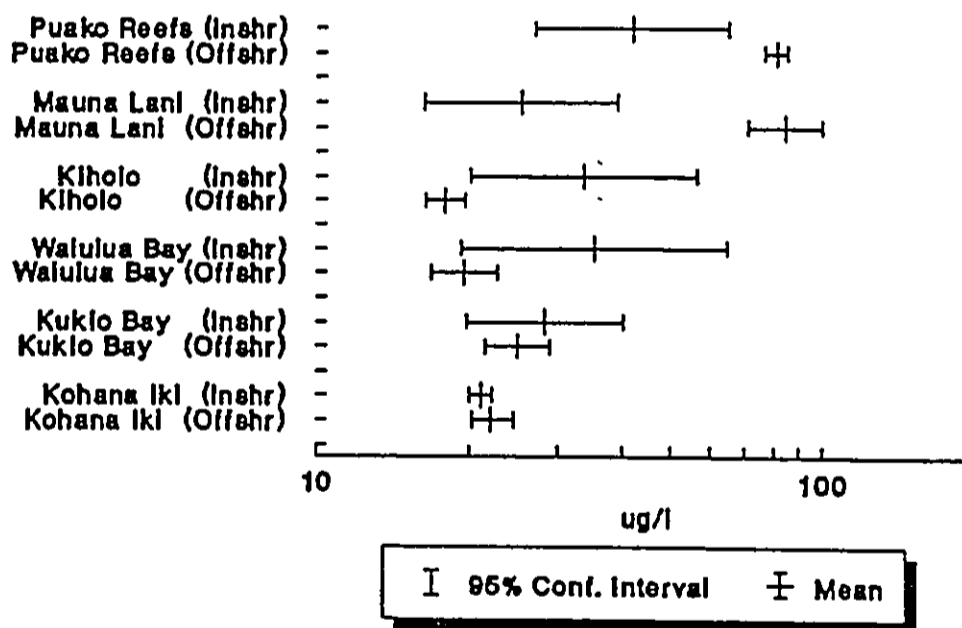


Fig. 2. 95% Confidence Limits for Mean (Log) Values of Total Dissolved Phosphorus



(Attachment to Ramos-Saunders Response)

Fig. 3. Statistical Summary

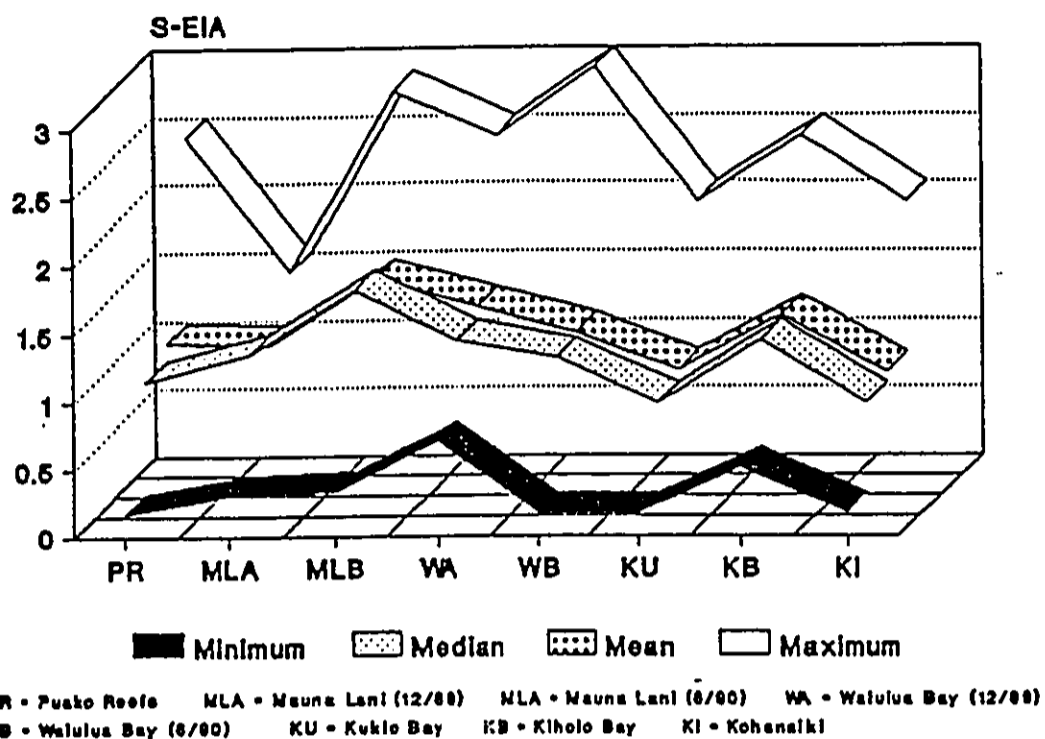
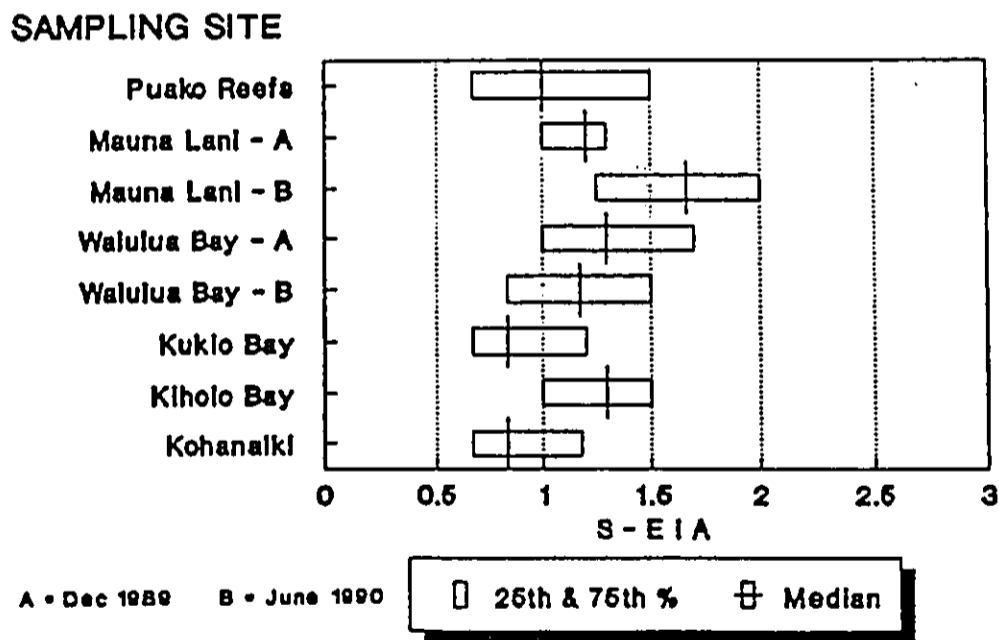
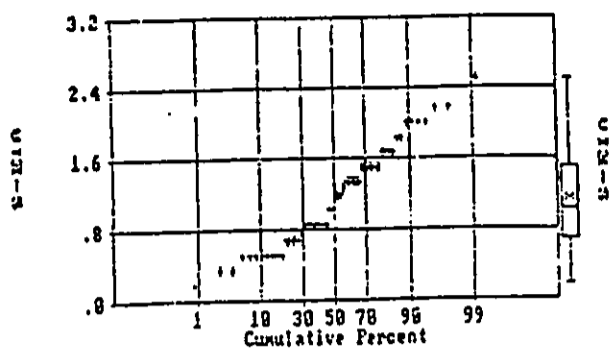


Fig. 4. Ciguatera Stick Enzyme Immunoassay Lower-Upper Quartiles and Median Values

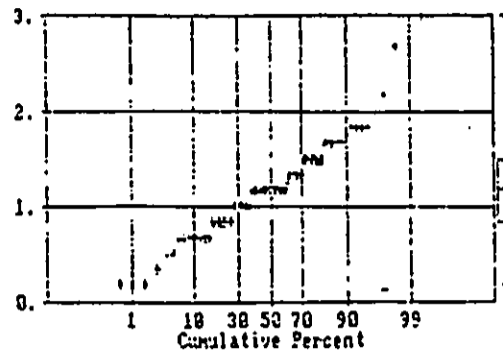


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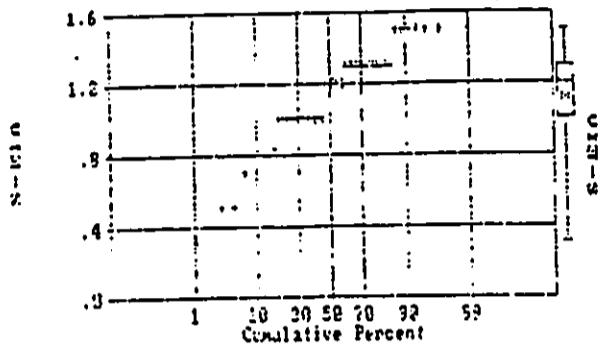
PROBABILITY PLOTS FOR S-EIA



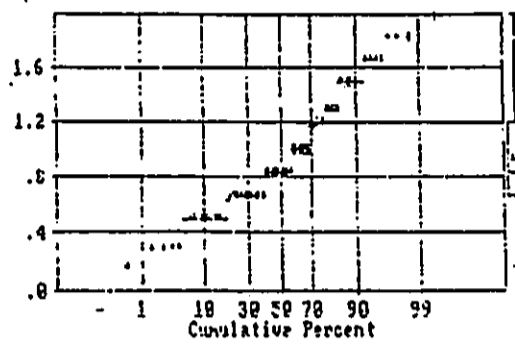
Puako Reef



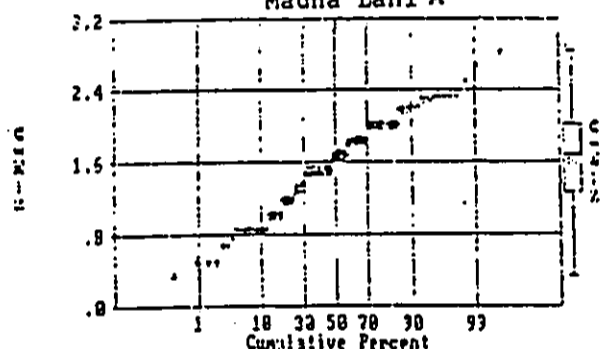
Waiulua Bay B



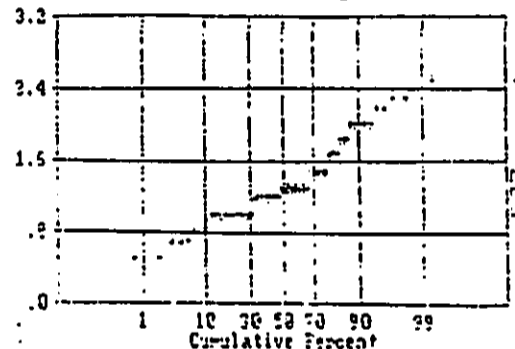
Mauna Lani A



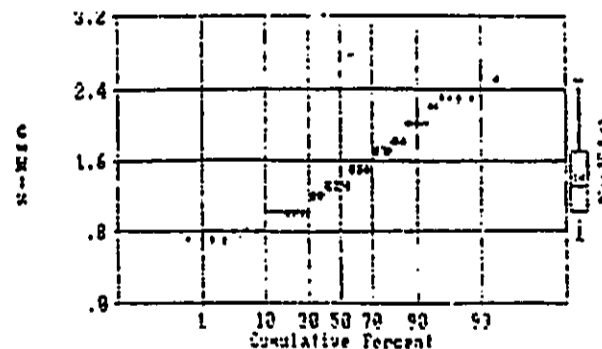
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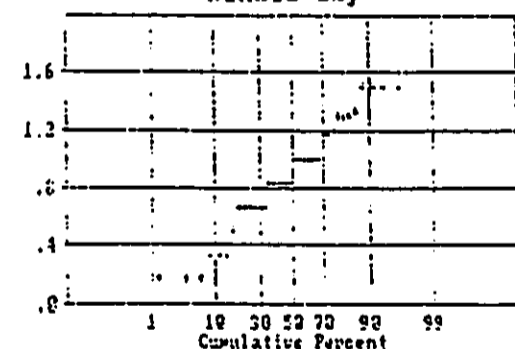
Mauna Lani B



Kiholo Bay



Waiulua Bay A



Kohanaiki

(Attachment to Ramos-Saunders Response)

SUMMARY OF MACROALGAL EXAMINATIONS FOR GAMBIERDISCUS TOXICUS

LOCATION	STATION	SPECIES	No. Cells/100 gm
1. Puako Bay	17	<i>Sphacelaria furcigera</i>	2
2. Mauna Lani	3	<i>Spyridia filamentosa/coral</i>	0
3. Mauna Lani	3	Sand	0
4. Mauna Lani	3	<i>Spyridia filamentosa/coral</i>	0
5. Hyatt Waikoloa	10	<i>Ulva fasciata</i>	16.9
6. Hyatt Waikoloa	3	<i>Cladophora fascicularis</i>	9.4
7. Hyatt Waikoloa	11	<i>Acanthophora spicifera</i>	11.7
8. Hyatt Waikoloa	5	<i>Acanthophora spicifera</i>	0
9. Hyatt Waikoloa	13	<i>Ulva fasciata</i>	0
10. Hyatt Waikoloa	3	<i>Acanthophora spicifera</i>	8.5
11. Kihole Bay	1	<i>Sargassum sp.</i>	0
12. Kukio Bay	9	<i>Turbinaria ornata</i>	0
13. Kukio Bay	9	<i>Amansia glomerata</i>	0
14. Kohana Iki	9	<i>Amansia glomerata</i>	0
15. Kohana Iki	9	<i>Ulva fasciata</i>	0
16. Kohana Iki	9	<i>Annfeltia concinna</i>	0

(Attachment to Ramos-Saunders Response)

CONCLUSION

Gambierdiscus cells proved to be extremely difficult to locate and identify during the three survey trips to Kona. Several factors may have been responsible for this:

1. Scarcity of macroalgae.
2. Misidentification of cells.
3. *G. toxicus* inhabiting other substrates.
4. Seasonal/weather factors affecting counts.

Scarcity of Macroalgae

Very little algae was found on five of the six sampling sites; the exception being the Hyatt Waikoloa Hotel lagoon area. Almost no algae was found below the low water mark along the shores of the survey areas. Diving on the reef flats also proved unsuccessful. High surf and strong currents prevented investigators from diving in water of greater than 20-foot depths. Finding algae in deeper waters may not be possible, in any event, because the lack of sunlight at these depths would inhibit their growth.

The lack of algae may be due to seasonal factors or over-grazing by reef fish. Another factor could be the absence of nutrients required by the algae and *G. toxicus* for growth.

The abundance of *Ulva* spp. at the Hyatt Lagoon may be due to soil runoff from the landscaped surroundings and lack of reef fish to check the growth of algae.

Misidentification of Cells

Very few cells of any type were found by microscopic examination--mainly plant (algal) cells dislodged during the assay procedure. The *G. toxicus* cells counted could have mistakenly been plant cells. More experience in identification of the dinoflagellate cells is needed.

With only one cell per sample found in approximately one ml of the filtrate, the results are statistically and scientifically unreliable. A larger number of samples with a greater population of cells would be needed for a more meaningful evaluation.

(Attachment to Ramos-Saunders Response)

G. toxicus Inhabiting Other Substrates

Current literature has stated that G. toxicus are epiphytic on certain macroalgae. But with the lack of algae at almost all the sampling sites, this information could not be verified.

Dr. Isabella Abbott of the University of Hawaii's Botany Department seems to think that the dinoflagellate would settle on any available substrate--not just specific algae. Only two samples of coral and one of sand were assayed, with negative results. This theory has yet to be sufficiently tested.

Seasonal/Weather Factors Affecting Counts

The absence of macroalgae could have been due to seasonal or weather factors such as sunlight, water temperature, wave action, etc. These factors are also related to the viability of G. toxicus in certain environments. Some investigators have concluded that fresh water intrusion, intense sunlight, and high wave activity are detrimental to the dinoflagellate. Therefore, a delicate balance of depth, available substrate, wave action and other factors may be influencing the population of the cells.

(Attachment to Ramos-Saunders Response)

GAMBIERDISCUS TOXICUS ASSAY PROCEDURE

1. Gather 100-300 grams of substrate alga near base with least disturbance of filaments.
2. Deposit sample in ziplock bag with enough seawater to cover sample.
3. Weigh out specimen and place in wide-mouth plastic bottle containing 500 ml sea water.
4. Shake bottle vigorously for 1-2 minutes and pass through 250 micron and 37 micron mesh sieves.
5. Flush residue retained on 37 micron sieve with 20 ml sea water into 25 ml graduated cylinder. Fill to 25 ml mark with sea water.
6. Take 0.5 ml of suspension and transfer to a microscope slide and coverslip.
7. Count number of dinoflagellate cells and multiply by 25 to obtain the total number of cells in the original 25 ml. Repeat with another 0.5 ml of suspension. (Dilute if necessary.)
8. The total number of G. toxicus cells is divided by the weight of substrate algae to find the number of cells per 100 grams.

(Attachment to Ramos-Saunders Response)

PUAKO FISH DATA
 DEC. 6, 1989
 SPECIES & TOTAL

NO.	SPECIES	COMMON NAME	TOTAL
1	Abudefduf abdominalis	Mamo	11
10	Mulloidichthys sp.	Weke	10
11	Naso unicornis	Kala	8
4	Acanthurus sandvicensis	Manini	8
13	Neomysus chapmani	Uouoa	6
12	Naso literatus	Uma-uma-lei	4
7	Caranx melampygus	Papoi	3
3	Acanthurus nigroris	Maiko	3
17	Zebrasoma flavescens	Yellow tang	2
16	Scarus sp.	Uhu	1
15	Rhinecanthus rectangulus	Trigger	1
14	Parupeneus porphyreus	Kumu	1
9	Gymnothorax sp.	Eel	1
8	Cirrhitus pinnulatus	Po'o-pa'a	1
6	Canthigaster sp.	Puffer	1
5	Aprion virescens	Uku	1
2	Acanthurus achilles	Tang	1
TOTAL NO. FISH =			63
TOTAL NO. SPECIES =			17

MAUNALANI FISH DATA
 SPECIES & TOTAL
 DEC. 7, 1989

NO.	SPECIES	COMMON NAME	TOTAL
7	Kuhlia sandvicensis	Anolenole	9
11	Neomysus chapmani	Uouoa	7
9	Mulloidichthys sp.	Weke	7
3	Acanthurus sandvicensis	Manini	6
15	Thalassoma duperrey	Hinalea	3
13	Polydactylus sexfilis	Moi	3
4	Caranx melampygus	Papoi	3
14	Scarus sp.	Uhu	2
8	Mullus cephalus	Mullet	2
5	Ctenochaetus strigosus	Kole	2
2	Acanthurus nigroris	Maiko	2
12	Parupeneus multifasciatus	Moana	1
10	Naso literatus	Uma-uma-lei	1
6	Elops hawaiiensis	Awa awa	1
1	Abudefduf abdominalis	Mamo	1
TOTAL =			50
TOTAL NO. SPECIES =			15

(Attachment to Ramos-Saunders Response)

HYATT WAIKOLOA FISH DATA
SPECIES & TOTAL
JAN. 11, 1990

NO.	SPECIES	COMMON NAME	TOTAL
16	Neomyrus chaptalli	Uouoa	31
11	Kuhlia sandvicensis	Aholehole	19
3	Acanthurus achilles	Tang	9
2	Abudefduf sordidus	Kupipi	9
10	Ctenochaetus strigosus	Kole	4
6	Carangoides ferdau	Omlu	4
20	Scarus sp.	Uhu	3
8	Chaetodon ornatissimus	Butterfly	3
5	Acanthurus sandvicensis	Manini	3
15	Mulloidichthys sp.	Weke	2
14	Mugil cephalus	Mullet	2
7	Caranx melampygus	Papio	2
21	Thalassoma duperrey	Hinalea	1
19	Rhinecanthus rectangulus	Humu	1
18	Parupeneus porphyreus	Kumu	1
17	Parupeneus multifasciatus	Moana	1
13	Lutjanus fulvus	Toau	1
12	Kyphosus cinerescens	Eneue	1
9	Chellinus rhodochrous	Poou	1
4	Acanthurus nigrofasciatus	Naenae	1
1	Abudefduf abdominalis	Mamo	1
TOTAL =			100
TOTAL NO. SPECIES =			21

MAUNALANI FISH DATA
2ND SAMPLING
SPECIES & TOTAL
JUNE 27-28, 1990

NO.	SPECIES	COMMON NAME	TOTAL
12	Acanthurus sandvicensis	Manini	51
8	Ctenochaetus strigosus	Kole	35
18	Neomyrus chaptalli	Uouoa	25
17	Scarus sp.	Uhu	11
19	Zebrasoma flavescens	Yellow tang	5
4	Cephalopholis argus	Blue-spotted grouper	5
3	Malichthys niger	Black trigger	5
2	Acanthurus achilles	Tang	5
11	Abudefduf abdominalis	Mamo	3
9	Parupeneus porphyreus	Kumu	3
5	Kyphosus cinerescens	Eneue	3
14	Chaetodon ornatissimus	Ornate butterfly	2
6	Cirrhitus pinnulatus	Po'o pa'a	2
16	Zebrasoma veliferum	Sailfin tang	1
15	Chellinus sp.	poou	1
13	Zanclus cornutus	Moorish idol	1
10	Forcipiger flavissimus	Long-nose butterfly	1
7	Rhinecanthus rectangulus	Humu	1
1	Chaetodon quadrimaculatus	4-spotted butterfly	1
TOTAL =			161
TOTAL NO. SPECIES =			19

(Attachment to Ramos-Saunders Response)

KUKIO FISH DATA
SPECIES & TOTAL
FEB. 14, 1990

NO.	SPECIES	COMMON NAME	TOTAL
4	<i>Acanthurus sandvicensis</i>	Manini	37
15	<i>Neomyxus chaptalii</i>	Uouoa	16
8	<i>Caranx melampygus</i>	Papio	8
18	<i>Scarus dubius</i>	Brown uhu	6
16	<i>Parupeneus multifasciatus</i>	Moana	5
3	<i>Acanthurus nigroris</i>	Maiko	5
1	<i>Abudefduf sordidus</i>	Kuipi	3
17	<i>Rhinecanthus rectangulus</i>	Humu	2
13	<i>Mullolidichthys sp.</i>	Weke	2
12	<i>Kuhlia sandvicensis</i>	Aholehole	2
11	<i>Ctenochaetus strigosus</i>	Kole	2
10	<i>Cirrhitis pinnulatus</i>	Po'o-pa'a	2
9	<i>Chaetodon auriga</i>	Butterfly fish	2
7	<i>Arothron hispidus</i>	Balloon fish	2
2	<i>Acanthurus achilles</i>	Tang	2
21	<i>Zebrafisoma flavescens</i>	Butterflyfish	1
20	<i>Zanclus cornutus</i>	Angel fish	1
19	<i>Scarus perspicillatus</i>	Blue uhu	1
14	<i>Naso unicornis</i>	Kala	1
6	<i>Aphareus furcatus</i>	Wahanui	1
5	<i>Anampses cuvier</i>	Wrasse	1
TOTAL =			102
TOTAL NO. SPECIES =			21

KOHANA IKI FISH DATA
SPECIES & TOTAL
FEB. 15, 1990

NO.	SPECIES	COMMON NAME	TOTAL
9	<i>Ctenochaetus strigosus</i>	Kole	13
5	<i>Acanthurus sandvicensis</i>	Manini	10
3	<i>Acanthurus nigroris</i>	Maiko	4
13	<i>Parupeneus multifasciatus</i>	Moana	2
1	<i>Acanthurus achilles</i>	Tang	2
12	<i>Myripristis murdjan</i>	Menpachi	1
11	<i>Mullolidichthys sp.</i>	Weke	1
10	<i>Forcipiger longirostris</i>	Butterfly fish	1
8	<i>Cirrhitis pinnulatus</i>	Po'o-pa'a	1
7	<i>Aulostoma chinensis</i>	Yellow trimpet	1
6	<i>Arothron hispidus</i>	Balloon fish	1
4	<i>Acanthurus olivaceus</i>	Tang	1
2	<i>Acanthurus glaucopareus</i>	Tang	1
TOTAL =			39
TOTAL NO. SPECIES =			13

(Attachment to Ramos-Saunders Response)

KIHOLO FISH DATA
SPECIES & TOTAL
JAN. 10, 1990

NO.	SPECIES	COMMON NAME	TOTAL
3	Acanthurus sandvicensis	Manini	32
17	T. crumenophthalmus	Halalu	14
11	Naso unicornis	Kala	4
8	Kuhlia sandvicensis	Aholehole	4
1	Abudefduf sordidus	Kupipi	4
16	Stolephorus purpureus	Nehu	3
18	Thalassoma duperrey	Hinales	2
14	Sardinella marquesensis	Sardine	2
10	Mullotichthys sp.	Weke	2
2	Acanthurus achilles	Tang	2
15	Scarus sp.	Uhu	1
13	Rhinecanthus rectangulus	Humu	1
12	Parupeneus multifasciatus	Moana	1
9	Melichthys viqua	Pink-tail humu	1
7	Chaetodon auriga	Butterfly fish	1
6	Carp	Carp	1
5	Calotomus sp.	Brown uhu	1
4	Arothron sp.	Balloon fish	1
TOTAL =			77
TOTAL NO. SPECIES =			18

HYATT WAIKOLA FISH DATA
2ND SAMPLING
SPECIES & TOTAL
JUNE 7-8, 1990

NO.	SPECIES	COMMON NAME	TOTAL
9	Acanthurus sandvicensis	Manini	38
10	Mullus cephalus	Mullet	12
17	Mullotichthys sp.	Weke	9
16	Neomysis chaptali	Uouoa	9
1	Kuhlia sandvicensis	Aholehole	6
8	Abudefduf abdominalis	Mamo	3
7	Ctenochaetus strigosus	Kole	3
15	Naso unicornis	Kala	2
13	Thalassoma duperrey	Hinales	2
14	Scarus sp.	Uhu	1
12	Cirrhitus pinnulatus	Po'o-pa'a	1
11	Canthigaster sp.	Puffer	1
6	Cantherines sp.	File fish	1
5	Kyphosus cinerescens	Eneue	1
4	Chaetodon auriga	Butterfly fish	1
3	Chromis verator	Black damsel	1
TOTAL =			91
TOTAL NO. SPECIES =			16

(Attachment to Ramos-Saunders Response)

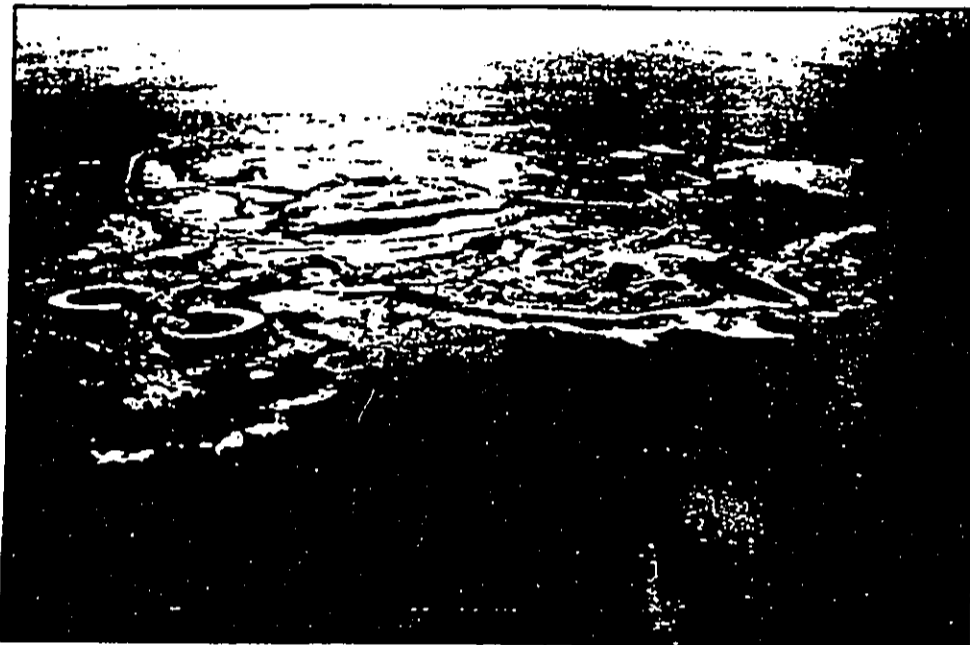
Impact of Golf Course Development Studied

by Justin J. Heard

Golf course development is on the rise throughout the state and pollution

the sea. As the groundwater moves to the sea, it passes beneath golf courses and other development projects.

Development creates the problem of



Waikoloa development on the Kona Coast of Hawaii

—Mike Lee photo

of nearby marine waters from golf courses has become a concern among the community.

The problem is of increasing interest in West Hawaii (Kona Coast of the Big Island) where a number of courses have been built or are proposed near the sea.

Recent and ongoing studies by Richard Brock, University of Hawaii Sea Grant Extension Service fisheries specialist, and assistant Alan Kam (with funding from the University of Hawaii Foundation) suggest that golf courses are not a major source of pollution to coastal waters.

Brock and Kam's studies focus on changes occurring in groundwater and coastal marine waters at Waikoloa on the Big Island because it has been the site of major resort and golf course development over the last 10 years.

Brock said the Waikoloa developments are situated on very porous lava containing groundwater originating from rainfall at high elevations, beginning miles from the coast and percolating to

waste disposal. There are various ways to dispose of sewage waste.

"It can be directly deposited into a cesspool where groundwater contamination is possible," Brock said. "Also it can be collected, treated and then pumped out through a pipe into the ocean, as done in most cases on Oahu."

Because of the arid nature of the Kona Coast, sewage generated by resorts at Waikoloa is treated, recycled and used to irrigate golf courses and surrounding resort shrubbery. Recycling cuts water use and takes advantage of inorganic nutrients in all sewage water. Concern has risen over the possible leaching of these sewage fertilizers into the groundwater and out to the ocean where they could stimulate plant growth (seaweeds or *limu* as well as microscopic phytoplankton) in the ocean.

"In high concentration, these fertilizers could have a negative impact on marine communities that exist in normally nutrient-poor nearshore waters," said Brock.

Brock sampled groundwater at

Waikoloa from wells situated inland of resort development, from natural brackish-water ponds (anchialine pools) located between the golf courses and the shoreline, and ocean water at varying distances offshore of development. Besides Waikoloa, water-quality sampling is carried out at other places both with and without any surrounding development.

Data for Waikoloa goes back to 1977 which precedes any golf course development, but since 1986 Brock has initiated a rigorous water-quality sampling program.

Water-quality samples are taken to determine inorganic nutrient concentrations (ammonia nitrogen, nitrate and nitrite nitrogen, and orthophosphate), salinity, and contents of oxygen, silicate, total organic carbon and chlorophyll-a as well as herbicides and pesticides in order to get a complete perspective.

The results of the program after the construction of the golf courses in Waikoloa have demonstrated a significant increase in the concentration of inorganic nutrients in the anchialine pools between the golf courses and the shoreline. However, there was no increase in inorganic nutrients from samples collected in wells inland of development, suggesting that golf courses are the source of these excess nutrients leaking down into the groundwater and to the anchialine pools where they were observed.

"Despite the high levels, the nutrient concentration in the anchialine pools at Waikoloa are within the range of nutrient concentrations found at similar pools on the Kona coast where there is no surrounding development," Brock said.

Brock and Kam conclude that on the Kona Coast, inorganic nutrient levels appear to be very variable in natural, undisturbed settings.

As high-nutrient groundwater moves through anchialine pools at Waikoloa to the sea, the concentration of nutrients decreases through both biological uptake (by surrounding vegetation) and dilution of intruding seawater. The dilution is rapid, resulting in no detectable nutrient elevation 100 yards offshore.

(Impact of Golf continued on page 5)

(Attachment to Ramos-Saunders Response)

Adding Ed. (Cont. from page 1)

visitors as they witness the complexity of marine life and its integration with Lanai's spectacular coral reef.

"The goal of the snorkel program is to have their experience be an educational one," Orcutt said. "They come back knowing that the yellow, striped and polka-dotted fish have names."

The Oceans Alive land tour of Lanai attempts to make tourists aware of the wildlife-conservation and management efforts on Lanai. Geological facts and Lanai's history are showcased during this part of the tour.

Until now, Hawaii's visitor industry has overlooked marine education as a form of ocean recreation. The UH Sea Grant Extension Service and Club Lanai hope that Oceans Alive will play an important part in offering visitors a new opportunity to learn about Hawaii's fascinating marine world.

(Editor's note: Annie Orcutt asked the Makai to give special recognition to students Heather Campbell and Tina Xavier for their participation as Marine Option Program interns for Oceans Alive during the summer of 1989.)

Full Speed Ahead for Hanauma Bay Project

On November 9, the State Board of Land and Natural Resources approved a conservation-district use permit for the Hanauma Bay Pilot Education Project. Since August, the UH Sea Grant Extension Service and the City and County of Honolulu Department of Parks and Recreation had been testing a 30-minute guided tour at the Bay for residents and visitors. The tour highlights the area's geological formation, native plants and animals, cultural importance and Hawaiian legends.

More than 2,300 people have taken the tour since the pilot project began. Response has been very positive, especially from residents who have rediscovered the Bay. In October, nearly half of the participants were either residents or students.

For more information on the tour and other educational programs, call Allen Tom, Roberta Sharp or Heather Campbell at 956-8191.

Impact of Golf (Continued from page 3)

Brock and Kam were unable to detect any herbicide or pesticide used by Waikoloa golf course maintenance personnel in any groundwater or coastal water samples. These results lead them to believe these products are not leaching into the water table at the amounts currently being used.

Brock and Kam have not observed any evidence of change in the marine communities fronting the golf courses at Waikoloa since the sampling program began. Groundwater entering the ocean from Waikoloa is expected to stimulate growth.

"If there is any biostimulation due to nutrient increases, we do not see it manifested in the algal (*limu*) community," Brock said. "Possibly because the numerous herbivorous fish (surgeonfish and parrotfish, etc.) offshore of the study area appear to be keeping all algae grazed down to mere stubble. Our sampling suggests that the nearshore marine communities are no different at Waikoloa than found elsewhere along the Kona Coast."

The aquatic communities found in the anchialine pools also appear to be safe from the effects of high nutrient concentrations. Under nutrient loading, the system is kept in balance by the abundant small red shrimp (*opae'ula*).

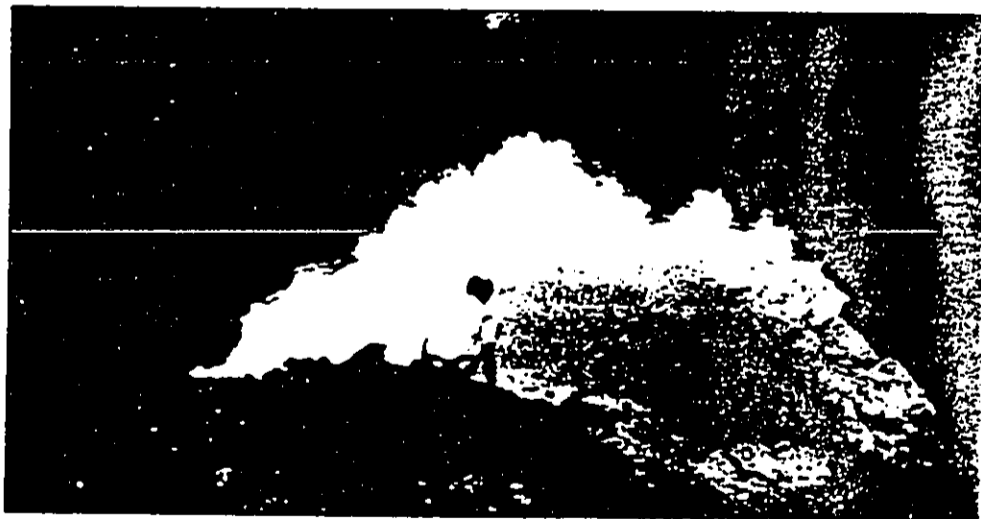
"The shrimp are herbivorous and feed on algae, but if the shrimp are absent pools usually fill with green filamentous algae and rapidly turn into a green mucky mess," said Brock.

Many ponds are being destroyed by the introduction by unaware fishermen of non-native fish which eat the shrimp. But without any outside intervention, the aquatic communities in anchialine ponds near the golf courses are able to function satisfactorily with the high-nutrient groundwater at Waikoloa.

"Golf courses using the treated-sewage 'fertigation' (fertilization and irrigation) system may, on very porous substrates such as lava, increase the concentration of inorganic nutrients in groundwater below. However, these increases are of the same concentration as measured in groundwater at completely undisturbed natural areas," Brock said. "Human-induced elevation of nutrients apparently has no negative impact on aquatic communities examined in our studies, and this insensitivity to nutrient loading is a reflection of the species in these communities having evolved in a system where inorganic nutrients are normally high and/or quite variable in concentration."

Brock realizes there are upper limits to the amount a system can be disturbed.

"At some point, inorganic nutrient concentrations will have an impact on a system," Brock said. "Currently, our studies say nutrient concentrations are not damaging aquatic communities, but they must be monitored to ensure that there are no problems in the future. That is one of the reasons for our continuing studies on the Kona Coast." ←



Within the lifeless lava exist the anchialine pools with their lively aquatic community.

—Richard Brock photo

(Attachment to Ramos-Saunders Response)

Sunset Beach and Pupukea Highlands Community Associations'
JOINT PLANNING COMMITTEE FOR THE OBAYASHI PROPERTY
P.O. BOX 471
Haleiwa, Hawaii 96712

Mr. Ben Lee, Chief Planning Officer
Department of General Planning
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

March 6, 1991

Dear Mr. Lee:

Community members of the Joint Planning Committee (JPC) have reviewed the Draft Environmental Impact Statement prepared and submitted by Obayashi. This letter presents our comments and concerns. The JPC is composed of representatives of Obayashi, and the two communities most directly affected by the proposed project, i.e. Pupukea Highlands and Sunset Beach. The community members of the JPC are members of their respective community associations. The JPC has been working with Obayashi for the last 18 months endeavoring to find a project proposal that would be acceptable to both the communities and Obayashi. To date this effort has been unsuccessful. One-third of the residents of Sunset Beach and Pupukea voted for a concept including a golf course. (See discussion on page 15 of Draft EIS). There is a general but pervasive feeling among many community members of distrust toward developers. Nonetheless, the JPC discussions are continuing.

The sheer size of the document, over 1,000 pages of text, tables and figures, limited our ability to review the entire document carefully. Since our communities' concern about this project goes to its impact on our neighborhood, we concentrated on Section 4.0 Description of Environmental Settings, Anticipated Impacts and Mitigative Measures. In addition to specific comments summarized subsequently, there are several comments that apply generally.

- * Extensive use is made of unsupported generalities.
- * Worst case scenarios are not considered in evaluating mitigative measures. The use of average conditions tends to underestimate the potential impacts.
- * There is no provision for independent qualified monitoring of the many areas where monitoring is offered and/or needed.
- * There are references to various laws, ordinances, and regulations without any indication of whether proposed solutions are compliant and/or adequate.

Traffic is a special concern to community residents. We are aware of Campbell Estate's plans for four new golf courses in the Kahuku area and Bishop Estate's anticipated development between Haleiwa and Waimea Bay. The cumulative effect needs to be addressed, and development approvals should be related to appropriate infrastructure improvements.

More specific comments are summarized below in the order in which the subject appears within the Draft EIS.

4.1 CLIMATE - Existing Conditions

The existing conditions are described in terms of the means. These data are then used elsewhere in discussions on storm runoff, wind erosion, irrigation requirements, etc. To truly evaluate the mitigative measures proposed, minimum and maximum conditions need to be considered.

4.2 TOPOGRAPHY - Mitigative Measures

The EIS too often offers unsupported generalities as a mitigative measure. For example, the statement on page 55 that the "land uses...will be designed to avoid changes in topography as much as possible" is meaningless. "As much as possible" would be no change at all. This is clearly not intended.

A second common fault is the reference to city and/or state ordinances and regulations without any indication of their specific contents. Most readers will not be familiar with these references, nor are they readily available.

4.3 SOILS - Mitigative Measures

Another reference to city and state controls without any description of specifics. The only reference to specifics, i.e. the use of cut-off ditches, temporary ground cover, and detention ponds, is hedged by the inclusion of the word "likely".

Again, references to a water program to control dust, and to landscaping to control erosion are given in generalities without substance.

4.4 AGRICULTURE - Mitigative Measures

After thoroughly discounting agriculture as feasible on the property, why is the saving of the prime land significant? This appears to be an instance where this document is written as a sales brochure, rather than a discussion of impacts and their long and short term effects.

4.3 SOILS & 4.4 AGRICULTURE

There is an extensive discussion about the unsuitability of the soils for agriculture. But there is no discussion on the suitability of the soils for a golf course. There is no mention of the amount of top soil that needs to be added. Since the addition of top soil is not clearing land, presumably extensive areas can therefore be covered without regard to the 15 acre limit. This being true, there is potential for erosion that is not covered by the discussion in the text.

4.5 GROUND WATER RESOURCES

The availability of water for people and agriculture is a growing concern on Oahu. Obayashi's approach of using non-potable water and treated sewage effluent is commendable. However, the assessment presented does not address some critical issues. The analysis assumes average rainfall, yet during the summer months the rainfall is so slight as to require irrigation as the only source of water. The analysis further assumes the maximum amount of effluent will be available, although, elsewhere it is assumed that some of the market homes will be unoccupied. Further, there is no justification given for the irrigated areas that are used. They are significantly lower than the cleared land areas given on page 34. Finally there is no allowance for irrigation of the driving range, the affordable house lots, or the pasture. Both will require water during the dry summer months. Assuming that the cleared areas plus the pasture and affordable housing land (less an allowance for structures and paving), the irrigation required is 1.5 MGD, twice that given in the EIS, and a value that is 50% greater than the predicted yield of these wells.

This raises the question of what happens if the yield of these wells is exceeded and/or the irrigation water becomes too saline for use. How will irrigation be provided? Does Obayashi expect to be able to draw on the potable water supply, if needed?

We feel that the use of water is of such importance that the analysis should consider a worst case, and address the contingencies that will arise. As presented, the Draft EIS clearly does not.

The discussion on the impact of fertilizers is restricted entirely to the golf course. While this is a major concern, the area of the driving range isn't included. Further, some fertilization of home sites must be expected. Its impact isn't discussed, although a comparable area is involved.

The Draft EIS states that careful control of the use of both pesticides and irrigation water will be maintained. However, there

is no definition of the outside agency who will monitor these control programs, nor the frequency of such monitoring, nor the availability of the results of the monitoring. To provide assurances that such programs are being implemented properly, there must be an independent monitoring. Failure to provide for such is a failure to provide the assurance promised. A similar comment applies to the groundwater monitoring program.

Obayashi indicates that lining of the heavily treated areas of the golf course is being considered. Presumably that was taken into consideration when the impact of the pesticides was discussed. However, what is not discussed is what method of assurance is provided to verify that these linings remain intact with time. Obviously, tears and/or holes in these linings would have a significant impact on the leachate that would reach the ground water.

Similarly, the proposed use of treated effluent as an irrigation source is discussed, and values for the quality of the effluent are given as "expected to be", but there is no indication of the monitoring program to verify these values. Is such a program contemplated, who will do the testing and to whom will reports be issued? If tests are to be performed by a cognizant government agency, are such tests applicable to the proposed application?

A water control program is mentioned. However, control of home owners irrigation is not discussed. How big an impact can this uncontrolled use of water have on the careful control? This uncertainty added to the concern about the long-term viability of irrigation wells and their ability to retain a sufficiently low saline content.

Pesticide usage is to be controlled by the use of an Integrated Pest Management program. However, again there is no indication of an outside agency monitoring this program. The golf superintendent has as his primary responsibility the maintenance of the golf course, not the reduction of the use of pesticides. An outside agency is needed to monitor this program.

Similar questions about the monitoring apply to the groundwater monitoring program. This is a good concept, but it needs better definition. How frequently will the samples be taken, who will do the testing, who will receive the reports, and most importantly, what will be done if the results indicate there is contamination? "Taking measures immediately" isn't very definitive.

4.6.1 STORM WATER RUNOFF

Obayashi correctly states that flooding of the Sunset Beach area is known to occur during heavy rains. However, their proposal is to merely see that the runoff is not increased, rather than attempting to mitigate the existing condition. As indicated, flooding in the lower flat lands is due to inadequate drainage.

This is primarily a result of the low elevation of the land makai of the highway. This makes natural drainage slow, since there is very little slope to create the gravitational head needed to produce high flow rates. A solution to this problem is to retain the runoff at higher elevations until the storm is past. Then release the trapped water slowly so that flooding at the lower levels is avoided.

This is the approach that Obayashi should have taken. The information given fails to define the size and number of retention ponds or their locations so that any evaluation of their adequacy can be made. However, merely designing to ensure that the runoff is no greater than presently exists does nothing to relieve the problem. There should be an attempt to improve the situation, even if they cannot eliminate the current flooding.

4.6.2 SURFACE WATER QUALITY

Under the heading of Erosion Control, reference is made to the County regulations limiting clearing to only 15 contiguous acres at a time. Will Obayashi plant this cleared area and allow the plantings to grow before proceeding to clear another 15 acres? Can Obayashi clear 15 acres here, then skip an area and clear another "15 contiguous acres", since they are not contiguous with the first fifteen?

4.8 VEGETATION

→ All native plants should be tagged and preserved.

4.11 ARCHAEOLOGICAL & HISTORIC RESOURCES

All burial remains including fragments, must be collected from their resting places - rock shelters, caves, etc. and consolidated for reburial in one location and sealed. Recommend that this be Site T-70.

The developer is expected to notify Linda Delaney of OHA and the Task Force of Native Hawaiian Historic Preservation so that an agreement can be made between the developer/owner and OHA.

Burial caves reconnaissance has been limited. Sub-surface excavation work needs to be completed.

Non Burial Sites

The archaeologist's reconnaissance only identified what is on the surface. The following sites need sub-surface excavation: T-1, T-2, T-47, T-54, T-69, T-73, T-75.

It appears (Appendix N, pg. 77) that some artifacts may have been removed from the site. All should be returned to the property

for reburial in T-70.

Through DLNR, a monitor must be on site, working along with the bulldozer, to determine whether artifacts or burial sites are being properly identified and treated.

4.12 ROADWAYS & TRAFFIC

The data presented show that the impact of traffic is predominantly what will result from the expansion currently underway at Turtle Bay. The Obayashi contribution will aggravate a condition that sorely needs remedial action. The present two-lane highway is currently overtaxed, particularly on weekends when residents from other communities join the tourist traffic and come to visit our beaches. Many residents feel that all future development on the North Shore should be halted until the state is prepared to provide an alternative route for traffic to the Kahuku/Laie/Turtle Bay area.

This EIS should include a comprehensive evaluation of 1997 traffic conditions, including the impact of potential developments on Campbell and Bishop lands. We feel that Obayashi should study and report to the community on this "worst case" but highly likely scenario regarding this possible traffic situation.

Included in this should be the increased volume of traffic due to Kuilima Resort Development (4,000-6,000 jobs) where as most likely the workers will need to travel from outside the primary and total study area due to the severe shortage and overcrowding of existing rental housing (with the likelihood of the conditions to be exacerbated.)

Construction Impacts

There is concern in this community that the placement of the proposed roadway on the side of the cliff as illustrated on pgs. 146 thru 152, will destroy the integrity and natural beauty of the cliff side in its present state. Although the roadway will be landscaped, it is felt that the extreme nature and placement of such a roadway will be unsightly and an abomination.

It seems that a more viable entrance to the property would be on the Paumalu side of the property where there is already an existing roadway. See Vol I, pg 12. The topographic lines on this map clearly indicate the presence of a trail near the bottom of the gulch which is within the boundaries of the property. Physical observation reveals that this is an existing roadway and that was used to access the Pupukea Paumalu forest reserve at one time.

Construction of a new road in place of this existing road would be far less an expense to the developer than the proposed road on the cliff face and it would have far less of a visual and

aesthetic impact upon the surrounding country side. In addition, this roadway would be more in keeping with the "country" or rural feeling of the area.

This roadway would also be a better route for emergency vehicles than the proposed roadway on the cliff which would be a behemoth similar to Pupukea Road with its hairpin turn. We would welcome a response from Obayashi.

4.15 VISUAL RESOURCES

This section deals extensively with the view of the project from the lower land beneath the bluffs. Looking back toward the bluffs from Paumalu Gulch and the beaches presents a scenic view that should be preserved. Building roof lines should not be located so that they are visible from these areas. However, of equal importance is the view from the top of the bluffs toward the ocean. According to the project plan, these views would no longer be available to the public, since access to the edge of the bluff would only be across private property. The view from the bluff is spectacular and should be available to all. It is suggested that the trail proposed run along the bluff edge, and that there be a large section set aside as a park with picnic tables for public use. The highest promontory on the Kahuku side of the project would be an excellent site for such a park. The park should be accessible from the road, and limited parking should be available. This park would ensure that these spectacular views are available to all the project residents as well as the public at large.

4.16 SOCIAL & ECONOMIC CHARACTERISTICS

It is clear that, regardless of claims by the developer to the contrary, the Obayashi project will have substantial impacts on the local schools and other infrastructure. Particularly when the cumulative impact of other developments is studied, it is apparent that much of the wording in the application is a wanton dismissal of concerns that the community has raised.

Anticipated Impacts (pg. 153) - This section reaches the conclusion, "it cannot be argued" that the Obayashi plans are inconsistent with population guidelines established in the General Plan. The members of the JPC take strong exception to this conclusion. As stated elsewhere (Appendix S, 5-5/5.2.5) in relation to the population of the primary study area...the project is a significant development."

(Appendix S, 2.3.3, 2-18) - According to this chart, the North Shore DP area is already growing at a rate faster than the island of Oahu as a whole.

(Appendix S, 5.2.5, 5-9) - Furthermore, it is stated, "it is quite possible that the North Shore DP area population could meet or exceed the guideline by 2010 even if little new housing were

built." The concatenation of population numbers and statistics used in this section suggest to us that they were contrived in a spacious endeavor to reach the foregone conclusion.

4.19 CUMULATIVE IMPACTS

With all of the golf course development on the North Shore in the near future, it is clear that a comprehensive plan must be developed before any more are granted permits to proceed. This location may or may not be best suited for a golf course due in part, but not limited to, its relative steep terrain and the possible impact to North Shore waters from fertilizer and pesticide runoff. Furthermore, golf courses should be situated closer to the customers.

5.0 ALTERNATIVES

From the start, there was no serious consideration given to any alternative use of the land.

6.0 RELATIONSHIP TO EXISTING POLICIES AND PLANS FOR THE AREA

The following comments pertain to Section 6, starting with Section 6.1, Hawaii State Plan, and concluding with Section 6.2 General Plan for the City and County of Honolulu.

6.1.1 OBJECTIVES AND POLICIES

Section 226-11 (pg. 195) - Direct employment opportunities are expected to provide 60 jobs at an average wage of \$15,000/yr., essentially the level of the Federal Poverty guideline for a family of four. This does not offer much opportunity for "improved living standards for Hawaii's people".

Section 226-11 (pg. 195/6) - The 559 acres of land that is to be maintained as open space equates to the area of land with slopes that exceed 30%, and are considered unusable. "Credit" is taken for this open space throughout the document. It is these steeper sloped areas that contribute to much of the erosion, and Obayashi indicated that they intend to mitigate this erosion. The multiple recreational facilities include a golf course, a tennis facility, a swimming pool, and an equestrian center, all of which are hardly "natural environment".

Section 226-12 (pg. 196/7) - Again a reference to the 559 acres of open space.

Section 226-13 (pg. 197/8) - To limit runoff rates so that they will not exceed existing conditions is not adequate. Flooding problems at the lower levels can be alleviated by controlling the runoff rates so as to reduce them significantly. The statement concerning the potable water resource capabilities is only true if property owners do not use it for irrigation. This in turn assumes

that the water from the private wells does not become too brackish for use.

Section 226-15 (pg. 198/9) - Although there are some legitimate concerns about the use of effluent for irrigation, Obayashi is to be commended for seeking an alternative to an ocean outfall.

Section 226-19 (pg.199) - As discussed earlier, water usage, both potable and non-potable, should be examined on a worst case basis, and not just using averages. Also, the possible failure of the brackish water supply as a useable irrigation source needs to be considered.

Section 226-19 (pg. 199/200) - The placement of affordable housing within the project is considered an unresolved issue.

6.1.3 FUNCTIONAL PLANS

State Housing Functional Plan (pg. 202/3) - The inclusion of affordable housing on the site is considered an unresolved issue.

State Recreational Functional Plan (pg. 203) - The major recreational facility to be provided is a golf course, which is clearly intended to serve non-residents, primarily tourists. The majority of the Sunset Beach and Pupukea Highlands residents have consistently indicated their opposition to a golf course as part of this project.

State Transportation Plan (pg. 203) - As indicated in the Obayashi traffic study, the development of the Turtle Bay Resort will overwhelm our present two-lane highway. The Obayashi project will add to the problem, although it is not a prime cause. Many residents of the North Shore feel that any further development in the area should be halted until the state provides an acceptable solution to the current traffic problem. Residents are equally as strong in the opinion that widening the Kamehameha Highway to four lanes is not an acceptable solution.

State Tourism Functional Plan (pg. 204) - As discussed earlier, the golf course is clearly intended to support the visitor industry, and is not well-supported in our communities.

It is also noted that there is no discussion of the State Educational Functional Plan, yet the addition of 300 new residences to the area can clearly be expected to have an impact on the public schools in the area, i.e. Sunset Beach Elementary and Kahuku Intermediate and High Schools. This impact is not discussed.

6.2.1 Population (pg. 205) - The rationale presented herein ignores the fact that the present population has already reached the projected limits of 1.6% - 1.8%. The 700 new residents, a

number which seems low for a total of 300 new residences, adds to the present, and therefore must exceed the guideline.

6.2.2 Economic Activity (pg. 206) - The addition of \$15,000/yr average jobs, primarily in service capacity, can hardly be considered to help people "attain a decent standard of living" or to "encourage the growth and diversification of Oahu's economic base."

6.1 HAWAII STATE PLAN & 6.2 GENERAL PLAN FOR THE C & C OF HONOLULU

The request by Obayashi to change zoning and general plan population guidelines must be looked at in the context of how it will impact the quality of life for members of the community & to people who visit the beaches from town and elsewhere. There is as much evidence in these documents to support the conclusion that this development could well exacerbate existing problems & possibly create new ones. At this time, there is no need for another golf course at this location, more jobs are not needed in this area, and the schools will not accommodate more students. The community needs rental housing to alleviate the crowded and expensive conditions existing which this proposal does not address.

It is far from a clear & convincing case that this proposal is in the best interest of this community to the extent that zoning should be changed to permit this development.

APPENDIX A COMMUNITY FACILITIES

The concern expressed in our Jan 5, 1991 letter about the evaluation of the community facilities package still apply. In particular, we would like to emphasize the comment that over half of the projected monetary benefits go to kamaaina golfers, a clearly disproportionate amount when most residents do not play golf.

We would like to further state that the concerns and objection raised in our letter concerning the golf course, water, waste water disposal, runoff, employment, and other North Shore developments still remain, even after reviewing the Draft EIS.

APPENDIX B WASTEWATER MANAGEMENT PLAN

Wastewater Collection System (pg. 5)

Concern over possibility of sewage pump failure in the sewage pumping stations in view of recent and continuing problems currently being experienced by nearby Turtle Bay Hilton Resort and many city sewage treatment plants.

Odor Abatement (pg. 9)

Since this particular method of treating domestic sewage has never been implemented in Hawaii, what will be the contingency for the possibility of system failure, e.g. effluent not able to be processed in the given amount of time and thereby resulting in a back log of untreated effluent.

What sort of contingency will be put in place for odor abatement should the need arise. This contingency should be implemented for the stabilization ponds and for the pumping stations and overflow storage vaults of the pumping stations. These storage vaults and pump stations should be located carefully within the site topography to eliminate the potential for leakage into storm runoff systems, given that 70% or more of the topography of this site consists of slopes greater than 20-30%.

APPENDIX D STORM DRAINAGE PLAN

(pg. 8) "Ponding areas to provide detention will be constructed in the horse pastures."

What will be done with this "ponded" water which will undoubtedly contain amounts of dangerous chemicals?

"Detention basins and injection wells will be provided in the low-lying area adjacent to Kam Hwy to offset any increase in runoff due to improvements proposed for the community facilities, the main access road and the area immediately mauka of this site."

This statement does not address the effects that a possible "injection well" combination "detention basin" will have on ocean water quality and the quality of all aquatic life within the area discharged that could be affected by the accumulation of pesticides/herbicides within these injection wells and detention basins.

There is concern that these injection wells would leach chemicals into the ocean considering the injection wells' close proximity to the ocean.

It has been verified by the state Health Department that existing cesspools in the Sunset Beach area do leach a significant amount of coliform bacteria into the ocean.

In addition, domestic cesspools are now illegal for all properties mauka of Kam Hwy and legal for properties on the makai side of Kam Hwy. According to the state Health Department, an injection well placed here could have an adverse impact upon the ocean eco-system and the community at large.

APPENDIX F AGRICULTURAL FEASIBILITY

Since this report was written by an Agricultural Economist, it is therefore based upon the assumption that all forms of agriculture are dependant upon making a profit.

Given the amount of arable land now available for the production of diversified sustainable agriculture for the people of these islands and given that the majority of arable land owned by this developer is not slated for any purpose other than grazing, the issue of providing portions of this land for the purposes of a sustainable, biointensive community farm arises.

If the developer is truly interested in appeasing the concerns of this community, a "land trust" could be established for the specific purpose of growing food for this community.

Many types of vegetables and trees would grow well on the agriculture lands of this site.

It is also true that in the adjoining existing development of Pupukea Highlands many people have garden plots and fruit and nut trees which provide a substantial part of their diet.

Irrigation of this "land trust" could be achieved through the use of catchment systems from public and private buildings and from the partial catchment of storm runoff from the 3 intermittent streams on the property.

An excellent example of this kind of farming commonly known as "Permaculture" is given in the following text:

Permaculture, a Designers Manual

Bill Mollison
c 1988 Tagari Publications
P O Box 1, Tyalgum, NSW Australia, 2484
(066-79-3442)

These lands could have a primary purpose and present a goal for the community to raise its own food without the use of chemical fertilizers or harmful biocides (organic farming) and achieve this at a lower cost than present commercial farming practices. This practice is already being done on a smaller scale by residents of Pupukea Highlands.

The secondary purpose of these lands would be to provide an income for the community "land trust" through the sale of food products not consumed by the community at large.

Also, orchard sections could be grown in the same space as truck crops e.g beans, lettuce, corn, kale, chard, eggplant, with starting lychee, avocado and citrus varieties for the first 5 to

10 years of orchard growth.

Truck crops could then be moved or rotated to different areas as the orchard develops.

Once the orchard section is established, this could be used for grazing by horses and/or other animals which would cut down on weeds and provide fertilizer for the orchard.

More information about organic farming and the biointensive method can be obtained from: Ecology Action, 5798 Ridgewood Rd., Willits, CA, 95490. This is a non-profit organization dedicated to seeking practical solutions to the urban and rural food, clothing, energy, and resource issues through its research, development, education and outreach programs.

APPENDIX I FERTILIZER, HERBICIDE & PESTICIDE USE

Summary & Conclusions (pg. i) "Mixing with turbulent shoreline waters will effect further dilution, resulting in negligible impact on the quality of coastal waters."

This statement is not a proven fact. This is an area of steep slopes, high clay soil content resulting in heavy runoff into the ocean. There are three major streams running through this property which have a high capacity during winter months. If pesticides or herbicides are applied, how will the owner monitor or quantify the amount of nitrogen or phosphorous or any other potentially dangerous chemical that may be present in coastline waters and affect reef life as a result of runoff from this property over time.

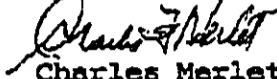
Further more, how will the Sunset Beach/Pupukea communities be assured that future owners of this property address all environmental impacts and keep in place existing sound management practices with regard to the application of biocides?

CONCLUDING REMARKS

In conclusion, we note again that a thorough review of such a voluminous document is not possible for a group such as ours. We have concentrated our efforts on our areas of concern. Raising these concerns should not be interpreted as opposition to the project per se. Neither the JPC nor the community associations that we represent have as yet taken a position for or against the project.

We also wish to note that the JPC is appreciative of the time and effort that Obayashi has put into working with the communities. The differences between the present project proposal and the development originally presented to the community in 1988 is evidence of their efforts to respond to community input. We feel that this should not go unmentioned.

Sincerely,




Charles Merlet
1st Vice-President, Sunset
Beach Community Association

Chairperson, Joint Planning
Committee



Ken Newfield
Member, Sunset Beach Community
Association

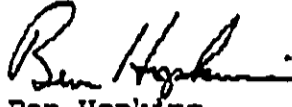
Member, Joint Planning
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Bill Howes
Member, Pupukea Highlands
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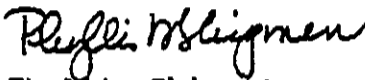
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cc: Dept of General Planning: Ben Lee
Dept of General Planning: Mai Murakami
OEQC
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Mayor Frank Fasi
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Ben Hopkins
Member, Board of Directors,
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Association

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Phyllis Shipman
Member, Sunset Beach Community
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GROUP 70
I N T E R I O R D E S I G N E R S

17 April 1991

Joint Planning Committee for the Obayashi Property
P.O. Box 471
Haleiwa, Hawaii 96712

**Subject: Lihi Lani Recreational Community Draft EIS
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear JPC Members:

Thank you for sending a copy of your March 6, 1991 letter to Chief Planning Officer Benjamin M. Lee concerning the above application. The JPC has obviously put substantial effort into the review and comment on the Draft Environmental Impact Statement, and we appreciate the continued joint efforts of your community associations for planning the future of this land. The following is offered as a response to your specific comments.

A. General Comments

The Draft EIS is a comprehensive document, with much detailed information regarding the proposed project, its potential impacts and proposed mitigative measures. The technical information presented in the main body of the document is intended to be clearly presented and understandable to those readers who do not have technical training. Technical consultant reports attached as appendices are included for those interested in more detailed study of specific topics. We understand your feelings about the difficulty involved in reviewing a document of this large size. We also understand your feelings, in some cases, that not enough information is presented on a subject. The amount of detailed information we present in the Draft EIS was limited in an effort to keep the document to a somewhat manageable size and scope. We hope that the responses provided herein and in the Final EIS document adequately respond to your comments and questions regarding the Draft EIS.

B. Cumulative Traffic Impacts

The Draft EIS includes a Traffic Impact Assessment prepared by Pacific Planning and Engineering, Inc. (PPE), which addressed the traffic impact of Lihi Lani in context with the future predicted traffic for the area, including sections of Kamehameha Highway in Haleiwa and Kahuku. This study considers future traffic conditions in the year 1997, estimated as the first year of full occupancy at Lihi Lani. The traffic study also includes new projects which are either involved in the development approval review process,

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projects which have received approvals, and projects currently under construction. Campbell Estate's four proposed golf courses in the Kahuku area and Bishop Estate's conceptual development plans for Haleiwa were not included because they are projects which are not currently being pursued. The Campbell Estate projects may enter the development approval review process next year. Bishop Estate is reconsidering its Haleiwa plans, and is not proposing any projects at this time. We do not believe it is appropriate to include these plans or any other conceptual or preliminary proposals in our assessment of future traffic for the area.

Obayashi will periodically update its traffic impact assessment to consider future cumulative traffic conditions relative to its project entrance operations. As new projects in the area become more definite in the future, the periodic traffic studies will account for their traffic on Kamehameha Highway, and improvements to the project entrance intersection will be made (approved by the State Department of Transportation) as required to maintain safe traffic flow.

The cumulative impact of traffic on Kamehameha Highway for 1997 with or without Lihi Lani is substantial, with traffic operations of Level of Service E or F (congested flow conditions) predicted for certain turning movements at three of the six study intersections. Highway travel at four study segments between Kahuku and Haleiwa are predicted to perform at Level of Service E by 1997 without the project. The additional traffic generated by Lihi Lani will add five to eight percent additional traffic to the Highway during the weekend peak traffic (worst case scenario). Even without new projects on the North Shore, traffic on Kamehameha Highway is predicted to become more congested in the future due to ambient (background) traffic growth. Transportation facilities planning for the North Shore will be very critical in the coming years, and Obayashi intends to be an active participant in creating an acceptable solution to the future traffic problem. Lihi Lani's traffic will contribute a very small part of the future traffic, yet Obayashi will likely play a significant role in helping to alleviate future traffic problems.

C. Climate Conditions

For the analysis of existing and future drainage conditions, existing and future erosion conditions, and the requirements for erosion control and drainage improvements at Lihi Lani, Engineering Concepts, Inc. and Dugan both used the 100-year storm (worst case) as their maximum condition. This is the level that the City and State require for maximum analysis. Irrigation requirements for the golf course and common areas also consider both minimum and maximum rainfall periods. The irrigation requirements calculated for the project are conservative estimates which provide for extended dry periods.

D. Topography Mitigative Measures

Our first mitigative measure relates to our project design, which is currently in a conceptual land plan form. In our concept plan, the proposed land uses in the master plan and siting of facilities were selected to minimize changes in topography as much as possible. This meant that most of the steep sections of the site are left out of the proposed development areas. As your comment indicates, "as much as possible" could mean "no change at all". There will be no topography changes made over 49 percent or 559 acres of the landowner's property. This land will remain in open space, but will be accessible to the public through a series of hiking and horse riding trails which will have preliminarily been planned with the guidance and input of members of the local community.

On the remaining 51 percent of the site (582 acres) which is shown in development areas, clearing and grading activities will occur on approximately 338 acres. Even though grading activities are planned for this portion of the site, grading could involve topography changes of several inches or several feet, depending on the location and the use requirements. Our next step in project design will involve more detailed site planning studies of the current land plan. In this process, we will pay close attention to the clearing and grading requirements involved, in an attempt to minimize changes where ever possible. The purpose in minimizing changes to the land is two-fold: (1) clearing, grading and earthwork costs are extremely high; and (2) the more land that is changed, the more erosion control and landscaping is required. There will also be undisturbed portions within the development areas, constituting approximately 194 acres, where no grading will occur and there will be only selective clearing for landscaping and view channel purposes.

The project design proposes several land uses which, by their nature and through careful site selection, require very little change to the existing topography such as the horse pastures, equestrian facilities and the campground. These facilities cover 112 acres yet will require approximately 12 acres of vegetation clearing. Where buildings are proposed, such as barns, stables or cabins, some leveling of ground would be required, but this will not cause a material or perceivable change in the existing topography and is included in the estimated 12 acres described above.

The intent of the mitigation measure, to avoid changes in topography, is clearly met through the conceptual project design. The proposed mitigation measure is suggested to ensure that this intention is carried out through subsequent and more detailed phases of project design.

E. Ordinances and Regulations for Control of Soil Erosion and Dust and Landscaping

By law, and in the interest of public health and safety, municipalities often have a series of standard regulations which are routinely applied to all projects, and implemented during the review of the detailed construction plans and during the on-site inspection phases of the project. In the Draft EIS, we state the various ordinances and guideline documents used to prepare the detailed erosion control plan to mitigate soil erosion. Because the project plans are only in a conceptual stage, we are not able to provide detailed construction plans, grading plans, drainage plans, erosion and dust control plans, and landscaping plans. Obayashi is willing, however, to comply with the requirements for these control measures. We will submit the required plans for review and approval by the City and County at a later stage in the project. The hundreds of specific measures that could be implemented are included in the publications listed in Section 4.3 of the Draft EIS, and in the State Department of Health's Best Management Practices guidelines. If you desire a more thorough review of these regulations and guidelines, all of these documents are available for your review at our project office in Haleiwa. For the purpose of keeping the Draft EIS to manageable size we have only mentioned a few of the typical measures that will be implemented. Cut-off ditches, ground cover and detention ponds are just several examples.

In order to clarify the intent, the last sentence of this mitigation measure will be re-written, as follows:

"Prior to issuance of a grading permit, the project proponent shall submit an erosion control plan for approval by the City and County of Honolulu, Department of Public Works, which shall include applicable measures as specified in the regulations cited above. Such erosion control measures may include, but are not limited to, the use of cut-off ditches, temporary ground cover and detention ponds."

F. Agriculture Mitigative Measures

The agricultural feasibility study by Scott (1988) included in the Draft EIS indicates that the Obayashi property is infeasible for commercial agriculture and that any agricultural use would likely accelerate an already serious erosion problem. Yet according to maps prepared by the Land Study Bureau of the University of Hawaii, there are portions of the site which are rated as prime agricultural soils. In response to government and community concerns about the loss of prime agricultural soils to development on Oahu and the North Shore, Obayashi proposes to keep as much prime agricultural soils as possible from being developed. Only portions of the tennis center and country lots will be constructed on prime soils. The development concept and mitigative measures proposed in the Draft EIS indicate the plan to use prime agricultural soils for horse pasture, which is an agricultural use. A

community garden area and project nursery would also utilize small portions of prime soils. The future potential for commercial agricultural use on the property (or a larger scale community farming area) remains a possibility if these lands are kept from intensive development.

G. Grading and Erosion Implications of Fill and Top Soil Importation to Construct a Golf Course

Extensive grading will be required to construct the golf course, as described in the Draft EIS, Section 2.0. Grading plans will be designed for the golf course which include the application of topsoil. The erosion control plan, which must be approved prior to issuance of a grading permit, will take fill material and topsoil into consideration. The 15-acre limit for contiguous grading area to which you refer is also a matter of City and County of Honolulu grading policy and will be applied to this project. This policy, as we understand it, does allow for multiple 15-acre areas to be cleared, as long as 50 to 100 feet of natural buffer is temporarily retained until soil erosion controls are in place. There can be no fill work done in areas which have not be included in the clearing and grading plans.

H. Groundwater Resources

Irrigation Water Use: For the dry season (April - October), the golf course and other landscaped areas of the project will require irrigation. To calculate the irrigation water requirement for the project, Engineering Concepts, Inc. uses a maximum irrigation rate of 1.5 inches per week for turfed areas. The daily average irrigation rate for the entire project is estimated as 0.9 million gallons per day. Irrigated areas will include: golf course and driving range (estimated at 100 acres); landscaped areas of the tennis center and clubhouse (estimated at 25 acres), and landscaped portions of the country lots (estimated at 30 acres). The horse pasture will not be irrigated.

For irrigation needs, the affordable housing will be served by potable water if individual 6,000 sq. ft. lots are developed. If the affordable housing is planned as a complex with common area maintenance, the irrigation would be by the non-potable system. The irrigation water demand for affordable housing (in either case) is a small portion of the total irrigation requirements for the site.

The estimated maximum yield available from the on-site brackish water wells is 1.0 mgd. To meet the average daily irrigation demand, these wells will draw substantially less than this amount. To be prepared for dry periods with high irrigation demand, irrigation water reservoirs will be created with capacity for ten days of irrigation demand for the project. This reserve will be available whether the treated effluent volume is at or less than 200,000 gpd. If the effluent volume is lower than predicted, the small difference in volume can be satisfied by the on-site wells.

If a prolonged drought occurs in the future (worst case scenario), a selective watering program for the large irrigated areas would be undertaken. For example, the rough (40 acres) and fairway (40 acres) areas of the golf course and the driving range (10 acres) would receive reduced or no irrigation. Landscaped common areas (25 acres) and country lot landscaping (40 acres) would also receive less irrigation during such a period. Obayashi's plan to include drought-resistant plantings (xeriscaping) will minimize the need for irrigation of common areas and residential lots.

Salinity of Irrigation Water: The groundwater impact study by Mink and Yuen reports that the salinity of the brackish water drawn from the on-site wells will remain well within the water quality limits required for irrigation of turf and landscaped areas at Lihi Lani. Salinity in this non-potable aquifer could increase slightly as a result of water demand by Lihi Lani. Potable water will not be used for irrigation, except possibly at the affordable housing area. By careful monitoring of weather and irrigation requirements, and the provision of adequate storage facilities, brackish water demand from the on-site wells will be kept well below the maximum withdrawal rate. If there is a peak demand placed upon these wells for a short period, the aquifer will not react quickly in terms of a potential salinity increase. Only long-term pumping at the maximum withdrawal rate over several months could potentially raise the salinity of the brackish aquifer. This extreme type of water demand is not expected, even in the worst case scenario, since precipitation data shows five months of high demand (May - September), two months of low demand (April, October), and five months of excess precipitation (November - March).

Non-Golf Course Fertilizer Use: The driving range, common areas and residential areas will receive some fertilizer amounts on an infrequent schedule. The driving range and common area are under the control of the grounds management staff. Slow-release fertilizers will be included on the driving range and common areas, and encouraged for use in the residential areas. The use of slow-release fertilizers will substantially reduce the potential for fertilizers to be carried off-site in runoff water or enter groundwater.

Pesticides Use: The Draft EIS goes to extensive lengths to address the concerns of pesticides application. A very extensive effort was given to the scientific analysis of potential impacts to the environment from runoff containing golf course chemicals, and this analysis process is still underway. Technical reports prepared to date by Murdoch and Green, Dugan and Marine Research Consultants all specifically addressed the expected golf course chemicals which could potentially leave the site and enter the intermittent streams, ocean or groundwater.

The studies cited above also considered the potential movement of pesticides from the golf course to surface runoff. Pesticides will be used in carefully

controlled amounts on the golf course, and possibly on some of the residential lots. An Integrated Pest Management (IPM) program will be implemented at the golf course and common areas of the project to ensure that chemicals will be used with extreme care along with biological and other management controls. It is likely that pesticides use will be extremely low due to the innovative turf types and landscaping technology that will be applied for this project. In addition, Obayashi is investigating using a lining technique which will trap leached chemicals at potential high application areas such as tees and greens, further minimizing potential contributions to the groundwater and the ocean.

Monitoring of ocean water, stream water and groundwater will be continued by Obayashi's consultants. The State Department of Health (DOH) will be provided results of the ocean water and stream water analyses as requested. The DOH does not typically monitor these waters on any regular frequency, although there has been some concern by DOH regarding the cesspool nitrate contribution generated by residences in Sunset Beach. The DOH will be involved in the review of groundwater quality data from monitoring wells to be installed downgradient of the golf course.

Synthetic Lining of Tees and Greens: To clarify our current position on this, Obayashi is investigating the liner technology for the tees and greens of the golf course. They have made no commitment to this measure at present, however, we believe that this measure would further safeguard the underlying groundwater aquifer. Our research to date has shown that technology from landfill liner design performed on the mainland will be more than adequate for safety assurance. The liner system has two layers so that a leak in the upper layer can be collected and detected in regular monitoring.

Effluent Treatment Monitoring: There will be regular monitoring of the wastewater treatment facilities by the plant operator. He prepares reports noting the volume of wastewater received, treated and discharged (pumped to the irrigation pond) and the effluent quality. These reports are submitted and reviewed by the State Department of Health. The Department inspects the operation of all private wells annually.

IPM Program Monitoring: There is no plan for an outside agency to periodically assess the strategies being employed in the IPM program. The IPM program will be changing constantly to address specific concerns on the golf course. Its success cannot be easily measured, because the quality threshold is with the golf course superintendant. At times, pesticides use is warranted as part of the IPM program. It is possible that records of the volume and types of pesticides applied could be reviewed by an outside entity, or an agency such as DOH. The DOH does not currently perform periodic reviews of pesticides use records for golf courses.

I. Storm Water Runoff

Flooding in Sunset Beach is a problem that we are concerned about. We are especially concerned about the need to control storm water runoff exiting the Obayashi property. Our drainage system design will keep runoff rates at or below the existing conditions. Obayashi can only control the drainage situation regarding its own land. It is not possible to retain all of the storm runoff on the site until a storm has passed, it is only possible to detain the runoff such that it is released at a controlled rate at or below existing conditions. Obayashi cannot undertake a flood control program for the entire surrounding area, however, they are interested in participating in a study of drainage solutions for this area.

Because the project is at a very preliminary stage in site planning, detailed grading and drainage plans have yet to be prepared. The lack of these plans makes it difficult to quantify the number and size of detention and retention ponds. Engineering Concepts, Inc., civil engineers for the project, can only describe typical drainage control features that will be included in the project design. These facilities must be designed to City and County of Honolulu standards. More details will be come available in the application for zoning change, which involves a closer evaluation of the site plans. An evaluation of the adequacy of proposed drainage facilities will be made at a later stage in the planning process, during the Department of Public Works review of construction plans for the project.

J. Tagging and Preserving all Native Plants

Nagata's botanical survey of the project site included in the Draft EIS (Appendix K) indicates that there are numerous common native plant species on the project site. These native plants are generally few in numbers and occur mostly as widely scattered individuals. There are no rare or endangered species on-site, although four rare Koolau Eugenia trees are located near the property on State Forest Preserve land. Local botanist Bill Garnett has preliminarily identified additional individuals of these trees in this same gulch. Obayashi will continue its coordinated efforts with DLNR-DOFAW to preserve and enhance the habitat for these endangered trees.

Nagata does not recommend the need to preserve native plants found on the property. It is not practical, from a construction operations viewpoint, to preserve every native plant on the site. All of the native plants identified on the site are common on Oahu, and many of these plants occur in the conservation areas of the project. Following a recommendation by Paul Weissich, our landscaping consultant, Obayashi will attempt to save some of the healthier native plant specimens that would have been cleared during grading. These plants will be temporarily relocated to an on-site nursery, then transplanted to select sites within the project or as native plant enhancement in a select portion of the open space area. In addition, the

detailed site planning will maintain many of the significant native and non-native trees and vegetation areas as part of the project landscaping design.

The mitigative measures proposed by Obayashi to save native plants and other significant vegetation on the site exceeds that which has been recommended as necessary to off-set the potential significant impacts of the project on botanical resources. Since Obayashi has agreed to some preservation of the common native plants, and these measures will further reduce the potential impact of the project on native plants.

K. Archaeological and Historic Resources

At this time, Obayashi cannot agree to implement the recommendations made by the JPC with regard to archaeological and historic features. The treatment of these features will be officially determined by the State Department of Land and Natural Resources (DLNR) - Historic Preservation Division (HPD). We will forward your comments to them for consideration in their review process.

The DLNR-HPD was provided with the reconnaissance survey results from our archaeology consultant Paul H. Rosendahl, Ph.D., Inc. (PHRI) in 1988. The Draft EIS has also been reviewed by this agency, and they recently provided comments which we will be responding to for the Final EIS. This agency will make specific recommendations regarding the disposition of the features which are proposed to be directly affected by construction activities. They are also concerned about the potential indirect impacts to significant sites that could result from the increased access onto the property.

The greatest concern in your comments and the DLNR comments is the preservation of the significant sites, especially burials. One burial site is expected to be affected by the construction of the access road. The treatment for this site will be determined by DLNR-HSS, including advice and direction from their Oahu Island Burial Council. This relatively new advisory group includes volunteer representatives of the community and government, including OHA. The Council has generally desired preservation in place for most burials, however, relocation of remains is a possible alternative. The Council will review the project plans and make their determination during a later phase of project planning.

Non-burial sites will also be reviewed by DLNR-HSS, and they must approve the plans for data recovery and mitigation proposed by PHRI before any further work on these sites can be undertaken. Some of this additional work will include excavations at appropriate locations. The Data Recovery and Mitigation Plan will be prepared in the near future. The earthwork phase of construction will be monitored by our consulting archaeologist, who is required to stop work and contact DLNR-HPD for guidance if additional features are encountered.

L. Roadways and Traffic

Our response in Item B. addresses your comments regarding cumulative growth of traffic. The PPE traffic study for Lihi Lani does include projections for visitors and employees associated with Kuilima Resort as of 1997. Further, we have obtained the additional traffic projections data you have requested regarding the five golf courses at Punamano (3) and Malaekahana (2) being considered by The Estate of James Campbell and Kuilima Resort Company. We are unable to quantify future traffic for the Bishop Estate lands in Haleiwa because their plans have yet to be worked out, and no projects are being pursued in the foreseeable future.

The Traffic Impact Assessment for the five golf course projects was prepared by Pacific Planning and Engineering, Inc. These five golf courses, if they were all completed, would generate approximately 360 vehicle trips at the 1997 weekend peak hour. The percentage of traffic on Kamehameha Highway traffic associated with the golf courses will represent approximately 12 percent at Punamano and 8 percent at Malaekahana. Almost 50 percent of the golf rounds are expected to be generated by golfers staying at Kuilima Resort in the hotels and condominiums. As a result, half of the traffic associated with these golf courses will be limited to the area from Malaekahana to Kuilima Resort. Of the approximately 180 vehicle trips not associated with Kuilima Resort, it is estimated that half will travel to and from the courses from the Haleiwa direction, and the other half coming and going from the Kaneohe direction. Assuming 90 vehicle trips (total of both directions) are added to the 1997 weekend peak hour traffic projections of 2,055 vehicle trips for the Sunset Beach segment of the highway at the project entrance, the traffic from the five golf courses will represent an additional 4.4 percent increase in the total traffic volume. This traffic will add slightly to an already congested traffic condition along this segment of the Highway.

M. Access Road Construction Impacts

Obayashi is concerned about retaining the natural beauty of its land, and will make every reasonable effort to avoid adverse visual conditions as a result of their short-term construction activities and the long-term operations. The potential alternatives to locating an access road to the site have been studied in great detail by Engineering Concepts, Inc. Use of Pupukea Road and the Wilinau Road access has not been studied due to resident opposition in Sunset Hills and Pupukea.

The Paumalu Gulch route was considered as one of the four alternative routes, but it has several drawbacks as follows:

- it would require new land purchase or easement for right-of-way to the Obayashi land;

- the route would be located in the Paumalu Gulch, which is subject to extreme storm runoff flow conditions, and would require extensive drainage controls to avoid affecting downstream areas;
- the route would need to climb the side of Paumalu Gulch to reach the upper portion of the site, which is extremely steep and will require much more extensive bench cuts and vegetation loss;
- traffic activity associated with the Chevron station and Kammies Market area would be affected by the traffic using the project's entrance;
- the cost to Obayashi for construction of the roadway along the Paumalu route could be nearly double that estimated for the currently planned route, not including new land costs; and
- wastewater from the community facilities area may need to be pumped up to the wastewater treatment facility, and a force main would need to be constructed along the bluff behind the Sunset Beach Elementary School, which will still involve extensive construction operations.

For the above-listed reasons, Obayashi has not pursued this alternative access road alignment. The other two alternatives studied have similar drawbacks involving Pakulena Gulch. Although these alternatives are similar to the planned route in terms of costs, we believe they could create more severe adverse visual and drainage impacts.

The proposed access road route was selected because there is a gently sloped section on this bluff which can be used for the roadway route without requiring as many bench cuts and associated vegetation loss. This gently sloped section will be used for a properly designed switchback turn which will be easier to negotiate and safer than the hairpin turn on Pupukea Road. Nearly all of the roadway route will be located in a cut (below the existing grade), so that cars traveling on it will not be visible from most locations below. In addition, once the extensive landscaping has grown along the roadway route, these trees and shrubs will generally shield the roadway from view. There will be a short-term adverse visual condition during the construction period and the early growth phases of the landscaping development. After a few years of growth, the roadway route will be much less visible than is Pupukea Road or Comsat Road.

N. Visual Resources

The visual impact of the project from locations below the bluff will be minimized by the design of the residential lots and clubhouse area. Vegetation along the bluff edge will generally be retained, except for view channels opened up for ocean vistas. The homes will not be perched on the edge of the bluff, rather they will be set back from the edge to shield views from below. Detailed line-of-sight studies will be completed in later stages of the planning process, which will demonstrate the lack of views or limited

views of residential structures and the clubhouse. It is possible that the roof line of some structures may be visible from locations below the bluff. The overall scenic character of the bluff will not be adversely affected by the development of the bluff lots. Visual impact of the access road is discussed in the previous response.

Views from the top of bluff will be made available to the public through the hiking and horse riding trail planned for the Haleiwa side bluff. The current plans also includes a scenic view park area at the military bunker located on the Kahuku side bluff. It is possible that a small picnic area could be established at this park. The access to the park is planned to be via an access trail off either the nearby residential roadway, or a bluff hiking trail leading from the clubhouse. A small parking area could be added at this residential location, however, there are concerns about controlling the privacy of this residential area if the scenic view park is active. In either access scenario, public access to the military bunker will be made available. Obayashi is not interested in creating a major tourist attraction at this scenic park site, and members of the community have expressed this over the last few years. The general public, including tourists who visit the site, will be able to experience wide ocean vistas from the clubhouse. Those individuals who are willing to expend the time and effort to walk to the military bunker will be treated to a better view of the shoreline below.

O. Cumulative Impact on Schools and Other Infrastructure

School Classroom Facilities: Representatives of Obayashi have met with the State Department of Education - Facilities Planning Division to discuss the need for providing additional classroom facilities at local schools in Sunset Beach and Kahuku. There will be an impact on local schools in terms of additional students, but the magnitude of this impact can only be estimated over a wide range at this point. Once developed, the actual occupancy of Lihi Lani by future residents will determine the real need for additional classroom facilities.

At present, the most appropriate estimate of new students that will be added to these schools from Lihi Lani has been provided by the DOE Facilities Planning Division. Some new classroom facilities would be required at both the Sunset Beach Elementary School and the Kahuku High and Intermediate School. As a result, the DOE will request the City and County to attach a condition on the DP Amendment approval for Lihi Lani which requires a commitment by Obayashi to participate in its fair share of costs for the new required classroom facilities. There are no other known plans for major new residential development in Sunset Beach, so there will be no cumulative impact in this area. The Kahuku area will have some additional housing development, so Lihi Lani will be adding to the number of students contributed from these projects.

Drainage Facilities: Drainage controls on the project site will control the rate of storm runoff at or below the existing runoff rate. There will be no adverse impact on off-site municipal drainage facilities, therefore no mitigative measures are warranted. Obayashi will also be required to control drainage from its project entrance intersection, to avoid flooding of Kamehameha Highway at this location.

Roadways: Kamehameha Highway is the main roadway serving the project site, and it will receive added traffic as a result of Lihi Lani operations. The project's impact on traffic at this location is described in an earlier response, and in the Draft EIS. Obayashi will make improvements to Kamehameha Highway at the project entrance intersection as required to maintain safe traffic flow. The small percentage of traffic contributed by the project to Kamehameha Highway does not warrant other roadway improvements. As major landowners in the area, Obayashi will participate in studying area traffic problems, and help to develop solutions to the problem of traffic congestion.

Electrical Supply: The Hawaiian Electric Company, Inc. (HECO) has commented that the total load of the project could reach 2,700 kVa, which could affect future plans for a third subtransmission line to the area. An existing 46 kV transmission line crosses through a portion of the site, and its protection is also a concern of HECO. Obayashi will coordinate its development with HECO requirements for power supply to the area. Obayashi will also participate in providing necessary improvements to the electrical distribution system required to serve Lihi Lani. The proposed project will not have an adverse impact on electrical supply facilities. This information will be included in the Final EIS.

P. Social and Economic Characteristics

Population: The population of the Primary Study Area (coterminus with Census Tract 101, Block Group 2, consisting of portions of Sunset Beach, Pupukea, and Waimea immediately surrounding the project site) was 3,212 in 1980. The significance of the anticipated 700 person resident population increase, which includes 504 persons from the affordable housing area, is attributable to the small size of the Primary Study Area. Within the Primary Study Area, the additional residents associated with Lihi Lani could be noticeable in terms of some added use of Kamehameha Highway, Foodland and the local beaches.

The General Plan Population Distribution Guidelines are based upon projections of growth for the North Shore Development Plan Area, which is far larger than the Primary Study area. The Population Distribution Guidelines are based on the City Council's intent to maintain the existing rural and country character of the North Shore DP Area. The project's population may or may not increase the population of the North Shore DP

Area above the 2010 General Plan Population Distribution Guideline, however, the planned low-density design and recreational character of Lihi Lani will be in keeping with the North Shore's country atmosphere. Significant other benefits of open space preservation, creation of new public recreational facilities and affordable housing may far outweigh the potential population impact. In general, none of the specific comments provide arguments which refute the Draft EIS conclusion that the population projections for the Lihi Lani Recreational Community are in line with the Goals and Objectives of the General Plan for the City and County of Honolulu.

Growth Rate of the North Shore: In the Draft EIS, the numbers of units for 1980 and 1989 are given for the North Shore and Koolauloa DP Areas and for Oahu as a whole. The housing growth rate between 1980 and 1989 for the North Shore was 0.9%; the rate was 0.7 % for Oahu as a whole. Your comment notes that "the North Shore DP area is already growing at a rate faster than the island of Oahu as a whole". This comment is noted, however, the issue of General Plan consistency is based upon projected population figures rather than housing figures and that the two cannot be directly compared.

Housing Demand: With the strong demand for housing, it is quite possible that the North Shore DP Area population could meet or exceed the guideline by 2010 even if little new housing were built — many people would live in more crowded conditions than now. Hence, Lihi Lani does not add population to the area so much as provide low-density housing in which a small part of the expected population can live. Your reference to this statement is noted, however, the pressures for housing do not directly bear on the assessment of the project's consistency with the City and County General Plan goals and objectives for population growth. Lihi Lani will provide additional affordable housing for the residents of the North Shore, which will help to ease some of the current pent-up demand for housing.

Q. Cumulative Impacts

The cumulative impact of this golf course in relation to others proposed on the North Shore was addressed in the Draft EIS, covering many subjects. A comprehensive plan of golf courses proposed for Oahu and the North Shore could provide additional information about potential cumulative environmental and socio-economic impacts. The City and County of Honolulu is currently performing their comprehensive examination of proposed golf courses through the DP Amendment Annual Review process. This new requirement for golf course projects on Oahu has caused proposed golf course projects to provide a thorough assessment of potential environmental, social and economic impacts associated with their project, including cumulative impacts.

The project site is suited to creating a high-quality championship golf course. The golf course will generally make use of the gently sloped portions of the land on the Kahuku side plateau. Because the land is steep adjacent to the golf course and the site is close to the ocean, Obayashi is paying special attention to minimizing the potential loss of fertilizer and pesticides chemicals to the ocean. As evidenced by the Draft EIS text and technical reports, extensive measures have been taken to minimize the potential for adverse effects to surface water and groundwater.

R. Alternatives

Obayashi has worked extensively with the local community over the last three years, and intensely with the JPC, to determine the future land use for the Obayashi property. Our current plan reflects the concerns of many residents in the area. Since the original proposal in 1988, substantial changes have occurred which have reduced the scope of the project and its potential environmental impact. We have addressed many different alternatives for the project, with the guidance of the community's expression of preferred land planning themes.

The discussion of alternatives included in the Draft EIS includes much of the community discussion topics regarding these different alternatives. We attempted to quantify impacts where ever possible for comparison to the proposed project. We believe there was serious consideration given to each of these alternatives. The reasoning we followed in the evaluation and comparison of alternatives was based on community issues and concerns.

S. Hawaii State Plan

Wages: The wage level used to assess operational employment impacts was approximately \$17,160 per year per full-time equivalent position, not including tips. This is a weighted average taken from eating and drinking places, miscellaneous retail stores, personal services, real estate and amusement and recreation services sector wages in the City and County of Honolulu. This income amount represents what one person working full-time would be bringing to the total family income. Many families on Oahu have two incomes contributing to the total family income. If both family members worked full-time at Lihi Lani (or elsewhere in similar service positions) and earned the average wage, their total annual income would be approximately \$34,000. This wage level would qualify this family to purchase one of the 60 affordable housing units at Lihi Lani that will be priced to be affordable to those families earning at or less than 80 percent of the median family income on Oahu (presently around \$41,000). They would also qualify for affordable housing in this price range somewhere else on Oahu. We have never purported Lihi Lani to be a great generator of new employment for the community, however, this example shows that the standard of living of

approximately 60 of Hawaii's people (and their families) could be improved by the project.

Open Space: The 559 acres of open space are generally steep lands that will become a conservation park including hiking and horse riding trails. We do not believe that open space is defined as gently sloped lands available for recreational facility development. Our project includes a wide variety of recreational facilities which will serve the public. The project should be credited for its efficient design which keeps the steep lands out of development while largely preserving prime agricultural soils as horse pastures on the flat plateau areas. Further, 338 acres of the site will be disturbed in the construction activities, which will leave 246 acres of generally undisturbed open space will occur within development areas. The total open space area is really 805 acres, or approximately 70 percent of the site.

Runoff: Flooding of the off-site areas is addressed earlier in this response letter. Flooding problems that presently exist in Sunset Beach will not be worsened by the development of the Obayashi property. It is possible that the drainage improvements included in the project will improve the current flooding conditions off-site. The control of runoff for the entire lowlands area cannot be accomplished on the Obayashi land alone, but could possibly be accomplished through an area-wide drainage improvement program. Obayashi is interested in participating in a study of this problem.

Potable Water: The BWS Pupukea Highlands system cannot provide Obayashi sufficient amounts of potable water to serve both the domestic and irrigation needs of the project. Expert studies conducted to date by Mink and Yuen indicate very tolerable salinity levels will occur in brackish water to be drawn from the site, even under peak demand conditions.

Effluent Irrigation: We believe that the treatment of effluent through the oxidation pond/marsh system, and disposal by irrigation of diluted treated effluent, is the most environmentally sound technique available for disposal of wastewater from the project. The system must meet all City and County and State standards for the treatment and disposal of effluent, and monitoring will be conducted to assess future groundwater and ocean water conditions prior to and during operation of this system.

Water Usage: Worst case water demand conditions are studied for both potable and non-potable water supply. Refer to response provided under Item H.

Affordable Housing: Obayashi believes that the entire North Shore community, especially Sunset Beach and Pupukea Highlands, should carefully consider the whether or not affordable housing should be included on-site. The City and County will base their decision about this portion of the project to a large extent around the local community's feelings.

State Housing Functional Plan: Refer to previous response above.

State Recreational Functional Plan: There is no data to substantiate the assertion that the majority of Sunset Beach and Pupukea Highlands residents oppose a golf course as part of this project. The Sunset Beach Community Association has indicated that the only type of golf course they would consider for this site would be an "organic golf course". There has been mixed support and opposition to inclusion of the golf course. Over 30 percent of the Sunset Beach and Pupukea Highlands residents surveyed at a community meeting last year preferred a plan including a golf course. Many residents feel that the golf course will enable much greater public benefits for the local community, because a portion of the golf course revenues will be applied to public recreational facilities and other community needs.

State Transportation Plan: Traffic considerations are addressed fully in our response under Items B. and I. Obayashi has never supported the widening of Kamehameha Highway to four lanes.

State Tourism Functional Plan: Users of the golf course at Lihi Lani will be partially from visitors to Oahu who are not members of the golf club, estimated at 15 percent at project stabilization. The golf club members who reside off Oahu are not included in this total. Most of the play will be by Oahu resident non-members (46 percent) and members of the golf club (39 percent). These statistics reveal that the use of the golf course is expected to be primarily Oahu residents.

State Educational Functional Plan: The impact of the project on local educational facilities is discussed in the response under Item L. The impact on educational facilities is a concern to Obayashi, who will participate in facilities improvements as will be determined by the State DOE.

Population: Refer to the response provided under Item J.

Economic Activity: Refer to the response provided under Item M. Wages.

Exacerbation of Existing Problems: The comments listed in this section are all addressed previously in this response, except for rental housing provisions. There is no plan to request a change in the General Plan Population Distribution Guidelines. Rental housing is currently being studied as a possible component of the affordable housing area at Lihi Lani, including the feasibility of elderly affordable rental units.

T. Appendix A - Community Benefits Package

Kama'aina golf rates create a substantial portion of the total benefits value projected by Obayashi. This is because the potential revenue losses from

including kama'aina rates in the rate structure is very substantial. There are many residents in the local community that do play golf. Just because there are a great number of surfers and sailboarders in the community, there is no evidence that the number of golfers on a per capita basis is less than anywhere else on Oahu.

U. Appendix B - Wastewater Management Plan

Sewage pump failure is a condition for which Obayashi has created a contingency plan, including back-up pumps, alarm systems, generators, and overflow vaults. Steep slope areas of the site are considered in the design of the storage vaults to ensure retention of possible overflows.

The wastewater facility planned for Lihi Lani will employ an extremely simple and effective technique through an oxidation pond and polishing marsh system. The system is being designed by Dr. Robert Gearheart of Arcata, California, who has extensive experience in this type of environmentally-sensitive treatment process. Not only will the wastewater be effectively processed to better than the required secondary treatment levels, the system will create an artificial habitat which will introduce new wildlife habitat to the site. This type of system does not present odor problems due to the presence of an oxygenated layer of surface water which inhibits the odoriferous gases from being released into the atmosphere. The distance from the effluent treatment facility to the closest residences in Pupukea Highlands is approximately 4,500 feet, which will also minimize the potential for residents being affected by any odors from the treatment facility. All future residents at Lihi Lani will be located much closer to the treatment facilities than residents in Pupukea Highlands. These residents living at Lihi Lani will be acutely interested in keeping this facility from creating any odor problem. Their Homeowner Association will pay close attention to controlling any nuisance odors of the system.

Odor abatement measures which may be incorporated in the facility include air scrubbing systems and chemical inhibitors at the pump stations and aeration devices and recirculation of effluent for the ponds.

Failure of some municipal wastewater treatment facilities on Oahu and elsewhere in the State has been publicized extensively. The State Department of Health will require back-up measures included in the design of the wastewater handling and treatment system at Lihi Lani. This treatment facility will be privately operated. The system will be much less mechanized than a traditional sewage treatment facility, which could reduce the potential for a failure. Back-up measures include the provision of additional storage capacity in the treatment for up to 30 days retention of treated wastewater during a high precipitation period. Back-up pumps and generators will be incorporated in the system. The system will be carefully designed considering the possibility of system failure.

V. Appendix C - Storm Drainage Plan

Ponded Water: Ponds located at the horse pastures or any other part of the site will not accumulate dangerous chemicals for eventual release to the off-site environment. Golf course ponds could contain some small quantities of pesticides in the pond sediments and decaying plant material. Most of the chemicals will be bound by soils on the golf course, grassy swales and, potentially, small artificial marshes also being studied as possible sites for detaining runoff from the golf course. The containment of chemicals allows for their degradation and further uptake by decaying organic material. Sediments and organic material will be retained in these ponds and marshes will be tested for chemicals periodically, and accumulated sediments will be removed to a safe disposal site.

Injection Wells: The injection wells proposed for the lower section of the property may reduce flooding in the adjoining Sunset Beach area but will not solve the chronic drainage problems in the area. The chemicals used to maintain the nearby soccer field and more distant 18th hole and driving range could potentially end up in the runoff collected at the injection wells. The quantity of pesticides and fertilizers applied to these areas will be very small, and most of the chemicals will be taken up in soils and vegetation of the site. The injection wells will aid in recharging runoff into the ground. The potential amounts of chemicals at the injection wells is expected to be very small, and the contribution to the ocean through recharged runoff to groundwater, is expected to be non-detectable.

W. Appendix F - Agricultural Feasibility

The use of prime agricultural lands on the property will be primarily for horse pasture. There is also a plan to provide one acre of the lower section for a community garden area. It is possible that more of the property could be used for a community-managed farming cooperative. We would like to discuss this possibility further with interested members of the community. Our largest concern is the potential long-term effects of farming activities on the other uses at the project.

X. Appendix I - Fertilizer and Pesticides Use

There are three intermittent streams which cross the property, none of which could be classified as major streams. The storm flow capacity of these streams has been identified in the drainage study. The control of chemicals applied to the golf course will be accomplished through the management program described in detail in the Draft EIS. Monitoring will be continued to assess the potential for chemical contributions to groundwater, stream water and the ocean. Experts studies prepared by Marine Research Consultants regarding marine water quality concerns describe very little potential for adverse water

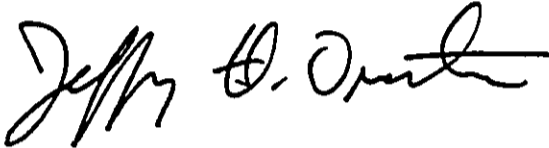
quality and marine life effects from this project. Detailed long-term studies of more susceptible upland environments (more porous soils) and oceanfront golf courses on the Big Island have shown no measurable degradation of water quality or the coral reef ecology.

Ocean water, stream water and groundwater monitoring results will be presented to the State DOH periodically, through the which the community can gain assurance of the success of Obayashi's management practices.

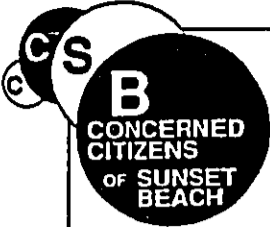
Thank you again for your suggestions and comments. We look forward to continued discussions with the JPC to review the current proposal and participate in planning the future of this property. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or concerns.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner



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GROUP 70
LIMITED

March 5, 1991

Mr. Mel Murakami
Department of General Planning
650 South King Street
Honolulu, Hawaii 96813

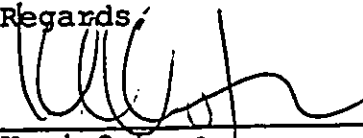
Dear Mr. Murakami:

Please find enclosed review comments regarding the DRAFT ENVIRONMENTAL IMPACT STATEMENT for the Lihi Lani Recreational Community, as described in the February 8, 1991 OEQC BULLETIN.

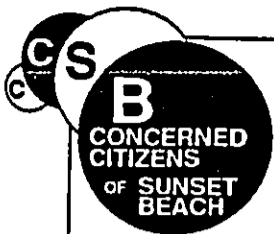
The Concerned Citizens of Sunset Beach (CCSB) are very much concerned with the health and welfare of the North Shore and are even more concerned with the present planning of our community which in turn will be the major contributing factor to the future well being of same.

For further assistance, please advise.

Regards,


Kari Ostman
Secretary, CCSB

cc: ✓ Jeffrey Overton
Obayashi Hawaii Corporation
OEQC



The following comments, by the Concerned Citizens of Sunset Beach (CCSB), focus on the possibility of adverse environmental and socioeconomic effects as reflected in the Lihilani Recreational Community EIS application for a North Shore development Plan amendment.

I. Affordable Housing Problems.

The 180 affordable housing units referred to in volume 1, page 25 of the draft obviously would increase an already excessive amount of Kam Highway traffic and in all likelihood would further aggravate lowland drainage and waste water disposal problems originating in the Pupukea and Sunset Hills Highlands.

Possible resolution of affordable housing infrastructure problems.

A. Delete from the EIS draft the portions applicable to the 28 acres allocated for the 180 density housing units until such a time as an infrastructure plan for the Sunset Beach lowlands is in place.

B. Relocate the affordable housing in Haleiwa town or some other suitable place with an adequate infrastructure plan in place.

One might note page 219 volume 1 of the EIS application refers to affordable housing as an unresolved issue. This raises the question - does it make sense for government officials to force a golf course developer to put affordable housing in an area where infrastructure can only support one acre country housing lots?

II. Access Road.

The EIS draft application volume 1, page 34 & 35 under heading "C" 'Excavation and Rock', drilling and blasting refers to building an access road from Kam. Highway to a Club House to be located on the bluffs above. One must consider in the event of excessive precipitation (rain) during the construction stage of the proposed access road, Shark's Cove [one of Sunset Beach's greatest attractions as a marine preservation and scuba diving area] could be temporarily or forever wiped out by excessive sediment muddying the waters to the extent all the marine life is killed off.

[NOTE: We have a very recent example of Waimea Falls having to close down for months after an unexpected flash flood.]

Suggested Solution:

The EIS application volume 1, page 35 E - Construction of building and roadways be amended to read something to the effect the affordable housing and access road from Kam highway will be put on hold until a feasibility study for a Sunset Beach By-pass road is completed. By following a procedure of first constructing the golf course and clearing the one acre country lots for development, the Lihilani project postpones irrevocably committing the Sunset Beach low lands to an ecological disaster that could result from a heavy downpour causing flooding during the construction phase of the access road. It also saves the Sunset Beach Community from further burdening Kam Highway already over loaded by trucks, tour busses and automobile travel to the Kuilima Development project in Kahuku.

In exchange for not building the density housing the highland residents should be more than willing to allow Obayashi to bring their heavy equipment up Pupukea Road.

NOTE: Delaying the building of an access road until a feasibility study for a bypass road is completed should not interfere with Obayashi providing the major public recreational

and community facilities earmarked for the first phase of the projects development.

III. Zoning and Land Use Controls.

Volume I, page 47 of the application addresses rezoning to P-2 to allow a golf course with the Club House and maintenance facility as a permitted accessory. The EIS application should be amended to include a study of what ecological dangers the club house and maintenance facility and golf course pose to the property owners located directly below on the mauka (mountain side) of Kam Highway. The EIS should include the square footage of club house, maintenance facility, parking lots etc.

Possible solution to club house issue:

To mitigate socioeconomic and environmental concerns by lowland property owners, particularly along the mountain side of Kam Highway, Obayashi, at the same time they are petitioning for rezoning to accommodate their vested interest, should ask that consideration be given to interested parties along Kam Highway (a form of compensatory relief) for upzoning their properties to commercial. After all, it is these people who are losing their residential amenities by additional traffic impact and who will be directly exposed to potential flooding and mudslide damage during the construction phase of the project.

IV. Benefit Package.

Obayashi proposes to mitigate ecological changes and socioeconomic threats to the property owners in the low lands of Sunset Beach by offering a benefit package to offset loss of residential amenities and acceptance of environmental risk. The

benefit package is defined in the application on page 40, volume 1. To wit: the Lihilani Recreational Community will include several features that will be available for public use. In addition to the golf course, the public will be able to use the driving range (with fee), the nine miles of hiking trails and bridle path (at no cost), tennis center (by fee), equestrian ranch (by fee) and camp grounds (by fee). Part of the club house facility will also be open to the public including the snack bar restaurant and golf shop, etc.

It should be noted in the sense [they are being operated at a profit] all these amenities are self serving. Moreover, the developers proposed services actually attract visitors thereby further taxing an already inadequate infrastructure. One would think the developers logistically would first address basic lowland infrastructure improvements essential to accommodating any further transient increases.

The benefit to the community package also includes a community facility complex, volume 1, page 40 (2.4) to be located on apparently ten (10) acres fronting Kam Highway on the Kahuku side and adjacent to the Sunset Beach Elementary School. This complex includes soccer/baseball fields, swimming pool, locker rooms, meeting hall, picnic areas, parking facilities, scholarship programs and kamaaina rates. One assumes this is a trade off to offset the detrimental traffic impact and environmental risk posed by the access road from Kam Highway to the golf course club house.

Possible resolution to benefit package problems:

To help mitigate our concerns, Obayashi could elect to use their good office to assist the CCBS in their efforts to persuade the state legislature to fund an EIS study for a Comprehensive North Shore Waste Water System from Waimea Falls to Kahuku and a feasibility study for a Sunset Beach By Pass Road from Wahiawa to Laie. It should be noted that the CCSB introduced bills at the 1991 session of the legislature to accomplish these ends. The

respective bills have been put on hold until next year purportedly to allow additional time for gathering more community input.

In reference to the portion of the benefit package dealing specifically with the 10 acres [soccer/baseball field etc], the draft, to be viable, should be amended to include space for more basic community needs such as a sub police station, fire station, post office and a public library.

V. Archaeological Historical Sites

Volume 1, page 101. The Church of Hawaii Nei and its Hawaiian Ethnic Art Museum members of CCSB are very concerned about disturbing the many pre-contact buried sites located within the confines of the 1143 acres of land described volume 1, page 10 (1.1) as the location where Obayashi plans to develop the Lihilani recreational project. While the Church can appreciate the previous archaeological study described on page 101 volume 1 under A-'Existing Conditions', [done by Dennis (1979) Rogers 1976 and Yent (1979 and some investigation by the Bishop Museum and the University of Hawaii] over the years the simple truth as borne out when 1000 or more bodies were uncovered in a similar golf course clearing on Maui a couple of years back, is that in areas covered by brush, surface or limited sub surface, examination is of little value in locating ancient burial sites. Ironically, volume 2, section N, page 1, under 'background', points out the same Paul H. Rosendahl PHR Inc., [whom Obayashi retained to make the archaeological reconnaissance survey], overlooked the hundreds of burial sites on the aforementioned Maui golf course project. For this reason, the Church of Hawaii Nei and the Museum, Curator, Maui Loa, contend the summary of identified sites, Pupukeya Paumalu. Development project area section 4, page 11, volume 2, is wholly misleading and inaccurate insofar as describing the number of archaeological and burial sites as 60 with only 12

containing pre-modern artifacts as described on page 10, section N, volume 2 under 'Findings'.

Suggested resolution to accurately identifying ancient archaeological and burial sites.

Maui Loa, the Kahu Minister of the Church of Hawaii Nei and Curator of the Museum, offers his service to be present when the bull dozer clears the brush and digs up the earth. The church Kahu and Curator would be able to immediately recognize those locations that were ancient archaeological and/or burial sites. These locations could be marked and preserved or when absolutely necessary, any remains uncovered could be reinterred in a small section of the Lihilani acerage set aside specifically for such a purpose.

VI. Drainage Infrastructure.

Volume I, page 171, Drainage facilities 4•17•4

The drainage conditions in the low lands of Sunset Beach are some of the poorest on the entire island of Oahu. While page 171 (under *Mitigating circumstances*) state this project will not place any additional hazards along Kam Highway, this most certainly will not be the case during the construction stage of the project, and, since water runs downhill, there is little guarantee during heavy rains that run off from the highland golf course will not contribute substantially to uncontrollable drainage problems below.

Suggested resolution to Sunset Beach drainage problems.

The best and perhaps only solution to the problem may be that the City and County make immediate plans to correct Sunset Beach's poorly planned antiquated drainage system.

VII. Waste Water management Plan for Lihilani Project.

Volume I, (9.0) Technical Appendices B Waste Water Management Plan. While on the surface, it appears that the Lihilani project has a well thought out plan for waste water disposal with stabilization ponds and effluent disposal on golf courses as outlined in appendix B, page 14 under conclusion ie.,. Significant adverse impacts due to effluent disposal by irrigation of the golf course is not foreseen. Along the same lines under mitigating circumstances, page 15 states there is ample storage for effluent in the irrigation pond during prolonged periods of inclement weather. Based on the recent Waimea Falls flooding experiences, such statements are very much suspect. It is doubtful, in the event of heavy rains, any number of retention ponds would save the low lands from a deluge of sewage overflow. Moreover, the pond system, as proposed by Obayashi at its best, serves only the Lihilani project which does absolutely nothing to alleviate the intolerable current condition resulting from the Pupukea and Sunset Hills overflow of sewage into the low lands of Sunset Beach everytime it rains.

Possible resolution of problems stemming from Lihilani waste water disposal system.

To conform with state law, Obayashi should build their pond based waste water disposal system to tie into a comprehensive low land disposal system inclusive of all Pupukea and Sunset Hill residents. Furthermore, to help safeguard the low lands from sewage seepage and overspill, Obayashi should refrain from building any density housing until a plan for a comprehensive highland and lowland waste water disposal system is in place. It might be noted such a comprehensive waste water disposal system covering the entire sewage district could be funded by City and County revenue bonds guaranteed by a consortium of North Shore developers, mainly Obayashi, Campbell Estates, Asahi Juyken, BYU Zion Corporation, PCC etc. Should this become a reality, it would

clearly demonstrate the desirability of Sunset Beach and other North Shore communities having a strong developer in their area.

This concept of consortium of developers guaranteeing revenue bonds could be in lieu of all other impact fees except those promised in community benefit packages. Under such circumstance, it appears that Obayashi would be Sunset Beachs' best hope for obtaining any relief in the foreseeable future from their grossly inadequate drainage and waste water disposal infrastructure.

VIII. Integrated Pest Management (IPM)

Certainly a high-sounding phrase - notwithstanding under the conditions where a golf course maybe located on the bluffs directly above a community lacking adequate drainage or waste water disposal control, any use of poisonous fungicides, herbicides or pesticides present a potential hazard to the residents living below and the ecological integrity of the marine preservation. This is particularly true during heavy rain storms when even the best planned water detention systems are prone to breakdown.

Consider further, IPM calls for strict monitoring procedures (see page 4, volume 2) labeled 'Roadblocks' to acceptance of IPM programs ie., In Hawaii, there may be a lack of trained personnel with experience in IPM programs. One must consider, even where personnel properly trained in IPM procedures, [as employees], would only be answerable to their employers whose decision making process is prone to be motivated by economic rather than ecological considerations.

Suggested resolution of problems stemming from the use of chemicals on the golf course.

Price Ralston Environmental Consultants, specializing in organic farming and gardening techniques contend: A golf course

can readily be designed to respond to organic rather than poisonous chemical treatment. Of interesting note, according to legal counsel, once a golf course developer and/or designer is put on notice to the inherent health and ecological dangers resulting from the use of toxic poisons, their liability for any damages to personage and/or property becomes a matter of record.

With the Lihilani golf course hovering right above Sunset Beach and the known porous nature of the earth beneath, the safest most prudent and possibly only publicly acceptable way to design this particular golf course would be to make it 100% organic. Such an action alone could justify the Obayashi Lihilani project. Note page 13, volume 2 states greens and tees should be fumigated with melting bromide plus chlorporcin. These are deadly poisons restricted to licensed control operators claiming these hazardous chemicals deteriorate rapidly offers little consolation to Sunset Beach residents located directly below.

The installation and maintenance of quality greens and tees would be relatively easy areas to keep chemically free.

Next we examine turf grass. Page 12, volume 2 states TIF green is perhaps the most desirous for use at the Lihilani site. TIF Green, like any other grass, properly planted does not need chemical treatment to thrive. Weed control with proper planning can be less costly and more efficient by utilizing non toxic herbicides.

In summary, Sunset Beach, one of the worlds most popular water sport communities attracts millions of visitors annually. Ohbayashi's proposed Lihilani Country Club, Golf Course and Country Estates plus other amenities has the potential of enhancing the areas prestige as a world class recreational center

Seemingly, community acceptability of the project hinges on the developers willingness to participate in the improvements of Sunset Beach's woefully inadequate infrastructure and in helping us beautify and protect our environment.



Kamuela Price
President, CCSB
638-7841



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17 April 1991

Concerned Citizens of Sunset Beach
P.O. Box 721
Haleiwa, Hawaii 96712

**Subject: Lihi Lani Recreational Community Environmental Assessment
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Mr. Price:

Thank you for your 5 March 1991 letter to Mel Murakami, Department of General Planning, concerning our Draft Environmental Impact Statement which was filed on 23 January 1991. We have appreciated your interest in our project over the last three years. The following responses are to your specific comments.

A. Affordable Housing

The inclusion of affordable housing on the project site was made in response to community concerns about the lack of affordable housing in the area. Obayashi must provide affordable housing, or funds in lieu of building such housing, to satisfy government requirements for new market residential housing. After studying several alternative parcels on the North Shore, Obayashi concluded that infrastructure limitations for wastewater disposal and water supply, along with major flooding problems, virtually eliminates most parcels currently available on the market. It is for this reason that Obayashi proposed to construct housing on its land in Pupukea.

Wastewater treatment capacity at Lihi Lani will accommodate the projected 180 units of affordable housing. Drainage controls included in the project will prevent adverse downstream drainage effects from occurring. Traffic impacts are the most tangible impact of the affordable housing area, with nearly 40 percent of all project traffic associated with the affordable units. The recommendation to relocate these affordable units to another more suitable site is a concern we would like to discuss further with your organization and the larger community.

B. Access Road Construction

The development of the access road to the project is integral to the success of the entire project. It has been clear from the beginning stages of this project that the residents of Pupukea Highlands and Sunset Hills strongly opposed the use of Pupukea Road as an access to the project. Obayashi has conducted

studies of access alternative to the site, and decided to pursue the most environmentally sensitive approach to the upper lands. The currently proposed access route approximately follows a somewhat gently sloped portion across the bluff slope, which will require substantially less rock removal and grading. There will likely be some rock removal required, but it is not yet known whether blasting or drilling will be required.

As shown in the Storm Runoff Plan prepared for the Draft EIS by Engineering Concepts, Inc. (Appendix D) the intermittent streams crossing the property do not receive runoff from the area that will be developed for the access road. Runoff from the access road area will be controlled in the lowlands of the project site, which will include a permanent drainage detention facility to be located along the Highway. Much of the sediment in runoff will be trapped in upper area detention basins and this major basin, and excessive sediment will not be introduced into ocean waters.

Substantial drainage and runoff controls measures will be employed to control drainage from all the construction areas. Eroded soils will be minimized by careful management of the construction site, following the best management practices recommended by the State Department of Health. The use of detention and retention ponds for controlling construction area runoff will contain suspended sediments on-site. As further mitigation, Obayashi will attempt to schedule the six month road construction period to coincide with the lower precipitation period of April to October.

It is important to understand that existing natural runoff conditions include substantial amounts of silt in runoff received by the ocean. There will always be some suspended sediments in runoff from the land, however, runoff and silt from the development site can be effectively controlled to levels which are the same or less than existing conditions. Once in operations, Lihi Lani will serve to reduce suspended sediments in runoff from the site to the ocean due to the planned extensive erosion controls and detention facilities. Shark's Cove or the more proximate sections of the coast will not be adversely affected by runoff from the Obayashi lands during construction.

C Golf Course, Clubhouse and Maintenance Facilities

The development and operation of the golf course and its support facilities will pose no ecological danger to residents and property owners located makai of the site. The use of chemicals will be carefully controlled on the site such that pesticides will cause no ecological or public health risk, and probably not even be detectable at off site locations. Drainage and erosion controls during and after construction will prevent adverse flooding or mudslide events from occurring at off-site locations. Construction operations will be required to take special measures to prevent rocks and other debris from rolling down the bluff onto neighboring lands. In addition, Table 2 of the Draft EIS does

include the estimated areas for the clubhouse, maintenance facility and parking lots.

D. Area Wastewater Study and By-Pass Road Study

Obayashi is concerned about the community's future wastewater disposal needs, and would be interested in participating in the study of the current problem and solutions available. Our project is essentially self-contained for wastewater treatment and disposal infrastructure requirements, and is not planned to accommodate other off-site sources. Once successfully implemented, the stabilization pond/marsh treatment system could serve as a model for Sunset Beach and other areas in Hawaii.

The potential for establishing a by-pass road to serve the Kuilima Resort and Laie attractions is a very remote possibility. A road of this magnitude could take decades to get approved, be extremely difficult to construct, and be tremendously expensive. The route that could be proposed for this roadway is the existing (but impassable) military roadway extending from Helemano near Wahiawa to Pupukea. There are other roads linked to this roadway, extending through military leased lands from Campbell Estate, which could be used to connect with the Kahuku area. The potential use of this roadway would be mainly guests, workers and supply vehicles associated with the Kuilima Resort and FCC. The number of vehicles served by these facilities would not justify the expense involved with creating the road.

Obayashi will work with the local community and State Department of Transportation to develop solutions to the existing and future traffic problems in the area. Participation in this effort by all of the significant traffic-generating landowners of the area will be encouraged.

E. Recommended Additions to Proposed Community Facilities

The community facilities area on the makai portion of the property could include other community-need facilities. Because land on this site is limited, the number and types of facilities that could be included would have to be carefully studied. Those facilities which would be linked to City and County of Honolulu, State or Federal services would require agency planning efforts that have not been initiated to date. Obayashi is open to discussing with the community the potential variety of public needs these facilities could satisfy.

F. Archaeological and Historical Sites

At this time, Obayashi cannot agree to implement the recommendations made with regard to archaeological and historic features. The treatment of these features will be officially determined by the State Department of Land and Natural Resources (DLNR) - Historic Preservation Division (HPD). We

will forward your comments to them for consideration in their review process.

The DLNR-HPD was provided with the reconnaissance survey results from our archaeology consultant Paul H. Rosendahl, Ph.D., Inc. (PHRI) in 1988. This agency concurred with the findings of the reconnaissance survey, and the preliminary mitigative measures proposed. The Draft EIS has also been reviewed by this agency, and they recently provided comments which we will be responding in the Final EIS. This agency will make specific recommendations regarding the disposition of the features which are proposed to be directly affected by construction activities. They are also concerned about the potential indirect impacts to significant sites that could result from the increased access onto the property.

The greatest concern expressed in your comments and the DLNR comments is the preservation of the significant sites, especially burials. One burial site is expected to be affected by the construction of the access road. The treatment for this site will be determined by DLNR-HSS, including advice and direction from their Oahu Island Burial Council. This relatively new advisory group includes volunteer representatives of the community and government, including OHA. The Council has generally desired preservation in place for most burials, however, relocation of remains is a possible alternative. The Council will review the project plans and make their determination during a later phase of project planning.

Non-burial sites will also be reviewed by DLNR-HSS, and they must approve the plans for data recovery and mitigation proposed by PHRI before any further work on these sites can be undertaken. Some of this additional work will include excavations at appropriate locations. The Data Recovery and Mitigation Plan will be prepared in the near future. The earthwork phase of construction will be monitored by our consulting archaeologist, who is required to stop work and contact DLNR-HPD for guidance if additional features are encountered.

The Kapalua project you referred to was a resort hotel project, not a golf course project. For this project, PHRI correctly identified the potential sand dune burial site through their site studies and detailed research of all available information regarding the history of the area and this particular site. The DLNR-HSS was also involved in making decisions about data recovery and mitigation for this site. It was not until actual construction that the project encountered hundreds of burials. The decision to reinter the remains identified and move the hotel was costly for the developer, but it was a wise decision for the preservation of a very significant Hawaiian burial complex. Although there is potential for additional remains and artifacts to be found, the consulting archaeologist will be on-site during clearing and grading activities to monitor earthwork and observe any new archaeological sites. If new sites are found, the archaeologist is obligated to notify the DLNR-HPD.

Obayashi will report to the community all new archaeological findings on the site.

G. Drainage

Drainage of storm runoff from the project site, both during and after construction, will be strictly controlled by drainage facilities to be developed by Obayashi. There will be no adverse off-site impacts to drainage conditions as a result of the project. We realize there have been chronic drainage problems in the area, and Lihi Lani will neither solve nor exacerbate these problems. We have also experienced the most recent flooding events of November 1990 and March 1991. Obayashi is interested in participating in a study of drainage problems and potential solutions for the area.

H. Wastewater Management Plan

The wastewater system proposed by Obayashi will have substantial additional capacity for retention during prolonged precipitation periods. This design will accommodate worst-case conditions, such as the recent high rainfall periods. There will also be multiple safeguards to prevent sewage system failures, including back-up pumps, auxiliary generators and containment systems. Obayashi is not planning to service any off-site wastewater sources at their wastewater treatment facility.

The area's wastewater problems should be studied in a comprehensive fashion. Obayashi is interested in participating in the study of this problem. Implementation of a major new municipal collection, treatment and disposal system for the entire North Shore has historically been difficult for the City and County to justify, since the population of the area is quite low and dispersed.

I. Pesticides

The practice of safe, controlled use of pesticides on a golf course has been refined greatly over the past few years. Lihi Lani will integrate the latest technology for golf course pesticides control, including implementation of an Integrated Pest Management (IPM) program. Most Hawaii golf courses will be using some type of IPM programming in the near future, and professional golf course managers will be required to understand and effectively implement this type of program.

Ideally, no pesticides would be required to maintain quality turf on the golf course, however, this is not practical. We are currently investigating products which would allow for sections of the golf course to be organically maintained. These products have not been thoroughly tested through golf course turf research experiments, and therefore have no track record to go with. Our initial findings, however, indicate that there may be promise for

Response to Concerned Citizens of Sunset Beach
17 April 1991
Page 6

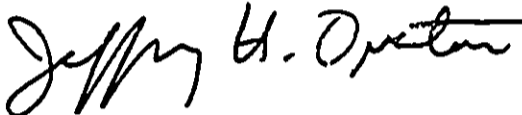
some types of soil amendments which will allow for a nearly organic operation. Until we have convincing evidence that these techniques can be effectively employed at Lihi Lani, Obayashi will continue as planned to include carefully managed pesticides use and extensive mitigative measures to prevent chemical migration off-site.

Although Obayashi is applying for its first development approval, there are several years to go before the golf course will be constructed, and the technology in organic golf course maintenance is expected to be further advanced during this period. Obayashi is willing to continue its research and design efforts in an effort to create an organically-maintained golf course at Lihi Lani.

Thank you again for your suggestions and comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or concerns.

Sincerely,

GROUP 70 LIMITED



Jeffrey H. Overton, AICP
Senior Planner

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EIS
JA/G

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William A. Bonnet
Manager
Environmental Department

March 5, 1991

RECEIVED
MAR 06 1991

GROUP 70
LIMITED

Mr. Roland Libby
City & County of Honolulu
Department of General Planning
Honolulu Municipal Building
650 S King St., 8th Floor
Honolulu, Hawaii 96813

Dear Mr. Libby:

Subject: Draft Environmental Impact Statement (DEIS) for
Lihi Lani Recreation Community North Shore Development
Plan Amendment (Volumes I & II)

We have reviewed the subject DEIS, and have the following
comments:

- (1) There is no mention of anticipated impacts or proposed policies or plans concerning HECO facilities.
- (2) The total load for ultimate development could reach 2700 kVa, which could affect future plans for a third subtransmission line to the area.
- (3) There is an existing 46 kV transmission line crossing through a portion of the proposed subdivision.
Routing of a new transmission line to the North Shore may be impacted.

HECO shall reserve further comment to the protection of existing power lines bordering the project area until construction plans are finalized.

Sincerely,

cc: Craig Yamagishi, Obayashi Hawaii Corporation
Jeffrey H. Overton, AICP ✓

An HEI Company



17 April 1991

William A. Bonnet, Manager
Environmental Department
Hawaiian Electric Company, Inc.
P.O. Box 2750
Honolulu, Hawaii 96840-0001

**Subject: Lihi Lani Recreational Community Draft EIS
Paumalu and Pupukea, Koolauloa, Oahu Hawaii**

Dear Mr. Bonnet:

Thank you for your 5 March 1991 letter to the Department of General Planning regarding the subject Draft EIS. The following responses are to your specific comments.

Prior to subsequent stages of planning, the landowner will meet with HECO to discuss an appropriate plan for meeting the electricity demands of the proposed project relative to the existing and proposed HECO facilities. Obayashi is prepared to participate in the development of new facilities that are required to serve Lihi Lani.

Thank you again for your comments. Please feel free to call either me or Kari Kilstrom (523-5866) if you have any questions or require additional information.

Sincerely,

GROUP 70 LIMITED

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LIHI LANI RECREATIONAL COMMUNITY
 •FINAL ENVIRONMENTAL IMPACT STATEMENT•

LIST OF PREPARERS

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		Integrated Pest Management
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LIHI LANI RECREATIONAL COMMUNITY
•FINAL ENVIRONMENTAL IMPACT STATEMENT•

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