OFFICE OF THE MAYOR

CITY AND COUNTY OF HONOLULU

HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

February 28, 1977

Mr. Allan Suematsu
Executive Secretary
Environmental Quality Commission
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Mr. Suematsu:

Subject: Revised Environmental Impact Statement for the 1.5 Million Gallon Heeia-Kai Reservoir at Heeia, Koolaupoko, Oahu

We have no objections regarding the project, and therefore, we recommend acceptance of the environmental impact statement.

Warm personal regards.

Sincerely,

FRANK F. FASI, Mayor
City and County of Honolulu

FFF:wl

REVISED ENVIRONMENTAL IMPACT STATEMENT

FOR THE

1.5-MILLION GALLON HEEIA-KAI RESERVOIR

AT

HEEIA, KOOLAUPOKO, OAHU

Prepared for:

Board of Water Supply
City and County of Honolulu
Honolulu, Hawaii

SUNN, LOW, TOM & HARA, INC.

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Prepared for:

Board of Water Supply
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Honolulu, Hawaii

Prepared by:

Sunn, Low, Tom & Hara, Inc.
Environmental Engineers
190 South King Street
Honolulu, Hawaii 96813

January 1977

SUMMARY

1. Description of the Proposed Action

The proposed project is the construction of a 1.5-million-gallon reservoir to upgrade water service to residents of the Kaneohe-Heeia area. The reservoir will be approximately 120 feet in diameter, with a height of 20 feet, and constructed of reinforced concrete. Related work includes site preparation and grading, construction of an access road to the reservoir site from Kahekili Highway, and installation of approximately 2,000 lineal feet of 16-inch-diameter transmission main connecting the reservoir to the existing water system. The total area affected by this project is approximately 2.7 acres.

The objectives of the proposed project will be consistent with the Board of Water Supply's policy of providing proper water supply management and obtaining the best use of the groundwater resources. Further, the proposed project should provide additional dependability and flexibility to the existing water supply system. When fully implemented and integrated with the existing 2.0-million-gallon Kapunahala reservoir, this system will provide further assurances of adequate water supply for domestic needs and fire protection and a more cost-effective operational program of water supply and distribution.

The project site is located approximately 150 yards mauka of Kahekili Highway and one-half mile north of Haiku Road. Land is presently zoned conservation and is under the ownership of the Bernice P. Bishop Estate.

2. Description of the Environmental Setting

The project site is situated atop a knoll overlooking Kahekili Highway and adjacent to the Haiku Plantation subdivision. No structures or utilities are known to exist within the affected area since the land is zoned conservation.

Lands are presently covered by scrub growth of plum, ohia lehua, guava, pili grass, and other native flora, typical of other areas of windward Oahu of comparable elevation and rainfall. No endangered species of flora or fauna were found in the general area or any records of endangered species in the immediate vicinity noted.

No archaeological or historic sites are known to exist in the affected area.

3. Probable Impacts of the Proposed Action

Short Term

a. Temporary disruption to local highway traffic due to construction activities

b. Temporary noise and dust disturbances to residents in proximities due to construction activities

c. Runoff from the site and related soil erosion during construction

d. Curtailment in the use of that branch of the "horse trail" that traverses the knoll area

Long Term

Positive effects of the completed project:

a. Water service to meet domestic and fire protection needs for Heeia will be upgraded.

b. Reductions in fire insurance rates for individual homeowners and entities as a result of an upgraded system may be possible.

c. The project will aid in providing for orderly, controlled growth.

d. Dampening of water pressure fluctuations in the 30-inch transmission main that also serves the Kailua-Kapaa areas may be possible.

Negative effects of the completed project:

a. The project will involve alteration of the physical landscape; cut and fill areas will be required for the reservoir site and access road.

b. Upper portions of the terraced slopes, which are required for the access road, will be visible to residents of the Haiku Park Subdivision and to motorists traveling in the Honolulu-bound direction of the highway within a 3,000-foot zone.

c. An irreversible commitment of monies, land, materials, and energy resources in the construction of the proposed action will be required.

4. Probable Adverse Impacts Which Cannot Be Avoided

Unavoidable adverse environmental effects associated with the implementation of the project will be in the form of short-term effects related to construction activities.

a. Temporary disruption to highway traffic during installation of the 16-inch water main

b. Temporary noise and dust disturbances to residents in proximity to construction activities

c. Potential for accelerated soil erosion of graded and exposed areas until soil stabilization work is completed

d. Clearing and covering of some indigenous flora

e. Curtailment in use of a branch of an existing "horse trail" that cuts through the reservoir site

5. Mitigation Measures Proposed to Minimize Impact

		Impact	Mitigation Measures
a.	Construction	Traffic	Construction traffic and roadway work will be scheduled for off-peak hours.
		Noise	City and state noise regulations will be enforced.
		Dust	Water sprinkling programs will be implemented to reduce airborne particulates where necessary.
		Soil erosion and runoff	Cutoff ditches above graded areas will be provided to minimize run-off onto slopes. Planting of terraces and slopes (immediately after completion of grading) will retard velocity of runoff and soil particle transport. County grading ordinances and soil erosion standards and guidelines will be enforced.
b.	Operation	Visual, aesthetics	Cut and fill slopes and terraces will be planted with ground cover providing virtually 100 percent coverage within three to six months. Reservoir area will be landscaped to a heavy massing of trees to screen the structure. Estimated time for virtual screening is less than five years. Access road will be landscaped with trees, tapering in density toward road junction with highway.

6. Alternatives

Conceptual. Two conceptual alternatives or variations to the proposed action are available. One alternative is that of programming additional pumping units at the water source to meet fluctuating water demands. Large capital outlays for pumping facilities, booster pump stations, and related controls and the attendant high operational requirements, however, make such a plan to encompass the windward water system infeasible.

A second alternative is the development of another water supply source; however, water source development options are limited for the Heeia area.

Sites. Alternative sites in the Heeia area for the reservoir were evaluated. Alternative sites were limited to areas farther mauka of the proposed site and recessed into the valley. These options require deeper excavation and extensive grading. Further, higher construction costs would be anticipated as a consequence of the greater requirements for earthwork, roadways, and pipelines.

The proposed site and its knoll-type feature naturally affords the necessary service elevation, minimum earthwork requirements, access, and proximity that provide the most cost-effective system.

No Action. This alternative, a no-action course or nonimplementation of the proposed action, would result in several severe consequences. More specifically, the objectives of assuring adequate and reliable water service to windward Oahu communities without other major modifications and/or additions to the system would not be realized. Such a situation is directly contrary to the Board of Water Supply's water management goals and policies.

7. A list of agencies, groups, and individuals receiving copies of the assessment for comment is attached to this Statement.

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ENVIRONMENTAL IMPACT STATEMENT

FOR THE

PROPOSED 1.5 MILLION GALLON HEEIA-KAI RESERVOIR

1. DESCRIPTION OF PROPOSED ACTION

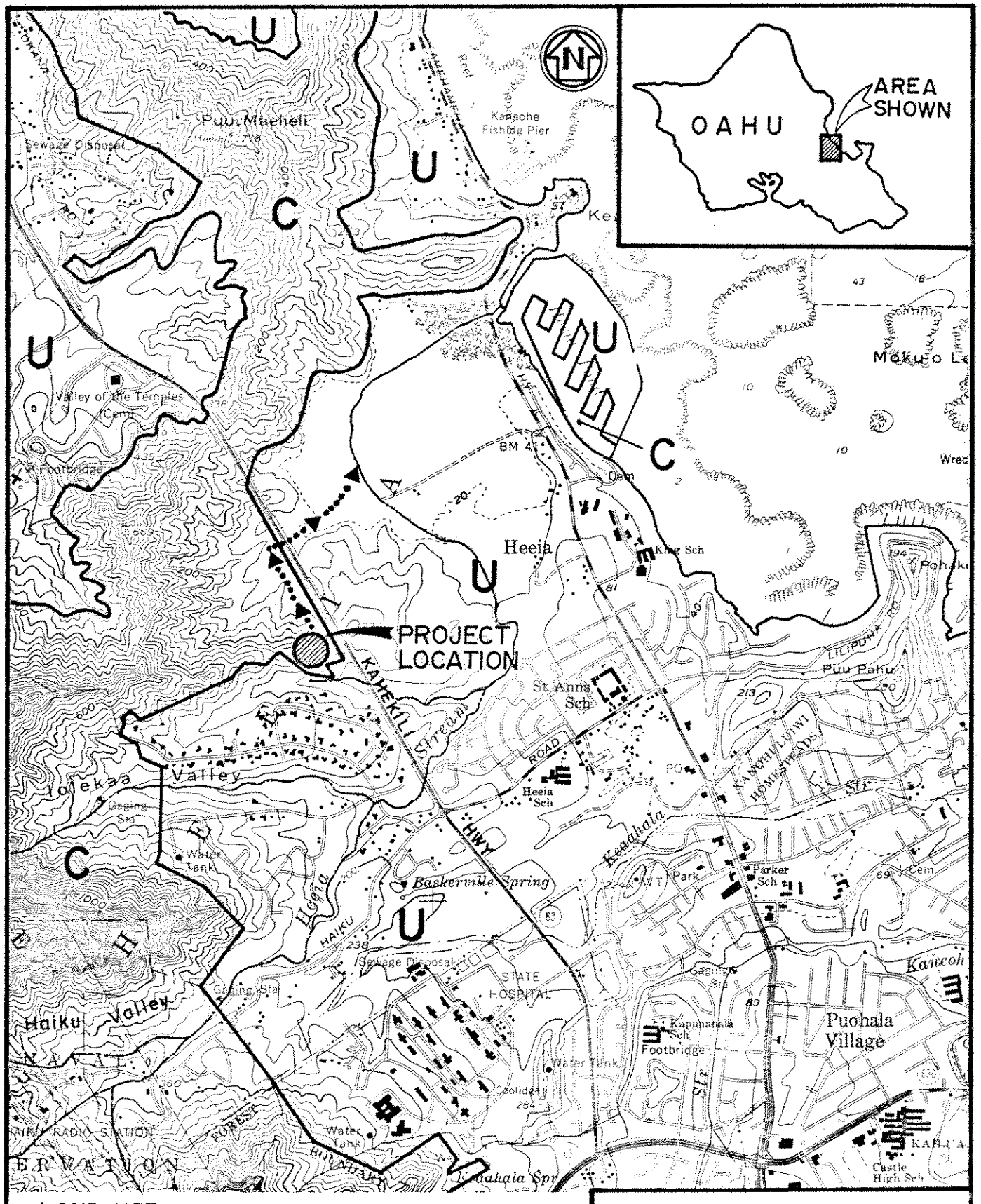
The proposed action, as initiated by the Board of Water Supply, is the construction of a 1.5-million-gallon reservoir to upgrade water service to residents of the Kaneohe-Heeia area. The reservoir will be approximately 120 feet in diameter, with a height of 20 feet, and constructed of reinforced concrete. Related work includes site preparation and grading, construction of an access road to the reservoir site from Kahekili Highway, and installation of approximately 2,000 linear feet of 16-inch diameter transmission main connecting the reservoir to the existing system. The total area affected by this project is approximately 2.7 acres.

PROJECT LOCATION

The project site is located approximately 150 yards mauka of Kahekili Highway and north (Kahuku side) of Haiku Road, as shown on Plate I. This 1.5-million-gallon reservoir site and access road will occupy 1.5± acres of land presently designated as conservation by the State Land Use Commission (tax map key: 4-6-14:5). Lands are presently under ownership of the Bernice P. Bishop Estate, and negotiations are underway to acquire the site in fee.

2. PROJECT OBJECTIVES

Water supply to residents of Heeia (low-level service) is presently provided primarily through the 30-inch Punaluu-Waihee transmission main, with its source at the Punaluu well fields. This water importation system, as reflected in the size of the transmission main, also extends water service to other areas as distant as Kapaa and Kailua.



LAND USE

C = CONSERVATION

U = URBAN

LEGEND

••• ▶ ••• GENERALIZED DRAINAGE PATTERN FROM PROJECT SITE

1000 0 1000 2000

SCALE IN FEET

PLATE I

LOCATION MAP AND DRAINAGE PATTERN

Stresses imposed by peak water demands in the Kaneohe-Heeia area and elsewhere along the 30-inch water transmission route subject the main to fluctuating water pressures. With the further anticipated growth in the windward service area, these demand stresses on water pressures can be expected to increase.

The objectives of the proposed action are to upgrade the existing system and provide further assurances of an adequate supply of water and fire protection flows to residents of the area. These objectives are consistent with the Board of Water Supply's policy of providing proper water supply management and obtaining the best use of the groundwater resources.

EXISTING WATER SUPPLY SYSTEM

Users in the Heeia area are serviced directly off the 30 inch transmission main, as shown on Plate II. High-level tunnels and reservoirs supply water to residents situated at the higher elevations (above Kahekili Highway).

AN OVERVIEW DESCRIPTION OF THE PROPOSED WATER SUPPLY SYSTEM

The proposed action (construction of the reservoir and 2,000 linear feet of 16-inch pipeline) is the first step in achieving an integrated system for the Kaneohe-Heeia area. Subsequent projects to meet this goal include construction of a 42-inch transmission main along Kahekili Highway and a 16-inch service water main along Kamehameha Highway, which will connect the proposed reservoir and the existing Kapunahala reservoir. Residents in the Kaneohe-Heeia lowlands will eventually be serviced by the 16-inch service main.

The timetable for implementation of the reservoir facility is tentatively scheduled for early 1980; construction of the 42-inch transmission main is anticipated beyond 1982. When fully implemented, this system will provide assurance of an adequate supply of water and fire protection needs in the following ways:

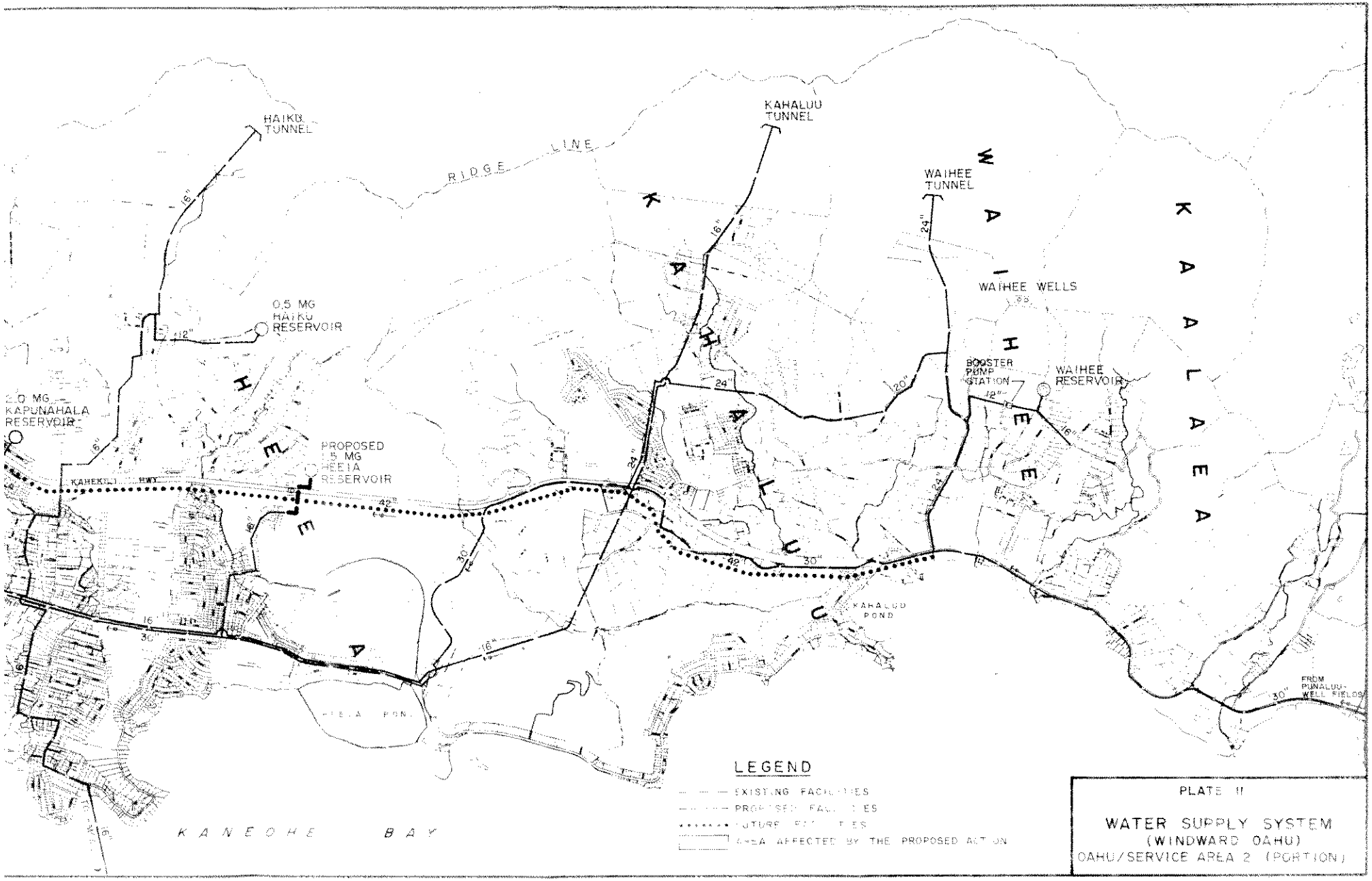


PLATE II

WATER SUPPLY SYSTEM
(WINDWARD OAHU)
OAHU/SERVICE AREA 2 (PORTION)

1. Multisource storage features will allow for a water supply capability from either source. This safety feature will assure a continuous source of water supply to both the Heeia and Kaneohe areas.

2. Storage capacity will (1) reduce peak pumping requirements and (2) serve as a temporary supplemental water supply in the event of mechanical failures to the pumping units or transmission main.

3. DESCRIPTION OF THE PROJECT'S TECHNICAL, ECONOMIC, SOCIAL, AND ENVIRONMENTAL CHARACTERISTICS

TECHNICAL CHARACTERISTICS

The scope of this project includes sitework, including clearing and grading; construction of the reservoir, access road, water transmission main, miscellaneous drainage, and structures; and landscaping. A general site plan is shown on Plate III.

Sitework

The reservoir site will be graded to obtain the necessary elevations so that the reservoir may be functionally incorporated into the existing system. Involved are cuts from 5 to as much as 20 feet in height that will be done in accordance with applicable ordinances of the City and County of Honolulu and recommended design criteria furnished by soils consultants. Cuts for the access road will be as much as 70 feet in height in the middle portion of the road alignment, with fill requirements for areas toward the highway junction.

Cuts will be sloped at 1-1/2:1 maximum, with 8-foot-wide benched areas between lifts to reduce slide potentials. Deep cuts in two separate areas of the access road, each spanning approximately 250 feet, will require two and three lifts or terraces. Other cut areas will "daylight" to existing grade within 20 feet of the roadway centerline. Fill slopes will be at 2:1, with 8-foot-wide benches. One lift or terrace extending about 220 feet along the roadway will be required.

The area will be grassed and landscaped to minimize the potential for erosion from the exposed slopes and to mitigate any visual impairment as a result of alteration to the earth surface.

1.5-Million-Gallon Reservoir

The reservoir will be cylindrical in shape, of reinforced concrete construction, and approximately 120 feet in diameter and 20 feet high. The structure will remain unpainted, reflecting the Board's recently-enacted policy of "minimized maintenance." The floor elevation will be 252 feet, with the structure "sunken" from 6 to 15 feet in relation to surrounding finish grades. A 12-foot-wide asphalt concrete road will encircle the reservoir to provide access to the grounds by maintenance vehicles and personnel. The design concept is based on providing the necessary elevation and reservoir capacity to improve water pressure service and provide better assurances of continuity in water service, including fire protection.

As mentioned previously, future work includes construction of a connecting water main along Kamehameha Highway to functionally integrate the proposed Heeia-Kai reservoir with the existing 2.0-MG Kapunahala reservoir (which now serves portions of Kaneohe), thus providing for systems flexibility and insuring continuity of service.

Sizing of Reservoir

The capacity of the proposed 1.5-MG low service reservoir was based on providing storage of one day water demand to existing residents in the Heeia-Kaneohe area makai of Kahekili Highway. Based on present-day needs in Kaneohe, a reservoir storage capacity of approximately 1.4 MG is required and was determined as follows:

Average demand to Kaneohe: 4.2 MG/day

Low service (area below Kahekili Highway) consumption: 80 percent of Kaneohe total

4.2 MG x 80% = 3.4 MG total storage requirement

3.4 MG - 2.0 MG (existing Kapunahala reservoir) = 1.4 MG

Summary: Minimum of 1.4 MG storage capacity is required to meet present-day demand

Areas to be benefitted when the proposed project is integrated with the Kapunahala reservoir system are delineated on Plate II.

Access Road

The access road will be 12 feet wide, concrete paved, and on a 20 percent grade along most of its 960-foot alignment. Road elevation at the highway right-of-way will be within 1 foot of the existing Kahekili Highway finish grade.

16-Inch Water Transmission Main

Initially, water will be conveyed to and from the reservoir via a 16-inch main to be installed along the access road. From the access road entrance at Kahekili Highway, the water main will parallel the highway for 550 feet before crossing, then traverse a 50-foot-high highway embankment for connection to the existing 16-inch water main at Kalali Street in the Haiku Park Subdivision. When the 42-inch transmission main is installed, the 16-inch main will serve exclusively as an effluent line.

Miscellaneous Drainage Structures

Storm runoff from the site will be directed overland into an existing swale located along the access road shoulder for drainage into an existing gulch, parallel to and mauka of the highway. A 30-inch drainage culvert passing under the access road will be the only modification to the gulch. Runoff (estimated at 44 cfs for a ten-year storm) will flow through this culvert and follow the existing northerly drainage pattern to eventually merge into Heeia Stream for discharge at the coast (see Plate I).

ECONOMIC CHARACTERISTICS

Implementation of the project will not jeopardize any economically valuable improvements since the land is presently vacant. The project cost, estimated at $1,400,000, will be financed by BWS capital improvement project monies. Construction is expected to start in 1980 and will require approximately 12 months for completion.

SOCIAL CHARACTERISTICS

The design concept of the project is directed toward improving service (most notably in terms of insuring continuity of service for consumptive needs and fire protection) to residents of Heeia. The degree to which such improvements will affect the growth rate and lifestyle of the area is not quantifiable, but it will aid in an orderly, controlled manner of growth.

ENVIRONMENTAL CHARACTERISTICS

The reservoir will be recessed six feet into the ground, relative to surrounding finish elevations. Despite this aspect, however, the structure will still be prominently exposed to view by nearby area residents and those motorists commuting along Kahekili Highway.

Disposal of excess earth will be required since cuts will exceed fills by a ratio of approximately 2:1. Special provisions, included as part of the contract documents, will prohibit stockpiling and onsite dumping of excess material to limit the affected area and preserve its natural features. Specifications regulating hauling procedures on roadways will also be enforced.

The access roadway needs to accommodate only infrequent traffic of maintenance vehicles; thus, road grades as high as 20 percent are anticipated. No blasting for excavation in the area is anticipated.

To prevent unauthorized entry into the reservoir grounds and thus insure public safety, the reservoir perimeter will be enclosed by a six-foot-high chain link fence. A chain and post barricade, provided just inside the access road entrance from Kahekili Highway, will prohibit unauthorized vehicle entry onto the access road during nonworking hours.

4. DESCRIPTION OF ENVIRONMENTAL SETTING

THE REGIONAL DISTRICT OF KOOLAUPOKO

The Koolaupoko district, generally referred to as windward Oahu, includes the subdistricts of Kailua, Kaneohe, Heeia, Kahaluu, Waihee,

Kaalaea, Waiahole, Waikane, Hakipuu, and Kualoa. High rainfall, giving rise to lush vegetation, streams, waterfalls, and other land features, contributes to the scenic quality of this area.

Contrasting lifestyles may be found within the Koolaupoko district. Because of increasing demands for cheaper land and housing units, the subdistricts of Kailua and Kaneohe have recently developed into residential communities serving as suburbs of Honolulu. In contrast, the subdistrict of Waiahole-Waikane has retained its "rural" atmosphere, characterized by long-time residents, whose lifestyle is basically an easy going, farm-related subsistence.

Major transportation arterials to the area include Likelike and Pali highways, linking windward Oahu with Honolulu. Other major highways include Kahekili Highway, joining the Heeia, Kahaluu, and Waihee areas to Likelike and Kamehameha highways, situated near the coast and providing an access route to the north portion of the island.

Windward Oahu is exposed to the prevailing northeastern tradewinds, which directly affect the climate in this area. Effects of the terrain on the wind provide the upper mountain areas with much of the island's rainfall. Mean annual rainfall, as much as 100 inches in the higher elevations of the Koolaus, tapers to 40 inches at the coastline. Diurnally, showers are more frequent during the night and early morning. Seasonally, the lowest rainfall months are June and September; the highest rainfall months are January and March.

Temperatures are equable year-round, reflecting the small seasonal variation and tempering effect of the ocean.

The prevailing tradewinds range from 10 to 20 mph. Occasional southern winds (Kona), which usually occur during winter months, bring high-intensity rain storms.

Climatological data for the Kaneohe Mauka 781 USWB station (located one-half mile from the project site) are shown in Table 1.

THE IMMEDIATE PROJECT AREA

The project site is situated in Heeia, just above Kahekili Highway and on the opposing slopes of Iolekaa Valley. Forest reserves lie in

TABLE 1

CLIMATOLOGICAL DATA

Station	District	Index No.	Latitude N	Longitude W	Elevation	Beginning of Record
Kaneohe Mauka 781	Koolaupoko	3112	21°25'	157°49'	198	1928

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Precipitation (inches)	7.44	7.14	7.28	5.44	4.42	2.97	4.28	4.27	4.01	5.74	5.75	6.85	65.6
Mean Temperature (°F)	71.4	71.2	71.2	72.4	74.0	75.8	76.5	76.9	76.6	76.1	74.2	72.1	74.0

Source: Climatic Summary of Hawaii - Supplement for 1919 through 1952, Supplement for 1951 through 1960, U.S. Department of Commerce, U.S. Weather Bureau, 1965

areas west of the site and up to the base of the majestically steep Koolau Mountain Range. To the north and northeast respectively lie preservation lands and residential-zoned areas not as yet developed. Directly south and east are developed residential areas.

The reservoir will be situated approximately two miles north of the intersection of Likelike and Kahekili highways and one mile inland from the coast, as shown on Plate II.

Present urban developments in proximity of the project site are in the Haiku and Iolekaa valleys, located mauka of Kahekili Highway, and the Crown Terrace and Haiku Park Unit II subdivisions, situated immediately mauka of the highway. To the northwest, a memorial park and subdivision (Club View) are other urban developments.

Physical Characteristics

Topography and Drainage. The proposed reservoir site is a knoll approximately the size of the reservoir itself. Slopes from the knoll and ridges in the area are generally 20 percent, but may be as much as 50 percent in some areas.

Two gullies flank the knoll, providing drainage of runoff for the area. The gully immediately south of the site and at the urban boundary of the Haiku Plantation residential subdivision can be characterized as virtually perennial, with the presence of trickling flows during dry weather periods. This gully runs a southerly course before crossing under Kahekili Highway and merging into Heeia Stream. The gully north of the site empties into a large swale that parallels Kahekili Highway. Flow is in a northern direction and eventually merges into Heeia Stream in the flatland area makai of the highway.

Soils. Soils within the area are of the Waikane series and have a fairly high moisture content as a result of the relatively high rainfall for the windward area. Surface soil in the area of predominantly 25 to 40 percent slope are a dark brown, silty clay, about 8 inches thick, of low fertility, and of a permeability that is moderately rapid.

The project area is anticipated to be predominantly of a soil and subsoil character, with very little rocks. Based on soil character and

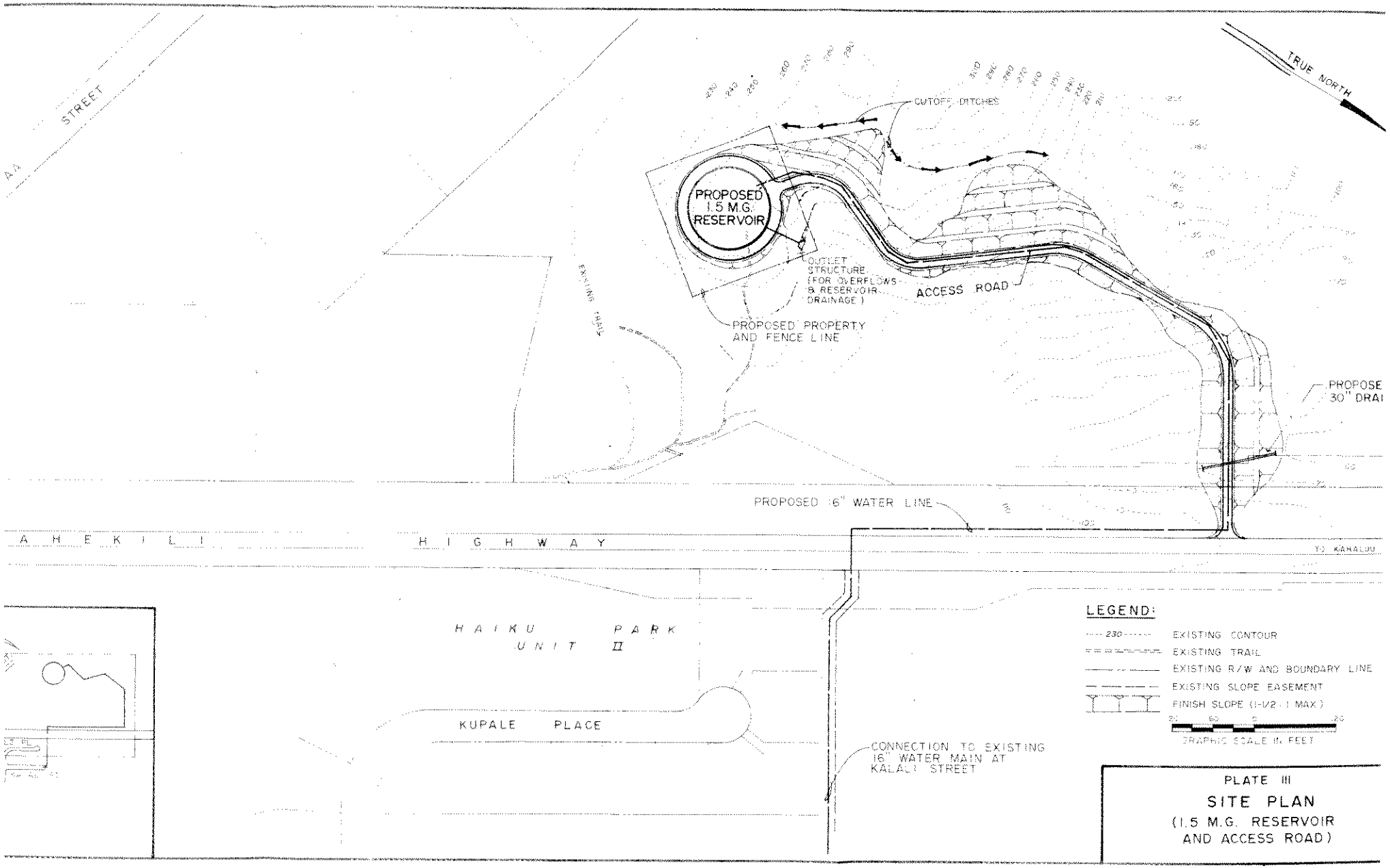


PLATE III

SITE PLAN
(1.5 M.G. RESERVOIR AND ACCESS ROAD)

topography, runoff is medium to rapid, and the potential for erosion is generally rated as moderate to severe.

Streams. Heeia Stream is the major drainage channel for runoff occurring in the basin encompassing Haiku and Iolekaa valleys and the adjoining watershed areas up to the ridge of the adjacent Ahuimanu Valley. Additional runoff is contributed by lower-lying areas since the stream winds toward its discharge point at the coast just above the northern limits of Heeia Pond.

Mauka of Kahekili Highway and within the Haiku Plantation subdivision, the stream branches into Haiku and Iolekaa valleys.

Stream gauging records of the U.S. Geological Survey for the branch of Heeia Stream extending into Haiku Valley (Haiku Stream) indicate the stream to be perennial, with an average discharge of 1.4 million gallons per day (as measured at elevation 272 feet MSL). Because of the generally sloping terrain, little natural water impoundment occurs after rainstorms.

Trails. The knoll and spur areas in the vicinity of the project site are accessible by a narrow foot trail that originates at the base of the highway embankment (see Plate III). This path is known to be a "horse trail" that branches out at various points along the ridge slopes. The main path leading from the access area on Kahekili Highway traverses directly through the reservoir site.

A dirt road also originating at the highway embankment base winds along and above the south gully. After approximately 500 feet, this road narrows to a trail.

Trails in this area are not believed to be major hiking trails.

Biological Characteristics

Two flora/fauna surveys of the project area were conducted by a botanist to identify those species that may be affected by implementation of this project. The first survey identified the species of plants encountered and their proportionate numbers. The second survey was conducted more to serve as a check on the first and to relate earlier findings to characteristics of the general area.

The following discussion is a summary of the findings of these surveys (see Appendix A for a more detailed report on the flora/fauna survey).

Flora. Vegetation in the vicinity of the proposed action is typical of that found in areas of windward Oahu of comparable elevation and rainfall. Scrub growths of various ferns, brassia trees, Java plum, pili grass, lauki, Hilo grass, 'akia, and Christmas berry trees were noted.

The growth of plants in the knoll area is dense, with the Christmas berry trees forming a rather tangled mass. In contrast, vegetation growth on the ridges and spurs is generally more open, being characterized mostly by the various grasses and ferns, with some scattered brush.

Vegetation in the gully south of the proposed reservoir site is more lush and dense than in other areas, due to the perennial stream in the gully. The north gully is a low area, with Panicum maximum (California grass) being the dominant growth. Trees found in this area are the silver oak (Grevillea robusta) and guava (Psidium guajava).

The approach to the top of the knoll (reservoir site) contains the following species (the botanical name, its common English name, and its Hawaiian name, if there is one, are listed):

1. Brassaia actinophylla; brassaia, umbrella tree, or octopus tree
2. Cassia leschenaultiana syn. C. minosoides; Japanese tea; lauki
3. Cyperus spp.; sedge
4. Eugenia cumini syn. E. jambolana; Java plum
5. Heteropogon contortus; tanglehead; pili (grass)
6. Nephrolepis biserrata; sword fern; pamoho
7. Mangifera indica; mango; manko
8. Paspalum conjugatum; Hilo grass; mau'u malihini
9. Passiflora spp.; passion fruit; lilikoi
10. Polypodium phymatodes syn. P. scolopedras; maile-scented fern; laua'e
11. Scaevola gaudichaudiana; mountain naupaka; naupaka kuahiwi
12. Schinus terebinthifolius; "Hawaiian" or Brazilian Christmas tree; wilelaiki
13. Spathoglottis plicata; spathoglottis

14. Stachytarphela jamaicensis; Jamaica vervain; 'oi

15. Stenoloma chinensis syn. Sphenomeris chusana and Odontosoria chinensis; lace fern; pala'a or palapala'a

16. Wikstroemia spp.; false 'ohelo; 'akia

Trees. The dominant tall growths are the Brazilian, Christmas, brassaia, and Java plum trees. All of these trees are exotic, i.e., introduced and are considered "obnoxious weeds." A large mango tree and 10 to 12 seedlings of the same species but of various sizes are located in the vicinity of the knoll. This large tree is handsome as well as old (estimated to be over 100 years old), but mango is not rare or an endangered species.

Shrubs. The dominant shrub in the knoll area is 'akia, a native Hawaiian plant that also grows in the surrounding areas. Approximately 25 plants of this species are earmarked for transplanting in the proposed road fill site.

Ground Cover. The dominant ground cover is pili grass, a plant probably brought in by early Hawaiian settlers. Next in abundance are the sword, laua'e, and pala'a ferns, in that order. These varieties are not rare or endangered species.

Vegetation Outside Project Area. Vegetation outside the project area is similar to that noted within the project limits, except, perhaps, in dominating species. A grove of hau (Hibiscus tiliaceus) and a clump of ironwood trees (Casuarina equisetifolia) were noted in an area adjacent to the project site.

No rare or endangered species of flora were found in the project and general area.

Fauna. No fauna were observed in the area on the day of the first survey since it rained almost the entire period. On the day of the second survey (characterized bv dry and sunny conditions), six white eyes, or mejiro (Zosterops palpebrosus japonicus), were observed mingling in the area. No other fauna were encountered, although the area is likely to be inhabited by several species of mongoose, rats, and mice, based on occasional sitings.

5. HISTORICAL AND ARCHAEOLOGICAL SITES

No historical or archaeological sites of significance are known to exist or are registered within the project limits. The Leleahina heiau, located at the western end of Haiku Plantation Road, is the nearest known point of significance and is approximately 3,000 feet mauka of the project site, well out of the affected area.

It has been noted in early field inspections (Appendix A), however, that a small stone platform-type structure exists on the north rim of the knoll. To further investigate the potential historic value and significance of this unusual outcrop of rocks in a predominantly soil surface area, a search for artifacts (or "middens") was conducted. None were found to substantiate the archaeological value to the stones. Corroboration with Dr. Kenneth Emory, renowned authority on Hawaiian archaeology at the B.P. Bishop Museum, led to the conclusion that the site need not be preserved since no evidence could be established attributing to its being of ancient Hawaiian origin.

6. CULTURAL AND SOCIAL CHARACTERISTICS

SOCIO-DEMOGRAPHIC

Population in the windward area has risen rapidly since the end of World War II. This has largely been a result of population overflows from Honolulu and the construction of trans-Koolau arterials that link the area directly to Honolulu. Some degree of growth can also be attributed to the presence of the Kaneohe Marine Corps Air Station (KMCAS) and the subsequent impact due to military residency. The Heeia area is characterized by residential units and small commercial establishments.

The 1975 population estimate within the Koolaupoko district is 104,200, or approximately 15 percent of the resident population on Oahu. The finest available breakdown for the Heeia area (census tract 105.01) shows a population of approximately 6,000 residents.

HOUSING

The 1970 estimate of housing units within census tract 105.01 is 1,400. Homes in the area reflect the more recent in-migration, since approximately 80 percent of the housing units have been constructed since 1960.

PERSONAL AND FAMILY INCOME

Income characteristics for the area, in addition to population and housing characteristics, are shown on Table 2. Similar figures for Honolulu and Kaneohe are also included for comparison. In general, the affected area's demographic character is very similar to that for Honolulu.

7. RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES, AND CONTROLS FOR THE AFFECTED AREA

DESIGNATED LAND USE IN STATE LAND USE COMMISSION DISTRICT

The project site is situated within an area designated as conservation on the State Land Use District Boundary Map (see Plate I). Adjacent lands south and east of the site are designated as urban.

The proposed action upon conservation lands does not conflict with the general objectives and specific terms of land use plans, policies, and controls of the State Land Use Commission. Regulations of the Department of Land and Natural Resources (DLNR) designate the area as a general use (GU) conservation subzone, in which establishment of a public utility activity may be permitted. Such use, however, must meet land compatibility and general physical and environmental preservation conditions as set forth by the DLNR and subject to approval by the State Board of Land and Natural Resources.

DESIGNATED LAND USE IN GENERAL PLAN AND ZONING

The General Plan (Detailed Land Use Map) and Zoning Boundary Map for the affected portion of the Heeia area are shown on Plates IV and V

TABLE 2

POPULATION, INCOME, AND HOUSING CHARACTERISTICS

Description	Census Tract 105.01[1]	Kaneohe	Honolulu[2]
Population (1970)	5,505	29,903	324,871
Median Income (Families and Unrelated Individuals)	$14,336	$13,725	$ 12,539
Housing[3]			
Number of units with value:			
Less than $5,000	-	2	50
$5,000-7,999	-	-	84
8,000-9,999	-	-	115
10,000-14,999	1	20	336
15,000-19,999	3	91	790
20,000-24,999	43	439	1,641
25,000-34,999	315	2,091	6,357
35,000-49,999	459	1,682	11,764
50,000 or more	193	540	10,469
Median value	$39,700	$34,000	$43,200

[1] Census tract 105.01 extends between Keaahala Stream and Heeia Stream and includes Heeia.

[2] Includes the Honolulu areas from Koko Head to Salt Lake; not to be confused with Honolulu County.

[3] Limited to one-family residences; value includes house and lot.

Source: Census Tracts, Honolulu, Hawaii, 1970 Census of Population and Housing, U.S. Department of Commerce PHC (1)-88, Bureau of the Census

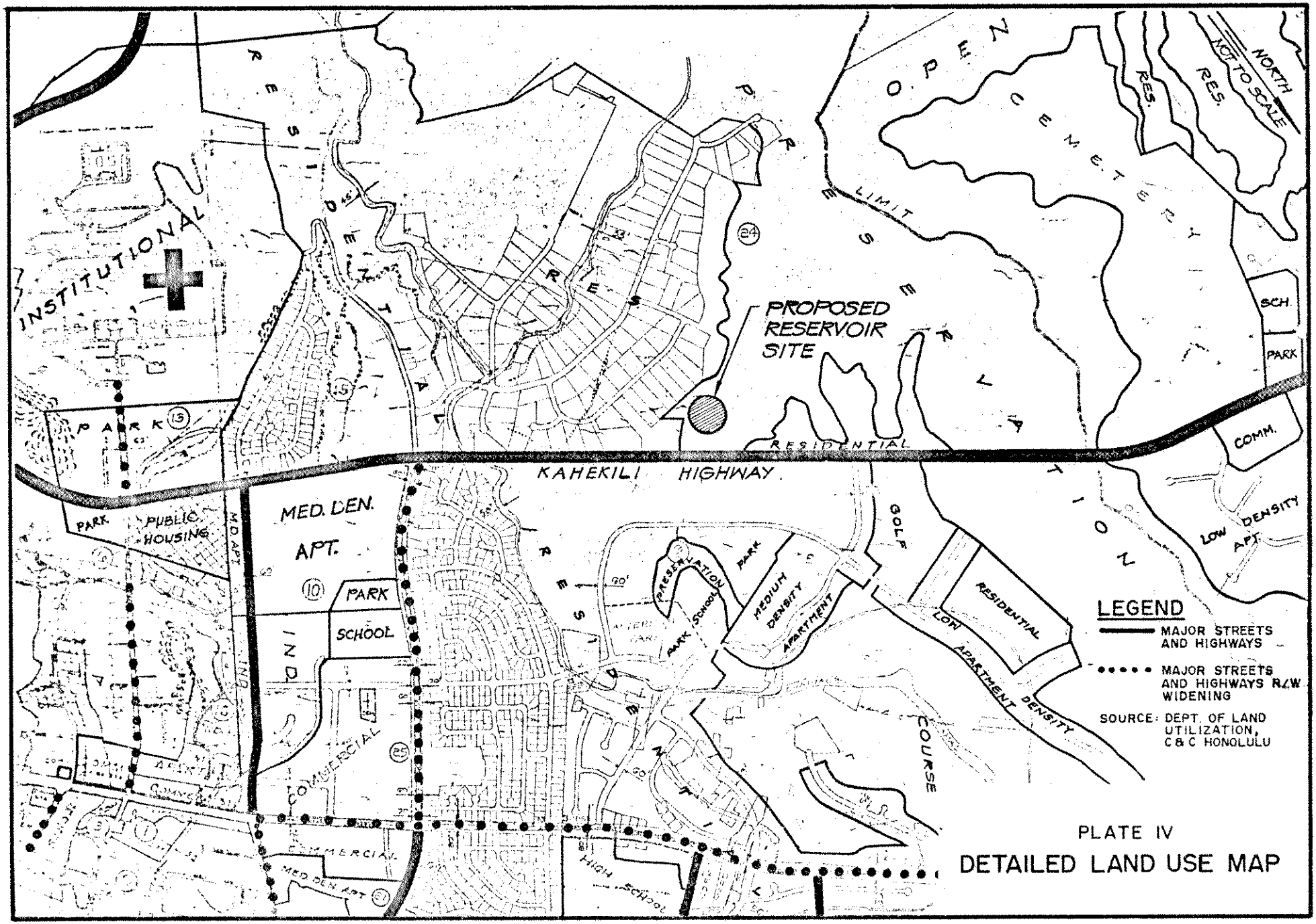


PLATE IV

DETAILED LAND USE MAP

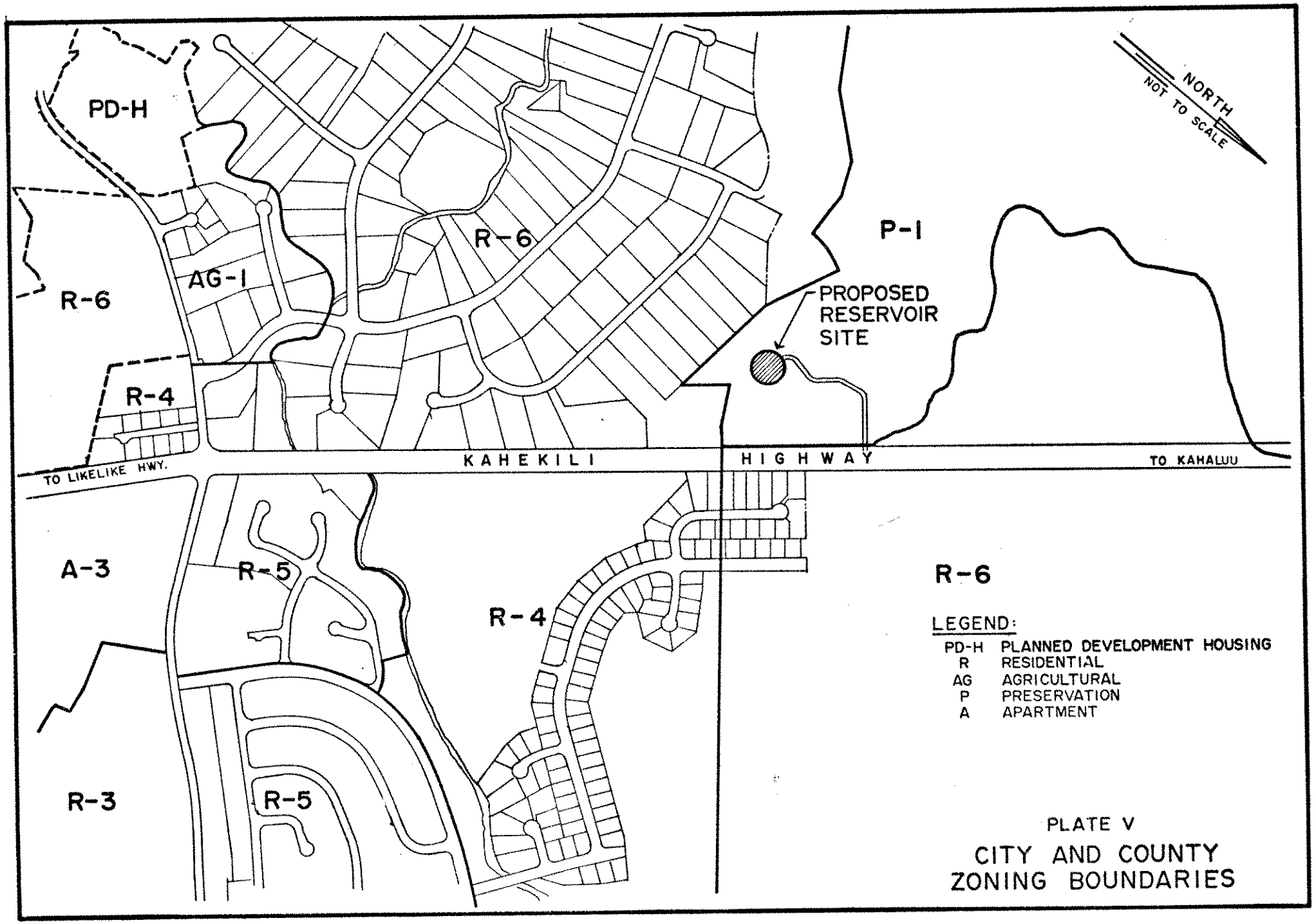


PLATE V

CITY AND COUNTY
ZONING BOUNDARIES

respectively. The proposed site is presently zoned preservation. Residential developments exist to the south and east areas of the site. Lands to the north are presently open but zoned residential. Lands to the west of the site are zoned preservation.

8. PROBABLE IMPACT OF THE PROPOSED ACTION ON THE ENVIRONMENT

The impact of the proposed project can be segregated into those attributable to (1) construction and (2) operation and implementation activities.

CONSTRUCTION AND CONSTRUCTION-RELATED ACTIVITIES

Construction operations will create temporary adversities upon the environment. While mitigating measures will be employed, some of these effects will still be unavoidable. Impacts due to construction can be identified as follows:

1. Traffic Disruption. Traffic disruption along Kahekili Highway will occur during construction of the 16-inch water main along and crossing the highway. Normal two-lane traffic will be restricted to a single lane pattern, with vehicular speeds accordingly reduced. Pipeline installation work along the highway shoulder and on the makai highway embankment should pose no serious physical constraints to normal vehicular flows; however, regulation of traffic flows for safety considerations may be required.

   Vehicular traffic generated by disposal of excess excavated material and other construction activities will be regulated to minimize interruption to normal traffic flow and should not generate serious traffic-related problems. Contract specifications will govern hauling procedures and methods so as not to hamper normal traffic flows.

2. Fugitive Dust. Fugitive dust will be created during the construction period, primarily from activities such as clearing,

grading, excavation, and backfilling. This could cause minor disturbances to residents in the proximity of the site. Such an impact would be temporary, and no continual air quality impairment should be created.

3. Noise. Noise will be generated by various vehicular equipment used to construct the reservoir, access road, and transmission main. Noise will be limited to machinery and motors, with no anticipated pile driving to be performed.

4. Water Quality. Stream water quality in the south gully will be affected when runoff from exposed ground areas occur during the interim period between earth moving operations and ground cover completion. Accelerated soil erosion is anticipated as a consequence of the high intensity rainfall, common to the area, and the steep cuts of the project. The degree of impairment cannot be quantified.

5. Drainage Pattern. The present drainage pattern for the site will not be altered by the project since runoff will continue to be directed into either of the gullies that flank the knoll. Storm waters on the access road will be directed into the swale paralleling the highway and should not flow into the highway or enter into any highway drainage structures. The quantity of runoff created by road and concrete surfaces that are part of the project should not contribute sizeably to that quantity that already occurs from the present situation.

6. Flora and Fauna. No endangered species of flora were found in the affected area nor evidence of any in the general area. Other studies in the adjacent valleys reveal similar findings, which can be related to the past use of these lands as pasture and grazing areas before urban development occurred.

Construction, however, will scarify a major portion of the scrub vegetation on the knoll, including the large mango trees. Foliage along the access road route will be covered by earth or removed by grading activities to provide the necessary road

elevations and side embankments required for slope stabilization.

Several of the more prominent flora have been selected for transplant as part of the landscape work to restore the area. Regrowth of other disturbed vegetation, common to the area, is also expected in the perimeter of fill areas.

7. Trail Use. Access and use of the immediate project area, including a portion of the "horse trail," will be restricted for the duration of construction. Upon completion of the project, portions of the trail complex must be rerouted to restore trail use.

   Use of the dirt road and other legs of the trails will, in all likelihood, remain accessible during construction.

   The trail complex in question is not believed to be a public hiking trail but, rather, limited to use by local residents. Access to points further inland is also provided by the dirt road and other trails originating within the Haiku Plantation subdivision.

8. Economics. A positive short-term economic impact is anticipated in the form of providing construction-related employment and other indirect income to various labor force segments.

OPERATION AND IMPLEMENTATION ACTIVITIES

Operations

Long-term impacts of the proposed action will be those associated with the implementation and operation of the proposed facility.

1. Description of Operation and Maintenance. Functional operation of the reservoir will be largely self-sustaining since only structures and piping are involved. Routine maintenance will involve periodically checking the reservoir water levels and groundskeeping work. The frequency of such checks and grounds keeping work is typically three times per week (duration of one

to two hours per visit) and once per month (duration of two to four hours per visit) respectively.

2. Hazards. There has been no record of any property damage to residents situated in proximity to reservoir facilities. The possibility of a tank overflow due to malfunctioning of mechanical apparatus is remote. The Kapunahala reservoir, located just above the junction of Kahekili and Likelike highways, has a record of one such occurrence in its 13 years of operation; the Haiku high-level reservoir has had no such experience in its 9 years of operation.

   In the event an overflow occurs, the site has the advantage of being flanked below by gullies, which will direct waters ultimately into Heeia Stream in much the same manner as storm runoff. The only adverse impact anticipated may be soil erosion during overflow periods.

   Instances of contamination of reservoir waters anywhere have also been rare. If necessary, the tank can be drained for cleaning and disinfection whenever waters are adjudged nonpotable. Water quality tests are performed approximately twice a week to monitor the stored waters. In addition, reservoirs are regularly scheduled for cleaning once every two years.

3. Noise. No noise will be associated with normal operations since the only mechanical equipment at the facility will be a small landscape irrigation pump operated on a timer-controlled basis.

4. Lighting. The reservoir site and access road will not be lighted at night. This aspect is not anticipated to encourage entry of unwarranted vehicles into the area, as evidenced by experience at other similar facilities. Moreover, to assure against such instances, a chain barrier will be provided just inside the access road and highway junction.

Implementation

The positive effects of the completed project will be as follows:

1. The proposed project will create a multisource storage system, thereby insuring better continuity (dependability) of water service to meet consumptive needs and fire protection demands of residents.

2. The storage capacity will serve as a temporary, supplemental water supply in the event of mechanical failures to the pumping units or transmission main.

3. The project will provide an overall improvement in the operational plan of the BWS by reducing peak pumping demands.

4. The objectives of the project will be consistent with the BWS's policy of achieving optimal utilization of limited groundwater resources and providing proper water supply and distribution management.

5. Reduction in fire insurance rates for individual homeowners and businesses as a result of an upgraded system may be possible in accordance with the criteria of the Grading Schedule for Municipal Fire Protection, Insurance Services Office.

6. The project will aid in providing for an orderly, controlled growth.

The negative effects of the completed project will be as follows:

1. Alteration of the physical landscape. Cuts will be required for the reservoir structure. Vehicular access requirements for maintenance purposes will require steep cut and terrace-type grading along portions of the access road.

2. Aesthetics. The terraced slopes will be visible to residents across the highway (Haiku Park Subdivision, Unit II) and to motorists commuting on Kahekili Highway (for a 3,000-foot distance or for approximately 60 seconds while commuting at the posted highway speed limit). Residents situated Haiku Plantation Subdivision will have a view of the upper portion of the gray concrete reservoir.

3. Irreversible commitment of monies, land, materials, and energy resources will be involved.

SECONDARY OR INDIRECT CONSEQUENCES OF THE PROPOSED ACTION

It is emphasized that the population and growth impacts indirectly due to the proposed action are not expected to be significant since the facility is designed to meet water demands of the existing urban areas of Heeia-Kaneohe.

Should significant growth occur in windward Oahu, the greatest contributing factor will relate, instead, to the market condition for sale of houses that, in turn, depends upon the availability of land. Should either of these ingredients not materialize, the potential for development is decreased, regardless of whether or not water and other utility services are provided. Adequate water service serves only to create a more favorable climate in which residential and urban development will be able to proceed in an orderly fashion.

Availability of land for development will depend upon land use controls that, by law, are reviewed periodically for evaluation of past growth and future trends. It is possible that the rate of growth may exceed that desired by area residents, in which case a new plan calling for staged development will have to be prepared through a process of public participation and legislation.

9. PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

Unavoidable adverse environmental effects associated with the completion of the proposed action are the short-term, negative effects related to construction activities. These are summarized as follows:

1. Temporary disruption to traffic highway during pipeline installation work on the 16-inch connecting waterline
2. Temporary noise and dust disturbances to residents in proximity to construction activities

3. Soil erosion of graded and exposed areas during the interim period between grading and soil stabilization

4. Clearing and covering of some indigenous flora

5. Curtailing the use of trails that traverse the reservoir site

10. ALTERNATIVES TO THE PROPOSED ACTION

CONCEPTUAL

An alternative to the concept of the proposed project (multisource storage) would be that of programming the pumping units at the water source (Punaluu well fields) and booster stations at critical points along the transmission main to provide the varying water supply and pressures required. In addition to the pumping units, related controls in the form of electrical and mechanical devices are required to complement the total pumping system. Such a plan to encompass the windward Oahu water system will require large capital outlays.

This pumping pattern of intermittent and widely fluctuating rates (as compared to constant pumping) will increase energy demands and maintenance requirements. Further, such an irregular pumping pattern may give rise to an "upconing" of the groundwater lens that could eventually impair water quality and ultimately lead to abandonment of the low-elevation well fields. This alternative, although technically plausible, can be immediately ruled out from an engineering standpoint of cost effectiveness, practicability, reliability, and flexibility.

A second alternative would be the development of another water source and related transmission mains to serve the Heeia area. Engineering options, however, are limited in regard to development of an adequate well field within this area. Implementation of this alternative may not be feasible in the Heeia area, not only because of large capital costs and hydrogeological constraints, but also because this concept may not be compatible with the overall master plan of the Board of Water Supply.

ALTERNATIVE SITES

Alternative sites in the immediate vicinity were analyzed farther mauka and to the north of the selected site. (Extensive urban development south of the proposed site restricts siting the reservoir in this direction.) Here, however, the reservoir would have to be located deeper into the valley to achieve the proper service elevation (272 feet MSL). Construction at any other site would entail much greater excavation into ridges, more extensive grading, a longer access road, and a larger commitment of lands and monies. Additionally, larger environmental problems may be anticipated.

In summary, the site selected for the reservoir naturally affords the service elevation, access, proximity, and knoll-type feature that provides the most effective system with consideration to cost and environmental impact.

NO ACTION

Nonimplementation of a multisource storage system will result in the continuation of a water supply management and distribution system for areas in windward Oahu that is inconsistent with the goals and policies of the Board of Water Supply. Future assurances of a dependable supply of water to meet consumptive and fire protection needs will remain unrealized. Additionally, increased water demand stresses upon the present transmission system may adversely reduce transmission main pressures to the outlying service areas to an undesirable service level.

11. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The site is anticipated to be committed for the life of the structure itself, or approximately 50 years. Because it is located on conservation land, the range of beneficial uses of the area is not expected to be narrowed since land use controls provide an overriding impact.

12. MITIGATION MEASURES PROPOSED TO MINIMIZE IMPACT

A number of considerations are identified that should mitigate the adverse environmental impacts of the proposed action. These considerations have been grouped according to duration of adversity, as previously discussed.

MITIGATION MEASURES OF UNAVOIDABLE SHORT-TERM IMPACTS

1. Noise produced by construction activities must comply with the city's code governing such levels, as set forth in the Comprehensive Zoning Code and the State Community Noise Control (Public Health Regulations, Chapter 44B).
2. A water sprinkling program can be implemented, as necessary, to effectively reduce dust generated during construction.
3. The contractor will restore to a practical extent any area damaged or disturbed by construction activities.
4. Pipeline construction and construction traffic on Kahekili Highway will be scheduled only for offpeak hours.
5. A soil erosion control program will consist of immediate landscape (grassing) work to retard the velocity of runoff. Cutoff ditches will also be provided to minimize runoff onto exposed slopes. Gullies in the area receiving runoff are stabilized by vegetation and, thus, should reduce erosion and soil particle transport. Applicable grading and soil erosion standards will be conformed with to abate water pollution, erosion, and slide potentials.
6. Construction activity will be limited to standard hours of operation.

MITIGATION MEASURES TO MINIMIZE POTENTIAL ADVERSE LONG-TERM IMPACTS

1. Those areas altered as a result of construction activities will be landscaped, with a view toward restoring the area as close to its natural state as possible. A number of the akia shrubs and pili grasses will be transplanted in the graded areas.

2. Terraces and slopes will be grassed or planted in ground cover to afford virtually 100 percent coverage within three to six months.

3. The reservoir site will be landscaped with a heavy massing of trees. Fifteen-gallon (seven-foot tall) pine-type trees will be planted and will afford virtually 100 percent peripheral concealment of the structure within a five-year period. The access road embankments will be landscaped with trees tapering in density toward the highway junction.

LANDSCAPE AND EROSION CONTROL PLAN

Due to the steepness of the cuts and the low fertility of the soil, the landscape and erosion control plan will require special considerations. Erosion control measures will include (1) ground cover landscaping of exposed areas for soil protection and (2) cutoff ditches above the cut areas to direct runoff away from the sloped areas.

The "severity rating number," derived in accordance with the Soil Erosion Standards and Guidelines, City and County of Honolulu, and which reflects the degree of hazard from potential damage by erosion and sediments, is approximately 14,000 for the subject project. (The standard severity rating number that represents the maximum amount of environmental damage considered tolerable is 50,000. See Appendix B for a more detailed description of the rating system.) In essence, the closer the severity rating number approaches 50,000, the more intensive should be the erosion and sediment control measures.

The landscape plan will incorporate provisions for the application of fertilizer, water sprinklers, and a post-maintenance program to assure sustained growth of the plantings. Such provisions are intended to alleviate the aesthetic impact of the presently bare highway cut fronting the project site (where erosion and subsequent collapsing of the topsoil structure made that area unable to support plant growth).

13. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The most noticeable irreversible commitment of the project is excavation of the knoll. Portions of the permanently altered landscape will be visible to motorists and area residents. Other prominent commitments of resources are the land area and the capital investment in the reservoir and pipeline facilities.

There will be no loss of cultural resources.

14. ORGANIZATIONS AND PERSONS CONSULTED

The following is a list of governmental agencies, groups, and individuals who were consulted with regard to aspects of the description and impact of the proposed project:

1. Department of Public Works, Division of Engineering, City and County of Honolulu
2. Department of Land and Natural Resources, State of Hawaii, Historic Sites Division
3. Honolulu Police Department, City and County of Honolulu
4. Hawaii Insurance Rating Bureau, Amfac Tower, Honolulu, Hawaii
5. Kawahara Nursery and Landscaping Co., Ltd., Honolulu, Hawaii
6. Department of General Planning, City and County of Honolulu
7. Fire Department, City and County of Honolulu
8. Department of Health, State of Hawaii
9. Department of Planning and Economic Development, State of Hawaii
10. United States Department of Agriculture, Soil Conservation Service
11. Hokuloa Owners' Association
12. Club View Gardens I Association
13. Club View Gardens II Association
14. Club View Gardens III Association
15. Kaneohe Community Council
16. Haiku Village Community Association

17. Crown Terrace Community Association
18. Haiku Plantations Community Association
19. Kaneohe Outdoor Circle
20. Conservation Council for Hawaii, Oahu Chapter
21. Hawaiian Trail and Mountain Club, Inc.
22. Sierra Club, Hawaii Chapter
23. The Outdoor Circle
24. Ms. Spencer Leineweber
25. Mr. Huston Eubank

15. LIST OF NECESSARY APPROVALS

Final construction plans for the proposed reservoir and water transmission line will be subject to approval by the following governmental agencies:

1. Department of Public Works, City and County of Honolulu (for grading work and work within highway right-of-way)
2. Department of Health, State of Hawaii (for grading work and water pollution abatement)
3. Department of Land and Natural Resources, State of Hawaii (for work within the conservation district)
4. Department of Transportation, State of Hawaii, Highways Division (for construction of waterline and road connection within the state highway right-of-way)

REFERENCE

1. Board of Water Supply, City and County of Honolulu, 2020 Plan, February 1971.

2. U.S. Department of Commerce, Climatic Summary of Hawaii-Supplement for 1919 through 1952, Supplement for 1951 through 1960. U.S. Weather Bureau, 1965.

3. U.S. Department of Commerce, 1970 Census of Population and Housing, Census Tract, Honolulu, Hawaii, Publication PHC (1)-88. Bureau of the Census, March 1972.

4. Department of Geography, University of Hawaii, Atlas of Hawaii, The University Press of Hawaii, 1973.

5. U.S. Soil Conservation Service, Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii, August 1972.

6. Gray, Rhee & Associates, Inc., Environmental Impact Statement for the Proposed Clubview Hills Planned Development-Housing Project, Honolulu, Hawaii, December 1975.

7. Department of Health, State of Hawaii, State Community Noise Control, Public Health Regulations, Chapter 44B.

8. Department of Public Works, City and County of Honolulu. Soil Erosion Standards and Guidelines, November 1975.

A P P E N D I X A

Report of Flora/Fauna Survey

of

Proposed Heeia Reservoir

and

Access Road

APPENDIX A

REPORT of FLORA/FAUNA SURVEY of PROPOSED HEEIA RESERVOIR and ACCESS ROAD

A first survey was made on July 25, 1976, and a second one on August 3, 1976.

Each survey was made by walking over the area involved, as indicated on a plan (map) provided by Sunn, Low, Tom, & Hara, Inc.

During the first survey, the species of plants encountered were recorded and the proportinate numbers of each noted. Special attention was paid to the possible occurrence of rare and/or "endangered" species.

The second survey was not as thorough as the first; it was used as a check on the first, to obtain photographs of the plant cover, and to check upon the occurrence of a possible archeological site.

For convenience in describing the flora in the approximate two acres involved in the proposed site, the area has been divided into three parts, designated as Area(s) A, B, and C, respectively (see attached plan).

Area A is located on the crest of a knoll (hill), and is the proposed site of the reservoir itself.

A path leads from the highway to the top of the knoll; this is flat. The approach to the top of the hill, and the crest itself, contains the following species* (in alphabetic order):

1. Brassaia actinophylla; brassaia or umbrella tree or octopus tree
2. Cassia leschenaultiana syn. C. mimosoides; Japanese tea: lauki
3. Cyperus spp.; sedge
4. Eugenia cumini syn. E. jambolana; Java plum

*The botanical name appears first; then the common name in English; and then the Hawaiian name, if there is one. The authority for this nomenclature is Neal, Marie. In gardens of Hawaii. 1948. Bernice P. Bishop Museum Special Publication 40.

5. Heteropogon contortus; tanglehead; pili (grass)

6. Nephrolepis biserrata; sword fern; pamoho

7. Mangifera indica; mango; manko

8. Paspalum conjugatum; Hilo grass; mau'u malihini

9. Passiflora spp.; passion fruit; lilikoi

10. Polypodium phymatodes syn. P. scolopedras; maile-scented fern; laua'e

11. Scaevola gaudichaudiana; mountain naupaka; naupaka kuahiwi

12. Schinus terebinthifolius; "Hawaiian" or Brazilian Christmas tree; wilelaiki

13. Spathoglottis plicata; spathoglottis

14. Stachytarphela jamaicensis; Jamaica vervain; 'oi

15. Stenoloma chinensis syn. Sphenomeris chusana and Odontosoria chinensis; lace fern; pala'a or palapala'a

16. Wikstroemia spp.; false 'ohelo; 'akia

Trees: The dominant tall growth, i.e., trees, included the Brazilian Christmas, brassaia, and Java plum trees. All of these plants are exotic, i.e., introduced. The first two, especially, and the las one to some extent, are considered "obnoxious weeds". There is one large mango tree (probably 100 years old), and 10-12 seedings of the same species, of various sizes near by. The large tree is hansome as well as old but mango is not rare or an endangered species.

Shrubs: The dominant shrub is 'aki. It is a native Hawaiian plant but occurs elsewhere in the surrounding areas, i.e., outside the proposed reservoir/access road site, and in other areas of this and the other Hawaiian islands. Approximately 25 plants of this species were marked for transplanting to another area, e.g., in the proposed road fill site (Area C on attached map). Mountain naupaka is not in great abundance but it is not rare or endangered.

"Ground cover": The dominant ground cover is pili (grass); this plant was probably brought in by early Hawaiian settlers. It is suggested that clumps of this grass be planted on the "cuts" to be made to accomodate the access road in order to hold the soil (Area B on attached plan). Next

in abundance are the ferns: sword, laua'e, and pala'a -- in that order. These species were probably brought in by early settlers, at least the last two. These ferns are not rare or endangered species. The other grasses are usually considered "obnoxious weeds". Japanese tea and Jamaica vervain are "common weeds".

The growth of plants in this area is rather dense, with the Christmas berry trees forming rather a tangled mass.

Area B is located along the sides of two ridges, "spurs" from the knoll of Area A. In contrast to the dense growth in Area A, this area (B) is comparatively "open", i.e., covered in large part with low plant growth consisting primarily of pili (grass), lace and sword ferns, etc.

'Akia also occurs here; it is more scattered than in Area A, however, anf forms larger and more handsome specimens. Several of these were marked for transplanting.

There are several 'ohi'a lehua (Metrosideros collina) trees in this area. If possible, several of the most handsome of these might be transplanted, although this species is not rare or endangered. It is, however, a native tree.

Area C. This is a low area, and the proposal is to make a fill to accomodate the access road.

There is not much pili (grass) in this area; the dominant grass is Panicum maximum (sometimes called "California" grass).

Among the trees already mention, there occur here: Christmas berry tree, Java plum and brassaia. Trees found here but not in the other two areas (except perhaps in very few numbers) are silky or silver oak (Grevillea robusta) and guava (Psidium guajava).

Among the shrubs here are some 'akia and the mountain naupaka, already mentioned as occurring in Areas A and B. In addition there occurs here the shrub Indian pluchea (Pluchea indica).

Rat's foot, or, in Hawaiian wawae'iole (Lycopodium cernuum) was found in Area C but not in the other two areas. This plant belongs to the club moss family.

The vine known as maile pilau (Paederia foetida) was found climbing on or over trees and shrubs.

None of the species listed for Area C are rare or endangered.

Vegetation outside area under consideration

The vegetation outside the area in question, i.e., surrounding it, is much the same as within, except perhaps in dominating species. In addition, there are a grove of hau (Hibiscus tiliaceus) and a clump of iron wood trees (Casuarina equisetifolia) present.

Fauna

On the day of the first survey, it rained almost the entire period; no fauna was observed. On the day of the second survey, it was dry and sunny; at that time six white-eyes or mejiros (Zosterops palpebrosus japonicus -- authority: Munro, George C. Birds of Hawaii. 1960. Bridgeway Press) were seen flying across Area C. No other fauna was observed.

Archeological site

At the time of the first survey, it was noted that there was what appeared to be a stone platform on the rim at the crest of the knoll (Area A) -- on the side of the hill toward the Valley of the Temples. I wondered if this might not have been the remainder of an ancient Hawaiian house platform.

Sunn, Low, Tom, & Hara Inc. contacted the Office of the State Historical Preservation Officer in the Department of Land and Natural Resources and found that the site had not been registered (see attached letter/memorandum). The men in that office indicated that they did not have the personnel to send out to make a survey themselves.

I then contacted Dr. Kenneth Emory of the B.P. Bishop Museum, a world-renowned authority on Pacific, and especially Hawaiian archeology. He, too, indicated that the Museum did not have sufficient personnel to send out for a survey of the site.

Dr. Emory suggested that I return to the site and search for "middens", that is shells, fish bones, etc., which would indicate, if present, that this had been a house site. Such a search was made but no middens were found. Upon reporting this to Dr. Emory, he said that there was no proof that this had been a house site without such evidence. He therefore felt and so stated to me that this site need not be preserved.

Beatrice H. Krauss

(Miss) Beatrice H. Krauss
Research Affiliate
Lyon Arboretum,
University of Hawaii
at Manoa
August 13, 1976

In background, mango tree; in middle distance, Java plum and Christmas berry trees; in foreground, pili (grass) and ferns

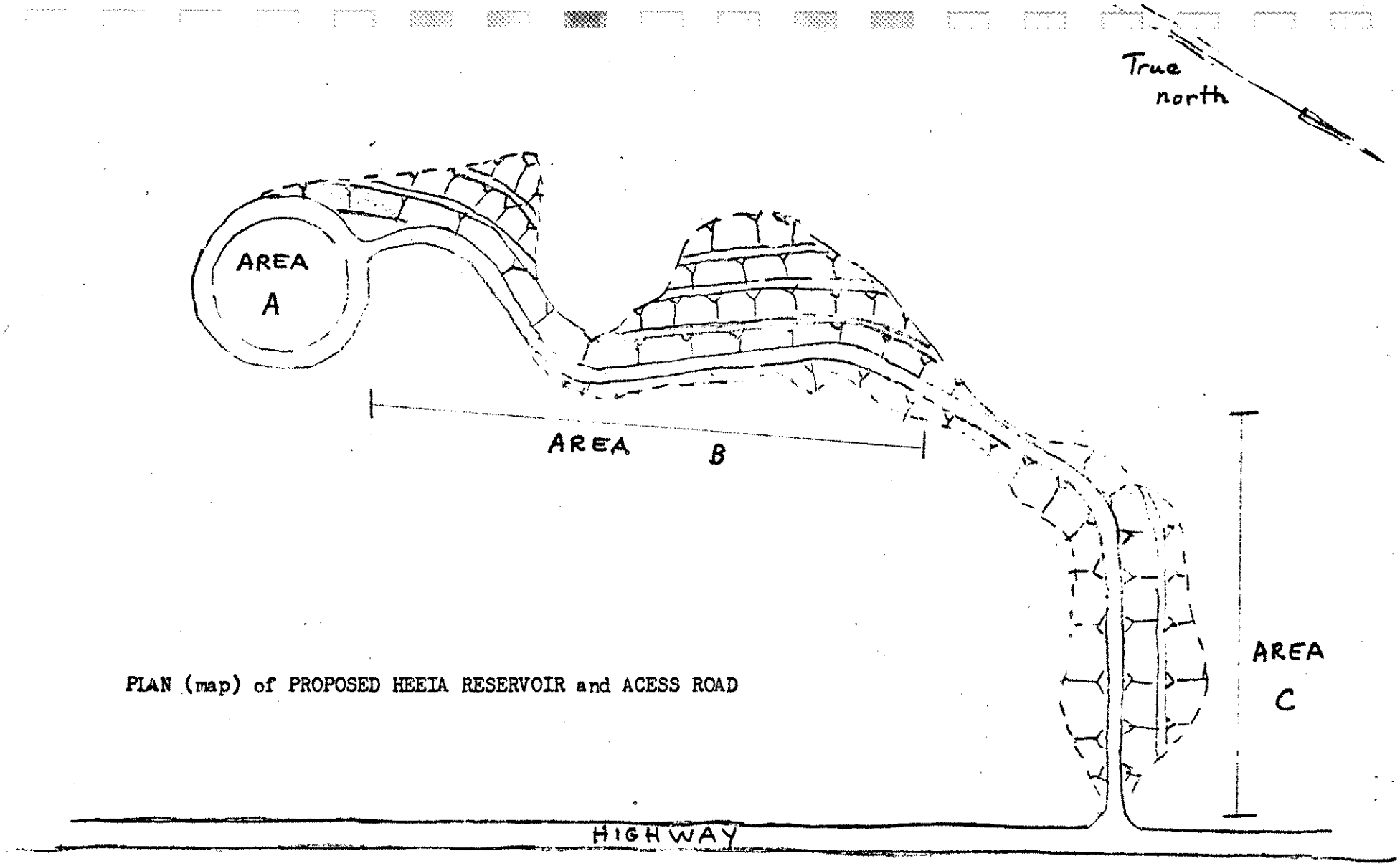
Mixture of 'ohi'a lehua, Java plum, pili (grass) lace ferns, and Christmas berry trees

Pili (grass), 'akia, and ferns

Mixture of pili (grass) and lace ferns

'Akia plant marked for transplanting

'Ohi'a lehua tree which should be transplanted if possible



PLAN (map) of PROPOSED HEEIA RESERVOIR and ACESS ROAD

A P P E N D I X B

Description and Determination

of

Severity Rating Number

(As Related to Soil Erosion)

APPENDIX B

SEVERITY RATING NUMBER SYSTEM

(Reference: Soil Erosion Standards and Guidelines, Department of Public Works, City and County of Honolulu, November 1975)

The severity rating number (SRN) reflects "the degree of potential damage by erosion and sediment" as compared to the standard severity rating number (SSRN) for Oahu, which "represents the maximum amount of environmental damage considered tolerable, based on studies of stream sediment loads and analysis of the degree of control attainable by the use of the best practical and feasible control measures."

The SSRN for Oahu is established as 50,000.

The following are considered when determining the SRN:

1. The potential for damage by sediment deposits to abutting properties or, if none, to areas downslope and downstream
2. Time duration of the project, from land disturbance to completion of construction and protection measures
3. Potential damage to coastal waters by sediment transport
4. Area of disturbance (graded)
5. Soil loss rate from erosion, based on site conditions

The SSRN of 50,000 serves as the criterion for the development of erosion and sediment control measures, i.e., the closer the SRN approaches 50,000, the more intensive should be the erosion and sediment control measures.

The SRN determined for the subject project is 14,000. Although this value is far below the standard, this does not necessarily warrant a relaxation of erosion control planning since the standard number should be applied subjectively.

The derivation of the project's Severity Rating Number, with figures and estimates used in the determination, is shown below.

The project's Severity Rating Number (SRN) of 14,000 is determined for the site based on the use of the following equation and the procedures outlined in the "Soil Erosion Standards and Guidelines," City and County of Honolulu, 1975.

$$SRN = (2FT + 3D)\ AE$$

where:

F = a unit factor for potential damage to areas downslope and downstream from the site

T = time duration in years, from clearing or first disturbance to completion of all construction and protective measures

D = a unit factor for potential sediment damage to coastal waters

A = area of disturbance, in acres

E = soil loss rate in tons per acre per year, as determined by the Universal Soil Loss Equation (USLE), E = RK (LS) (CP)

R = a factor representing the total erosive effect of an average years' rainfall

K = a soil erodibility factor (values have been established for all soil groups in Hawaii)

(LS) = a factor for length (L) and steepness (S in percent) of slope

(CP) = a combined factor for the protective effect of ground cover and mechanical or engineering erosion control measures

Determination of soil loss rate, E. Annual rainfall, soil type, slope characteristics of the completed project, and subjective integration of hydrologic and topographic charts yielded the following values for use in the USLE:

R = 350	LS = 20
K = 0.1	CP = 0.53

Therefore, the rate of soil loss from erosion with incremental grading under wet month conditions is

$$E = 350\ (0.1)\ (20)\ (0.53) = 370 \text{ tons/acre/yr}$$

Determination of Severity Rating Number, SRN. The estimates on time duration between clearing and completion of erosion protective measures and area of earth disturbance are considered conservative.

F = 1 D = 4
T = 1.5 yr A = 2.5 acres

Therefore,

SRN =(((2 (1) (1.5) +(3)(4)))(2.5) (370)
= 13,900 or approximately 14,000

A P P E N D I X C

Comments Received from Responding Agencies,

Organizations, and Individuals

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

KAZU HAYASHIDA
DIRECTOR AND CHIEF ENGINEER

ENV 76-321

July 21, 1976

Sunn, Low, Tom and Hara, Inc.
190 South King Street
Pacific Trade Center, Suite 600
Honolulu, Hawaii 96813

Gentlemen:

Subject: Environmental Impact Assessment for the Proposed 1.5 Million Gallon Heeia-Kai Reservoir

We have reviewed the assessment for the proposed project and have the following comments.

1. The design of the on-site drainage improvements should be coordinated with the Drainage Section of the Division of Engineering.

2. A 30-24-inch effluent force main from the proposed Kahaluu treatment plant to the existing Kaneohe plant will be constructed along Kahekili Highway near the project site. To avoid future conflicts, the design of the 42-and 16-inch transmission lines should be coordinated with the Division of Sewers.

3. The grade of the proposed access road at the Kahekili Highway connection should be compatible with the future widened road elevations.

Very truly yours,

Wallace Hayashida
for KAZU HAYASHIDA
Director and Chief Engineer

cc: Div. of Engineering
Div. of Sewers

September 21, 1976

Mr. Kazu Hayashida
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

ATTENTION: Mr. Wallace Miyahira
Deputy Director

SUBJECT: Environmental Impact Assessment for the Proposed Heeia-Kai Reservoir, Board of Water Supply

Thank you for your review and comments of July 21 (ref: ENV76-321), regarding the subject assessment.

Design of onsite drainage improvements and grading will be coordinated with the Division of Engineering. Alignment and profile of the 16-inch transmission line will also be coordinated with construction plans of the Division of Sewers for the proposed 30-24-inch effluent force main. Plans and specifications will be submitted to your office for final approval.

The draft environmental impact statement for the subject project will be available soon for public inspection, and notice of such time will be published in the newsletter of the Environmental Quality Commission.

PAUL T. F. LOW
Senior Vice President

MN/bs

cc: Mr. Edward Hirata

DEPARTMENT OF GENERAL PLANNING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

ROBERT R. WAY
CHIEF PLANNING OFFICER

DGP7/76-1720(JB)

July 23, 1976

Sunn, Low, Tom & Hara, Inc.
Pacific Trade Center, Suite 600
190 South King Street
Honolulu, Hawaii 96813

Gentlemen:

Proposed Heeia-Kai Reservoir
EIS Preparation Notice

We have examined the above-captioned and offer the following comments for your consideration.

Real property for the proposed project is designated for Preservation use on the adopted General Plan Detailed Land Use Map for the Kaneohe-Kualoa areas. The DLUM in turn is the framework of the Oahu General Plan.

Identification of the real property by tax key should be shown in the environmental impact statement report.

That the proposed public improvement is an element of the adopted Water Facilities Program for the City and County of Honolulu might be mentioned.

We appreciate the opportunity to participate in the review process.

Sincerely,

ROBERT R. WAY
Chief Planning Officer

RRW:fmt

September 21, 1976

Mr. Robert Way
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

SUBJECT: Environmental Impact Assessment for the Proposed Heeia-Kai Reservoir, Board of Water Supply

Thank you for your review and comments of July 23 (reference DGP7/76-1720(JB)), regarding the subject assessment.

Designation of the project site as preservation and identification of the parcel by tax key will be noted in the draft environmental impact statement now under preparation.

PAUL T. F. LOW
Senior Vice President

MN/bs

cc: Mr. Edward Hirata

FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

[redacted]
1455 S. Beretania Street, Room 305
Honolulu, Hawaii 96814

FRANK F. FASI
MAYOR

B. K. AIU
CHIEF

July 27, 1976

Mr. Paul T. F. Low
Vice President
Sunn, Low, Tom & Hara, Inc.
Pacific Trade Center, Suite 600
190 So. King Street
Honolulu, Hawaii 96813

Dear Mr. Low:

We have reviewed the draft of your Environmental Impact Statement for the proposed Heeia-Kai reservoir of the Board of Water Supply and do not have any further comments.

However, we would appreciate being informed of any streets or roadways that will be partially or completely closed during construction.

Very truly yours,

Boniface K. Aiu

BONIFACE K. AIU
Fire Chief

BKA:sb

September 21, 1976

Mr. Boniface K. Aiu
Fire Chief
City and County of Honolulu
1455 South Beretania Street
Honolulu, Hawaii 96814

SUBJECT: Environmental Impact Assessment for the Proposed Heeia-Kai Reservoir, Board of Water Supply

Thank you for your letter dated July 27, 1976, regarding the subject assessment.

Your office will be informed by the Board of Water Supply of any streets or roadways that will be partially or completely closed during construction.

PAUL T. F. LOW
Senior Vice President

MN/bs

cc: Mr. Edward Hirata

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O.Box 3378
HONOLULU, HAWAII 96801

July 28, 1976

GEORGE A. L. YUEN
DIRECTOR OF HEALTH

Audrey W. Mertz, M.D., M.P.H.
Deputy Director of Health

James S. Kumagai, Ph.D., P.E.
Deputy Director of Health

Henry N. Thompson, M.A.
Deputy Director of Health

In reply, please refer to:
File: EPHS-SS

Mr. Paul T. F. Low, Vice President
Sunn, Low, Tom & Hara, Inc.
Pacific Trade Center, Suite 600
190 S. King St.
Honolulu, Hawaii 96813

Dear Mr. Low:

Subject: Request for Comments on Proposed Environmental Impact Statement (EIS) for the Proposed Heeia-Kai Reservoir of the Board of Water Supply

Thank you for allowing us to review and comment on the subject proposed EIS. Please be informed that we have no comments or objections to this project at this time.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

Sincerely,

JAMES S. KUMAGAI, Ph.D.
Deputy Director for
Environmental Health

September 21, 1976

Department of Health
State of Hawaii
P. O. Box 3378
Honolulu, Hawaii 96801

ATTENTION: Dr. James Kumagai
Deputy Director for Environmental Health

SUBJECT: Environmental Impact Assessment for the Proposed
Heeia-Kai Reservoir, Board of Water Supply

Thank you for your letter of July 23 (file: EPHS-SS), regarding the subject assessment.

The draft environmental impact statement should be available soon for public inspection, and notice of such time will be published in the newsletter of the Environmental Quality Commission.

PAUL T. F. LOW
Senior Vice President

MN/bs

cc: Mr. Edward Hirata

GEORGE R. ARIYOSHI

HIDETO KONO
Director

FRANK SKRIVANEK
Deputy Director

DEPARTMENT OF PLANNING
AND ECONOMIC DEVELOPMENT

Kamamalu Building, 250 South King St., Honolulu, Hawaii • Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

July 28, 1976

Ref. No. 1708

Mr. Edward Y. Hirata
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
Honolulu, Hawaii

Dear Mr. Hirata:

Subject: Environmental Impact Statement Preparation Notice for Heeia-Kai 1.5 Million Gallon Reservoir, Heeia, Koolaupoko, Oahu, Hawaii

We have reviewed the subject Environmental Impact Statement Preparation Notice and wish to offer the following comments for your consideration.

1. Since the proposed action is viewed as an initial step in achieving an integrated water supply system for the Kaneohe area, the timing and phasing of related future action should be included in the EIS.

2. The project involves severe grading activity. In this respect, specific measures to minimize erosion and runoff during and after construction should be adequately described. The composition and characteristics of on-site soils should also be identified.

3. The statement should define the magnitude of deficiency in the existing system. Information on existing pressure capacities should be provided and related to current and anticipated demands.

4. The estimated level of recreational use of the adjacent "horse" trail, and the impact of the proposed action upon this use, should be identified.

We appreciate this opportunity to review the subject document and hope that the comments we have provided will be of use to you in developing the environmental impact statement.

Sincerely,

Frank Shiromoto

for HIDETO KONO

September 21, 1976

Mr. Hideto Kono, Director
Department of Planning and
Economic Development
State of Hawaii
P. O. Box 2359
Honolulu, Hawaii 96804

ATTENTION: Mr. Frank Skrivanek
Deputy Director

SUBJECT: Environmental Impact Assessment for the Proposed
Heeia-Kai Reservoir, Board of Water Supply

Thank you for your letter of July 28 (ref. no. 1708), regarding the subject assessment.

Your comments and suggestions concerning erosion controls, deficiency in the existing system, and impact of the project on the trail will be addressed in the draft environmental impact statement. The completed draft will be available for public inspection, and notice of such time will be published in the newsletter of the Environmental Quality Commission.

Thank you for participating in the review process.

PAUL T. F. LOW
Senior Vice President

MN/bs

cc: Mr. Edward Hirata

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

HONOLULU, HAWAII 96814

FRANK F. FASI
MAYOR

RICHARD K. SHARPLESS
MANAGING DIRECTOR

FRANCIS KEALA
CHIEF

EUGENE FLETCHER
DEPUTY CHIEF

OUR REFERENCE PPK-NZ/LF

YOUR REFERENCE

July 30, 1976

Mr. Paul T. F. Low
Vice-President
Sunn, Low, Tom & Hara, Inc.
Pacific Trade Center, Suite 600
Honolulu, Hawaii 96813

Dear Mr. Low:

Thank you for the opportunity to comment on the environmental impact statement for the proposed Heeia-Kai reservoir of the Board of Water Supply.

We would like to suggest that barricades be erected during non-working hours and adequate signs be posted at the roadway entrance from Kahekili Highway to prohibit trespassing and congregating. This would also preclude littering, dumping of derelict vehicles and vandalism.

Should you have any further questions, please feel free to contact Major Paul Kim, District Commander of the Windward Police at 274-2166.

Very truly yours,

FRANCIS KEALA
Chief of Police

September 21, 1976

Mr. Francis Keala
Chief of Police
Honolulu Police Department
1455 South Beretania Street
Honolulu, Hawaii 96814

SUBJECT: Environmental Impact Assessment for the Proposed Heeia-Kai Reservoir, Board of Water Supply

Thank you for your comments of July 30, 1976 (reference PPK-NZ/LF), regarding the subject assessment.

Your suggestion that a barricade be provided at the roadway entrance from Kahekili Highway to prohibit trespassing will be incorporated in the design.

The draft environmental impact statement for the subject project is now under preparation, and notice of its availability for public inspection will be published soon in the newsletter of the Environmental Quality Commission.

PAUL T. F. LOW
Senior Vice President

MN/bs

cc: Mr. Edward Hirata

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

CHRISTOPHER COBB, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
-DEPUTY TO THE CHAIRMAN

DIVISIONS:
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

August 2, 1976

The Honorable Edward Y. Hirata
Honolulu Board of Water Supply
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Sir:

We have reviewed the EIS preparation notice for the Heeia-Kai Reservoir.

The proposed project will not affect any known historic or archaeological site but if any unanticipated features or remains are encountered, please contact the Historic Preservation Officer at 548-6408 immediately.

Very truly yours,

Edgar A Hamasu

CHRISTOPHER COBB
Chairman of the Board

September 21, 1976

Mr. Christopher Cobb
Chairman of the Board
Department of Land and
Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

ATTENTION: Mr. Edgar A. Hamasu
Deputy to the Chairman

SUBJECT: Environmental Impact Assessment for the Proposed
Heeia-Kai Reservoir, Board of Water Supply

Thank you for your review and comments of August 2 regarding the subject assessment.

We will concur with your request and contact the Historic Preservation Officer immediately should any unanticipated features be encountered.

Notice of the availability of the draft environmental impact statement for public inspection will appear in the newsletter of the Environmental Quality Commission in the near future.

PAUL T. F. LOW
Senior Vice President

MN/bs

cc: Mr. Edward Hirata

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
440 Alexander Young Building, Honolulu, HI 96813

August 10, 1976

Mr. Paul T. F. Low
Sunn, Low, Tom & Hara, Inc.
Pacific Trade Center, Suite 600
190 South King Street
Honolulu, HI 96813

Dear Mr. Low:

Subject: Environmental Impact Statement for the Proposed Heeia-Kai Reservoir of the Board of Water Supply

We have reviewed the environmental impact assessment for the Heeia-Kai reservoir and have the following comment:

> The soils in the area are of low fertility and a heavy application of a complete fertilizer is needed to establish vegetation on the exposed slopes.

Thank you for the opportunity to review this document.

Sincerely,

Francis C. H. Lum
State Conservationist

September 21, 1976

U.S. Department of Agriculture
Soil Conservation Service
440 Alexander Young Bldg., Room 440
Honolulu, Hawaii 96813

ATTENTION: Mr. Francis C.H. Lum
State Conservationist

SUBJECT: Environmental Impact Assessment for the Proposed
Heeia-Kai Reservoir, Board of Water Supply

Thank you for your review of the subject assessment.

Your comment of August 10 regarding the low fertility of soils in the area is noted and will be addressed in the landscape plan and soil erosion control portion of the draft environmental impact statement.

We appreciate your interest in this document.

PAUL T. F. LOW
Senior Vice President

MN/bs

cc: Mr. Edward Hirata

GEORGE R. ARIYOSHI
GOVERNOR

RECEIVED
BD OF [illegible]

RICHARD E. MARLAND, PH.D.
DIRECTOR

TELEPHONE NO.
548-6915

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
OFFICE OF THE GOVERNOR
550 HALEKAUWILA ST.
ROOM 301
HONOLULU, HAWAII 96813

December 8, 1976

Edward Y. Hirata
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu

Dear Mr. Hirata,

Subject: Environmental Impact Statement for the Proposed 1.5 Million Gallon Heeia-Kai Reservoir, Heeia, Oahu

This Office has reviewed the subject EIS and offers the following comments:

1) We note that the proposed project is (p.3), "the first step in achieving an integrated system for the Kaneohe-Heeia area." Also, that, "subsequent projects to meet this goal include construction of a 42-inch transmission main along Kahekili Highway and a 16-inch service water main along Kamehameha Highway, which will connect the proposed reservoir and the existing Kapunahala reservoir." A Negative Declaration for the Kahaluu - Ahuimanu portion of the 42-inch transmission main was published in the August 8, 1976 EQC Bulletin. These actions should be considered together. The EIS Regulations, section 1:12 C, Sub-Part B states,

> "A group of actions shall be treated as a single action when: (1) the component actions are phases or increments of a larger total undertaking; (2) an individual project is a necessary precedent for a larger project; (3) an individual project represents a commitment to a larger project; or (4) the actions in question are essentially the same and a single Statement will adequately address the impacts of any single action."

The impact of the system should be evaluated, rather than each piece of the system separately.

2) Several large cuts will be required for the access road. The total size (height) of the large cuts is not stated. The infertility of the exposed soils and sub-soils will require substantial fertilization and maintenance to prevent soil erosion, sedimentation and aesthetic impacts. What species of grass or ground cover will be used

Copy sent to Myron Thompson, 12/13/76.

on the large cut slopes? The calculated "severity rating number," is stated (p.30) as 14,000 for the subject project. Neither the text, nor Appendix B, "Severity Rating Number System," shows how this figure was derived. What were the figures and estimates used in making this determination?

3) What is the quality of the receiving water body? How will this project affect that water quality? Would it be a significant environmental effect of this project?

4) Estimates should be given of the noise generated during the construction of the project and what the noise levels would be at the nearby residences.

5) The long-term use of the horse trail on the site appears to curtailed by the project. How will this loss be mitigated?

6) The proposed facility is stated as being "designed to meet water demands of the existing urban areas of Heeia-Kaneohe." We note that a portion of the urban zoned lands in the Heeia-Kaneohe area are still vacant, such as those north of the site. Will this project foster the growth of this area?

This Office and the Environmental Quality Commission have received ten comments on the subject EIS as shown on the attached list.

We trust that these comments will be helpful to you in preparing the Revised Statment. Thank you for the opportunity to review this EIS.

Sincerely,

Richard E. Marland
Director

attachment

cc: Robert Way, Dept. of General Planning
w/attach.

List of comments for the Environmental Impact Statement for the proposed 1.5 Million Gallon Reservoir, Heeia-Kai, Oahu. BWS.

State Agencies	Date of Comment
*Dept. of Agriculture	Nov. 23, 1976
Dept. of Health	Nov. 15, 1976
*Dept. of Defense	Nov. 15, 1976
*Dept. of Social Services and Housing	Nov. 10, 1976
Federal Agencies	
*Army - Commnading General/Environmental Section	Nov. 8, 1976
*Army - DAFE	Nov. 16, 1976
City and County of Honolulu	
Dept. of Land Utilization	Dec. 3, 1976
Dept. of Transportation Services	Dec. 1, 1976
Dept. of Housing and Community Development	Nov. 12, 1976

*Denotes no comments

January 6, 1977

Dr. Richard E. Marland
Director
Office of Environmental Quality Control
550 Halekauwila Street
Honolulu, Hawaii 96813

Dear Dr. Marland:

SUBJECT: Your letter of December 8, 1976 commenting on our Environmental Impact Statement for the 1.5 Million Gallon Heeia-Kai Reservoir

Our responses to your comments are as follows:

1. Response to Comment No. 1

Ultimately, the department plans to integrate its entire water system. However, each phase or increment may not necessarily be a precedent or commitment for a larger project as in the present case. The Heeia-Kai Reservoir was committed by the developers as part of the Crown Terrace and Alii Shores Subdivision and would benefit only the consumers in the area. This reservoir is not a precedent or a commitment to the proposed 42-inch main along Kahekili Highway.

The 42-inch main is needed to transport additional water developed from new sources to meet the increased demand. This main is needed even if the Heeia-Kai Reservoir is not built.

The two projects will be integrated for these reasons:

1. Operational flexibility,
2. Increased storage capacity,
3. Stabilized water pressures, and
4. Multi-source capability.

Since one project is not dependent upon the other for justification, each project was addressed separately.

2. Response to Comment No. 2

The several large cuts required for the access road will range in total height from approximately 15 feet in the upper areas to as much as 70 feet in the benched areas (see Plate III). Landscaping will commence immediately upon completion of grading activities, with implementation of a fertilization and post-maintenance program to insure successful restoration of the area. Contract provisions require the contractor to coordinate the fertilization program with recommendations of the Cooperative Extension Service, University of Hawaii.

Ground cover to be used at the site will be A. coromandeliana (common name, Asystasia), with a height and spread of approximately six inches. Pili grass, native to the site, will also be transplanted in designated areas on the cut slopes.

The severity rating number (SRN) of 14,000 calculated for the project was determined based on guidelines outlined in the "Soil Erosion Standards and Guidelines," City and County of Honolulu, 1975.

The enclosed attachment summarizes the procedures, figures, and estimates used in deriving the SRN.

3. Response to Comment No. 3

Runoff from the reservoir site drains into Heeia Stream at a point in the meadow area north of the site and makai of Kahekili Highway (Plate I). The stream discharge is at the northern limits of Heeia Pond in the estuarine portion of Kaneohe Bay, a Class AA water body (i.e., the highest beneficial use classification of the state).

The water quality of the bay does not meet state standards, due, primarily, to the large quantities of uncontrolled natural runoff and sewage effluent entering the bay.

The present estimate of soil losses into Kaneohe Bay is 35,000 tons per year (Bartram, 1972). The contribution during the construction phase of the project, as estimated using the Universal Soil Loss Equation (USLE) and the conservative assumption that grading work will occur during the winter, or wet,

season is 150 tons, or less than one-half of one percent of the total bay influx. Based on an examination of climatological and relief characteristics of the watershed, it is our judgement that the impact due to implementation of the project will not significantly affect the water quality of the receiving waters.

(Reference: Bartram, Paul; Available Information on Sediment Yields and Methods of Estimation Applicable to Kaneohe Drainage Basins; Hawaii Environmental Simulation Laboratory; University of Hawaii; 1972)

4. Response to Comment No. 4

The construction site is situated approximately 500 to 600 feet from the closest residences. With noise generated from construction equipment at the site expected to be within the 80 to 100 dBa range, the estimated levels outdoors at the residences can be expected to be from 60 dBa to intermittent levels of 80 dBa. As a basis of comparison, the existing ambient noise levels attributable to highway traffic at these same residences is estimated to be about 50 to 60 dBa. (Noise level estimates were derived by a model based on the straight-line logarithmic decay formula according to Pollution Engineering Practice Handbook by P. N. Cheremisinoff and R. A. Young, 1975.)

In compliance with the Public Health Regulations, Chapter 44B, noise levels exceeding 55 dBa will require a permit regulating the time of such work. Noise levels exceeding 95 dBa will be restricted to hours between 9:00 a.m. and 5:30 p.m.

5. Response to Comment No. 5

The proposed project will restrict the use of portions of the "horse" trail that presently provides direct access to the ridge areas mauka of the proposed site. This restriction will be necessary to ensure public safety. The ridge areas will remain accessible from other existing trails that lead to points further inland and from trail areas originating within the Haiku Plantation subdivision. It is believed that the "horse" trail is limited in use to residences of the Haiku Plantation subdivision.

6. Response to Comment No. 6

The reservoir is not intended to foster growth in the area and is designed to meet only existing demands. All proposals for developments in the area will be evaluated to determine whether the developer will be required to provide a new water source or contribute his pro-rata share in the development of a new source.

Your letter and our responses will be appended to our final environmental impact statement.

Very truly yours,

L. D. Rathburn
FOR Edward Y. Hirata
Manager and Chief Engineer

ATTACH.
cc: Mr. Robert Way (with attach.)
Dept. of General Planning
City and County of Honolulu

LHYW:bmy
cc: LHYW(with attach)

The derivation of the project's Severity Rating Number, with figures and estimates used in the determination, is shown below.

The project's Severity Rating Number (SRN) of 14,000 is determined for the site based on the use of the following equation and the procedures outlined in the "Soil Erosion Standards and Guidelines," City and County of Honolulu, 1975.

$$SRN = (2FT + 3D)\ AE$$

where:

F = a unit factor for potential damage to areas downslope and downstream from the site

T = time duration in years, from clearing or first disturbance to completion of all construction and protective measures

D = a unit factor for potential sediment damage to coastal waters

A = area of disturbance, in acres

E = soil loss rate in tons per acre per year, as determined by the Universal Soil Loss Equation (USLE), $E = RK\ (LS)\ (CP)$

R = a factor representing the total erosive effect of an average years' rainfall

K = a soil erodibility factor (values have been established for all soil groups in Hawaii)

(LS) = a factor for length (L) and steepness (S in percent) of slope

(CP) = a combined factor for the protective effect of ground cover and mechanical or engineering erosion control measures

Determination of soil loss rate, E. Annual rainfall, soil type, slope characteristics of the completed project, and subjective integration of hydrologic and topographic charts yielded the following values for use in the USLE:

R = 350	LS = 20
K = 0.1	CP = 0.53

Therefore, the rate of soil loss from erosion with incremental grading under wet month conditions is

$$E = 350\ (0.1)\ (20)\ (0.53) = 370 \text{ tons/acre/yr}$$

Determination of Severity Rating Number, SRN. The estimates on time duration between clearing and completion of erosion protective measures and area of earth disturbance are considered conservative.

F = 1 D = 4
T = 1.5 yr A = 2.5 acres

Therefore,

SRN =(((2 (1) (1.5) +(3)(4)))(2.5) (370)
= 13,900 or approximately 14,000

GEORGE R. ARIYOSHI
GOVERNOR

JOHN FARIAS, JR.
CHAIRMAN, BOARD OF AGRICULTURE

YUKIO KITAGAWA
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF AGRICULTURE
1428 SO. KING STREET
HONOLULU, HAWAII 96814

November 23, 1976

MEMORANDUM

To: Environmental Quality Commission

Subject: 1.5 Million Gallon Heeia Kai Reservoir

The Department of Agriculture has no comments on the subject Environmental Impact Statement.

Thank you for the opportunity to comment.

John Farias, Jr.
Chairman, Board of Agriculture

JF:k:d

December 20, 1976

Mr. John Farias, Jr.
Chairman, Board of Agriculture
State of Hawaii
1428 So. King Street
Honolulu, Hawaii 96814

Dear Mr. Farias:

SUBJECT: Your Letter of November 23, 1976 Re Environmental Impact Statement for 1.5 Million Gallon Heeia-Kai Reservoir at Heeia, Koolaupoko, Oahu

Thank you for your comments. A copy of your letter will be appended to our final environmental impact statement.

Very truly yours,

Edward Y. Hirata
Manager and Chief Engineer

cc: Mr. Robert R. Way
Dept. of General Planning
City and County of Honolulu

Environmental Quality Commission 12/22
State of Hawaii

MHS:bmy
cc: RN, LHYW (12/22)

GEORGE R. ARIYOSHI
GOVERNOR

VALENTINE A. SIEFERMANN
MAJOR GENERAL
ADJUTANT GENERAL

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
FORT RUGER, HONOLULU, HAWAII 96816

15 NOV 1976

HIENG

Dr. Albert Tom, Chairman
Environmental Quality Commission
550 Halekauwila Street
Honolulu, Hawaii 96813

Dear Dr. Tom:

1.5 Million Gallon Heeia-Kai Reservoir
at Heeia, Koolaupoko, Oahu

Thank you for sending us a copy of the Environmental Impact Statement for the proposed "1.5-Million Gallon Heeia-Kai Reservoir at Heeia, Koolaupoko, Oahu". We have received the publication and have no comments to offer.

We are returning the Environmental Impact Statement for the proposed project per your request.

Yours truly,

WAYNE R. TOMOYASU
Captain, CE, HARNG
Contr & Engr Officer

Enclosure

December 20, 1976

Department of Defense
State of Hawaii
Fort Ruger
Honolulu, Hawaii 96816

ATTENTION: Capt. Wayne R. Tomoyasu

Gentleman:

SUBJECT: Your Letter of November 15, 1976 Re Environmental Impact Statement for 1.5 Million Gallon Heeia-Kai Reservoir at Heeia, Koolaupoko, Oahu

Thank you for your comments. A copy of your letter will be appended to our final environmental impact statement.

Very truly yours,

Edward Y. Hirata

Edward Y. Hirata
Manager and Chief Engineer

cc: Mr. Robert R. Way
Dept.of General Planning
City and County of Honolulu

Environmental Quality Commission } 12/22
State of Hawaii

MHS:bmy
cc: RN, LHYW (12/22)

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

GEORGE A. L. YUEN
DIRECTOR OF HEALTH

Audrey W. Mertz, M.D., M.P.H.
Deputy Director of Health

Henry N. Thompson, M.A.
Deputy Director of Health

James S. Kumagai, Ph.D., P.E.
Deputy Director of Health

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. Box 3378
HONOLULU, HAWAII 96801

November 15, 1976

In reply, please refer to:
File: EPHS – SS

MEMORANDUM

To: Dr. Richard E. Marland, Director
Office of Environmental Quality Control

From: Deputy Director for Environmental Health

Subject: Environmental Impact Statement (EIS) for the 1.5-Million Gallon Heeia-Kai Reservoir at Heeia, Koolaupoko, Oahu

Thank you for allowing us to review and comment on the subject EIS. Please be informed that we have no objections to this project.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

JAMES S. KUMAGAI, Ph.D.

cc: Department of General Planning
Board of Water Supply, City & County of Honolulu

(740)

November 29, 1976

Mr. James S. Kumagai
Deputy Director for Environmental Health
Department of Health
State of Hawaii
P. O. Box 3378
Honolulu, Hawaii 96801

Dear Mr. Kumagai:

SUBJECT: Your Letter of November 15, 1976 to Dr. Richard Marland of the Office of Environmental Quality Control Regarding our Environmental Impact Statement for the 1.5 Million Gallon Heeia-Kai Reservoir at Heeia, Koolaupoko, Oahu

Thank you for your comments. They will be appended to our final environmental impact statement.

Very truly yours,

L.S. Rathburn

FOR Edward Y. Hirata
Manager and Chief Engineer

SM:bmy
cc: RN, LHYW

740
12/1 Check
copy to RN, LW

GEORGE R. ARIYOSHI
Governor

HIDETO KONO
Director

FRANK SKRIVANEK
Deputy Director

DEPARTMENT OF PLANNING
AND ECONOMIC DEVELOPMENT

Kamamalu Building, 250 South King St., Honolulu, Hawaii • Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

November 29, 1976

Ref. No. 2457

Mr. Edward Y. Hirata
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96813

Dear Mr. Hirata:

Subject: Environmental Impact Statement for the 1.5-Million Gallon Heeia-Kai Reservoir at Heeia, Koolaupoko, Oahu

The subject EIS has been reviewed and appears to be adequate in identifying and evaluating the potential environmental impacts that can be anticipated from the proposed project.

We are pleased to note that the comments made in our letter dated July 28, 1976, on the EIS Preparation Notice for this proposed project were addressed in this document.

Thank you for the opportunity to review and comment on this EIS.

Sincerely,

Frank Skrivanek

for HIDETO KONO

December 7, 1976

Mr. Hideto Kono, Director
Department of Planning and Economic
Development
State of Hawaii
P. O. Box 2359
Honolulu, Hawaii 96804

Dear Mr. Kono:

SUBJECT: Your Letter of November 29, 1976 Relating to the Environmental Impact Statement for the 1.5-Million Gallon Heeia-Kai Reservoir at Heeia, Koolaupoko, Oahu

Thank you for your comments which will be appended to our final environmental impact statement.

Very truly yours,

L.G. Rathburn

FOREDWARD Y. HIRATA
Manager and Chief Engineer

SM:pdc
cc: RN, LHYW
12/9 - ltr. out
12/9 - copy sent to RN

GEORGE R. ARIYOSHI
GOVERNOR

ANDREW I. T. CHANG
DIRECTOR OF SOCIAL SERVICES & HOUSING

STATE OF HAWAII
DEPARTMENT OF SOCIAL SERVICES AND HOUSING
P.O. Box 339
Honolulu, Hawaii 96809

November 10, 1976

Environmental Quality Commission
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Gentlemen:

Re: Environmental Impact Statement for the 1.5-Million Gallon Heeia-Kai Reservoir at Heeia, Koolaupoko, Oahu

We have reviewed the EIS and have no comment to offer relating to our program areas.

We are returning the EIS for your usage. Thank you for the opportunity to review and comment.

Sincerely,

Andrew I. T. Chang
Director

Att.

December 20, 1976

Mr. Andrew I. T. Chang
Director
Dept. of Social Services and Housing
State of Hawaii
P. O. Box 339
Honolulu, Hi. 96809

Dear Mr. Chang:

SUBJECT: Your Letter of November 10, 1976 Re Environmental Impact Statement for 1.5 Million Gallon Heeia-Kai Reservoir at Heeia, Koolaupoko, Oahu

Thank you for your comments. A copy of your letter will be appended to our final environmental impact statement.

Very truly yours,

Edward Y. Hirata
Manager and Chief Engineer

cc: Mr. Robert R. Way
Dept. of General Planning
City and County of Honolulu

Environmental Quality Commission } 12/22
State of Hawaii

MHS:bmy
cc: RN, LHYW (12/22)

John Chang

December 13, 1976 STP 8.4010

Dr. Richard E. Marland
Office of Environmental
Quality Control
550 Halekauwila St., Room 301
Honolulu, Hawaii 96813

Dear Dr. Marland:

Subject: EIS, 1.5 Million Gallon Keeia-Kai Reservoir, Oahu

We have reviewed the above-captioned document and have the following comments to make:

1. On page 32, add Item 4, Department of Transportation, State of Hawaii, Highways Division (for construction of waterline and road connection within the State highway right-of-way.)

2. On Plate III, the Access Road's elevation at the highway right-of-way line should be within 1 foot of the existing Kahekili Highway finished grade.

3. The 16-inch water line should be located along either the makai or mauka boundary of the highway right-of-way.

Sincerely,

E. ALVEY WRIGHT
Director

ALK:jk

cc: Dept. of General Planning
Board of Water Supply
HWY-P

Coordinate comments w/ Design

C-37

December 22, 1976

Admiral E. Alvey Wright
Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813

Dear Admiral Wright:

SUBJECT: Your Letter of December 13, 1976
Re Environmental Impact Statement
for 1.5 Million Gallon Keeia-Kai
Reservoir

Thank you for your comments. They will be incorporated into our final environmental impact statement. A copy of your letter will also be appended to our final statement.

Very truly yours,

L.S. Kathburn

FOR EDWARD Y. HIRATA
Manager and Chief Engineer

MHS:pdc
cc: RN, LHYW
(12/28)

DGP 1976-2971

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

RE:0216

Office of the Director

December 8, 1976

MEMORANDUM

TO: Department of General Planning
City & County of Honolulu

FROM: Doak C. Cox, Director
Environmental Center

RE: Review of Environmental Impact Statement for the proposed 1.5 Million Gallon Heeia-Kai Reservoir

RECEIVED
'76 DEC 13 AM 9:49
DEPT. OF GENERAL PLANNING C & C HONOLULU

The Environmental Center review of the above cited EIS has been prepared with the assistance of Paul Ekern (WRRC and Agronomy and Soils), Ruth Gay (Botany) and Mae Kato Pattison (Environmental Center).

Page 8. What will be the potential environmental impact of flows greater than that expected from the ten-year storm? We recommend that the 30-inch culvert be designed to handle not only the ten-year storm, but also emergency flows. This might be accomplished by modifying the culvert with a hooded intake.

Page 12. The specific soil found in the proposed project area is not mentioned. We recommend that this be done. It appears to be Waikane from the map with inclus on of details on management from Foote, et al, 1972, and details on erodibility and infiltration from Dangler, et al, 1976.

Page 8, Page 12. We suggest that the geomorphology of the proposed site be elaborated on, if in fact the Waikane is formed on gravelly alluvial-colluvial terraces. In this line we recommend that the reality of the stability of the gullies into which the waters will discharge be established in more detail than the single statement now incorporated on page 29.

Page 24. We recommend an assessment be made on potential earthquake damage or a catastrophic failure of the structure. What are the potential impacts should such an event occur? We suggest identification and description of the areas downstream which might be affected in the event of such a disaster.

Plate III. We find no mention in the proposed EIS of the outlet structure shown connected to the proposed reservoir. What is the purpose of this structure?

Pages 29, 30. We suggest that the names of the grasses and other plants to be used in landscaping the proposed site after construction be given. Only names of the native plants are given. Since the success of native restoration will depend in part on the characteristics of the other planted species, a full listing of pine-type trees, grasses, etc. should be included.

Thank you for the opportunity to review this EIS. We will appreciate your consideration of our comments.

Doak C. Cox

cc: Board of Water Supply
OEQC
Contributors


(Joins sheet 58)
Kaneohe Fishing Pier
Kealohi Point
Mok o Loe
(Coconut Island)
University of Hawaii
Marine Laboratory
Pohakea
Oahope Point
Puu Pahu
St. Anns School
KANEOHE
Valley
Pond
Stream
(Joins sheet 60)
2 Miles
10 000 Feet

January 5, 1977

Dr. Doak C. Cox, Director
Environmental Center
University of Hawaii
Crawford 317
2550 Campus Road
Honolulu, Hawaii 96822

Dear Dr. Cox:

SUBJECT: Your letter of December 8, 1976 commenting on our Environmental Impact Statement for the 1.5 Million Gallon Heeia-Kai Reservoir

Our responses to your comments are as follows:

1. Page 8

Emergency flow from the reservoir would occur only during overflow instances and is generally attributable to a malfunctioning altitude valve. As mentioned in the EIS, the possibility of this occurring is remote. Further, the possibility of the altitude valve malfunctioning during a significant storm is even more remote.

A flow of 44 cfs is estimated for a ten-year storm. Hydraulic calculations indicate that the water level at the upstream side of the headwall would attain a level of 2.5 feet above the crown of the pipe during the ten-year storm. In the event emergency flows (estimated at 15 cfs) from the reservoir occur at the same time as a ten-year storm, (flows total approximately 60 cfs), the water level would attain a level of five feet above the crown of the pipe.

The impact of the larger flow would be a greater inundated area. Inundation of the access road or Kahekili Highway, however, is not anticipated since both road and highway are 20 feet above the invert of the pipe. The most significant impact would be temporary inundation of the gully area and related erosion of ground slopes. It is felt, however, that landscape stabilization of that area would minimize any adverse impacts.

Additionally, no impact on the access road or the highway is anticipated from flows of a 50-year storm (62 cfs.)

2. Page 12

The soils of the project area, as delineated in the U. S. Soil Conservation Service survey, are classified as Waikane silty clay. The erosion hazard for this soil type is moderate to severe.

Soil boring data at the reservoir site suggest that the geomorphology at the site is in general agreement with that described for the Waikane soil series. Based on field and laboratory findings, recommendations have been made by the foundation consultants. Slope stability requirements of 1-1/2 to 2-1/2 horizontal to 1 vertical are incorporated into the grading plan.

The stability of the vegetated gullies has been established and demonstrated in the time since construction of the highway. Since the gullies will remain intact, except in the immediate area of the drainage culvert and access road, little impact upon their stability is anticipated.

3. Page 24

As with all structures in the state, the reservoir is designed with considerations to seismic effects. Structural parameters for zone 3 (the highest designation in terms of earthquake precautions) are incorporated in the design of the reservoir. Such measures, however, do not necessarily preclude potential catastrophic failure and even collapse of the structure. Should such a disaster indeed occur and depending upon the nature of the failure, floodwaters from the site could flow not only into the gullies that flank the site both north and south but also to the east over the highway embankment and onto the highway.

The potential for damage to existing homes in the vicinity of the reservoir site is minimal due, in large part, to the energy-dissipating character afforded by the gullies and by ground elevation differences. (The Haiku Park development is situated on a knoll about 50 feet above and across the highway; the Haiku Plantation residences are located approximately 40 feet above the gulch.) Areas immediately downstream are as yet not developed.

4. Plate III

The outlet structure shown connected to the proposed reservoir (Plate III) will be used during instances when the reservoir will require draining for maintenance work or when overflows occur. The overflow line previously described is connected to the outlet structure.

5. Pages 29 and 30

In addition to transplanting the native growth of 'aki, pili (grass), 'akia, and 'ohi'a lehua, other species in the restoration effort will be a number of Tristania conferta (common name, Brisbane box) for spatial cover and A. coromandeliana (common name, Asystasia) for ground cover.

Your letter and our response will be appended to our final impact statement.

Very truly yours,

L.S. Kathleen

FOR Edward Y. Hirata
Manager and Chief Engineer

cc: Mr. Robert Way (1/7)
Dept. of General Planning
City & County of Honolulu

LHYW:bmy
cc: LHYW

University of Hawaii at Manoa

Water Resources Research Center

December 1, 1976

MEMORANDUM

TO: Board of Water Supply
City and County of Honolulu

FROM: Reginald H. F. Young RHFY
Asst. Director, WRRC

SUBJECT: EIS for 1.5 Million-Gallon Heeia-Kai Reservoir

We have reviewed the subject EIS, consider it complete and well-presented, and have no critical comment. We are retaining the EIS in our files for possible future reference.

RHFY:jm

cc: Env. Center
H. Gee

December 8, 1976

Dr. Reginald H. F. Young
Assistant Director
Water Resources Research Center
University of Hawaii
2540 Dole Street
Honolulu, Hawaii 96822

Dear Dr. Young:

SUBJECT: Your Comments of Decerber 1, 1976 Regarding Environmental Impact Statement for 1.5-Million Gallon Heeia-Kai Reservoir

Thank you for your comments which will be appended to our final environmental statement.

Very truly yours,

Edward Y. Hirata

EDWARD Y. HIRATA
Manager and Chief Engineer

MHS:pdc
cc: LHYW

cc: Mr. Robert R. Way
Chief Planning Officer
Department of General Planning

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
440 Alexander Young Building, Honolulu, HI 96813

December 14, 1976

Dr. Richard E. Marland
Office of Environmental Quality Control
550 Halekauwila St., Rm. 301
Honolulu, HI 96813

Dear Dr. Marland:

Subject: Environmental Impact Statement for the 1.5-Million Gallon Heeia-Kai Reservoir at Heeia, Koolaupoko, Oahu

We have reviewed the above-mentioned document and have no comments to offer.

Thank you for the opportunity to review this document.

Sincerely,

Jack P. Kanalz
State Conservationist

December 28, 1976

Mr. Jack P. Kanalz
State Conservationist
U. S. Department of Agriculture
440 Alexander Young Building
Honolulu, Hawaii 96813

Dear Mr. Kanalz:

SUBJECT: Your Letter of December 14, 1976
Re Environmental Impact Statement
for the 1.5 Million Gallon Heeia-Kai
Reservoir, Heeia, Oahu

Thank you for your comments. Your letter will be appended to our final environmental impact statement.

Very truly yours,

L. S. Rathburn

FOR EDWARD Y. HIRATA
Manager and Chief Engineer

MHS:pdc
cc: LHYW

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 15th AIR BASE WING (PACAF)
APO SAN FRANCISCO 96553

REPLY TO ATTN OF: DEEE (Mr. Nakashima, 4492158)

6 DEC 1976

SUBJECT: Environmental Impact Statements

TO: Environmental Quality Commission
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

1. This headquarters has no comment to render relative to the following Environmental Impact Statements:

Sanpo Land Industrial (Hawaii) Co., Ltd.
Retail Complex in Waikiki

1.5 Million Gallon Heeia-Kai Reservior
at Heeia, Koolaupoko, Oahu

2. We greatly appreciate your cooperative efforts in keeping the Air Force apprised of your development projects throughout the State and the opportunity to review the subject statements.

BEN D. KOSA
Dep Dir of Civil Engineering

December 20, 1976

Department of the Air Force
Headquarters 15th Air Base Wing (PACAF)
APO San Francisco 96553

ATTENTION: DEEE (Mr. Nakashima, 4492158)

Gentlemen:

SUBJECT: Your Letter of December 6, 1976 Re. Environmental Impact Statement for 1.5 Million Gallon Heeia-Kai Reservoir at Heeia, Koolaupoko, Oahu

Thank you for your comments. A copy of your letter will be appended to our final environmental impact statement.

Very truly yours,

Edward Y. Hirata
Manager and Chief Engineer

cc: Mr. Robert R. Way
Dept. of General Planning
City and County of Honolulu

Environmental Quality Commission
State of Hawaii

12/22

MHS:bmy
cc: RN, LHYW (12/22)

DEPARTMENT OF THE ARMY
HEADQUARTERS UNITED STATES ARMY SUPPORT COMMAND, HAWAII
APO SAN FRANCISCO 96558

AFZV-SG-EC

8 November 1976

Richard E. Marland, PhD
Office of Environmental Quality Control
State of Hawaii
Room 301, 550 Halekauwila Street
Honolulu, Hawaii 96813

Dear Dr. Marland:

The following Environmental Impact Statements were reviewed by our office:

Gentry-Waipio, Waipio, Oahu

Sanpo Land Industrial (Hawaii Co., Ltd., Retail Complex in Waikiki

✓ 1.5 Million Gallon Heeia-Kai Reservoir at Heeia, Koolaupoko, Oahu

We have no comments to offer at this time.

Thank you for the opportunity to review these statements.

Sincerely,

LEE C. HERWIG, JR.
Colonel, MSC
Environmental Consultant to Commander,
U.S. Army Support Command, Hawaii

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

December 20, 1976

Lee C. Herwig, Jr.
Colonel, MSC
U. S. Army Support Command, Hawaii
APO San Francisco 96558

Dear Colonel Herwig:

SUBJECT: Your Letter of November 8, 1976 Re Environmental Impact Statement for 1.5 Million Gallon Heeia-Kai Reservoir at Heeia, Koolaupoko, Oahu

Thank you for your comments. A copy of your letter will be appended to our final environmental impact statement.

Very truly yours,

Edward Y. Hirata
Manager and Chief Engineer

cc: Mr. Robert R. Way
Dept. of General Planning
City and County of Honolulu

Environmental Quality Commission
State of Hawaii

12/22

cc: RN, LHYW (12/22)

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY SUPPORT COMMAND, HAWAII
APO San Francisco 96558

16 NOV 1976

AFZV-FE-EE

Mayor (Dept of General Planning)
City & County of Honolulu
Honolulu, Hawaii 96813

Gentlemen:

Reference is made to the Environmental Impact Statement (EIS) for Board of Water Supply's proposed 1.5 million gallon Heeia-Kai Water Reservoir at Heeia, Koolaupoko, Oahu, dated November 1976.

We have reviewed the EIS document and have no comments to offer. There are no Army installations in the area of the proposed project.

Thank you for the opportunity to review the document.

Sincerely yours,

Original signed by
CARL P. RODOLPH
Colonel, CE
Director of Facilities Engineering

NOV 19 3 23 PM '76

CF:
Board of Water Supply
City & County of Honolulu
Honolulu, Hawaii

Environmental Quality Commission
State of Hawaii
550 Halekauwila Street
Room 301
Honolulu, Hawaii

December 3, 1976

Col. Carl P. Rodolph, CE
Director of Facilities Engineering
Headquarters, U. S. Army Support
Command, Hawaii
Department of the Army
APO, San Francisco 96558

Dear Col. Rodolph:

SUBJECT: Your Letter Dated November 16, 1976 Relating to the Environmental Impact Statement for the 1.5-Million Gallon Heeia-Kai Reservoir at Heeia, Koolaupoko, Oahu

Thank you for your comments. They will be appended to our final environmental impact statement.

Very truly yours,

L. G. Pathburn

FOR EDWARD Y. HIRATA
Manager and Chief Engineer

SM:pdc
cc: RN, LHYW

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DIVISION, PACIFIC OCEAN
BLDG. 230, FT. SHAFTER
APO SAN FRANCISCO 96558

Mr. Robert Way
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813

Dear Mr. Way:

We have reviewed the Environmental Impact Statement for the 1.5-Million Gallon Hoeia-Kai Reservoir and have the following comments:

a. The EIS should project population growth and commercial development in the service area to estimate how much demand stresses on the existing water supply system can be expected to increase.

b. The EIS should describe how the proposed 1.5-million gallon (MG) reservoir will satisfy the future demands of the service area, which already requires a minimum of a 1.4 MG storage capacity at the present time.

c. The EIS should determine whether the existing site has the design capacity for future expansion, if this proves necessary.

d. Appendix B of the EIS should provide a breakout of the calculations used to determine the project's Severity Rating Number.

We appreciate the opportunity to participate in the review process.

Sincerely yours,

KISUK CHEUNG
Chief, Engineering Division

Copy furnished:
Manager and Chief Engineer
Board of Water Supply
630 S. Beretania Street
Honolulu, Hawaii 96813

January 5, 1977

Mr. Kisuk Cheung
Chief, Engineering Division
Department of the Army
U. S. Army Engineer Div., Pacific Ocean
Building 230, Fort Shafter
APO San Francisco 96558

Dear Mr. Cheung:

SUBJECT: Your letter of December 1976 to Mr. Robert Way commenting on our Environmental Impact Statement for the 1.5 Million Gallon Keeia-Kai Reservoir

Our responses to your comments are as follows:

1. Response to Item a:

Projections on population growth and commercial developments were not mentioned in the EIS since the proposed reservoir is designed to meet only present demands. All plans for any future development in the area must be submitted to us for review. This review will determine whether the developer will be required to develop a new source or contribute his pro-rata share for the development of a new source.

2. Response to Item b:

The proposed reservoir was committed by the developer for the Crown Terrace and Alii Shores Subdivisions and is designed to meet only present demands. All new developments will be evaluated and the cost for any additional storage requirement will be assessed the developer on a pro-rata share.

3. Response to Item c:

Future expansion of the existing site for an additional reservoir is not feasible. On a fairly large integrated system like the one involved, it is more beneficial to have reservoirs located at different strategic sites than to have them all at one location. Scattering of the reservoirs on a planned basis would minimize the effects of localized stresses occurring within the system.

4. Response to Item d:

The derivation of the project's Severity Rating Number, with figures and estimates used in the determination, is shown below.

The project's Severity Rating Number (SRN) of 14,000 is determined for the site based on the use of the following equation and the procedures outlined in the "Soil Erosion Standards and Guidelines", City and County of Honolulu, 1975.

$$SRN = (2FT + 3D)\ AE$$

where

F = a unit factor for potential damage to areas downslope and downstream from the site

T = time duration in years, from clearing or first disturbance to completion of all construction and protective measures

D = a unit factor for potential sediment damage to coastal waters

A = area of disturbance, in acres

E = soil loss rate in tons per acre per year, as determined by the Universal Soil Loss Equation (USLE), E = RK (LS) (CP)

R = a factor representing the total erosive effect of an average year's rainfall

K = a soil erodibility factor (values have been established for all soil groups in Hawaii)

(LS) = a factor for length (L) and steepness (S in percent) of slope

(CP) = a combined factor for the protective effect of ground cover and mechanical or engineering erosion control measures

Determination of soil loss rate, E. Annual rainfall, soil type, slope characteristics of the completed project, and subjective integration of hydrologic and topographic charts yielded the following values for use in the USLE:

R = 350	LS = 20
K = 0.1	CP = 0.53

Therefore, the rate of soil loss from erosion with incremental grading under wet month conditions is

$$E = 350\ (0.1)\ (20)\ (0.53) = 370 \text{ tons/acre/yr}$$

Determination of Severity Rating Number, SRN. The estimates on time duration between clearing and completion of erosion protective measures and area of earth disturbance are considered conservative.

F = 1	D = 4
T = 1.5 yr	A = 2.5 acres

Therefore,

$$SRN = (((2\ (1)\ (1.5) + (3)\ (4)))\ (2.5)\ (370)$$
$$= 13{,}900 \text{ or approximately } 14{,}000$$

Your letter and our response will be appended to our final Environmental Impact Statement.

Very truly yours,

L.G. Rathburn

FOR Edward Y. Hirata
Manager and Chief Engineer

cc: Mr. Robert R. Way (w/o)
Dept. of General Planning
City & County of Honolulu

LHYW:bmy
cc: LHYW ✓

DEPAR[illegible] OF HOUSING AND COMMUNITY DEV MENT
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813
PHONE 523-4161

FRANK F. FASI
MAYOR

RICHARD K. SHARPLESS
MANAGING DIRECTOR

WILLIAM BLACKFIELD
DIRECTOR

TYRONE T. KUSAO
DEPUTY DIRECTOR

November 12, 1976

MEMO TO: Office of Environmental Quality Control

FROM: William Blackfield, Director
Department of Housing & Community Development

SUBJECT: Environmental Impact Statement for Proposed 1.5 Million Gallon Heeia-Kai Reservoir

The Department of Housing and Community Development has reviewed the EIS for the "Proposed 1.5 Million Gallon Heeia-Kai Reservoir." We have no comments to make relating to this Agency's program or workload. We are returning the copy of the EIS for your further use.

Thank you for the opportunity to review this matter.

WILLIAM BLACKFIELD
Director

Attach.

December 20, 1976

Mr. William Blackfield
Director
Dept. of Housing and Community Development
City and County of Honolulu
650 So. King Street
Honolulu, Hi. 96813

Dear Mr. Blackfield:

SUBJECT: Your Letter of November 12, 1976 Re Environmental Impact Statement for 1.5 Million Gallon Keeia-Kai Reservoir at Keeia, Koolaupoko, Oahu

Thank you for your comments. A copy of your letter will be appended to our final environmental impact statement.

Very truly yours,

Edward Y. Hirata
Manager and Chief Engineer

cc: Mr. Robert R. Way
Dept. of General Planning
City and County of Honolulu

Environmental Quality Commission } 12/22
State of Hawaii

MHS:bmy
cc: RN, LHYW (12/22)

ENV 76-411

November 12, 1976

MEMORANDUM

TO : ROBERT R. WAY, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM : KAZU HAYASHIDA, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR THE 1.5 MILLION GALLON HEEIA-KAI RESERVOIR AT HEEIA, KOOLAUPOKO, OAHU

The subject statement is satisfactory with respect to our area of responsibility.

KAZU HAYASHIDA
Director and Chief Engineer

cc: Board of Water Supply

November 29, 1976

Mr. Kazu Hayashida
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Hayashida:

SUBJECT: Your Memorandum dated November 12, 1976 to Mr. Robert Way of the Department of General Planning Regarding the Environmental Impact Statement for the 1.5 Million Gallon Heeia-Kai Reservoir at Heeia, Koolaupoko, Oahu

Thank you for your comments. They will be appended to our final environmental impact statement.

Very truly yours,

L.G. Rathburn

FOR Edward Y. Hirata
Manager and Chief Engineer

SM:bmy
cc: RN, LHYW

12/1 - Ltr. out
copy to RN, LW

DWS
Larry Wong

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

DEC 1 [illegible]

FRANK F. FASI
MAYOR

GEORGE C. VILLEGAS
DIRECTOR

TE11/76-2306

DEC 1 1976

Environmental Quality Commission
550 Halekauwila St., Rm. 301
Honolulu, Hawaii 96813

Gentlemen:

Subject: Environmental Impact Statement for the 1.5 Million Gallon Heeia-Kai Reservoir at Heeia, Koolaupoko, Oahu

The probable impact on traffic during construction of the 16-inch water main along and crossing Kahekili Highway has been adequately identified in the subject Environmental Impact Statement. Mitigation measures discussed to minimize traffic disruptions during this period should be fully implemented.

Very truly yours,

George C. Villegas

GEORGE C. VILLEGAS
Director

cc: Dept. of Gen. Planning
✓Board of Water Supply

C-63

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

GEORGE S. MORIGUCHI
DIRECTOR

LU11/76-3461(GN)
EIS

December 3, 1976

Mr. Donald Bremner, Acting Chairman
Environmental Quality Commission
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Mr. Bremner:

Environmental Impact Statement
1.5 Million Gallon Heeia-Kai Reservoir

We have reviewed the above and are in agreement with the objectives of the proposed action and feel that the statement submitted adequately describes potential effects of the environment.

Thank you for the opportunity to review and comment on this document.

Very truly yours,

GEORGE S. MORIGUCHI
Director

GSM:ls

December 20, 1976

Mr. George S. Moriguchi
Director
Department of Land Utilization
City and County of Honolulu
650 So. King Street
Honolulu, Hawaii 96813

Dear Mr. Moriguchi:

SUBJECT: Your Letter of December 3, 1976 Re Environmental Impact Statement for 1.5 Million Gallon Heeia-Kai Reservoir at Heeia, Koolaupoko, Oahu

Thank you for your comments. A copy of your letter will be appended to our final environmental impact statement.

Very truly yours,

Edward Y. Hirata
Manager and Chief Engineer

cc: Mr. Robert R. Way
Dept. of General Planning
City and County of Honolulu

Environmental Quality Commission } 12/22
State of Hawaii

MHS:bmy
cc: RN, LHYW (12/22)