DRAFT ENVIRONMENTAL ASSESSMENT

CASTLE HILLS ACCESS ROAD DRAINAGE IMPROVEMENTS

District of Koolaupoko, Island of Oahu
Project No. HWY-O-04-98

Prepared Pursuant to Chapter 343, Hawaii Revised Statutes (HRS)

by the

State Of Hawaii Department Of Transportation
Highways Division

March 2006

Castle Hills Access Road Drainage Improvements

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Project No. HWY-O-04-98

Draft Environmental Assessment

Prepared Pursuant to Chapter 343, Hawaii Revised Statutes (HRS)
for the State of Hawaii Department of Transportation Highways Division

Notice of availability of this document will be made in the April 8, 2006 issue of the Environmental Notice published by the Office of Environmental Quality Control. Written comments regarding this document must be postmarked by May 8, 2006 to be included in the Final Environmental Assessment.

For additional information concerning this document please call:

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I. PROJECT SUMMARY

APPLICANT:	State of Hawaii Department of Transportation Design Branch, Highways Division 601 Kamokila Boulevard Kapolei, Hawaii 96707 Contact: Karen Chun (808) 692-7552 Project Engineer
ENGINEERING: CONSULTANT	Park Engineering 711 Kapiolani Boulevard, Suite 1500 Honolulu, Hawaii 96813 Contact: Russell Arakaki (808) 593-1676
ENVIRONMENTAL CONSULTANT:	Environmental Communications, Inc. 1188 Bishop Street, Suite 2210 Honolulu, Hawaii 96813 Contact: Taeyong Kim (808) 528-4661
PROJECT NAME:	Castle Hills Access Road Drainage Improvements Project No. HWY-O-04-98
PROJECT LOCATION:	Kapunahala Stream between Pookela Street and Kupohu Street Kaneohe, Koolaupoko, Oahu, Hawaii
TAXMAPKEY/ OWNERSHIP:	4-5-024: 002 / Private Owner / 5,452 sf / .125 ac 4-5-024: 003 / Private Owner / 5,667 sf / .13 ac 4-5-024: 004 / State of Hawaii / 5,789 sf / .133 ac 4-5-024: 005 / Private Owner / 6,145 sf / .141 ac 4-5-108: 068 / Private Owner / 6,106 sf / .14 ac 4-5-108: 069 / Private Owner / 8,146 sf / .187 ac 4-5-108: 070 / Private Owner / 8,391 sf / .193 ac 4-5-108: 071 / Private Owner / 5,940 sf / .136 ac 4-5-108: 072 / Private Owner / 6,353 sf / .146 ac 4-5-108: 073 / Private Owner / 6,629 sf / .152 ac 4-5-108: 074 / Private Owner / 21,559 sf / .495 ac
AREA:	1.978 acres (86,177 square feet)

STATE LAND USE:	Urban
DEVELOPMENT PLAN AREA:	Koolaupoko Sustainable Communities Plan
EXISTING ZONING:	R-5 Residential District
SPECIAL MANAGEMENT AREA:	No
FLOOD ZONE:	Zone X
CURRENT LAND USE:	The project site presently consists of a single-family dwelling residential area and a stream serving as the primary drainage collector for the Castle Hills and Kahelelani Subdivisions. The surrounding area is zoned for single-family dwelling use.
PROJECT SCOPE:	The proposed action consists of the acquisition of 10 residential lots adjacent to the Kapunahala Stream, and the construction of drainage improvements on portions of each lot. Existing structures will be moved or demolished as the proposed improvements will render the lots unsuitable for continued residential use.
PROJECT COST/PHASING	The estimated construction cost for the project is approximately $20,000,000. The scope of work for the project will be conducted in a single continuous construction phase.
PERMITS REQUIRED	-Department of the Army, Section 404 Nationwide -National Pollutant Discharge Elimination System -Department of Health Section 401 -Dept. of Land and Natural Resources Stream Alteration Permit -City and County of Honolulu Grading Permit

II. PROPOSED ACTION, ALTERNATIVES AND OBJECTIVES

A. Project Location

The proposed project is located within a single-family residential district bounded by Pilina Way to the north, Kupohu Street to the south, Pookela Street to the west, and Pilina Place to the east (Figure 1). The project area slopes down from Pookela Street to Pilina Place. The project area is commonly referred to as the Castle Hills Subdivision. Kapunaha Stream bisects the site from the uphill westerly direction down to the southerly easterly direction. The area subject of the proposed drainage improvements is fed by a culvert located under Pookela Street and exits into a culvert system located beneath Pilina Place which is part of the Kahelelani Subdivision.

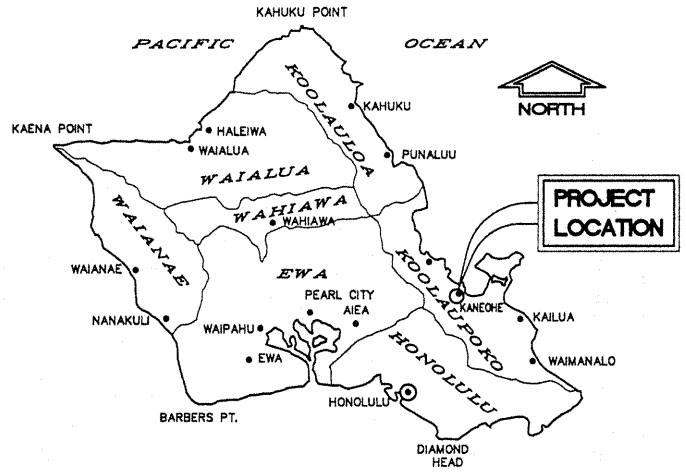
Major landmarks to the north of the project site include the Windward Community College and the Kaneohe District Park. The Likelike Highway lies to the south and east of the project area, and the H-3 Interstate lies to the west.

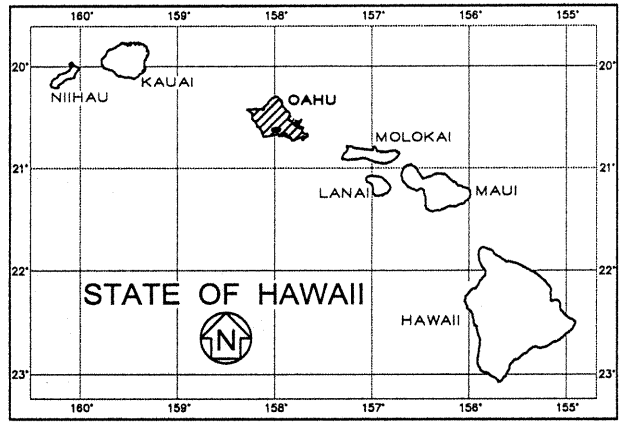
B. Need for Project

In 1996 a period of heavy rainfall caused the subject area along Kapunahala Stream to experience severely flooding. Since that time, the area has undergone significant settling and extreme erosion resulting in the loss of property and the potential to cause sever damage to homes located adjacent to the stream. One home was deemed unsafe and has already been acquired by the State of Hawaii.

A number of engineering solutions have been considered to remedy the ongoing settling and erosion problem. Initial solutions proposed to channelize the entire length of the stream from Kapunahala Street to the existing eastern headwall. A second alternative included the addition of a new detention basin mauka (west) of Pookela Street. These alternatives were developed to allow the remaining residences to stay in their current location. Both alternatives were subsequently rejected because the existing soil conditions make construction of retaining walls along the stream banks very difficult and potentially dangerous to the existing residences during the construction period. Other considerations include the high cost and the difficulty in obtaining timely approval of the required stream permits.

The proposed project improvements will feed into an existing City and County of Honolulu storm water system located beneath Pilina Place. Discussions between the State of Hawaii and the City determined that the project improvements will require the detention of storm waters to control input into the existing 6-foot by 4-foot City culvert. This detention system requires additional land area necessitating the acquisition of adjacent properties.





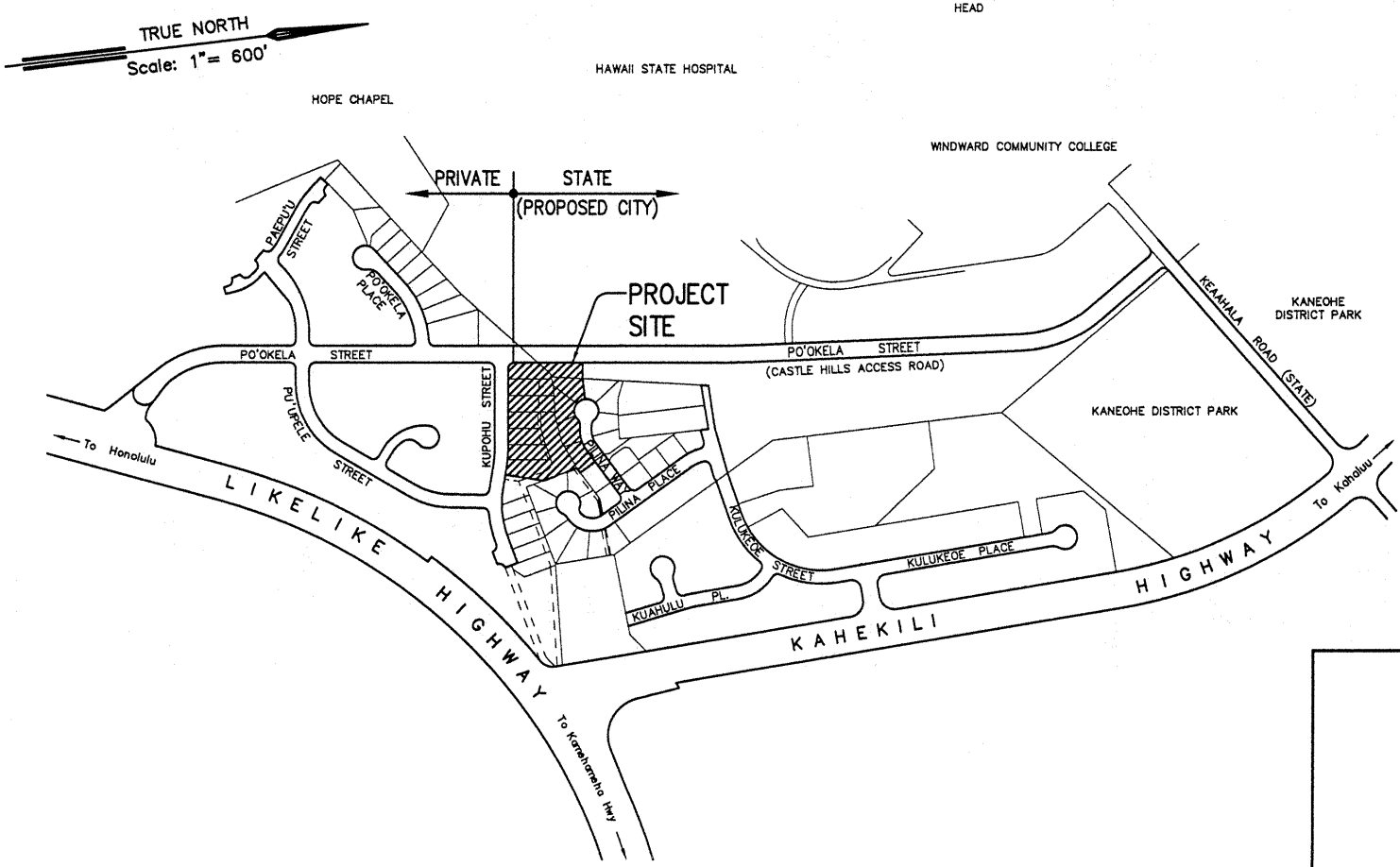


Figure 1

LOCATION MAP

2-2

C. Preferred Alternatives

The project consists of the acquisition of a total of ten (10) private properties located within the Castle Hills (7 properties) and Kahelelani (3 properties) subdivisions and the construction of drainage improvements, including stream bank stabilization and a possible detention basin, along a portion of Kapunahala Stream in the vicinity of Pookela Street, Kupohu Street and Pilina Place in Kaneohe, Oahu, Hawaii (Figure 2). Two major alternatives are under consideration for the drainage improvement project. The first consists of stream bank stabilization measures developed in conjunction with a detention basin. The second alternative under consideration consists of improvements to the drainage culvert below Pookela Street which will stabilize erosion and settling at this outfall and will allow the stream to run naturally along the vacated properties.

Stream Bank Stabilization Measures:

The proposed stream bank stabilization measures include reinforced concrete retaining walls along both stream banks. Due to the soft underlying soil, a deep foundation, such as micropiles, and a tieback system will likely be required to support the concrete retaining walls (Figure 3). Grading is also proposed to minimize the wall heights.

Gabion retaining walls were considered as an alternative stream bank stabilization measure. However, this alternative was discarded because of concerned about long-term maintenance and performance of these rock-filled wire baskets (Figure 4).

Concrete rubble masonry (CRM) retaining walls were also considered to stabilize the stream banks. Again, due to the soft underlying soil conditions, the CRM walls are anticipated to settle under it's own weight. Cracks will then develop in the CRM walls. This alternative is anticipated to require frequent maintenance and repair.

Detention Basin:

The proposed detention basin is located within properties having a tax map key number 4-5-024: 2, 3 and 4 and 4-5-108: 71, 72, 73 and 74. The detention basin will reduce the 100-year peak stormwater runoff rate flowing into the downstream drainage system. The detention basin will also reduce the flow velocities, minimize erosion along this reach of Kapunahala Stream and provide for stormwater quality improvements.

Reinforced concrete retaining walls and grading are also proposed for the detention basin to maximize the storage volume for stormwater runoff.

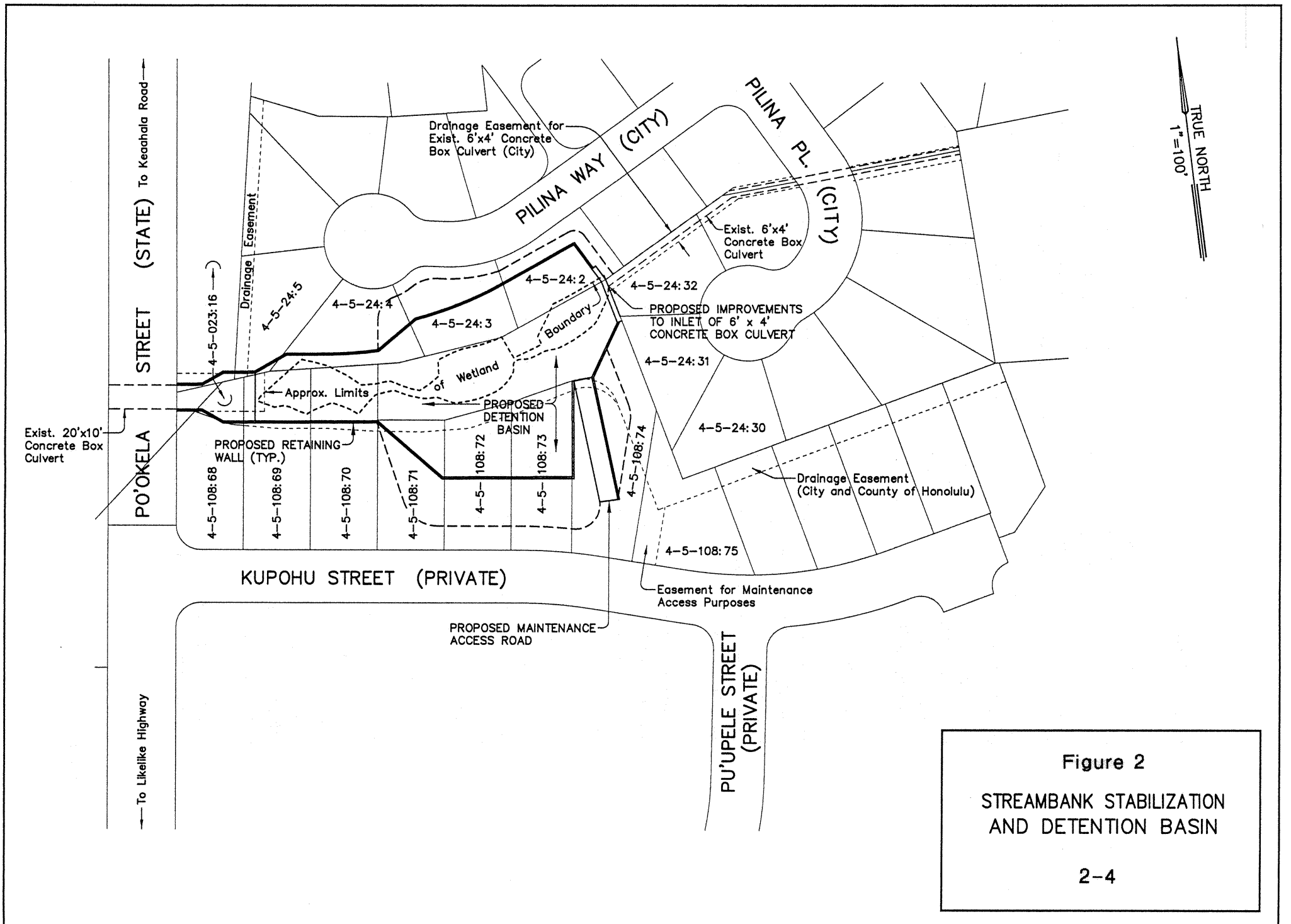


Figure 2

STREAMBANK STABILIZATION AND DETENTION BASIN

2-4

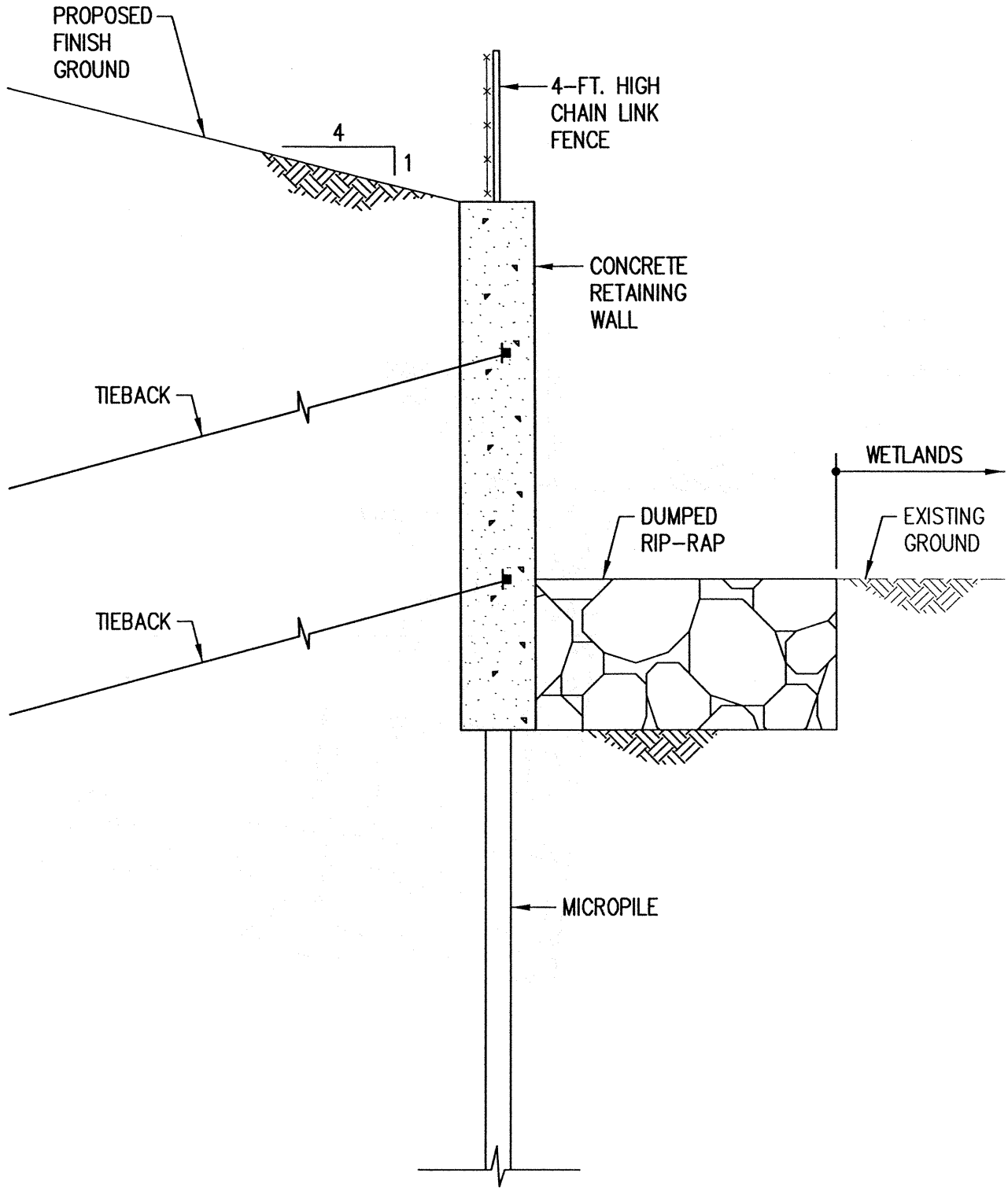


Figure 3

TYPICAL SECTION
CONCRETE RETAINING WALL

2-5

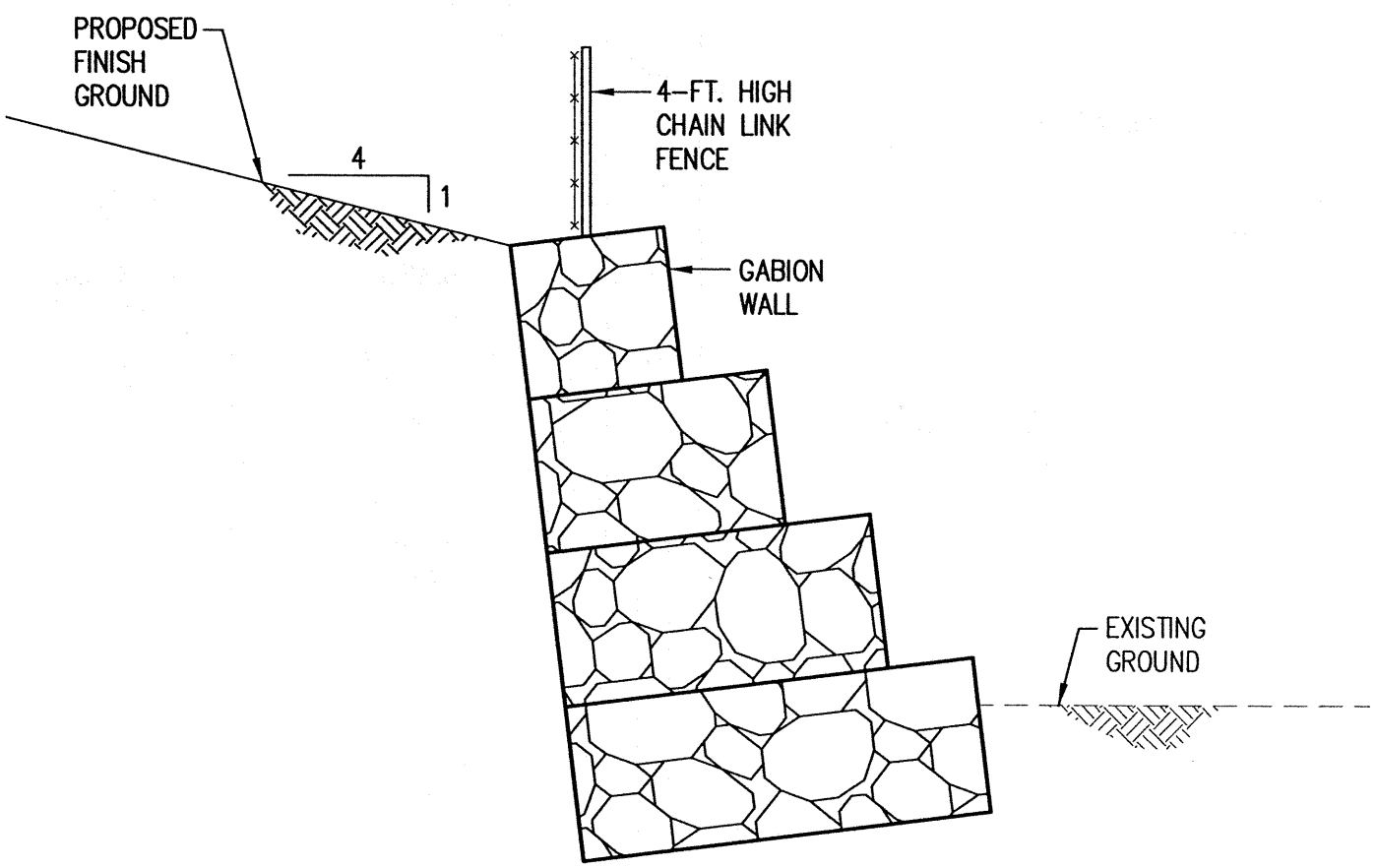


Figure 4

TYPICAL SECTION
GABION WALL

2-6

Outflow from the detention basin will enter into the existing 6-feet by 4-feet concrete box culvert, which is owned by the City and County of Honolulu. Improvements to the inlet of the 6-feet by 4-feet concrete box culvert are also proposed to increase the capacity of the culvert.

Construction activities include but are not limited to the demolition and removal of ten (10) residential dwellings, installation of best management practices (BMP), clearing and grubbing, excavation, grading, installation of permanent erosion control measures (such as turf reinforcement matting, grouted rubble paving, dumped riprap lining and/or grassing), construction of a reinforced concrete retaining walls and maintenance access road, and the installation of a chain link fence along the perimeter of the project.

The proposed action will have minimal impact to the existing wetlands as all retaining walls and other drainage improvements will be constructed outside of the wetland boundary except near the inlet of the existing City owned 6-foot by 4-foot concrete box culvert. The proposed improvements will be designed to limit improvements in the wetland area to less than 25 cubic yards of fill material to eliminate the need for a Department of the Army Section 404 Individual Permit.

The cost of this alternative is approximately $20 million of which $8 million is anticipated for acquisition and $12 million will be used for design and construction.

Drainage Improvements at Outlet of Existing 20-foot by 10-foot Concrete Box Culvert

An alternate drainage improvement design under consideration will consist of the reconstruction of the existing outlet (Figure 5). This plan would include limited lengths of concrete retaining walls and an invert slab. A drop structure will be integrated into the new outlet to reduce the flow velocity and dissipate energy. Additional improvements include grading and the installation of dumped and/or grouted riprap lining for erosion control purposes. The improvements will be designed to minimize fill material introduced in the wetlands to less than 25 cubic yards. This alternative will require a DA Nationwide Permit rather than a 404 Individual Permit. The remainder of the stream will be allowed to run in its natural state.

The cost for this alternative is approximately $12 million with $8 million allocated for acquisition and $4 million budgeted for design and construction.

D. Other Alternatives Considered

Two alternatives were considered for the proposed action however each was rejected in favor of the proposed plan. Non-action was not considered an

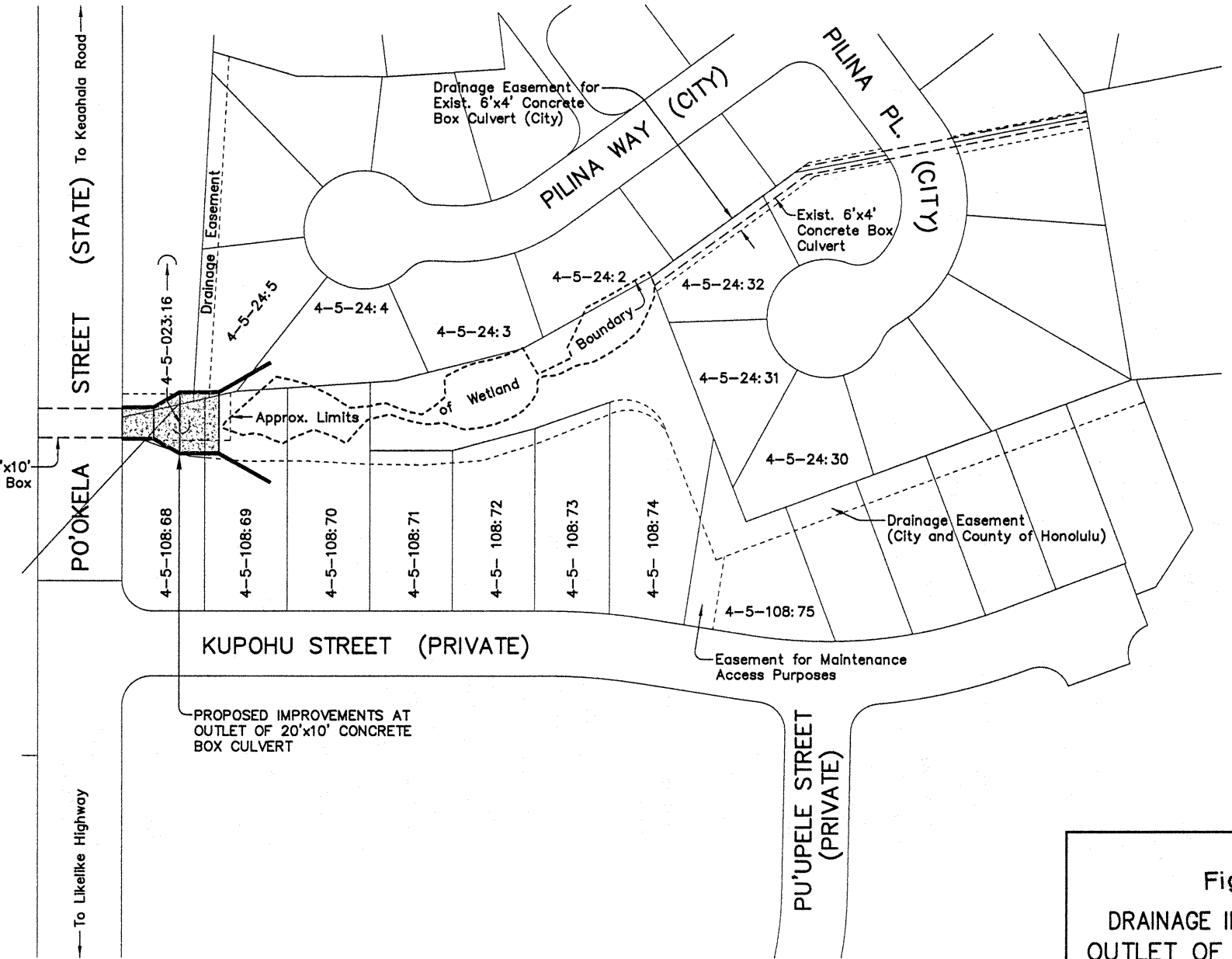


Figure 5

DRAINAGE IMPROVEMENTS AT OUTLET OF EXISTING 20'x10' CONCRETE BOX CULVERT

2-8

alternative as this would result in the unacceptable risk to health, safety and property by allowing the hazardous settling and erosion conditions to continue.

Concrete-Lined Drainage Channel

This alternative would consist of the construction of a 24-foot wide concrete-lined channel that would start at the existing State owned 20-foot by 10-foot Pookela Street box culvert and would end at the existing City owned 6-foot by 4-foot culvert located near Pilina Place in the Kahelelani Subdivision (Figure 6). This alternative was not selected as the carrying capacity of the channel would exceed the capacity of the City owned culvert. The City is in the early stages of planning for future drainage improvements to accommodate an increase in storm water flow. These improvements, however, will not be completed in time to handle any additional capacity from State constructed improvements. This would result in a potentially dangerous condition during the interim period and is not considered an acceptable course of action. The cost of this alternative is approximately $12 million for improvements and $8 million to acquire the adjacent properties.

Stream Bank Stabilization and Detention Basin

This alternative would consist of the same improvements described for the concrete-lined drainage channel and would include the construction of a detention basin mauka (west) of Pookela Street on State owned property (Figure 7). Under this plan, runoff waters would be retained upslope of the residential area and would be allowed to enter the drainage channel in a controlled manner. The area considered for the detention basin has a shallow water table that would require the construction of an earth berm to create adequate storage capacity. The use of the mauka lands for a detention basin would also result in the loss of wetlands to construct the berm and basin. Poor subsurface soils in the mauka area also caused concern that the underlying soils may not support the weight of the basin and berm and could cause settlement, cracking and possible failure of the berm. The cost of this alternative is approximately $17 million for improvements and $8 million to acquire the adjacent properties.

In light of the concerns raised by the alternatives, it was determined that the proposed action of creating a detention basin on the project site provided the best solution given the need for immediate improvement, technical feasibility, cost and regulatory simplicity.

E. Project Objective

The proposed project will involve the acquisition of 10 residential properties located on both sides of the section of Kapunahala Stream to be improved. Poor soil conditions along the stream banks of Kapunahala Stream in the project area have caused extreme settling and hazardous conditions where the existing

dwellings may become unsuitable for continued use. It is the objective of the proposing agency to mitigate the unsafe condition by acquiring the affected properties, removing or demolishing the existing structures, and constructing stabilization measures that ensure flood waters are properly contained and released into the downstream section of the drainage system. Ultimately, the proposed action will create a safe, stable waterway that will ensure public safety and the protection of property for the project area.

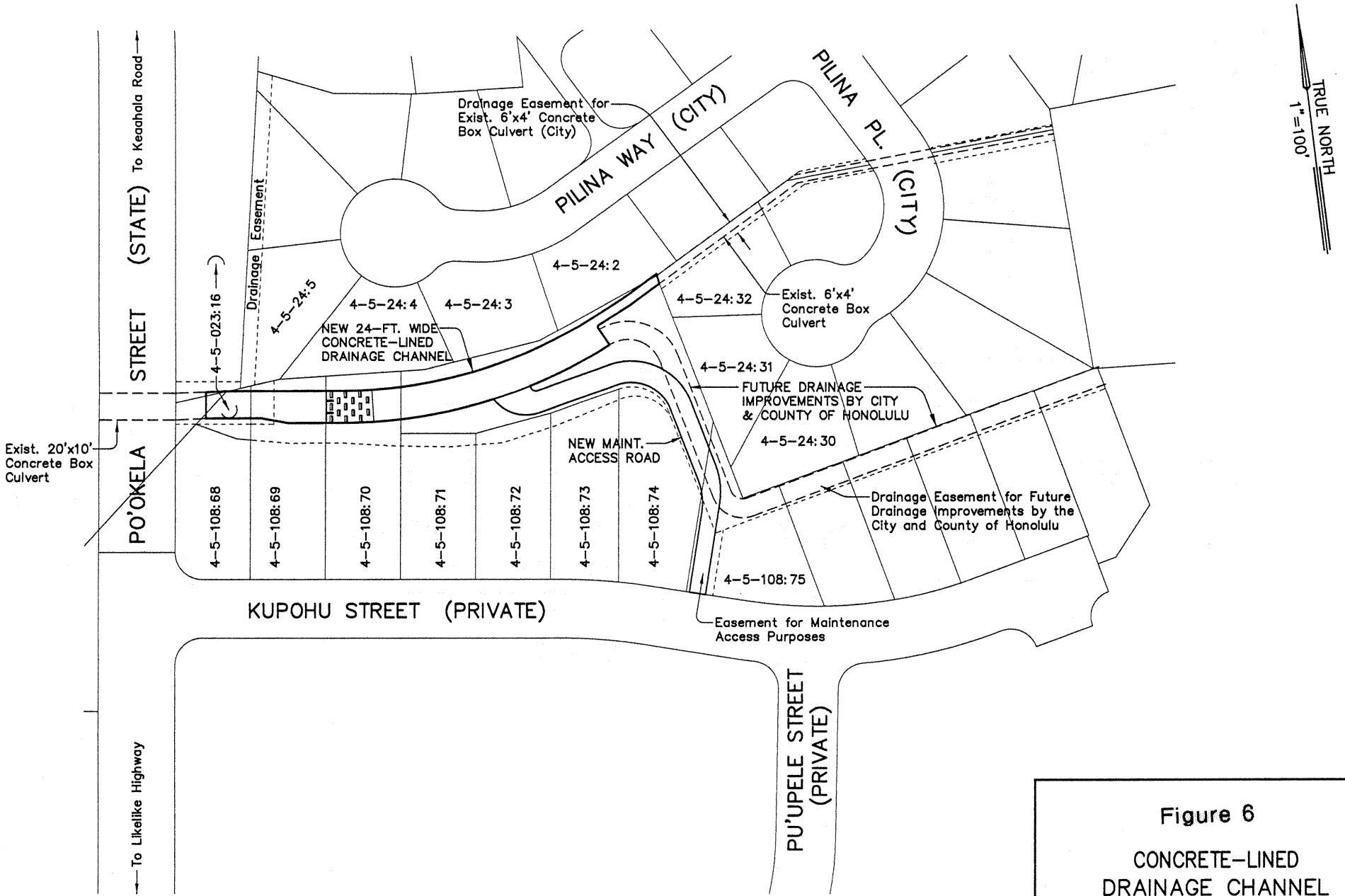


Figure 6

CONCRETE-LINED DRAINAGE CHANNEL

2-11

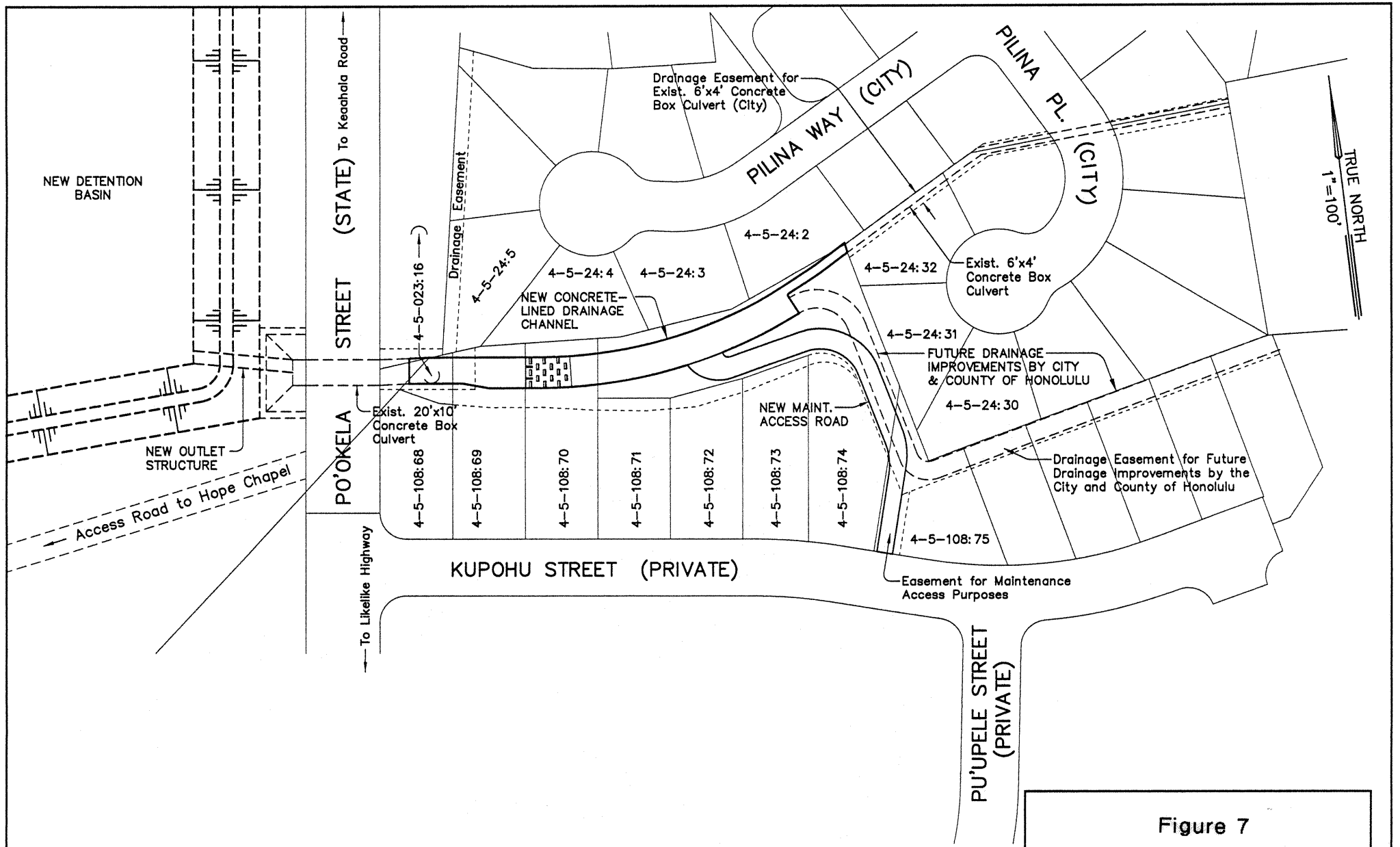


Figure 7

STREAMBANK STABILIZATION AND DETENTION BASIN

2-12

III. DECRIPTION OF ANTICIPATED IMPACTS AND MITIGATION

A. Environmental Setting

The project site is located within a single-family dwelling residential area. The project site consists of 10 single-family dwellings that will be acquired and removed or demolished to accommodate drainage improvements to the Kapunahala Stream which bisects the project area.

The residences are located on subdivided parcels varying from approximately 5,000 to 22,000 square feet. The dwellings are typically constructed of wood framing on concrete slab or post and pier foundations. Back yards adjacent to the stream are generally landscaped or left in a natural overgrowth state.

The stream enters the project area though a culvert located beneath Pookela Street where it drops into a concrete channel and a rip-rap section of hardened stream. The stream flows naturally until it reaches a headwall and concrete culvert located at the end of Pilina Place.

B. Surrounding Uses

Surrounding uses are primarily detached single-family dwellings located on similarly sized parcels serviced by county standard streets and infrastructure. The area is commonly referred to as the Castle Hills subdivision. The Hawaii State Hospital, Windward Community College and the Kaneohe District Park are located to the north and west. Likelike Highway lies to the south and east of the project area.

Roadways serving the affected properties will remain in use and other adjacent properties will not be affected by the proposed action.

C. Environmental Considerations

1. Geological Characteristics

Topography

The natural grade of the project site is moderately sloping from Pookela Street (west) towards Pilina Place (east). Each of the affected properties also slopes towards the Kapunahala Stream. Most properties feature improved yards that naturally descend to the stream banks however the properties located along Pilina Way have CRM walls that drop down to the stream bank. The stream banks are naturally vegetated.

The waterway is consists of large and small boulders, silty flats and muddy eroded stream banks. Landscaping is found along portions of the stream banks while significant overgrowth lines the majority of the stream.

Climate

While Hawaii is generally characterized as being temperate, the geography of the Kaneohe District is notable for its temperate to wet climate. Rainfall in the project area is generally higher than other regions on Oahu. Prevailing trade winds flow from the northeasterly direction.

According to the Atlas of Hawaii, Third Edition, the project typically experiences 80 to 100 inches of rainfall annually. Average mean temperatures in district range from mean highs between 75 and 85 degrees to mean lows between 62 and 67 degrees Fahrenheit.

USDA Soil Survey Report

According Sheet Number 60 of the Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii by the US Department of Agriculture Soil Conservation Service, the project site is located on soils classified as HnB Hanalei silty clay, 2 to 6 percent slopes (Figure 7).

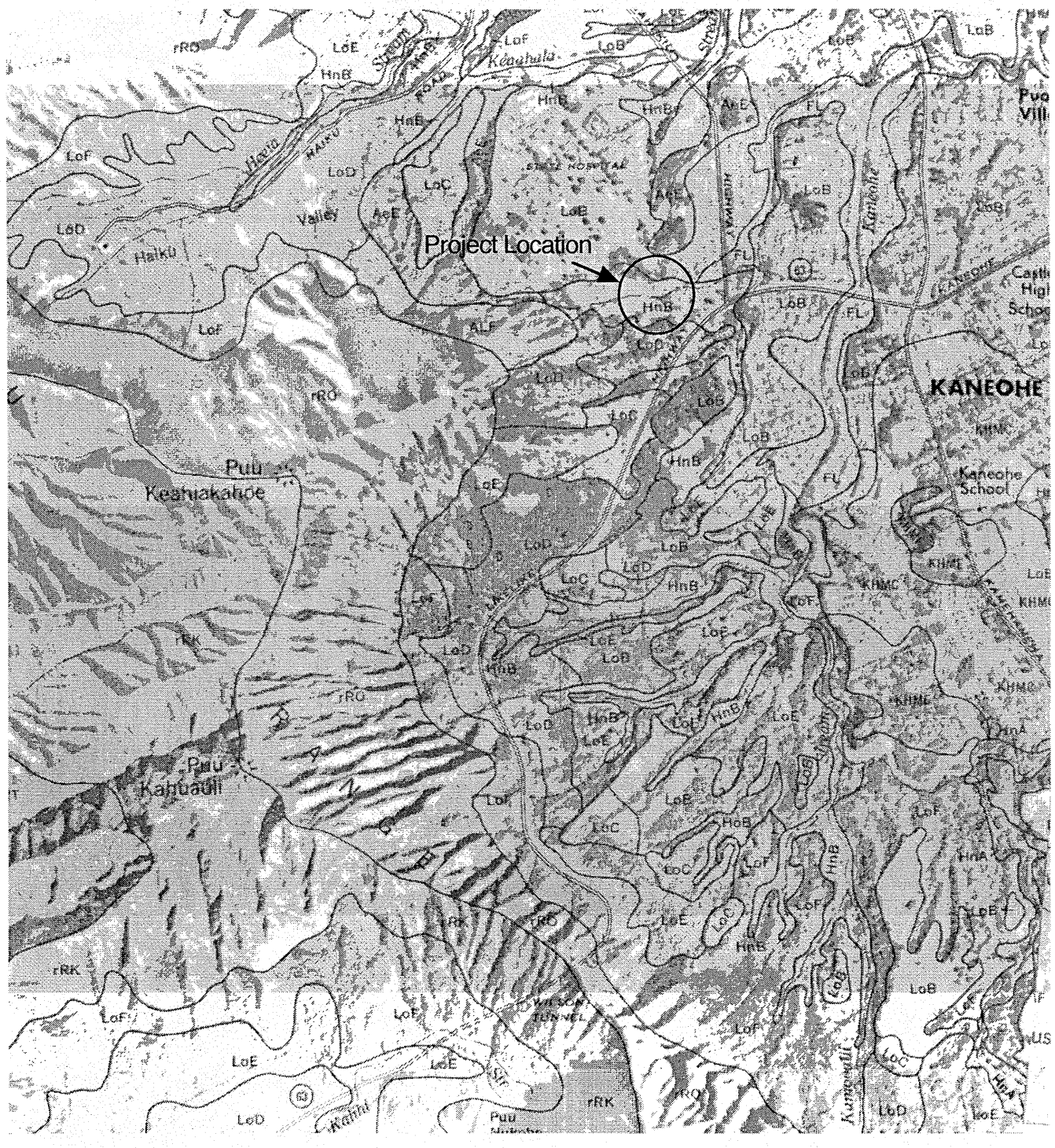
This soil type consists of poorly drained soils that were developed in alluvium derived from basic igneous rock. Runoff is slow and erosion hazard is considered slight.

Detailed Land Classification

The project site is classified by the University of Hawaii Land Study Bureau as land type Urban on panel 184 of the Detailed Land Classification-Island of Oahu report (Figure 8). This land type is generally characterized by moderately productive, rock-free lands with deep soil. These lands are not considered agriculturally significant according to this study.

2. Water Resources

The project does not does not serve as a water source of any agricultural activity however the Kapunahala Stream does serve as a natural drainage source for the area. The stream flows into an improved drainage system immediately east of the project boundary. The project area is also fed by a culvert located beneath Pookela Street.



Castle Hills Access Road Drainage Improvements

Soil Survey Map

Prepared by: Environmental Communications, Inc.
Source: US Department of Agriculture Soil Conservation Service

Figure 8
Page 3-3

Castle Hills Access Road
Drainage Improvements

LSB Designation

Prepared by: Environmental Communications, Inc.
Source: Land Study Bureau

Figure 9
Page 3-4

Hydrologic Hazards and Resources

According to Panel 270 of the Federal Emergency Management Agency Flood Insurance Rate Map as viewed from the Department of Planning and Permitting GIS Hicentral internet site, the project site is located in Zone X, an area where base elevations have not been determined.

The project site is also not identified as an area subject to tsunami evacuation hazard according to the Oahu Civil Defense Agency Maps.

Special Management Area

The project site is not located within the Special Management Area (SMA).

Wetlands

Areas around the stream are designated as wetlands that are considered a valuable natural resource. Wetlands often serve as a natural habitat for various species of flora and fauna and are regulated by the U.S. Army Corps of Engineers. Actual delineation of the wetland was verified in a survey conducted with the Corps of Engineers and was mapped for planning purposes (Figure 10). A letter confirming this survey is included as Appendix A. An earlier survey of the site is included as Appendix B.

The proposed improvements were designed with all retaining walls located outside of the wetland boundary. This will allow the wetlands to continue to serve as potential habitat and will also allow the project to proceed without a Department of the Army 404-Individual Permit.

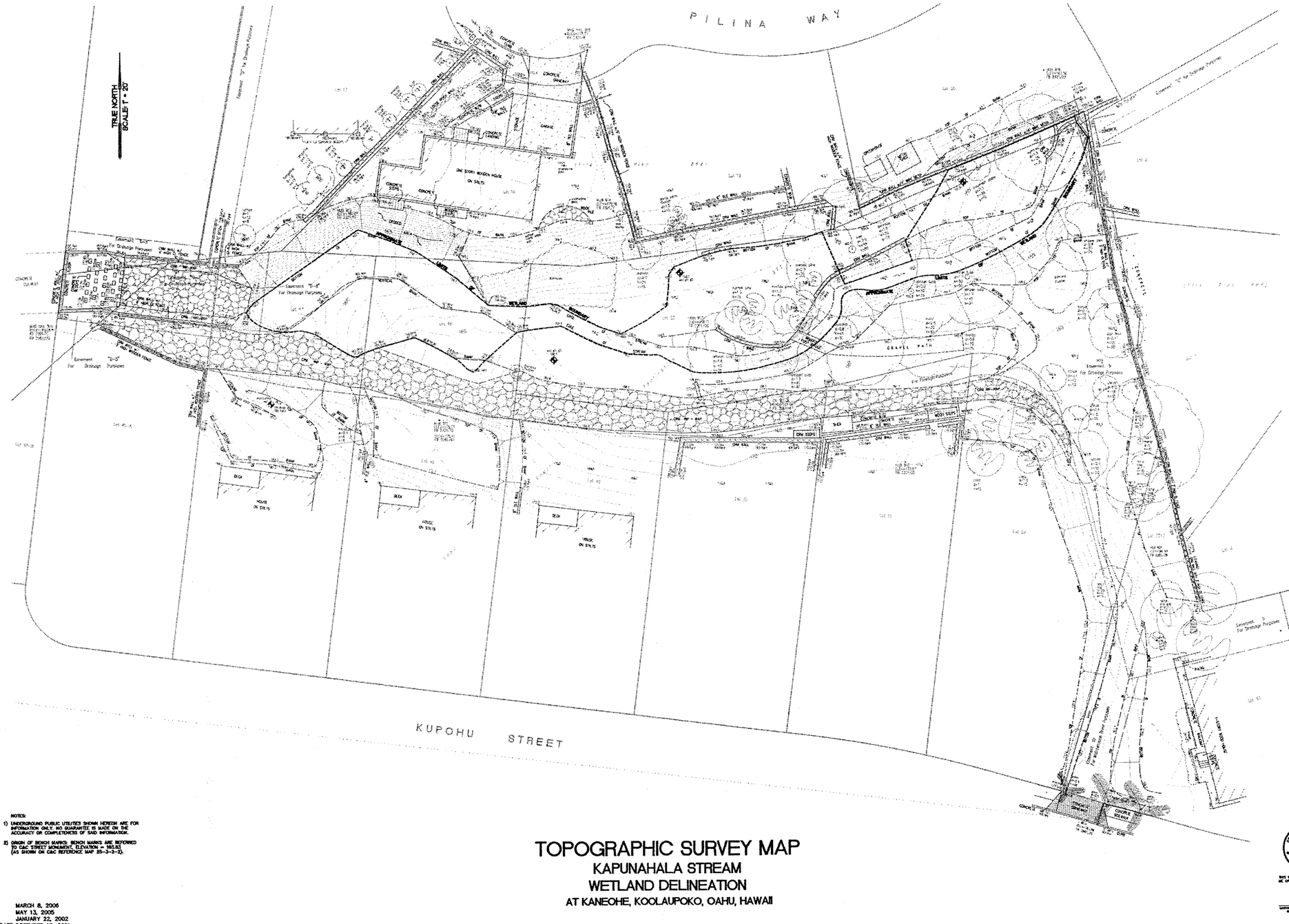
3. Archaeological, Cultural, Botanical and Faunal Resources

Archaeological Resources

A survey of archaeological resources in the project area was conducted by Garcia and Associates for the proposed project. The report can be found in its entirety in Appendix C.

The report summarized other studies conducted in the project area and found that:

...the archaeology of Kaneohe has been well documented by numerous archaeological projects, including inventory survey, monitoring, and data recovery. Agricultural remains, lithic-working sites, habitation areas, ceremonial structures, and burials have been found. Because the current project area runs along a major stream, traditional agricultural remains might be expected. These could include terraces, 'auwai, and subsurface pondified deposits. Remnants of



NOTES:
1) UNDERGROUND PUBLIC UTILITIES SHOWN HEREON ARE FOR INFORMATION ONLY. NO GUARANTEE IS MADE ON THE ACCURACY OR COMPLETENESS OF SAID INFORMATION.
2) ORIGIN OF BENCH MARKS: BENCH MARKS ARE REFERRED TO C&C STREET MONUMENT. ELEVATION = 165.82' (AS SHOWN ON C&C REFERENCE MAP 25-3-2-2).

MARCH 8, 2006
MAY 13, 2005
JANUARY 22, 2002
DATE: DECEMBER 18, 2001
FIELD BOOK NO. 2321/1

TOPOGRAPHIC SURVEY MAP
KAPUNAHALA STREAM
WETLAND DELINEATION
AT KANEOHE, KOOLAUPOKO, OAHU, HAWAII

SURVEY WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

Castle Hills Access Road
Drainage Improvements

Prepared by: Environmental Communications, Inc.
Source: Park Engineering

Wetland Delineation Map

Figure 10
Page 3-6

historic era land use would likely be related to cultivation or habitation, and might include the remains of water control features and/or historic artifacts.

A survey conducted along the project site resulted in the following conclusion:

No archaeological surface features were found on TMK: 4-5-024: 002, :003, :004, :005, 4-5-108:069, :070, :071, :072, : 073, or :074. Most parcels are residential lots, with houses, landscaped yards, and paved driveways, and are therefore heavily disturbed. The only finds in the project area were a circular stone pit and a ceramic shard. The pit is clearly recent in age, and the ceramic shard was likely deposited secondarily during heavy stream flow. Drainage improvements to Kapunahala Stream will have no effect on significant historic properties because significant historic properties are absent on the ten surveyed parcels. It should be noted that subsurface archaeological remains, including human burials, might be discovered during construction activities, even though no archaeological remains occur on the surface. This is unlikely, however, given the extensive modern alteration t the land in this area. For this reason, archaeological monitoring is not recommended for construction activities. Should human burial remains be discovered during construction, work in the vicinity of the remains must cease and the Oahu Island Archaeologist should be contacted.

Cultural Resources

Historic land uses within the Kaneohe area were researched by Garcia and Associates as part of the Archaeological Assessment included as Appendix C. A summary of historic land uses is presented as follows:

With its productive fishponds of Kane'ohe Bay and extensive agricultural resources, Kane'ohe Ahupuaa was one of Oahu's major population centers in traditional times. Kane'ohe lowland irrigated taro fields were so vast that the interior slopes were not terraced. Kula lands were planted in hala, wauke, mai'a, and 'uala, but no dryland taro was grown. At the base of the Ko'olau, a famous hala grove produced fragrant keys for lei, and yams, olona, and other plants were cultivated. By 1839, many taro lo'i were abandoned due to population decline. By the 1880s sugar and rice were the dominant crops in Kane'ohe, although taro continued to be cultivated into the Twentieth Century. Pineapple was also grown in Kane'ohe, with a peak period of cultivation between 1910 and 1925, and cattle ranching took place after the late 1800s.

The shoreline of Kane'ohe was used extensively for fishpond aquaculture, and 14 ponds are named by Sterling and Summers. These include Kalokohanahou, Kanohuluiwi, Punalu'u, Keana, Mahinui, Kaluoa, Mikiola, Kea'alau, Hanalua, Papa'a, Halekou, Nu'upia, Kaluapuhi, and Muliwai'olena. The offshore waters provided fish as well; the ocean at Mokapu Peninsula was a kapu fishing ground reserved for ali'i.

A number of heiau were once located in Kane'ohe, but many have been destroyed. The heiau that have been lost include Kukuiokane, Pu'upahu, Kalaoa, and Pu'umakani. Ahukini, Kawa'ewa'e and Pu'uwaniania Heiau are still standing.

Kukuiokane Heiau was in the land division of Luluku. It has been described as the most important heiau in the region and a very large. It is said that when the heiau was destroyed by Libby, McNeil, and Libby Co., their pineapples were consumed by disease and their venture failed.

Pu'upahu Heiau was once located on a hill named Pu'upahu. It has been destroyed and there are no remains.

Kalaoa Heiau has also been destroyed. It was once located on a hill near the Kane'ohe municipal campground. The stones were used in the construction of a mill, leaving nothing remaining of the structure.

Pu'umakani Heiau once sat on the ridge that faces the Nu'uanu Pali. It was destroyed and its stones were used in the construction of a cattle pen on the slope. This heiau is thought to have been built by Olopana.

Ahukini Heiau is located near Kokokahi Road. This is a small heiau set on a hill. It was built mostly with small cobbles and has low walls. A large stone stands in the southwest corner.

Kawa'ewa'e Heiau sits atop the ridge between Kane'ohe and Kailua, on the Kane'ohe side of the ridge. The structure is composed of a large enclosure with substantial walls and a small terrace on the north side of the enclosure. The enclosure was used as a cattle pen during the historic era, obliterating any features within the walls. The heiau was built by Olopana in the beginning of the Twelfth Century.

Pu'uwaniania Heiau is located near the Pali Highway before the hairpin turn. It is thought to be an agricultural heiau and is composed of a low stone wall that encloses two large stones.

The Mokapu area was an extensive burial site in traditional Hawai'i. More than 500 burials have been documented, making this the largest known burial ground in the islands.

The sport of holua sledding was practiced in Kane'ohe, as evidenced by a holua slide documented in 1853. The slide was located on a small round hill near Kawaewae Heiau, although the name of the hill has been lost. The slide was destroyed by pineapple cultivation.

The sport of maika, similar to bowling, was also played in Kane'ohe. A maika field, or kahua maika was located near the ocean at Ulupa'u. This field was used by the father of Kamehameha the Great.

Flora

The project site contains a mix of landscaped areas and natural overgrowth. Most of the parcels in residential use contain lawn grass and ornamental plants down to the stream banks. Areas that are not landscaped in an around the stream include: California grass, bamboo, kukui, African tulip, papyrus and ferns. No rare or endangered species were observed in the area.

Fauna

Based on on-site observation, the only aquatic wildlife noted were guppies and tadpoles. Crayfish, bullfrogs and toads may also inhabit the stream and bank area but none were observed during the field inspections. No rare or endangered species were found in the stream.

4. Infrastructure and Utilities

The proposed improvements are not expected to have a significant negative impact on existing infrastructure. The project is expected to result in the improvement of the existing storm drainage conditions. Public safety will also be improved by providing a large buffer adjacent to the stream, ensuring that no damage will occur to surrounding residential properties.

Vehicular Access and Traffic Conditions

No significant off-site traffic impacts are expected as a result of the proposed improvements. The immediate neighborhood will experience a minor decrease in traffic by the removal of 10 residential properties.

Noise and Air Quality

Noise and air quality impacts resulting from the development of the proposed project can be assessed in two categories, short-term construction related impacts and long-term operational related impacts.

Construction of the proposed improvements will result in an increase in noise levels and a degradation of air quality. The primary noise impacts occurring during the construction period will from construction vehicles. Typically bulldozers, dump trucks and air hammers will be used in the site preparation process. The operation of these heavy machinery vehicles are subject to State Department of Health Community Noise Standards however it must be acknowledged that during the construction period, noise levels in the project vicinity will increase.

No increase in noise levels is anticipated from the proposed improvements. It is likely that a very minor decrease in noise levels will result from the decrease in residences in the area.

Water

The proposed improvements will result in a minor decrease in water demand in the project area from the decrease in residences in the area.

Wastewater

The proposed improvements will result in a minor decrease in wastewater disposal demand in the project area from the decrease in residences in the area.

Drainage

No additional drainage will be created by the proposed improvements and no additional demand will occur on the existing storm drain system. It is possible that a minor decrease in storm drainage will result from the decrease in covered and paved surfaces after the existing residences have been removed.

Solid Waste

Solid waste disposal systems will not be affected by the proposed improvements. Refuse will continue to be collected by the municipal waste collection service.

Telephone and Electrical Services

No telephone or electrical services will be affected by proposed project.

5. Public Facilities

The proposed project will not have any impact on public facilities including schools, police, and fire or emergency medical services.

Kaneohe Fire Station Number 17 provides fire protection and first response emergency and rescue service to the project area. The station is located at 45-910 Kamehameha Highway approximately one mile from the project site. Response time to the sites is less than 5 minutes. This station is served by an engine and ladder company.

Ambulance service for the project vicinity is co-located at Kaneohe Fire Station Number 17.

Police service is provided by the Honolulu Police Department's District 4, Beat 469. District 4 includes the area between Kahuku to Kailua. The district main station is located at 45-270 Kaikalua Road in Kaneohe.

D. Social and Economic Characteristics

The proposed project will require the acquisition of 10 residential properties to accommodate the proposed improvements. This action will have a direct and significant impact on the affected property owners. The State had already acquired a residence (TMK: 4-5-025: 004) due to the unsafe condition of the property after a major storm event.

Acquisition was deemed the only suitable alternative when preliminary studies indicated that construction of all evaluated alternatives would render the existing homes unusable. In the interest of public health and safety, it was determined that the properties must be acquired for drainage improvement use.

Homeowners of the affected properties have been notified and a formal offers for acquisition are forthcoming. In addition to receiving the appraised value of their property, the displaced property owners will be entitled to relocation assistance as provided in the Hawaii Revised Statutes (HRS) Chapter 11 or Title 49 part 24 of the Code of Federal Regulations (49CFR24).

It is anticipated that approximately $8 million dollars will be required to purchase the properties and approximately $12 million dollars will be required for construction and design costs.

E. Relationship to Plans, Codes and Ordinances

1. Federal Plans and Approvals

Work within streams and wetlands generally fall under the jurisdiction of the Department of the Army. Work within Kapunaha Stream will require a Department of the Army (DA) 404-Nationwide Permit. This requirement is differentiated from a DA 404-Individual Permit which is required when more than 25 cubic yards of fill material are used within a stream. The proposed plan will introduce less than 25 cubic yards of material allowing for a less stringent Nationwide Permit.

2. State of Hawaii Plans and Approvals

Project site is located with the Urban District on the State Land Use Map. The proposed use is consistent with this designation and no approval from the State Land Use Commission will be required.

The project may require a Stream Channel Alteration Permit (SCAP) from the Department of Land and Natural Resources Commission on Water Resource Management. This permit is required whenever work occurs within a perennial stream.

The State Department of Health also will require Section 401 Water Quality Certification which runs in parallel with the DA-Nationwide Permit. In addition, a National Pollutant Discharge Elimination System (NPDES) approval will be required for any disturbances greater than one acre.

3. City and County of Honolulu Plans and Approvals

Zoning for the project area is R-5 Residential. The proposed action will not require any change in zoning.

The project area is also subject to the Koolaupoko Sustainable Communities Plan. The following excerpt from the Infrastructure Section of plan summarizes the conformance of the proposed action with the general policies pertaining to Koolaupoko's drainage system.

- Promote drainage system design that emphasizes control and minimization of non-point source pollution and the retention of storm water on-site and in wetlands.

- Modifications needed for flood protection should be designed and constructed to maintain habitat and aesthetic values, and avoid and/or mitigate degradation of stream, coastline and nearshore water quality.

- View storm water as a potential irregular source of water that should be retained for rechargeof the aquifer rather than quickly moved to coastal waters.

- Select natural and man-made vegetated drainageways and retention basins as the preferred solution to drainage problems wherever they can promote water recharge, help control nonsource pollutants, and provide passive recreation benefits.

- Keep drainageways clear of debris to avoid the flooding problems that have occurred in the past.

The Planning Principles to guide the maintenance and improvement of Koolaupoko's drainage systems include:

- Retention and Detention. Emphasize retaining or detaining storm water for gradual release into the ground as the preferred strategy for management of storm water. Also, large capacity boulder and debris basins in upper valleys above urbanized areas should be properly maintained in order to prevent the blocking of downstream channels during major storm events.

- Stream Channel Improvements. Integrate planned improvements to the drainage system into the regional open space network by emphasizing the use of retention basins, creation of passive recreational areas, and recreational access for pedestrians and bicycles without jeopardizing public safety. In places where the hardening of stream channels is unavoidable or highly desirable to prevent significant loss of property or threat to public health and safety, the improvements should be designed and made in a manner which protects natural resource and aesthetic values of the stream.

The project is not located within the Special Management Area (SMA) boundaries and will not require a Special Management Area Permit (SMP) prior to final approval of the project

The proposed improvements will require demolition and grading permits from the City and County of Honolulu, Department of Planning and Permitting. Work on the proposed improvements will not commence until the demolition and grading permits and the environmental assessment process are completed.

F. Probable Impact on the Environment

The proposed action will result in any long-term change to the environment. The current residential uses on the project site will be lost in favor of an improved drainage system. The addition of retaining walls and the creation of a detention basin will alter the residential characteristic of the area and will replace it with an expanded open area.

These improvements will have direct benefit to the entire vicinity, as the proposed project is an integral part of a major local drainage system. When all downstream segments are completed, the Kapunahala Stream will have the capacity to serve as a safe and effective drainage system. An additional benefit is the expanded wetland that will be created by the detention basin. This will provide a large open area that may become a wildlife habitat.

G. Adverse Impacts Which Cannot be Avoided

The relocation of 10 households is unavoidable as a result of the necessity to create an enlarged detention basin. While this impact on the families residing in

the affected residences is significant, there relocation should also be considered a safety measure. The deterioration of the properties from settling and erosion is likely to continue and will eventually create hazardous conditions. Therefore, it is in the affected residents best interest to relocate to safer areas while allowing the proposing agency to stabilize the site.

Other adverse impacts that cannot be avoided are generally related to short-term construction activities. These impacts can be minimized by sound construction practices, adherence to applicable construction regulations as prescribed by the Department of Health, and coordination with applicable State and County agencies.

H. Alternatives to the Proposed Action

Alternatives considered to the proposed action are described in detail in Section II of this Environmental Assessment. The alternatives considered were rejected due the length of time required to implement the projects or due to technical difficulties in creating reliable designs. Non-action was not considered as an alternative as this would allow a hazardous condition to continue.

I. Mitigation Measures

Long-term impacts resulting from the proposed improvements will ensure that stormwater drainage conveyed through the Kapunahala Stream will no longer jeopardize public safety or property. When improvements are completed by the City and County of Honolulu for the downstream portion of the stream, the drainage system for the area will operate optimally for the benefit of the entire watershed. A maintenance road is provided in the design to allow for regular clean outs of the detention basin and culvert interface to ensure that stream flow is not impeded.

Short-term construction related noise and air quality impact mitigation measures include general good housekeeping practices and scheduled maintenance to avoid a prolonged construction period. The contractor will be directed to use best management practices (BMP) wherever applicable.

Examples of BMPs that may be implemented include silt fences, stabilized construction entrances, inlet protection, surface covering, and sediment traps. All waste materials will be securely contained and appropriately disposed.

The project contractor will be directed to comply with the rules relating to the Guidelines and Rules Relating to Storm Drainage Standards. The BMPs that will be specified for the project include: drainage inlet filters that will be monitored for adequate screening of debris into the storm drain system, silt fencing and dust

screening, installation of temporary access points, site inspection and clean up of accumulated debris.

J. Irreversible and Irretrievable Commitment of Resources

Implementation of the proposed project will result in the irreversible and irretrievable commitment of resources in the use of non-recyclable energy expenditure and labor. Materials used for new construction may have salvage value; however, it is unlikely that such efforts will be cost-effective. The expenditure of these resources is offset by gains in construction-related wages, increased tax base and tertiary spending.

IV. ANTICIPATED DETERMINATION

1. Anticipated Finding of No Significant Impact (FONSI).

   Pursuant to Hawaii Administrative Rules Title 11 Chapter 200, the State of Hawaii Department of Transportation anticipates that the proposed action is not likely to have a significant impact upon the environment that will warrant an Environmental Impact Statement.

2. Evaluation of Significance Criteria.

   The project impacts have been evaluated against the 13 significance criteria contained in Section 11-200-12 of the Hawaii Administrative Rules. The following numbered items cite each of the 13 particular significance criteria then provide the Department of Transportation's evaluation for the criteria.

   Involves an irrevocable commitment to loss or destruction of any natural or cultural resources.

   The project does not involve an irrevocable commitment to loss or destruction of any natural or cultural resources.

   An archaeological and cultural assessment was conducted for this project has determined that the project will not significantly affect any cultural practices. A copy of the cultural survey is contained in Appendix C.

   The project will not cause significant negative impact upon botanical resources and may increase the potential for the site to become a wildlife habitat through the expansion of wetlands.

3. Curtails the range of beneficial uses of the environment.

   The project will permanently remove residential use from the site but does not curtail the range of beneficial uses of the natural environment.

   When completed, the drainage improvements not curtail, vehicle, bicycle, and pedestrian safety.

   When completed, the drainage improvements will not cause significant negative impact to recreational, agricultural, or other adjacent areas.

   Conflicts with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.

The project does not conflict with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS nor with any revisions thereof and amendments thereto, court decisions, or executive orders.

- In brief, the State's environmental policy is to conserve the natural resources and enhance the quality of life. The project is consistent with this environmental policy in that the project: (a) Has examined whether the project causes impacts to natural, cultural, or historic resources; (b) Has determined that the project does not cause any significant negative impact to such natural, cultural, or historic resources, and; (c) Will enhance the quality of life by improving public safety through construction of drainage system improvements.

Substantially affects the economic or social welfare of the community or State.

The project will affect the economic or social welfare of the community or the State.

- The project will result in the loss of 10 residences required to complete the drainage improvement project. This acquisition will be offset by compensation to the homeowners at the appraised value of their homes and through relocation assistance as required by Federal and State law.

- The project is a localized safety improvement project which will create limited temporary construction employment, but generally has insubstantial effect upon economic or social welfare.

- The project has no effect upon potential development, land use policies, and social programs in the existing community.

Substantially affects public health.

The project positively affect public health and safety.

- Public safety will be significantly increased by the proposed drainage improvements. Residences along the stream will be removed due to the unstable soil conditions and retaining walls along portions of the stream will ensure that no damage will occur to private property and that stream waters will be minimally affected by accelerated erosion.

Involves substantial secondary impacts, such as population changes or effects upon public facilities.

The project does not involve substantial secondary impacts, such as population changes or effects upon public facilities.

- The project is a localized health and safety improvement project.

- The proposed project does not cause population increases, nor will it negatively effect public facilities, or other substantial secondary impacts.

Involves a substantial degradation of environmental quality.

The project does not involve a substantial degradation of environmental quality.

- The project, is in effect, a environmental improvement. Construction of the proposed improvements and expanded drainage way will create a natural habitat in addition to providing increased public safety.

Is individually limited but cumulatively has considerable effect on the environment or involves a commitment for larger actions.

The project does not have a cumulative considerable effect on the environment and does not involve a commitment for larger actions.

- The temporary noise, dust, and traffic impacts generated by the construction activities are not anticipated to have a considerable effect upon the environment. These temporary impacts will cease when the construction is completed.

- The project is a localized safety improvement project and does not commit larger actions.

Substantially affects a rare, threatened, or endangered species, or its habitat.

The project does not substantially affect any rare, threatened, or endangered species, or its habitat.

Detrimentally affects air or water quality or ambient noise levels.

The project positively affect air or water quality or ambient noise levels.

- The project is not anticipated to cause detrimental effects to air quality. The construction activities are not anticipated to cause significant dust or other aerial emissions. Dust control measures will be implemented to minimize dust emissions. Construction machinery will be properly equipped and maintained to minimize exhaust emissions.

- The project will positively affect water quality in the long-term. Proposed project will stabilize stream bank areas that have been highly erosive and

consequently, result in better water quality with less soil washing into the stream.

- The project is not anticipated to cause detrimental effects to ambient noise levels. The construction activities will increase noise levels but these impacts are short-term. The long-term impact of the project will result in a net decrease in noise levels due to the absence of human activity on the former residential sites.

Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.

- The proposed action is an environmental improvement that will ensure improved water quality as well as public safety. Use of the site for natural drainage and open space use will increase the likelihood of the site to become a wildlife habitat.

Substantially affects scenic vistas and viewplanes identified in county or state plans or studies.

The project does not substantially affect scenic vistas or viewplanes.

- The project location is not identified within County or State plans or studies for scenic vistas or viewplanes.

Requires substantial energy consumption.

The project does not require substantial energy consumption.

- The project construction does not require substantial amounts of energy for the construction activities and will have minimal effect upon energy consumption.

V. LIST OF PARTIES CONSULTED DURING THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT

Federal Agencies

- U.S. Army Corps of Engineers

State of Hawaii

- State Historic Preservation Division, DLNR
- Department of Transportation

City and County of Honolulu

- Department of Environmental Services
- Department of Facilities Maintenance
- Department of Planning and Permitting
- Honolulu Fire Department
- Honolulu Police Department

Appendix A
Department of the Army Correspondence

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
FT. SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF

March 15, 2006

Regulatory Branch

File No. POH-2005-647

Russell M. Arakaki
ParEn, Inc. dba Park Engineering
Pacific Park Plaza, Suite 1500
711 Kapiolani Boulevard
Honolulu, HI 96813-5249

Dear Mr. Arakaki:

This letter is written in regards to a wetland delineation completed in the Castle Hills Subdivision area on parcels adjacent to Kapunahala Stream. The parcels adjacent to the stream are identified as TMK: (1) 4-5-108:69 thru 74, TMK: (1)4-5-24:02 thru 05, Kaneohe, Hawaii. Although a wetland delineation completed by Char and Associates in March 1997 was never certified by the Corps, this document was used as a reference.

An on-site inspection was conducted on March 1, 2006 by Ms. Lolly Silva of my staff and the boundaries of the current wetland was flagged and surveyed by your company the following day. A review of the draft topographic survey map dated March 8, 2006 is accepted as the current wetland delineation within the stream corridor. Upon receipt of a final topographic survey map, we will issue a letter validating the wetland jurisdictional delineation for a period of five (5) years.

Should you have any questions or require further information, you may contact Ms. Lolly Silva at 438-7023 or by email at laurene.l.silva@usace.army.mil and reference the above file number.

Sincerely,

George P. Young, P.E.
Chief, Regulatory Branch

Appendix B
1997 Wetland Delineation Study

CHAR & ASSOCIATES
Botanical / Environmental Consultants
4471 Puu Panini Ave.
Honolulu, Hawaii 96816
(808) 734-7828

March 1997

KAPUNAHALA STREAM WETLAND DELINEATION
KANE'OHE, KO'OLAU POKO DISTRICT, ISLAND OF O'AHU

INTRODUCTION

The study area is located along Kapunahala Stream within TMK: 4-5-108: 74 and is accessed from 45-823 Kupohu Street. Portions of the study site along the stream are landscaped and mowed. The soils within the study area are mapped as "HnB", Hanalei silty clay 2 to 6 percent slopes (Foote et al. 1972). This soil type has small included areas that meet the criteria for hydric soils. Hydric soils develop where the depth to water table is less than 1.5 feet, ponding occurs for a long or very long duration, or flooding occurs frequently for a long or very long duration. These conditions generally occur in depressions and low positions near streams and ponds (U.S. Soil Conservation Service 1990).

The State Department of Transportation is proposing to repair and install new GRP lining along the streambank. The proposed project will require several permits as the site contains wetlands. Among them, the Department of the Army (DA) 404-Nationwide Permit, the Department of Health (DOH) 401 Water Quality Certification, the Office of State Planning (OSP) Coastal Zone Management Consistency Determination, and the Department of Land and Natural Resources (DLNR) Stream Channel Alteration Permit.

Field studies to delineate the wetland area on the subject property were conducted on 07 February 1997. The findings from the field studies will be included as part of the application for a DA permit and DOH certification.

RESULTS

The southern boundary of the wetland is well-defined by the topography (see map attached). From stake A-1 to A-3, the boundary follows along the bottom of the existing CRM rip-rap. It then continues along the top bank of the stream from A-3 (end of rip-rap) to A-6 (concrete wall south of box culvert). Vegetation in the area is largely scattered stands of banana (Musa X paradisiaca cultivars) and various ornamental plantings.

The northern wetland boundary, in most places, lies just downslope of an existing CRM wall which marks the approximate property line (Lot 52). The low-lying areas along the stream from stake B-1 to midway between B-2 and B-4, and from B-7 to B-9 appear to be frequently flooded during periods of heavy rainfall. Water seeping from upslope outside of the property also flows through the area between stake B-2 and B-5. Soil test pits #1, #2, and #4 all contained free standing water within the first foot (see data forms attached). Water rapidly filled test pits #1 and #2; the soils in these two pits are anaerobic and gleyed.

The vegetation in the low-lying areas consists primarily of Hilo grass (Paspalum conjugatum) with smaller patches of other herbaceous species. Barren areas under the large trees are common. Elevated mounds/planting areas contain landscape species. As the property is maintained and landscaped, the vegetation criteria was not as useful. We determined wetland presence by occurrence of free standing water in the soil test pits and by the gleyed and mottled soils.

Soil test pits #3 and #5, in the upland or nonwetland sites, contained fill material, that is, undetermined soils and potting material.

References

Foote, D.E., E.L. Hill, S. Nakamura, and F. Stephens. 1972. Soil survey of the islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii. U.S. Department of Agriculture, Soil Conservation Service, Washington, D.C.

Reed, P.B., Jr. 1988. National list of plant species that occur in wetlands: Hawaii (Region H). U.S. Fish and Wildlife Service Biological Report 88(26.13).

U.S. Soil Conservation Service. 1990. Hydric soil list for the State of Hawaii. Unpublished list, Honolulu office. May 1990.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Kapunahala Stream, Kane'ohe, O'ahu
Applicant/Owner:
Investigator: Char + Associates

Date: 07 Feb. 1997
County:
State:

Do Normal Circumstances exist on the site? (Yes) No
Is the site significantly disturbed (Atypical Situation)? Yes (No)
Is the area a potential Problem Area? (Yes) No
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: Soil Test Pit # 1

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Paspalum conjugatum grass		FAC+
2. Kyllinga (Cyperus) brevifolius grass		FAC
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

occ.

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). > 50% FAC

Remarks:
Area partially landscaped and mowed.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available

Field Observations:

Depth of Surface Water: — (in.)
Depth to Free Water in Pit: 11 (in.)
Depth to Saturated Soil: 6 (in.)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
X Saturated in Upper 12 Inches
___ Water Marks
X Drift Lines
X Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Water rapidly filling in test pit; we stop digging at 1.5 ft. down.

SOILS

Map Unit Name (Series and Phase): Hanalei silty clay 2-6% slope (HnB) Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations Confirm Mapped Type? (Yes) No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12	A	10YR 3/1	2.5YR 5/6	occasional	very sticky
+12-24	B	10YR 4/2	2.5YR 5/6 (red to orange-red)	light/few	very sticky

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- X Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- X Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- X Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- X Other (Explain in Remarks)

Remarks: Smelly, anaerobic, sticky soil; earth worms in top 1 foot then none.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) (Yes) No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Kapunahala Stream, Kane'ohe, O'ahu
Applicant/Owner: _____
Investigator: Char + Associates

Date: 07 Feb. 1997
County: _____
State: _____

Do Normal Circumstances exist on the site? (Yes) No
Is the site significantly disturbed (Atypical Situation)? Yes (No)
Is the area a potential Problem Area? (Yes) No
(If needed, explain on reverse.)

Community ID: _____
Transect ID: _____
Plot ID: Soil Test Pit # 2

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Paspalum conjugatum	grass	FAC+
2. Kyllinga (Cyperus) brevifolius	grass	FAC
3. Alocasia macrorrhiza	forb	FAC-
4. Paederia scandens	vine	NL*
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

occasional

Percent of Dominant Species that are OBL, FACW or FACW (excluding FAC-). Paspalum > 50% cover

Remarks: Mowed area.

*NL = not listed (Reed 1988)

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: — (in.)

Depth to Free Water in Pit: 8 (in.)

Depth to Saturated Soil: 1 (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- X Saturated in Upper 12 Inches
- ___ Water Marks
- X Drift Lines
- X Sediment Deposits
- X Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: Water seeping from upslope property flows through this area and down toward stream.

SOILS

Map Unit Name
(Series and Phase): Hanalei silty clay 2-6% slope (HnB) Drainage Class: _____

Field Observations
Confirm Mapped Type? (Yes) No

Taxonomy (Subgroup): _____

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
1-24	A	10YR 3/1	–	–	very sticky

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- X Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- X Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- X Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- X Other (Explain in Remarks)

Remarks: No distinct horizons -- Gray black muck throughout pit.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes)	No	(Circle)
Wetland Hydrology Present?	(Yes)	No	
Hydric Soils Present?	(Yes)	No	

Is this Sampling Point Within a Wetland? (Yes) No (Circle)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Kapunahala Stream; Kane'ohe, O'ahu
Applicant/Owner:
Investigator: Char + Associates

Date: 07 Feb. 1997
County:
State:

Do Normal Circumstances exist on the site? (Yes) No
Is the site significantly disturbed (Atypical Situation)? Yes (No)
Is the area a potential Problem Area? ~~Yes~~ (No)
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: Soil Test Pit # 3

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Hedychium flavescens	forb	FAC
2. Alocasia macrorrhiza	forb	FAC
3. Pentas lanceolata	forb	*NL
4. Carica papaya	tree	*NL
5. Cordyline fruticosa	shrub	*NL
6. (Litter)		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-).

Remarks: Mixed species, no dominants. Ornamental landscape planting.

*NL = not listed (Read 1988)

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: ___ (in.)

Depth to Free Water in Pit: ___ (in.)

Depth to Saturated Soil: ___ (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: Well-drained on slope next to wall.

SOILS

Map Unit Name (Series and Phase): — (undetermined) Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks: Red clay to reddish brown clay; may be fill. Also contains potting soil and perlite.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes (No) (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No)

Is this Sampling Point Within a Wetland? (Circle) Yes (No)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Kapunahala Stream, Kaneohe, O'ahu
Applicant/Owner:
Investigator: Char + Associates

Date: 07 Feb. 1997
County:
State:

Do Normal Circumstances exist on the site? (Yes) No
Is the site significantly disturbed (Atypical Situation)? Yes (No)
Is the area a potential Problem Area? (Yes) No
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: Soil Test Pit #4

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. ~~No~~ Paederia scandens	vine	*NL
2. Alocasia macrorrhiza	forb	FAC-
3. Various tree seedlings+	forb	*NL
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). —

Remarks: Under shade of trees (longan or dragon's eye), so mostly barren soil and leaf litter (about 50%)

*NL = not listed (Reed 1988). + African tulip (Spathodea), longan (Euphoria), etc.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: — (in.)
Depth to Free Water in Pit: 11.5 (in.)
Depth to Saturated Soil: 6 (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- X Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): Hanalei silty clay 2-6% slope (HnB) Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations Confirm Mapped Type? (Yes) No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12	A	10YR 3/1	5YR 3/4 (reddish-brown)	occasional	

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- X Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- X Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks: Soil is not smelly.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes (No)* (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) (Yes) No

Remarks: * Heavily shaded, mostly barren soil.

Depth to free-standing water & HnB soils make this a wetland, but vegetation criteria is weak. We think this test pit is ~~near~~ boundary upland/wetland; we did not expect to find free-standing water.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Kapunahala Stream, Kane'ohe, O'ahu
Applicant/Owner:
Investigator: Char + Associates

Date: 07 Feb. 1997
County:
State:

Do Normal Circumstances exist on the site? (Yes) No
Is the site significantly disturbed (Atypical Situation)? Yes (No)
Is the area a potential Problem Area? Yes (No)
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: Soil Test Pit #5

VEGETATION

	Dominant Plant Species	Stratum	Indicator
Common	1. Paspalum conjugatum	grass	FAC+
Common	2. Litter		
	3. Filicium decipiens seedlings	forb	* NL
	4.		
	5.		
	6.		
	7.		
	8.		
	9.		
	10.		
	11.		
	12.		
	13.		
	14.		
	15.		
	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): <50%

Remarks: On slope next to mountain apple and longan trees.

* NL = not listed (Reed 1988)

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: — (in.)

Depth to Free Water in Pit: — (in.)

Depth to Saturated Soil: — (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): – (undetermined)

Drainage Class: _____

Field Observations
Confirm Mapped Type? Yes No

Taxonomy (Subgroup): _____

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks: Dark brown soil. Live roots throughout, both small and large (from nearby trees). Soil loose, friable, clean smelling. Worms numerous and happy.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes (No) (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No)

Is this Sampling Point Within a Wetland? (Circle) Yes (No)

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Kapunahala Stream, Kane'ohe, O'ahu
Applicant/Owner:
Investigator: Char + Associates

Date: 07 Feb. 1997
County:
State:

Do Normal Circumstances exist on the site? (Yes) No
Is the site significantly disturbed (Atypical Situation)? Yes (No)
Is the area a potential Problem Area? (Yes) No
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: Soil Test Pit #6

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Paspalum conjugatum	grass	FAC+
2. Musa x paradisiaca	forb	FACU
3. Litter		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). < 50% (Paspalum ± 3%)

Remarks: Litter is abundant.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: — (in.)
Depth to Free Water in Pit: 18 (in.)
Depth to Saturated Soil: 6 (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- X Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): — (undetermined) Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

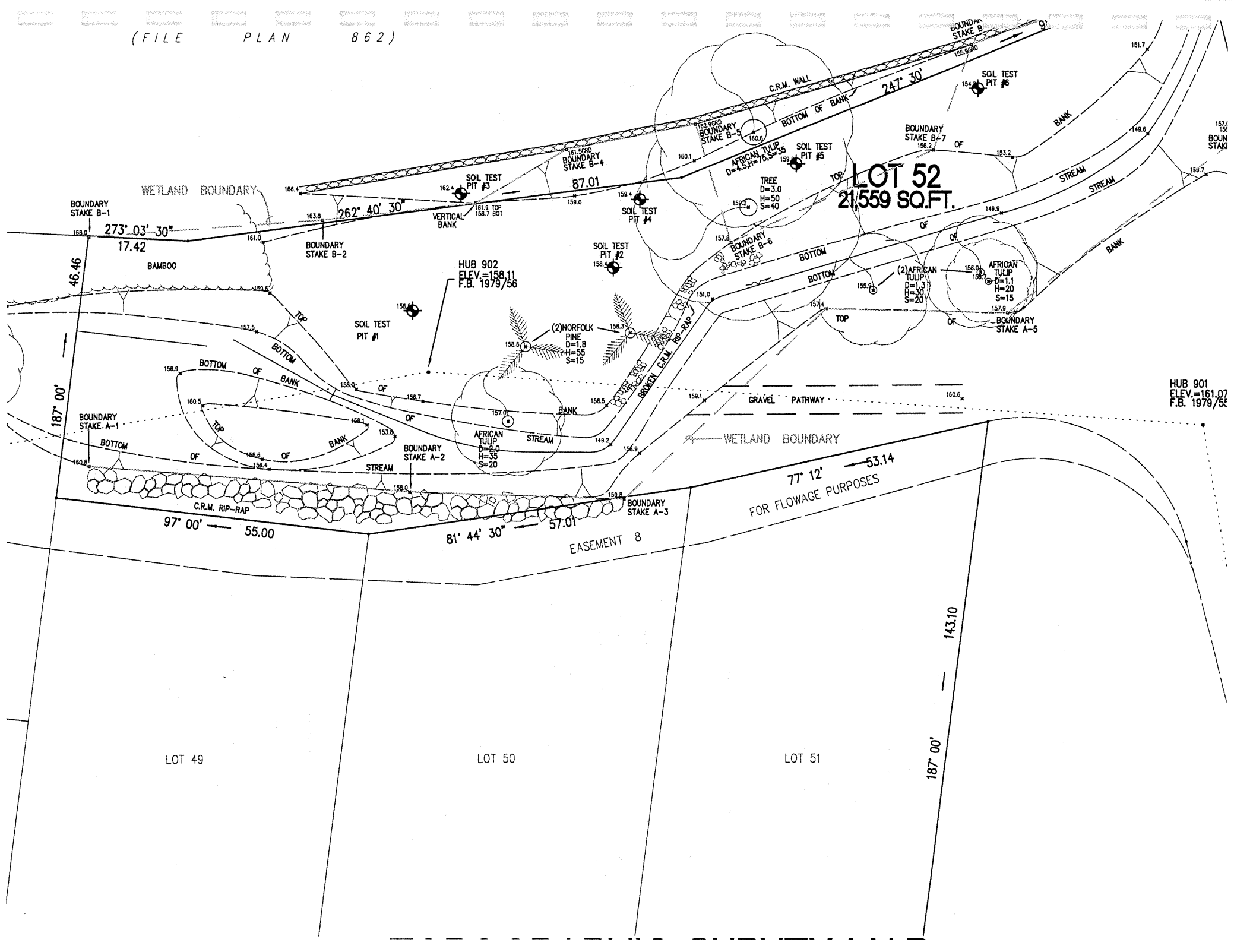
Remarks: Reddish-brown clay. Healthy roots down to 1 foot or so.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes (No) (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? Yes (No)

Is this Sampling Point Within a Wetland? (Circle) Yes ~~No~~ No

Remarks: This test pit is on the interface and we ran the line upslope of it. (See map).


(FILE PLAN 862)
LOT 52
21,559 SQ.FT.
HUB 902
ELEV.=158.11
F.B. 1979/56
HUB 901
ELEV.=161.07
F.B. 1979/5
BOUNDARY STAKE B-1
BOUNDARY STAKE B-2
BOUNDARY STAKE B-4
BOUNDARY STAKE B-5
BOUNDARY STAKE B-6
BOUNDARY STAKE B-7
BOUNDARY STAKE A-1
BOUNDARY STAKE A-2
BOUNDARY STAKE A-3
BOUNDARY STAKE A-5
SOIL TEST PIT #1
SOIL TEST PIT #2
SOIL TEST PIT #3
SOIL TEST PIT #4
SOIL TEST PIT #5
SOIL TEST PIT #6
WETLAND BOUNDARY
C.R.M. WALL
C.R.M. RIP-RAP
BROKEN C.R.M. RIP-RAP
BOTTOM OF BANK
VERTICAL BANK
GRAVEL PATHWAY
EASEMENT 8
FOR FLOWAGE PURPOSES
BAMBOO
AFRICAN TULIP D=2.0 H=35 S=20
AFRICAN TULIP D=4.5,H=75,S=55
(2)NORFOLK PINE D=1.8 H=55 S=15
TREE D=3.0 H=50 S=40
(2)AFRICAN TULIP D=1.3 H=30 S=20
AFRICAN TULIP D=1.1 H=20 S=15
262° 40' 30"
87.01
273° 03' 30"
17.42
46.46
187° 00'
97° 00'
55.00
81° 44' 30"
57.01
77° 12'
53.14
143.10
247° 30'
LOT 49
LOT 50
LOT 51

Appendix C
Archaeological Assessment

DRAFT—Archaeological Assessment of TMK: 4-5-024:002, :003, :004, :005, 4-5-108:069, :070, :071, :072, :073, and :074, Kāne'ohe Ahupua'a, Ko'olaupoko District, Island of O'ahu, Hawai'i

Prepared For:

Environmental Communications, Inc.
1188 Bishop St., Suite 2201
Honolulu, Hawai'i 96813

Prepared By:

Garcia and Associates
146 Hekili St., Suite 101
Kailua, Hawai'i 96734

March 2006

GANDA Report No. 2088

DRAFT—Archaeological Assessment of TMK: 4-5-024:002, :003, :004, :005, 4-5-108:069, :070, :071, :072, :073, and :074, Kāne'ohe Ahupua'a, Ko'olaupoko District, Island of O'ahu, Hawai'i

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GANDA

March 2006

GANDA Report No. 2088

MANAGEMENT SUMMARY

An archaeological inventory survey was carried out on 10 parcels: TMK: 4-5-024:002, :003, :004, :005, 4-5-108:069, :070, :071, :072, :073, and :074, in Kāne'ohe, O'ahu. Most of these are residential lots, and Kapunahala Stream runs through the center of the project area. Subsurface testing was not conducted. No significant historic properties were observed.

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1.0 INTRODUCTION

At the request of Environmental Communications, Inc., Garcia and Associates (GANDA) conducted an archaeological inventory survey of TMK: 4-5-024:002, :003, :004, :005, 4-5-108:069, :070, :071, :072, :073, and :074, where State and County drainage improvements will take place. The primary focus of the survey was on the discovery and appropriate treatment of historic properties that might be affected by the undertaking.

This report is drafted to meet the requirements and standards of state historic preservation law. These include Chapter 6e of the Hawai'i Revised Statutes and the State Historic Preservation Division's *Rules Governing the Standards for Archaeological Inventory Surveys and Reports*, §13-276.

The report begins with a description of the project site and an historical overview of land use, Hawaiian traditions, and archaeology in the area. The next section presents the survey methods, and the following section details the results of the inventory survey. Project results are summarized and recommendations are made in the final section.

1.1 PROJECT AREA

The project area consists of ten parcels located in Kāne'ohe Ahupua'a, Ko'olaupoko District, on the island of O'ahu (Figure 1). This is in the subdivision of Castle Hills, between the Likelike Highway and Windward Community College. The project area is bounded on the west by Po'okela Street, on the south by Kupohu Street, on the east by residential lots, and on the north by Pilina Way. Kapunahala Stream runs through the center of the survey block, emerging from beneath a bridge over Po'okela Street on the west and continuing east between the residential lots.

Drainage improvements to Kapunahala Stream are proposed for the project area. This undertaking may take place on multiple TMK parcels, including TMK: 4-5-024:002, :003, :004, :005, 4-5-108:069, :070, :071, :072, :073, and :074. Drainage improvements require the construction of a detention basin to reduce stream flow velocity and curtail erosion along the stream banks. Construction activities may involve demolition of houses, clearing and grubbing, excavation, installation of erosion control features, and the construction of a concrete drop structure, access road, and fencing.

TMK: 4-5-024:002 is a 0.125 ac. parcel owned by Michael and Sharon Ohata. TMK: 4-5-024: 003 is a 0.130 ac. property owned by Lyle and Catharina Swindell. TMK: 4-5-024:004 is a 0.133 ac. piece of land owned by the State of Hawai'i. TMK: 4-5-025:005 is a 1.41 ac. parcel owned by Fook Ki Lau. TMK: 4-5-108:069 is a 0.187 ac. property owned by Carrie Castle. TMK: 4-5-108-070 is a 0.193 ac. parcel owned by Nathan King. TMK: 4-5-108-071 is a 0.136 ac. property owned by Joseph Orchowski. TMK: 4-5-108-072 is a 0.146 ac. parcel owned by Owen and Michelle Goya. TMK: 4-5-108-073 is a 0.152 ac. piece of land owned by Curtis and Pauline Harada. TMK: 4-5-108-074 is a 0.495 ac. property owned by Brenton and Shontae Hill.

1.2 PHYSICAL ENVIRONMENT

TMK 4-5-108:074 consists of narrow strips of land along the north and south banks of Kapunahala Stream. The banks are gently to steeply sloping toward the stream and the land above the stream is gradually sloping to the east, with one sharp incline one the west side of the parcel. TMK: 4-5-024:004 is an abandoned, overgrown lot on the north side of the stream with no structures on it. The

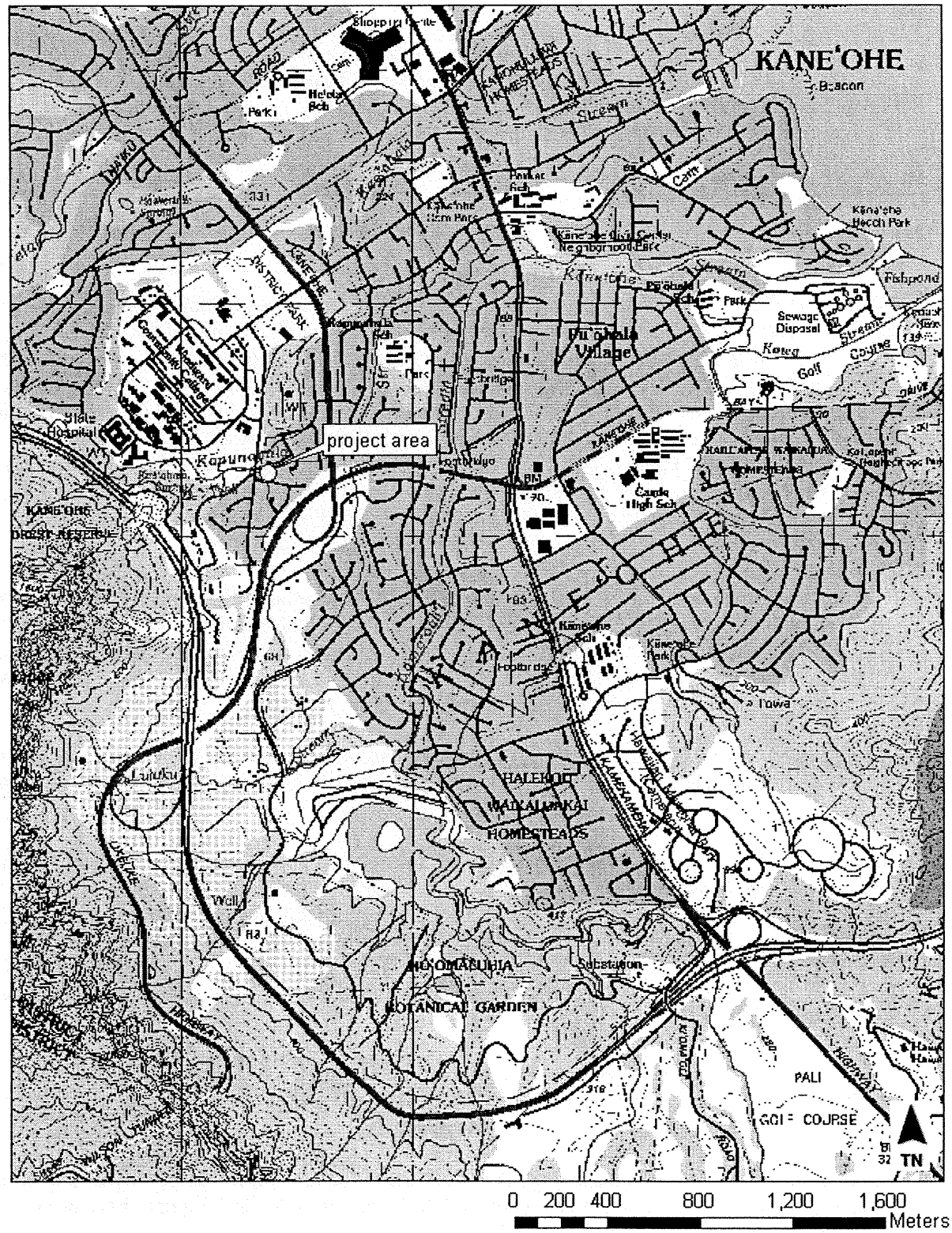

Figure 1. Project location.

remaining parcels are residential lots with single-family dwellings and landscaped yards. Located near the foot of the Ko'olau mountains, rainfall is high in Castle Hills, averaging 80-100 inches per year (Juvik and Juvik 1998). Soils in the area consist of Lolekaa silty clay and Hanalei silty clay (Foote et al. 1972). Vegetation is heavy along Kapunahala Stream and in the abandoned lot (TMK: 4-5-024:004), consisting of California grass, bamboo, *kukui*, African tulip, papyrus, and ferns.

1.3 CULTURAL BACKGROUND

Land Use

With its productive fishponds of Kāne'ohe Bay and extensive agricultural resources, Kāne'ohe Ahupua'a was one of O'ahu's major population centers in traditional times (Devaney et al. 1982). Kāne'ohe's lowland irrigated taro fields were so vast that the interior slopes were not terraced (Handy and Handy 1972). *Kula* lands were planted in *hala, wauke, mai'a,* and *'uala*, but no dryland taro was grown (Handy and Handy 1972). At the base of the Ko'olau, a famous *hala* grove produced fragrant keys for *lei*, and yams, *olonā*, and other plants were cultivated. By 1839, many taro *lo'i* were abandoned due to population decline (Devaney et al. 1982:37). By the 1880s sugar and rice were the dominant crops in Kāne'ohe, although taro continued to be cultivated into the Twentieth Century (Devaney et al. 1982:37). Pineapple was also grown in Kāne'ohe, with a peak period of cultivation between 1910 and 1925, and cattle ranching took place after the late 1800s.

The shoreline of Kāne'ohe was used extensively for fishpond aquaculture, and 14 ponds are named by Sterling and Summers (1978:208-214). These include Kalokohanahou, Kanohuluiwi, Punalu'u, Keana, Mahinui, Kaluoa, Mikiola, Kea'alau, Hanalua, Pāpa'a, Halekou, Nu'upia, Kaluapuhi, and Muliwai'ōlena. The offshore waters provided fish as well; the ocean at Mōkapu Peninsula was a *kapu* fishing ground reserved for *ali'i* (Devaney et al. 1982: 124).

A number of *heiau* were once located in Kāne'ohe, but many have been destroyed. The *heiau* that have been lost include Kukuiokane, Pu'upahu, Kalaoa, and Pu'umakani. Ahukini, Kawa'ewa'e and Pu'uwaniania Heiau are still standing.

Kukuiokane Heiau was in the land division of Luluku. It has been described as the most important *heiau* in the region and a very large structure (McAllister in Sterling and Summers 1978:207). It is said that when the *heiau* was destroyed by Libby, McNeil, and Libby Co., their pineapples were consumed by disease and their venture failed.

Pu'upahu Heiau was once located on a hill named Pu'upahu. It has been destroyed and there are no remains.

Kalaoa Heiau has also been destroyed. It was once located on a hill near the Kāne'ohe municipal campground. The stones were used in the construction of a mill, leaving nothing remaining of the structure.

Pu'umakani Heiau once sat on the ridge that faces the Nu'uanu Pali. It was destroyed and its stones were used in the construction of a cattle pen on the slope. This *heiau* is thought to have been built by Olopana (Sterling and Summers 1978:221).

Ahukini Heiau is located near Kokokahi Road. This is a small *heiau* set on a hill. It was built mostly with small cobbles and has low walls. A large stone stands in the southwest corner.

Kawa'ewa'e Heiau sits atop the ridge between Kāne'ohe and Kailua, on the Kāne'ohe side of the ridge. The structure is composed of a large enclosure with substantial walls and a small terrace on the north side of the enclosure. The enclosure was used as a cattle pen during the historic era, obliterating any features within the walls. The *heiau* was built by Olopana in the beginning of the Twelfth Century (Sterling and Summers 1978:218).

Pu'uwaniania Heiau is located near the Pali Highway before the hairpin turn. It is thought to be an agricultural *heiau* and is composed of a low stone wall that encloses two large stones.

The Mōkapu area was an extensive burial site in traditional Hawai'i. More than 500 burials have been documented, making this the largest known burial ground in the islands (Sterling and Summers 1978:216).

The sport of *holua* sledding was practiced in Kāne'ohe, as evidenced by a *holua* slide documented in 1853 (Sterling and Summers 1978:219). The slide was located on a small round hill near Kawaewae Heiau, although the name of the hill has been lost. The slide was destroyed by pineapple cultivation.

The sport of *maika*, similar to bowling, was also played in Kāne'ohe. A *maika* field, or *kahua maika* was located near the ocean at Ulupa'u. This field was used by the father of Kamehameha the Great (Emerson in Sterling and Summers 1978:215).

Mo'olelo

The name "Kāne'ohe" translates to "bamboo husband" (Pukui et al. 1974:85). The *ahupua'a* was so named when a woman likened her husband to a bamboo knife because of his cruelty. (Pukui et al. 1974:85, Sterling and Summers 1978:205). There are many *mo'olelo* relating to Kāne'ohe Ahupua'a. These are summarized from Sterling and Summers (1978:205-227).

The mountain peak Keahiakahoe was so named because of an incident involving two brothers, Pahu and Kahoe. Pahu was a fisherman and Kahoe a farmer. The brothers and their two other siblings were sent away because they would always fight with their parents. Kahoe would give poi to Pahu when he came to visit, but Pahu would bring only bait fish for Kahoe, and not good-eating fish. Kahoe discovered that Pahu had been catching an abundance of choice fish and not sharing them with him. Soon after, a famine ensued, and cooking was done in secret. Cooking fires were lit at night so the smoke would not give away the location of people with food. Kahoe lived in a location where the smoke traveled a distance from his home before being visible, so he did not have to cook under the cover of darkness. When Pahu saw the smoke, he knew it was his brother cooking, and he gazed longingly. His sister Lo'e admonished "So, standing with eyes gazing at Keahiakahoe (Kahoe's fire)." Pahu had no response because he had not treated his brother fairly. The name Keahiakahoe still refers to the mountain peak where Kahoe's smoke could be seen. There is also a spring near Keahiakahoe that was formed by the tears of Lo'e.

The waters of Hi'ilaniwai are said to be sacred. They were used in ceremony, spiritual healing, and cleansing of sins. A stone altar once stood at the base of the cliffs near the west boundary of Kāne'ohe village. Spray from the stream misted a platform made of solid stone. The rite of *hui wai* was performed here, in which a high priest offered a child for the use of a deity.

Kumukumu Spring, near Kukuiokane Heiau was also sacred. It is said that a man once boasted that he could dry the spring's waters with a touch of his cane. When he immersed his cane into the spring, the cane turned to salt because the water was so powerful.

The red dirt hill, possibly Pu'u Pahu, came to be after a battle between Kahalaiu and the *akua* over control of Malaekahana. After the battle, a man named Manuka moved to Kāne'ohe and later died there. At the time of his burial, a large grave was excavated, and the *akua* brought red dirt in a cloud from 'Ewa to fill the hole. The red dirt mounded above the grave and formed the hill, the only area where red dirt can be found in the vicinity.

A fenced area near Hi'ilaniwai on the mountain of Keahiakahoe was named Kapapua'a. This name was given after a fierce battle between good and evil. It is said that a wicked sorcerer lived near Waikalua. Two springs flowed near his abode; one of them gave forth life and purity to those who partook of its water, while the other imparted demons that spread chaos and death to those they touched. The gods and spirits of good and evil once battled over possession of the springs. The good spirits prevailed and the evil spirits were exiled to an adjacent field, where they continued to wreak havoc. After another battle, the evil spirits were driven away to the center of the earth. The battleground was later fenced off and named Kapapua'a,, or "The Pig Pen".

Near the Kokokahi YWCA was a spring that possessed healing powers, and people from all over Ko'olau would come to drink of its waters. When the *kahuna* of Kāne'ohe heard that a group of Kailua people were to visit the spring, they poisoned the waters, killing 4,000 of them. The *kahuna* did not inform the Kāne'ohe residents of the poison, however, and 40,000 of their own people were killed. The spring was known as Kinikailua-Manokāne'ohe, or "4,000 from Kailua-40,000 from Kāne'ohe". Another account translates the name as "Hundreds of Kailua and Thousands of Kāne'ohe," for the number of people killed by a boar god.

Ulupa'u Head at Mōkapu was the place in which Pele chose to arrive on the island of O'ahu during her wanderings through the islands. It is said that she scooped out the crater before moving on. Ulupa'u, or "Fumes Growing Up" was named for the volcanic eruption that followed.

It is said that the first man was made at Mōkapu, at Mololani, where the soil is red intermixed with bluish black earth. The place was first called Kahakahakea, and later Pahuna. It is in this spot that Kane and Kanaloa inscribed the figure of a man in the earth and with Ku and Lono uttered "Come to Life," "Live," and the figure became a living man. In another account, Kane drew the head of the human figure, Lono inscribed the heart, and Ku created the legs.

Mokumanu, an island off Mōkapu was where a shark god lived. A cave on the leeward side of the island was his home. An early Twentieth Century boatsman stated that he was baptized near the island when he was young to give him strength and bravery in the ocean.

1.4 PREVIOUS ARCHAEOLOGY

Kāne'ohe Ahupua'a has been thoroughly documented archaeologically. The following is a summary of the major reports found in the State Historic Preservation Division library, presented in chronological order.

Between 1972 and 1976, archaeological survey and excavation was carried out along Kamo'oali'i Stream for a U.S. Army Corps of Engineers Flood Control Project (Rosendahl 1976). A total of 31 sites were recorded, including terraces, platforms, retaining walls, ditches, stone alignments, a fishpond, and an earthen mound. Mapping and test excavations were conducted on seven sites,

including the earthen mound. Salvage excavations were later carried out on the mound, revealing 49 features, including post holes, firepits, a platform, and an historic burial. Four radiocarbon and 107 hydration rind dates were obtained. Radiocarbon ages ranged from AD 1154 to modern (Rosendahl 1976:6-44). More than 200 artifacts were collected, including adze flakes, basalt and volcanic glass flakes, and historic items. The mound was thought to be constructed in the historic era by removal of the earth surrounding the mound. In this way, pre-contact deposits were left in place within the mound. Two phases of pre-contact use were evident: a lower layer of dryland swidden farming, and an upper occupation layer. Historic use of the area was thought to involve irrigated rice and taro cultivation.

In 1985 an archaeological reconnaissance was conducted in a portion of the banana patches along the Likelike Highway above Ho'omaluhia Park (Neller 1985). A possible shrine, graves, and agricultural terraces were noted in the area proposed for the H-3 freeway. It is not clear whether or not these sites were destroyed during construction of the freeway.

Salvage excavations were carried out at a habitation site bordering Kāne'ohe Stream, east of the Pū'ōhala Village subdivision (Clark and Riford 1986). Features included postholes, pits, hearths, and human burials. Adze performs, basalt flakes, awls, grindstones, hammerstones, and other basalt tools were found.

The most recent large-scale study of *lo'i* agriculture in a windward setting occurred within the Interstate Route H-3 corridor on O'ahu (Allen 1987; Dockall et al. 2003). Reconnaissance survey, intensive survey, test excavations, and trenching were conducted in 1984 and 1985, revealing extensive use of irrigated and dryland agricultural complexes. Seventeen sites were documented, 16 of which were recommended for preservation. These include agricultural fields, an *'ili* boundary wall, historic refuse dumps, traditional habitation features, and grave sites. Recovered artifacts included grinding slabs, volcanic glass fragments, basalt flakes, a possible *kukui* oil lamp, a poi pounder fragment, and a number of historic items. Inventory survey, data recovery, and archaeological monitoring continued through 1990, and a total of 49 sites were documented, including agriculture, habitation, ceremonial, and burial areas (Dockall 2003).

In 1987 an archaeological inventory survey was carried out behind the Pali Golf Course and just south of Ho'omaluhia Park, at the foot of the Pali cliffs (Shun et al. 1987). A private golf course was proposed for this area. Four sites were found: a terrace complex, a series of depression features, a habitation complex, and a stone wall with an enclosure at one end.

Archaeological monitoring of utility line trenching was carried out along the Likelike Highway, south of the project area from 1987 to 1988 (Hammatt and Shideler 1989). Two hearths, two pit features, and a stone-filled *imu* were documented. Wood charcoal from the *imu* returned a radiocarbon age of A.D. 1260-1405.

Between 1988 and 1990, archaeological monitoring and data recovery were conducted at the Minami Golf Course Development, between Ho'omaluhia Park and the Pali Golf Course (Meeker 1995). Seventeen sites were recorded, four of which were recommended for preservation. These were a dryland agricultural site, two lithic-working areas, and a complex of mounds. Data recovery took place at two other lithic activity areas, six firepits, and five historic charcoal kilns. Eighteen radiocarbon dates were obtained. The dryland agricultural complex dated to A.D. 1000-1250. Isolated firepits dated to A.D. 1250-1450. Some lithic worksites and larger firepits dated to A.D. 1450-1650, while other lithic work areas dated to A.D. 1650 to the present. Volcanic glass and basalt flakes were the most abundant artifacts recovered.

An archaeological inventory survey took place just north and west of the project area for the Castle Hills access road (Hammatt et al. 1992). The relatively flat ridge land between Kea'ahala and Kapunahala Streams was disturbed by modern activity and contained no surface archaeological features. The area adjacent to Kapunahala Stream showed fewer signs of disturbance, but no surface features were found. Two 1 m^2 test units were excavated along the north side of Kapunahala Stream where the road was to be constructed, and a disturbed *A*-horizon extended to 75 cm below the surface, with undisturbed natural deposits below. Monitoring was conducted for the construction of the road (Duncan and Hammatt 1993), and an historic site was discovered. This consisted of a trash pit and concrete box, located 152 m from Po'okela Street. Bottles dating to the turn of the Twentieth Century were collected.

An archaeological inventory survey was carried out for the Hope Chapel Church site above the Castle Hills II housing development, just *mauka* of the project area (McGerty and Spear 1998). Two previously recorded features were relocated: an *'ili* boundary wall and an outhouse. Cultural material was found in four areas within the 8-acre survey block. Three areas contained isolated lithic artifacts in secondary context, and one area contained an *in situ imu*. The *imu* was excavated by shovel probe, and basalt flakes, volcanic glass, and charcoal were found. A radiocarbon date from charcoal found at the base of the *imu* returned an age of A.D. 1308-1635.

In sum, the archaeology of Kāne'ohe has been well documented by numerous archaeological projects, including inventory survey, monitoring, and data recovery. Agricultural remains, lithic-working sites, habitation areas, ceremonial structures, and burials have been found. Because the current project area runs along a major stream, traditional agricultural remains might be expected. These could include terraces, *'auwai*, and subsurface pondfield deposits. Remnants of historic era land use would likely be related to cultivation or habitation, and might include the remains of water control features and/or historic artifacts.

2.0 METHODS

The undertaking may take place on multiple TMK parcels, most of which are privately-owned residential lots. These include TMK: 4-5-024:002, :003, :004, :005, 4-5-108:069, :070, :071, :072, :073, and :074. Two parcels were systematically surveyed on foot: TMK: 4-5-108:074, which immediately borders the stream and TMK: 4-5-024:04, an abandoned lot. The remaining parcels are developed residential lots with paved driveways and landscaped yards, and these were visually inspected from the side of each property that borders the stream. The non-paved portions of these lots were completely visible to the archaeologists, and all areas were affected by modern use.

Archaeological inventory survey was conducted on February 15 and March 24, 2006 by Windy McElroy and Kari Nishioka. John Peterson, Ph.D. served as principal investigator. One-hundred percent of TMK: 4-5-108:074 and 4-5-024:004 were systematically surveyed, with archaeologists spaced approximately 5 m apart, walking through the properties inspecting the ground surface for archaeological remains. Heavy vegetation hindered movement and obscured the ground surface in both parcels (Figure 2). No subsurface testing was conducted.

Figure 2. Project area facing west, showing typical vegetation in the area.

3.0 RESULTS

The survey indicated that no surface archaeological features are present on the ten parcels in the project area. The land bordering Kapunahala Stream (TMK: 4-5-108:074) is either steeply sloping or within the flood zone of the stream. The steeply sloping areas are not suitable for traditional habitation, cultivation, or other use, and large portions of the slopes are covered in concrete. The few areas of flat land near the stream are low-lying and subject to flooding during heavy rain. It is possible that archaeological features were present in these areas at one time but have been washed away and are no longer intact. No surface archaeological remains were observed on the neighboring parcels that might be affected by the undertaking. If surface archaeological features were present in these areas at one time, they have been destroyed or buried by modern development. Houses, paved driveways and landscaped yards occur in eight of the nine parcels that border the stream (TMK: 4-5-024:002, :003, :005, 4-5-108:069, :070, :071, :072, and :073). Remnants of recent habitation were observed on the abandoned lot, TMK: 4-5-024:004. These include metal pipe, concrete blocks, and a concrete walkway.

Modern structural remnants were found along the north bank of Kapunahala Stream. This consisted of a stone circular pit, approximately 45 m from the east end of the project area. Concrete was observed beneath the structure and a plastic liner was visible within the pit, indicating recent construction (Figure 3). The pit appears to be a modern landscaping feature, such as a small pond, and is not archaeologically significant.

One surface artifact was collected during the survey. This was a ceramic sherd found on the north bank of Kapunahala Stream, approximately 40 m from the east end of the project area, just east of the circular pit. The sherd is a saucer fragment with a red double-line rim band and a "UNITED STATES ARMY MEDICAL DEPARTMENT" crest on the front surface (Figure 4). The underside of the saucer fragment bears a faint green image, possibly part of a maker's mark, although no text is visible. It is not clear if the sherd was associated with the circular pit or washed down the stream. Recent episodes of heavy rain render it likely that the sherd was deposited secondarily during flooding.

Figure 3: Modern pit feature, showing plastic lining. The scale is marked in 10 cm increments.

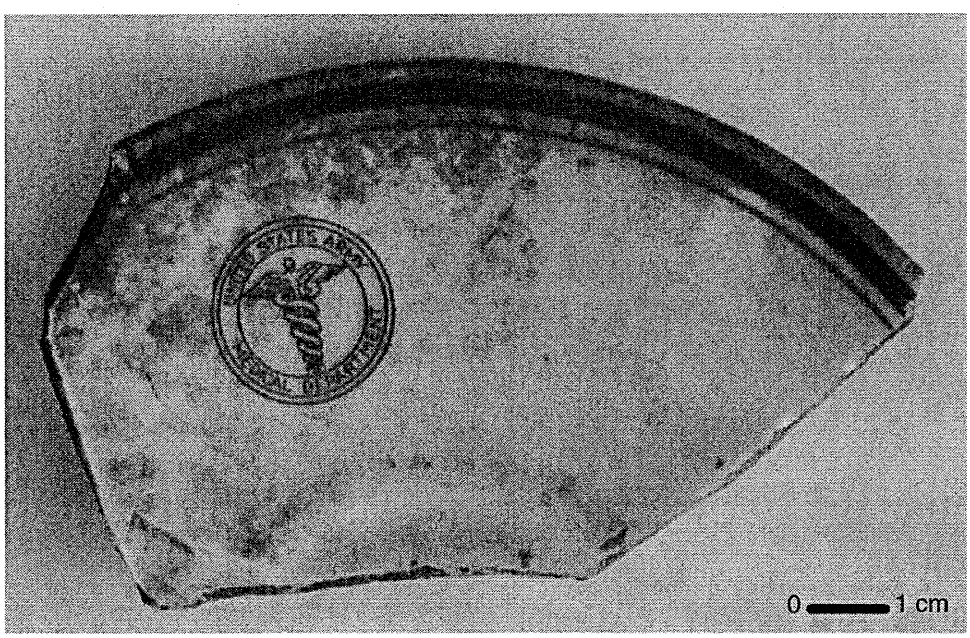

Figure 4. Ceramic sherd found on the north bank of Kapunahala Stream.

4.0 DISCUSSION AND CONCLUSION

No archaeological surface features were found on TMK: 4-5-024:002, :003, :004, :005, 4-5-108:069, :070, :071, :072, :073, or :074. Most parcels are residential lots, with houses, landscaped yards, and paved driveways, and are therefore heavily disturbed. The only finds in the project area were a circular stone pit and a ceramic sherd. The pit is clearly recent in age, and the ceramic sherd was likely deposited secondarily during heavy stream flow. Drainage improvements to Kapunahala Stream will have no effect on significant historic properties because significant historic properties are absent on the ten surveyed parcels. It should be noted that subsurface archaeological remains, including human burials, might be discovered during construction activities, even though no archaeological remains occur on the surface. This is unlikely, however, given the extensive modern alteration to the land in this area. For this reason, archaeological monitoring is not recommended for construction activities. Should human burial remains be discovered during construction, work in the vicinity of the remains must cease and the O'ahu Island Archaeologist should be contacted.

5.0 GLOSSARY

African tulip The invasive *Spathodea campanulata* tree, common in wet environments from sea level to 1,000 m.

akua God, goddess, spirit, ghost, devil, image.

ali'i Chief, chiefess, monarch.

'auwai Ditch, often for irrigation.

Bamboo The shrub or tree *Dendrocalamus, Phyllostachys, Schizostachyum*, or *Bambusa*. The species native to Hawai'i are *Bambusa vulgaris* and *B. aureovariegata*. These were traditionally used for many items, including hula implements, nose flutes, water containers, and tapa-decorating equipment.

California grass The invasive *Brachiaria mutica* that forms dense stands to 2 m tall.

hala The indigenous pandanus tree, or *Hibiscus tiliaceous*, which had many uses in traditional Hawai'i. Leaves were used in mats, house thatch, and basketry; flowers were used for their perfume; keys were utilized in *lei* and as brushes; roots and leaf buds were used medicinally; and wood was fashioned into bowls and other items.

'ili Traditional land division, usually a subdivision of an *ahupua'a*.

kapu Taboo, prohibited, forbidden.

kukui The candlenut tree, or *Aleurites moluccana,* the nuts of which were eaten as a relish and used for lamp fuel in traditional times.

lo'i Irrigated terrace for the cultivation of taro.

mai'a The banana, or *Musa* sp, whose fruit was eaten and leaves used traditionally as a wrapping for cooking food in earth ovens.

mauka Inland, upland, toward the mountain.

mo'olelo A story, myth, history, tradition, legend, or record.

olonā The native plant *Touchardia latifolia*, traditionally used for making cordage.

papyrus The sedge *Cyperus papyrus*, introduced to Hawai'i in the historic era and grown ornamentally today.

'uala The sweet potato, or *Ipomoea batatas*, a Polynesian introduction.

wauke The paper mulberry, or *Broussonetia papyrifera*, which was made into tapa cloth in traditional Hawai'i.

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