BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

June 3, 2016

Mr. Scott Glenn, Director
State of Hawaii
Department of Health
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Mr. Glenn:

Subject: Final Environmental Assessment – Finding of No Significant Impact Publication Request for Honolulu Board of Water Supply's Aina Haina 170' Potable Reservoir No. 2, Aina Haina, Oahu

With this letter, the Honolulu Board of Water Supply (BWS) hereby transmits the Final Environmental Assessment and Finding of No Significant Impact (FEA-FONSI) for the Aina Haina 170' Potable Reservoir No. 2 project situated at (1)3-6-016:040 and (1)3-6-019:012, in the East Honolulu District on the island of Oahu for publication in the next available edition of the Environmental Notice.

The Honolulu BWS has included copies of comments and responses that it received during the 30-day public comment period of the Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI).

Enclosed is a completed Office of Environmental Quality Control Publication Form, two (2) copies of the FEA-FONSI, an Adobe Acrobat PDF file of the same, and an electronic copy of the publication form in MS Word. Simultaneous with this letter, we have submitted the summary of the action in a text file by electronic mail to your office.

If you have any questions regarding this submittal, please contact Scot Muraoka, Long-Range Planning Branch of the Water Resources Division at 748-5942 or via email at smuraoka@hbws.org.

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OFC. OF ENVIRONMENTAL QUALITY CONTROL

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

Enclosures

cc: Jason Nakata, Limtiaco Consulting Group

AGENCY
PUBLICATION FORM

Project Name:	Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2
Project Short Name:	BWS Aina Haina Reservoir 2
HRS §343-5 Trigger(s):	Use of state or county lands or the use of state or county funds.
Island(s):	Oahu
Judicial District(s):	Honolulu
TMK(s):	(1)3-3-016:040 and (1)3-6-019:012
Permit(s)/Approval(s):	National Pollutant Discharge Elimination System (NPDES) Permit, Community Noise Permit, Community Noise Variance, Non-Covered and/or Covered Source Permit, Lane Use Permit for Construction Work, Oversized and Overweight Vehicles on State Highways Permit, Building Permit, Grading, Grubbing and Stockpiling Permit, Erosion Control Plan/Best Management Practices, Indirect Drain Connection License, Industrial Wastewater Discharge Permit, Street Usage Permit for Construction, Public Infrastructure Map Amendment, Subdivision Application
Proposing/Determining Agency:	Honolulu Board of Water Supply
Contact Name, Email, Telephone, Address	Scot Muraoka, P.E. 630 S. Beretania Street Honolulu, Hawaii 96843 smuraoka@hbws.org (808) 748-5942
Accepting Authority:	(for EIS submittals only)
Contact Name, Email, Telephone, Address	
Consultant:	The Limtiaco Consulting Group
Contact Name, Email, Telephone, Address	Jason Nakata 1622 Kanakanui Street Honolulu, Hawaii 96817 jason.n@tlcghawaii.com (808) 596-7790

Status (select one)	**Submittal Requirements**
____ DEA-AFNSI	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEA, and 4) a searchable PDF of the DEA; a 30-day comment period follows from the date of publication in the Notice.
__X_ FEA-FONSI	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; no comment period follows from publication in the Notice.
____ FEA-EISPN	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; a 30-day comment period follows from the date of publication in the Notice.
____ Act 172-12 EISPN ("Direct to EIS")	Submit 1) the proposing agency notice of determination letter on agency letterhead and 2) this completed OEQC publication form as a Word file; no EA is required and a 30-day comment period follows from the date of publication in the Notice.
____ DEIS	Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEIS, 4) a searchable PDF of the DEIS, and 5) a searchable PDF of the distribution list; a 45-day comment period follows from the date of publication in the Notice.
____ FEIS	Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEIS, 4) a searchable PDF of the FEIS, and 5) a

searchable PDF of the distribution list; no comment period follows from publication in the Notice.

____ FEIS Acceptance Determination	The accepting authority simultaneously transmits to both the OEQC and the proposing agency a letter of its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS; no comment period ensues upon publication in the Notice.
FEIS Statutory Acceptance	Timely statutory acceptance of the FEIS under Section 343-5(c), HRS, is not applicable to agency actions.
____ Supplemental EIS Determination	The accepting authority simultaneously transmits its notice to both the proposing agency and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is or is not required; no EA is required and no comment period ensues upon publication in the Notice.
____ Withdrawal	Identify the specific document(s) to withdraw and explain in the project summary section.
____ Other	Contact the OEQC if your action is not one of the above items.

Project Summary
Provide a description of the proposed action and purpose and need in 200 words or less.

The Honolulu Board of Water Supply (BWS) proposes installation of a second 0.5 million gallon potable water reservoir at its existing reservoir facility at 855 Alamuku Street in Aina Haina. The reservoir will be an enclosed concrete structure similar to the existing reservoir. The project will involve installation of the reservoir, connection of the reservoir to water, drainage and electrical utilities, and installation of control and monitoring equipment.

Due to special constraints, the BWS may acquire a small portion of the adjacent Wailupe Community Park. It is estimated that approximately 0.03 acres of the park will be acquired to accommodate the proposed reservoir. However, a waiver from County setback requirements will be sought to reduce the acquired land to the minimum extent practicable. The existing concrete retaining wall surrounding the facility will be reconstructed to follow the new property boundary. The area to be acquired is currently an open, grassy space; no structures within the park will be impacted.

The project will improve the storage capacity and reliability of the potable water supply and distribution system for the East Honolulu communities of Wailupe Peninsula, Aina Haina, Niu Valley and Kuliouou, and will address an existing storage deficit in this system.

Final Environmental Assessment

Honolulu Board of Water Supply
Aina Haina 170’ Potable Reservoir No. 2

Honolulu, Oahu, Hawaii

May 2016

Prepared for:

City and County of Honolulu
Board of Water Supply

Prepared by:

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

Final Environmental Assessment

for the

Aina Haina 170' Potable Reservoir No. 2

Honolulu, Island of Oahu, Hawaii

This environmental document has been prepared pursuant to
Chapter 343, Hawaii Revised Statutes

Prepared For:

City and County of Honolulu
Board of Water Supply
630 South Beretania Street
Honolulu, Hawaii 96843

Prepared By:

The Limtiaco Consulting Group
Civil Engineering and Environmental Consultants
1622 Kanakanui Street
Honolulu, Hawaii 96817

May 2016

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LIST OF ABBREVIATIONS

Abbreviation	Definition
AIS	Archaeological Inventory Survey
ASA	Aquifer Sector Area
ASYA	Aquifer System Area
BMPs	Best Management Practices
BWS	Honolulu Board of Water Supply
CAB	Clean Air Branch
CCH	City and County of Honolulu
CWB	Clean Water Branch
CZM	Coastal Zone Management
DFW	State of Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife
DLNR	State of Hawaii Department of Land and Natural Resources
DOH	State of Hawaii Department of Health
DOT	State of Hawaii Department of Transportation
DPP	City and County of Honolulu, Department of Planning and Permitting
DPR	City and County of Honolulu, Department of Parks and Recreation
DTS	City and County of Honolulu, Department of Transportation Services
EA	Environmental Assessment
FONSI	Finding of No Significant Impact
FWS	(U.S.) Fish and Wildlife Service
HAR	Hawaii Administrative Rules
HECO	Hawaiian Electric Company, Inc.
HFD	City and County of Honolulu Fire Department
HPD	City and County of Honolulu Police Department
HRS	Hawaii Revised Statutes
LID	Low Impact Development
LPE	Lualualei extremely stony clay, 3 to 35 percent slopes
LUO	(City and County of Honolulu) Land Use Ordinance

LIST OF ABBREVIATIONS (Continued)

Abbreviation	Definition
MG	million gallon(s)
MGD	million gallons per day
NAAQS	National Ambient Air Quality Standards
NFIP	National Flood Insurance Program
NPDES	National Pollutant Discharge Elimination System
RLS	Reconnaissance Level Survey
SAAQS	State (of Hawaii) Ambient Air Quality Standards
sf	Square foot/feet
SHPD	State of Hawaii Department of Land and Natural Resources, Historic Preservation Division
SMA	Special Management Area
TMK	Tax Map Key
UIC	Underground Injection Control

PROJECT SUMMARY

Proposing/Determination Agency:	Honolulu Board of Water Supply (BWS)
Contact:	Mr. Scot Muraoka, P.E.
Location:	Honolulu, Oahu, Hawaii
Tax Map Keys:	(1) 3-6-016: 040 and 3-6-019: 012
Land Area:	0.9319 acres and 0.03 acres
Recorded Fee Owner:	BWS
Existing Use:	BWS Facility (one storage reservoir and pump station)
Proposed Use:	BWS Facility (two storage reservoirs and pump station)
Community Plan Region:	East Honolulu
Land Use Designations:	
State Land Use	Urban
Development Plan	Residential
County Zoning	R-7.5 Residential District
Action Requested:	The BWS proposes to install a new 0.5 million gallon potable water reservoir and appurtenant facilities on its property in Aina Haina in East Honolulu. The BWS has determined that the proposed reservoir is needed to provide adequate potable water storage for existing uses and to improve the reliability of the existing water system. The proposed project may involve the acquisition of approximately 0.03 acres of unobstructed land from the adjacent Wailupe Community Park parcel. The project will increase the total potable water reservoir capacity for the affected water system from 1.5 to 2.0 million gallons.
Agency Determination:	Finding of No Significant Impact (FONSI)

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1. SETTING AND PROJECT DESCRIPTION

1.1. Introduction and Background

The Honolulu Board of Water Supply (BWS) is a semi-autonomous agency of the City and County of Honolulu (CCH) that manages the development, operation, and maintenance of Oahu's municipal water system. The agency is responsible for maintaining the water resource and distribution system throughout Oahu in order to meet the current and future water supply needs of its customers.

The BWS proposes to improve the reliability and storage capacity of the potable water supply and distribution system for the East Honolulu communities of Wailupe Peninsula, Aina Haina, Niu Valley and Kuliouou by adding a second 0.5 million gallon (MG) enclosed reservoir with a 170-foot spillway elevation within its property at 855 Alamuku Street in Aina Haina (see Figure 1). The BWS-owned parcel identified as Tax Map Key (TMK) 3-6-016: 040 will hereafter be referred to as the project site. The addition of the new reservoir increases the total water storage capacity for the affected 170' system from Aina Haina to Kuliouou from 1.5 to 2.0 MG. No additional pumping capacity is proposed as part of the project. The new reservoir, which would be known as the Aina Haina 170' Potable Reservoir No. 2, will be designed to have similar capacity, spillway elevation and dimensions as the Aina Haina 170' Potable Reservoir No. 1.

Project actions to install the new reservoir will require new connections to on-site drainage infrastructure. The new reservoir would add about 4,070 square feet (sf) of building area to the project site, which currently contains an enclosed reservoir (4,070 sf) and pump station building (960 sf) that were constructed around 1950. The existing BWS site is about one acre in size.

Approximately 0.03 acres of unobstructed land from the adjacent Wailupe Community Park (formerly Wailupe Valley Elementary School) may be acquired from the CCH. The additional acreage may be required to accommodate the extension of an access road within the project site that will encircle the new reservoir and for compliance with setback requirements specified in the Land Use Ordinance (Chapter 21 of the Revised Ordinances of Honolulu) for the R-7.5 Residential District. The transfer of ownership may be accomplished through the consolidation and re-subdivision of TMKs 3-6-019: 012 and 3-6-016: 040. A portion of the retaining wall and concrete gutter between the two parcels would be realigned to reflect the new property line. In order to minimize the area of land that must be acquired from the Wailupe Community Park, the project designer will consider the possibility of obtaining a Land Use Ordinance Waiver from the CCH. However, this Environmental Assessment (EA) will consider impacts of the project assuming that no waiver will be obtained since the outcome of a request for a waiver cannot be known until after the EA process is completed.

The proposed project would use County and BWS lands and BWS funds. Therefore, the proposed project requires preparation of an EA pursuant to Chapter 343, Hawaii Revised Statutes (HRS) and associated Title 11, Chapter 200, Hawaii Administrative Rules (HAR). The EA addresses the technical, environmental, social, and economic consequences of the project. Agencies, individuals, and community groups with jurisdiction or interest in the proposed project have been consulted during the preparation of this EA.

1.2. Project Need and Objectives

The project site contains the Aina Haina 170' Reservoir and pump station that are part of the BWS low service "170-foot" potable water supply and distribution system, serving the area from Wailupe Peninsula and Aina Haina to Kuliouou. This service area is herein referred to as the "affected system", and is shown in Figure 2. The affected system encompasses BWS Water Use Zones 11151 and 11152, and is part of the broader East Honolulu 170' water system.

Average water usage in the affected system from calendar years 2010 through 2014 was about 1.274 million gallons per day (MGD). The storage requirement, based on BWS standards, is approximately 1.91 MG (1.274 MGD x 1.5 [BWS standard max day factor]). The project will address the storage deficit in the affected system and provides a redundant 0.5 MG reservoir to better meet the needs of the community during an event that temporarily interrupts normal water system service (e.g., power outage). A new reservoir at the project site allows the BWS to perform maintenance on the existing reservoir without sacrificing service to the system. The increase in reservoir capacity also allows the water system to better accommodate short periods of unusually high water demand.

Adequate reservoir storage minimizes fluctuations in water pressure, provides water for emergencies, and helps to meet peak consumption demands. Reservoir facilities allow for stabilized rates of water pumping, rather than in response to consumption demand. Water stored during periods of low demand is utilized during peak demand hours. Pumps operate to refill the reservoirs when stored water decreases to a predetermined level. Water storage facilities help to maintain service continuity.

Fluctuations in water use coincide with climatic and seasonal changes (e.g., higher water usage occurs when the climate is hot and dry). Geographical and economic considerations also affect water use; however, people tend to perform the same activities inside and outside their homes (e.g., bathing, cooking, watering the yard, washing the car, etc.) wherever they live. Residential communities that have high water use may exhibit some or all of following characteristics:

- Larger lots with pools, gardens, manicured lawns, abundant landscaping, or sprinkling systems that require large amounts of water.

- A more affluent customer base that uses more automobiles, boats and convenience appliances.
- Numerous older homes with high-water-use fixtures and appliances.

The census tract areas of Wailupe, Kuliouou and Aina Haina-Hawaii Loa Ridge have characteristically high (e.g., around and above $100,000) median household and family income. Residential neighborhoods in the service area are characterized by large lots that are landscaped and well-maintained.

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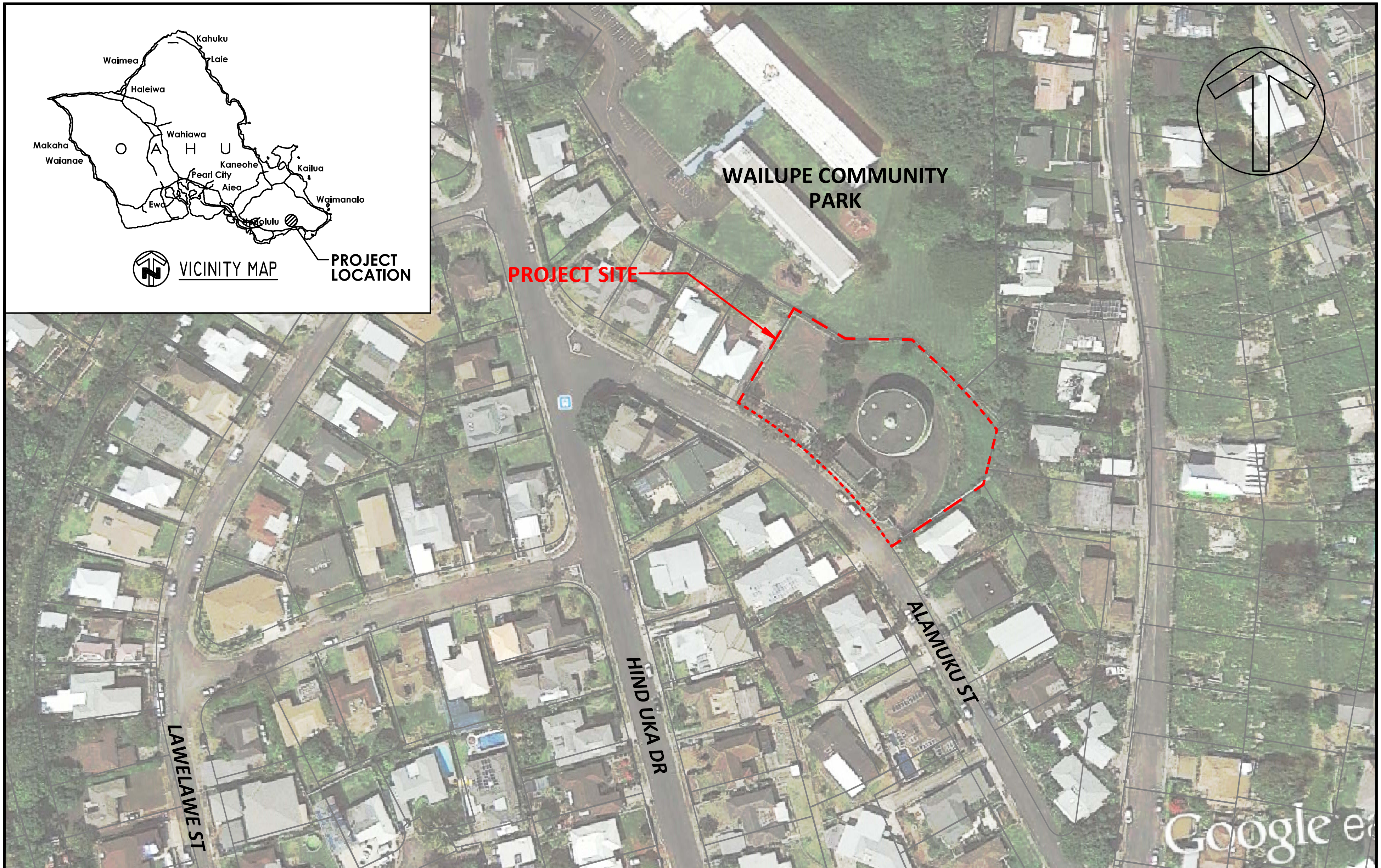

LEGEND

PROJECT SITE

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CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

FIGURE 1
PROJECT LOCATION

SCALE: NOT TO SCALE	DATE: MAY 2016

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FIGURE 2

AINA HAINA TO KULIOUOU 170' SYSTEM SERVICE AREA

SCALE: NOT TO SCALE	DATE: MAY 2016

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1.3. Project Location

The BWS proposes to site the new reservoir at its existing facility in Aina Haina. The project site is located along Alamuku Street, which is a connecting roadway between Hind Iuka Drive and Ailuna Street. The BWS facility at 855 Alamuku Street is located within a residential neighborhood of single-family homes interspersed with some public facilities and institutional uses. Figure 3 depicts the project site in relation to surrounding uses.

Concrete retaining walls and chain link fencing delineate the boundaries of the BWS facility. Adjacent residential parcels along Alamuku Street and residential parcels across from the project site contain single-family homes. Several residential parcels containing single-family homes overlook the project site along its northwestern and southeastern perimeter. The Wailupe Community Park at 939 Hind Iuka Drive abuts the project site along its rear property line. The park is the former Wailupe Valley Elementary School, which operated from September 1958 to June 2009. The park parcel is owned by the CCH and is currently utilized by the Department of Parks and Recreation (DPR), District 1 East Honolulu. In addition to departmental office uses, various community classes are held at the park.

1.4. Site Description

The project site consists of 0.9 acres that originally sloped from northeast to southwest. The lowest portions of the project site lie along the Alamuku Street property line. Retaining walls were constructed around the property to accommodate grade differences between different sections of the project site. Large flat areas within the project site were graded for construction of the Aina Haina 170' Reservoir No. 1 and pump station building. The existing reservoir is located in the center of the project site as shown in Figure 4. The reservoir is 72 feet in diameter and is approximately 24 feet tall. A 12 foot wide asphalt-concrete access road encircles the reservoir.

Two booster pumps are housed in an existing two-story building at the project site. The first story of the pump station building is located below-grade. The building footprint is approximately 40 feet by 24 feet, and is located roughly 12 feet away from the existing reservoir. Control and monitoring cabinets for the Aina Haina 170' Reservoir No. 1 are also housed in the pump station building.

The northwest portion of the project site is a relatively flat, gravel covered area. Record drawings indicate that a base yard was originally planned for construction at this location; however, no base yard was established at the project site and the area has remained vacant. The Aina Haina 170' Reservoir No. 2 is proposed to be installed within this flat, unobstructed area.

The State land use designation for the project site is Urban (see Figure 5). The BWS facility is a public use and structure that is permitted in the R-7.5 Residential District (see Figures 6). Applicable zoning requirements as specified in the CCH’s Land Use Ordinance (LUO), which is Chapter 21 of the Revised Ordinances of Honolulu, include a 30-foot front yard setback and 15-foot side/rear yard setback for uses other than dwellings. Vehicular access to and egress from the project site is via a 12 foot wide asphalt-concrete driveway with a padlock secured gate along Alamuku Street. The BWS facility has an intrusion detection system consisting of alarms and video cameras that are remotely monitored.

1.5. Technical Considerations

Water is supplied to the Aina Haina 170’ Reservoir No. 1 through a 16-inch water main on Hind Iuka Drive. An altitude valve, which regulates flow into the reservoir, is located in a vault on a BWS-owned parcel (TMK 3-6-016: 056) one block away from the project site. From the valve, the 16-inch water main runs through the long, narrow BWS-owned parcel to Alamuku Street before entering the project site and connecting to the Aina Haina 170’ Reservoir No. 1.

Two pump units located at the project site are rated for 1000 gallons per minute at 235 feet of head. The pumps tap the 16-inch water main and supply water to another BWS reservoir, which is located on a ridge overlooking Wailupe Valley, through a 12-inch water main along Alamuku Street.

The proposed Aina Haina 170’ Reservoir No. 2 will be constructed of reinforced concrete and have similar spillway elevation, capacity, and dimensions as the existing Aina Haina 170’ Reservoir No. 1 for ease of operation. The new reservoir will therefore be approximately 72 feet in diameter and 24 feet tall. A perimeter road will encircle the new reservoir in conformance with the Water System Standards (BWS, et al, 2002). The guidelines state that perimeter roads shall have a minimum width of 10 feet. The road will allow BWS personnel to access the Aina Haina Reservoir No. 2 for maintenance.

Figure 7 presents a conceptual representation of proposed improvements from the *Preliminary Engineering Study, Aina Haina 170’ Potable Reservoir No. 2* (The Limtiaco Consulting Group, 2012) that was prepared for the BWS in 2012 to evaluate the overall feasibility of constructing the Aina Haina 170’ Reservoir No. 2 at the project site. The proposed reservoir and perimeter road will conflict with the existing retaining wall along the rear property line. In order to accommodate the new reservoir and perimeter road, the BWS may acquire approximately 0.03 acres of unobstructed land from the adjacent Wailupe Community Park parcel that is owned by the CCH. The acquired area will be integrated into the BWS property through the process of consolidation and re-subdivision of TMKs 3-6-019: 012 and 3-6-016: 040.

The exact acreage that is needed to accommodate the access road around the new reservoir and for conformance with rear yard setback requirements will be determined during the design phase of the project, which will occur after completion of the EA process. Consequently, the area depicted in Figure 7 is a reasonable assumption based on available information. The BWS will acquire land to the extent necessary for its purposes and will be mindful of existing structures (e.g., nearby playground equipment) and uses at Wailupe Community Park. The BWS will consult with the DPR, which operates Wailupe Community Park, throughout the development of the project to avoid or minimize the impacts of the proposed project in regards to public park facilities and services. During the design process, the BWS will consider obtaining a Land Use Ordinance Waiver in order to minimize the area of land that must be acquired from Wailupe Community Park.

The BWS proposes to demolish and replace two segments of the existing retaining wall and gutter along the rear boundary of its property. The two wall sections would align with the new property line. The retaining wall and gutter will likely be constructed using reinforced concrete. The BWS will ensure that construction activities are generally confined to the project site; however, there may be some minor activities such as the installation of a dust control fence and the erection of safety barriers that may occur within the adjacent Wailupe Community Park parcel. Areas inside the project site are expected to be prepared for construction of the Aina Haina 170' Reservoir No. 2 and perimeter road after the retaining wall has been fully constructed.

The new reservoir will be connected to water, electrical, and drainage infrastructure. Water will be supplied to the Aina Haina 170' Reservoir No. 2 via an existing 16-inch influent-effluent line that currently supplies the Aina Haina 170' Reservoir No. 1. The proposed project includes the installation of a water line that connects the Aina Haina 170' Reservoir No. 2 to the 16-inch line.

The *Water System Standards* of the BWS require washout and overflow drainage lines for reservoirs. The washout line allows the reservoir to be drained for maintenance purposes, and the overflow line prevents damage to the reservoir in emergency situations (e.g., over-filling due to sensor malfunctions). The drainage lines will be connected to the existing drainage system at the project site, which discharges into the CCH's municipal drainage system on Alamuku Street.

Electrical, control, and monitoring systems for the new reservoir will be installed within the pump station building at the project site. Control and monitoring systems for the Aina Haina 170' Reservoir No. 1 are already located in the pump station building. Reportedly, the existing system has adequate capacity for additional controls such that no major construction is necessary to house the electrical, control, and monitoring systems for the Aina Haina 170' Reservoir No. 2.

1.6. Environmental Considerations

The proposed action involves siting a new 0.5 MG reservoir at an existing BWS facility in Aina Haina. The Aina Haina 170' Reservoir No. 2 will connect to water, electrical, and drainage infrastructure that is already in place for Aina Haina 170' Reservoir No. 1. The BWS proposes to install the new reservoir upon land that was previously graded and prepared for use. A geologic survey of the affected area confirmed shallow cut-and-fill conditions with relatively shallow depths to basalt. It is anticipated that a conventional foundation on the underlying basalt stratum can support the proposed concrete reservoir. There are no indications of settlement or poor soil conditions at the project site. The proposed action would also disturb approximately 0.03 acres of land that may be acquired from the adjacent Wailupe Community Park and a portion of the sloped area within the project site along the rear property line (see Figure 7).

The proposed project will not alter or disturb the existing reservoir and pump station building. Traditional and cultural practices are not known to have occurred on the property within recent times because access to the project site is restricted to authorized BWS personnel via padlocked gates. The new reservoir with similar capacity, spillway elevation and dimensions as the Aina Haina 170' Potable Reservoir No. 1 will be consistent with the visual character of the surrounding area. The proposed project is an infrastructure improvement that does not affect population levels or the supply of housing units.

Construction activities associated with the proposed project would generate short-term effects such as fugitive dust, noise, intermittent traffic, solid waste, and potential disruptions to utility services that would cease upon project completion. Anticipated short-term impacts will be mitigated to the extent practical with the use of appropriate construction techniques and Best Management Practices (BMPs). In the long term, the increased potable water storage capacity improves the reliability and storage capacity of the area to better accommodate the water service needs of the affected community.

1.7. Project Schedule and Cost

Construction may begin in fiscal year 2019. The estimated cost for construction of the Aina Haina 170' Reservoir No. 2 and associated improvements is approximately $2 million. Design fees and costs for anticipated permits and approvals are included in the estimate.

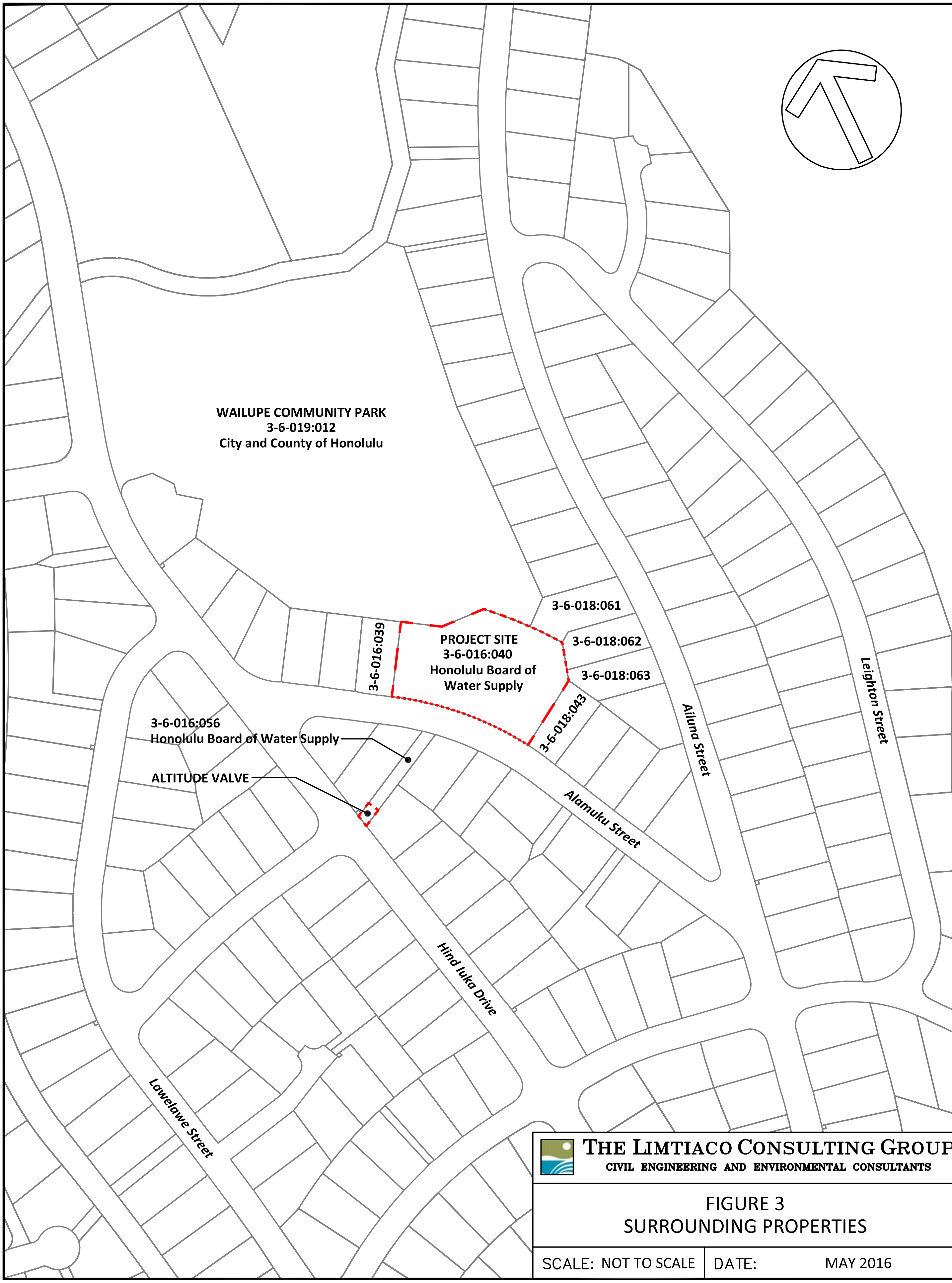

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FIGURE 3
SURROUNDING PROPERTIES

SCALE: NOT TO SCALE	DATE: MAY 2016

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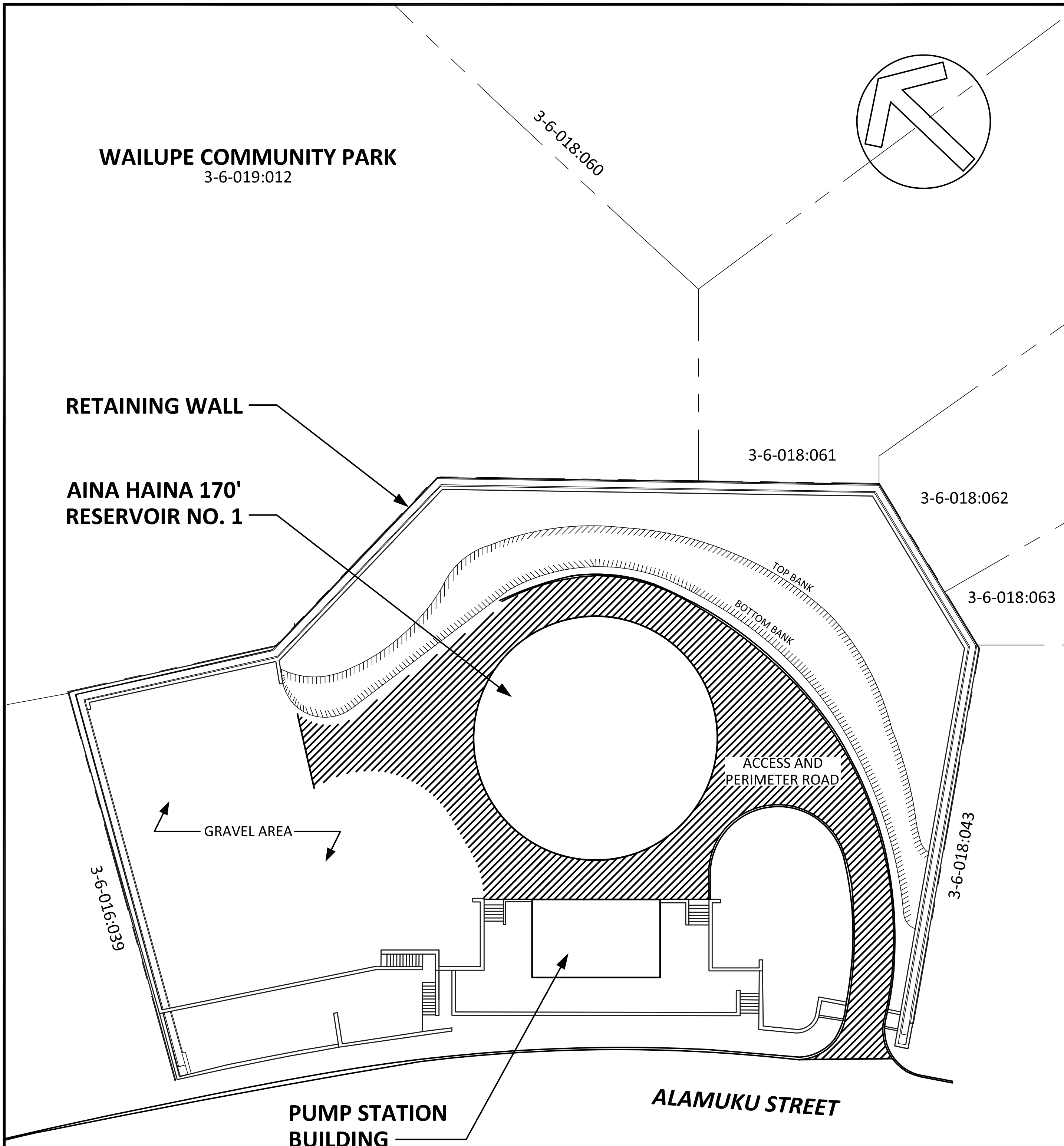

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FIGURE 4
EXISTING CONDITIONS

SCALE: NOT TO SCALE | DATE: MAY 2016

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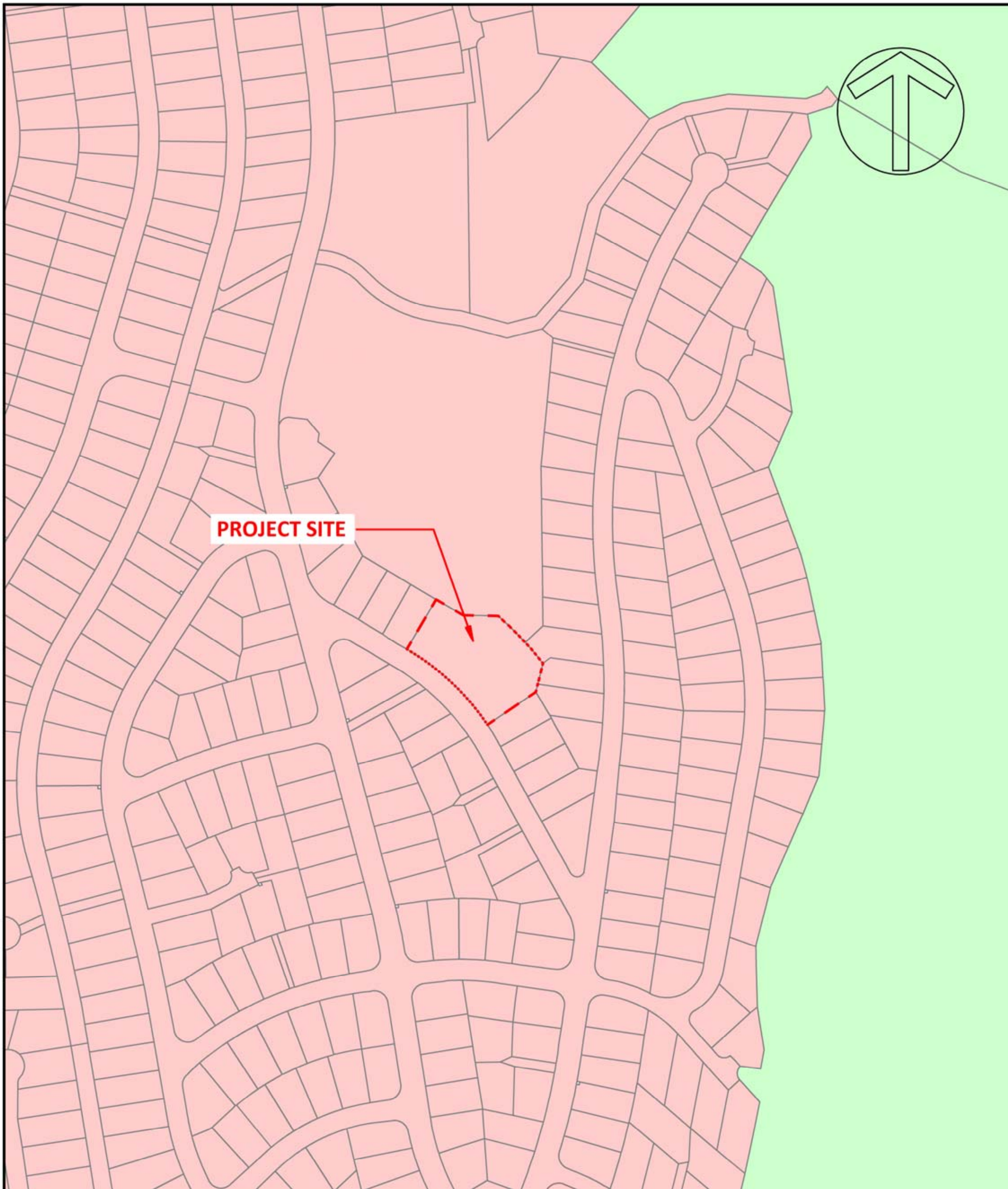

LEGEND

PROJECT SITE

URBAN LAND USE DISTRICT

CONSERVATION LAND USE DISTRICT

THE LIMTIACO CONSULTING GROUP

CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

FIGURE 5

STATE LAND USE DISTRICTS

SCALE: NOT TO SCALE | DATE: MAY 2016

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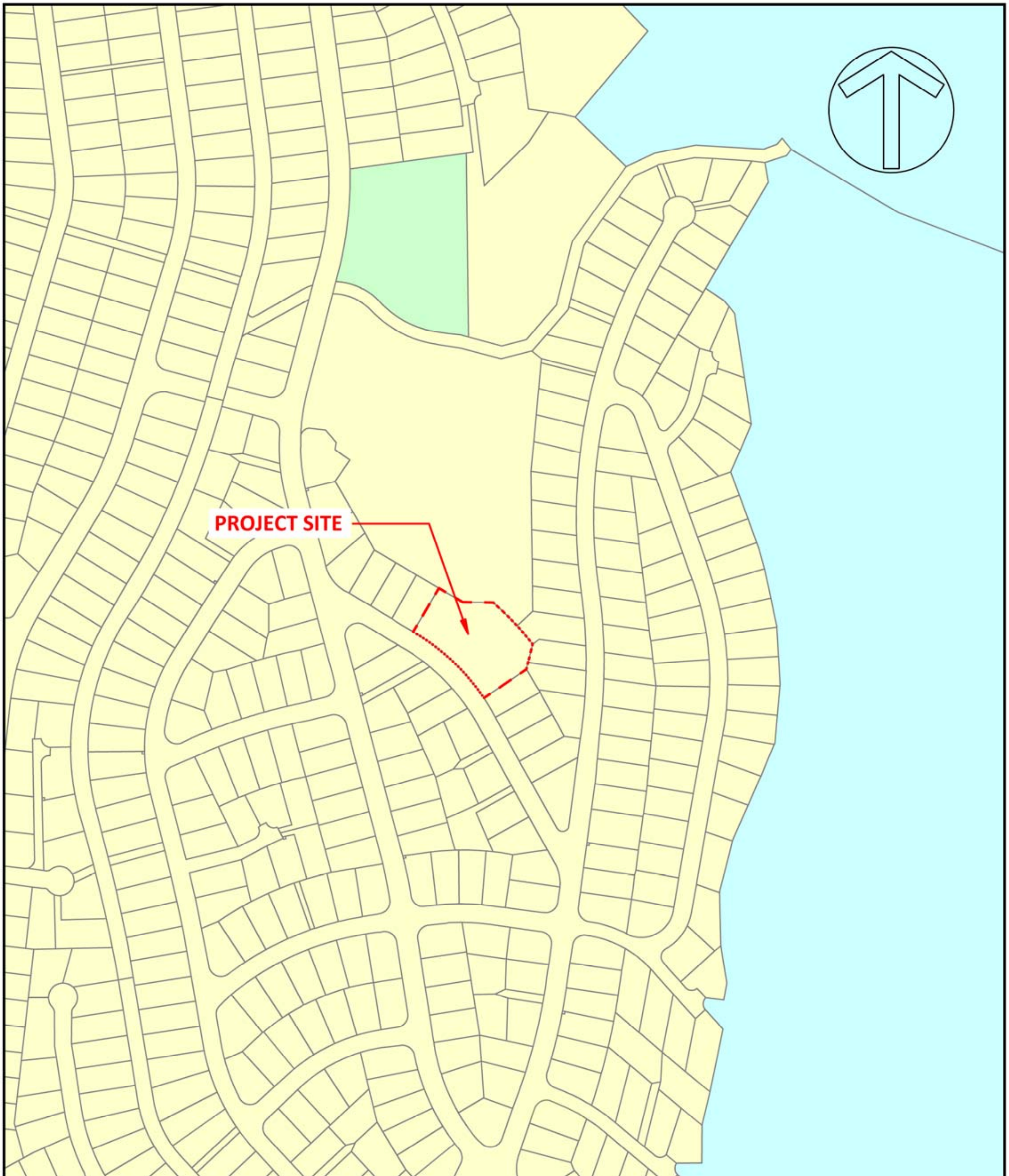

LEGEND

- PROJECT SITE
- R-7.5 ZONE
- P-2 ZONE
- P-1 ZONE

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FIGURE 6
COUNTY ZONING

SCALE: NOT TO SCALE | DATE: MAY 2016

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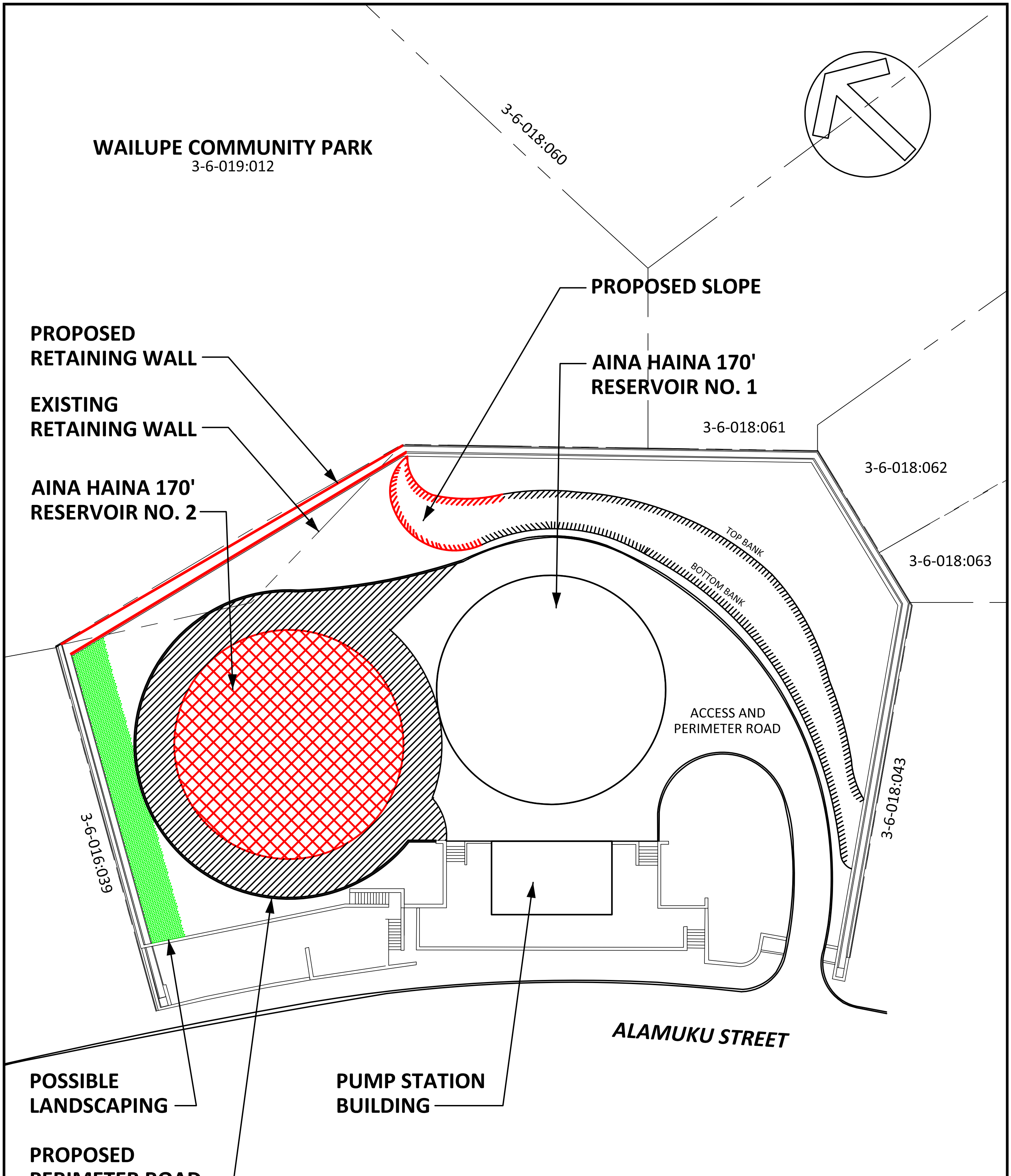

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FIGURE 7
PROPOSED SITE PLAN

SCALE: NOT TO SCALE | DATE: MAY 2016

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2. DESCRIPTION OF EXISTING ENVIRONMENT, PROJECT IMPACTS, AND MITIGATION

2.1. Climate and Air Quality

The climate throughout the State of Hawaii is generally characterized by mild temperatures with low daily and monthly variability, moderate humidity, persistent trade winds, and abundant sunshine. The Hawaiian climate is further characterized by a two-season year: the summer season from May through September is generally warmer and less wet than the cooler and wetter winter season from October through April (Western Regional Climate Center, 2014). Rainfall distribution across the State of Hawaii varies greatly according to geographic conditions, elevation and long-term climatic cycles.

The project site in Wailupe Valley has a mild semi-tropical climate similar to rest of the State of Hawaii. Average temperatures at the project site range from 70 degrees Fahrenheit in February to 77 degrees Fahrenheit in August (Giambelluca, 2014). The average annual rainfall at the project site is estimated to be 42 inches and the wetter months of the year are from November through March (Ibid). Trade winds in the project vicinity are generally from the northeast. Strong winds are known to occur in connection with storm systems that disrupt climatic patterns.

Ambient air quality in the State of Hawaii consistently meets National Ambient Air Quality Standards (NAAQS) established by the U.S. Environmental Protection Agency per requirements of the Clean Air Act and State Ambient Air Quality Standards (SAAQS) established by the State of Hawaii, Department of Health (DOH). The State standards for select parameters are more stringent than their Federal counterparts. The NAAQS and SAAQS are periodically exceeded due to volcanic activity and exceptional events such as New Year’s fireworks celebrations.

The project site is located within a single-family residential area such that ambient air quality at the project site may be influenced by nearby human activities and vehicular emissions from residential automobile traffic along Alamuku Street, Ailuna Street and Hind Iuka Drive. The prevailing northeast trade winds help to disperse vehicular emissions and other airborne pollutants.

Impacts and Mitigation Measures

Land acquisition, the installation of a new reservoir along with its connection to onsite draining infrastructure, the extension of an access road within the project site, and the realignment of a portion of the retaining wall will have no effect on long-term climatic conditions such that no permanent mitigation measures are necessary.

Ambient air quality at the project site will be temporarily affected by construction-related vehicles, equipment and activities that would generate fugitive dust and emissions. The construction contractor will be responsible for complying with HAR Title 11, Chapter 60, “Air Pollution Control.” The contractor will be responsible for the implementation of erosion and dust control measures as necessary for compliance with the above-mentioned rules. Construction equipment and vehicles shall be properly maintained in order to control vehicular emissions. Said exhaust emissions are anticipated to have negligible impacts on air quality in the project vicinity since the carbon monoxide and nitrogen oxide emissions would be intermittent and readily dissipated.

Based on the October 22, 2015 comment letter from the DOH, Clean Air Branch (CAB), it is recommended that a dust control plan should be implemented by the contractor. The following mitigation measures should be considered to mitigate the impacts of potential dust-creating activities during construction:

- Construction should be phased to minimize the amount of disturbed area at any given time;
- Minimize the amount of dust-generating materials and activities;
- Centralize on-site vehicular traffic routes;
- Locate potential dust-generating equipment in areas of least impact;
- Provide water as dust control
- Landscaping;
- Minimize dust from shoulders and access roads;
- Provide dust control during non-work hours; and
- Control dust from construction debris.

CAB notes that DOH approval of a dust control plan is not required. Nevertheless, a dust control plan is highly recommended to mitigate the potential for the project to create fugitive dust during construction.

Based on record drawings, the presence of asbestos-cement is not anticipated. However, if the presence of asbestos-cement is discovered, the Asbestos Office of the DOH, Indoor and Radiological Health Branch will be contacted and the contractor will be required to comply with all applicable State regulations regarding work with asbestos-cement.

No significant air quality impacts are anticipated from the new reservoir, which represents a continuation of the functions and activities that currently occur at the project site.

2.2. Geology and Soils

The Island of Oahu comprises the remnants of two basaltic volcanoes that eroded to form the Waianae and Koolau Ranges, which are connected by a central plateau. The mountain range formed by the older Waianae volcano spans a distance of about 20 miles across the western third of Oahu. The younger Koolau volcano contributed to the main mountain range on Oahu that extends for 37 miles in a northwest to southeast alignment across the eastern two thirds of the island. The Koolau Range consists of thin, narrow layers of basaltic lava flows. Dissected valleys were etched into the basalt range formations through weathering and natural erosion processes. Numerous dikes and small amounts of volcanic ash are present. The valley floors contain alluvium (e.g., clay, silt, sand, gravel, or similar material) and unconsolidated non-calcareous sediments transported from valley slopes by stream flows.

Soils underlying Wailupe Valley belong to the Lualualei-Fill land-Ewa association and are deep, nearly level to moderately sloping, well-drained, fine textured and moderately fine textured soils (U.S. Department of Agriculture, Soil Conservation Service, 1972). Lualualei soils have a high shrink-swell potential that may cause unstable soil conditions and these soils "account for about 75 percent of the acreage which has been involved in mass movements (landslides, creep) on the island of Oahu" (GK and Associates, 1991). Basaltic bedrock, weathered basalt, alluvium and colluvium (e.g., rock detritus and soil accumulated at the foot of a slope) are found in the project area.

According to the *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* (U.S. Department of Agriculture, Soil Conservation Service, 1972) and *Web Soil Survey* (U.S. Department of Agriculture, Natural Resources Conservation Service, n.d.), the predominant soil type in the vicinity of the project site is classified as Lualualei extremely stony clay, 3 to 35 percent slopes (LPE). The LPE soil type has limited topsoil mixed with a substantial amount of stones and is characterized by medium to rapid runoff with a moderate to severe erosion hazard. The soil classifications are shown in Figure 8.

The Aina Haina area is known to have unstable soils. "In the 1990s, the city paid $6.7 million to buy out a group of homes on Ailuna and Leighton streets when a leaky sewer pipe caused them to slip down the hill" (Fassler, 2008). There are no indications of settlement or poor soil conditions at the project site itself. In September 2011, exploratory test borings taken from the flat, vacant area of the project site confirmed shallow cut-and-fill conditions with relatively shallow depths to basalt. It is anticipated that a conventional foundation on the underlying basalt stratum can support the proposed concrete reservoir.

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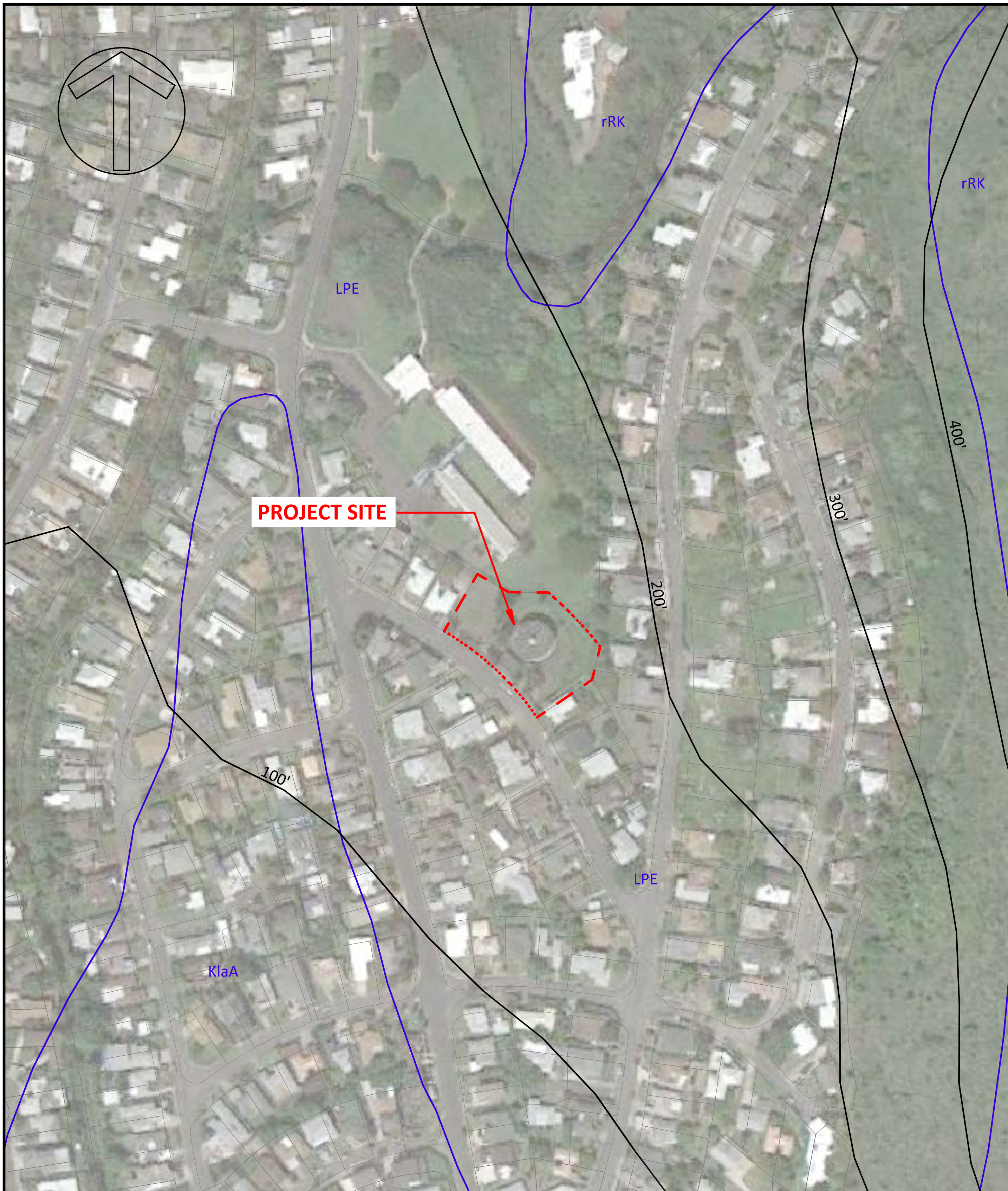

LEGEND

PROJECT SITE
LPE LUALUALEI EXTREMELY STONY
KlaA KAWAIHAPAI STONY CLAY LOAM
rRK ROCK LAND
100' CONTOUR ELEVATION

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

FIGURE 8
SOILS AND TOPOGRAPHY

SCALE: NOT TO SCALE	DATE: MAY 2016

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Impacts and Mitigation Measures

Because there are known concerns over erosional forces and landslides in the Aina Haina area, the *Preliminary Geotechnical Engineering Study, Aina Haina Reservoir No. 2* (Hirata & Associates, 2011) was prepared to help determine the feasibility of siting the proposed reservoir at the project site. The study, which involved two borings and one probe hole at the project site and one boring at the Wailupe Community Park, determined that there is a relatively shallow depth to basalt. As such, it was determined that construction of the proposed reservoir is feasible at the project site. In order to ensure proper project design with respect to erosional concerns, an additional geotechnical study will be performed during the design phase of the project. The contractor will also be responsible for ensuring that excavation techniques do not cause excess vibrations, which could result in damage to adjoining properties. Any construction related damage would be investigated and addressed by the BWS.

The new reservoir will be properly designed with respect to subsurface conditions within the footprint of new construction. The replaced portion of the retaining wall and concrete gutter will also be properly designed and constructed with respect to geotechnical concerns. Project actions would therefore have no adverse impacts on the underlying geology and soils at the project site such that no mitigation measures are necessary.

Earth disturbing activities may create exposed areas at the project site that are susceptible to erosion from wind and rain. The construction contractor is expected to implement dust barriers/fences and other dust control measures that effectively minimize or prevent nuisance concerns from fugitive dust and the effects of wind erosion. Mitigation that addresses sediment-laden runoff is discussed in Section 2.4, Water Resources. Areas affected by project actions will be stabilized and either paved or landscaped, which reduces the long-term potential for erosion by water and wind. No graded areas will remain uncovered.

2.3. Topography

Most of the project site is located between approximately 145 to 165 feet above mean sea level (refer to Figure 8). The general topography of the surrounding area suggests that the project site originally sloped from northeast to southwest. Undeveloped land along the northeastern to southeastern boundaries of the project site may reflect the original topography of the area, whereas developed portions of the project site are mostly level. Retaining walls define the site boundaries and were constructed when the project site was developed for use as a BWS facility.

Project actions may include the acquisition of approximately 0.03 acres of land from the adjacent Wailupe Community Park site at TMK 3-6-019: 012 in order to comply with the setback requirements associated with the extension of the access road around the new reservoir. In order to minimize the area of land that must be acquired, the BWS will consider obtaining a Land Use Ordinance waiver from the CCH during the design phase. The relatively flat, unobstructed area that abuts the retaining wall and concrete gutter is between approximately 150 to 160 feet above mean sea level.

Impacts and Mitigation Measures

Project actions would generally retain the overall topographic profile for most of the site. The new reservoir would be situated within a flat, vacant area on the western portion of the project site that was previously graded and originally planned for use as a baseyard. The previously graded area contains no topographical features that would obstruct site preparation activities and placement of the foundation for the new reservoir; therefore, no significant amount of site work or grading is anticipated. Minor grubbing and grading will be accomplished to the extent necessary within the limits of the affected construction area. Two sections of the retaining wall and concrete gutter along the rear property line would be removed and realigned according to the adjusted site boundaries resulting from the consolidation and re-subdivision of TMKs 3-6-019:012 and 3-6-016:040. Mitigation that addresses drainage and surface runoff is discussed in Section 2.4, Water Resources.

2.4. Water Resources

The project site is within the Waialae-East Aquifer System Area (ASYA) that is part of the Honolulu Aquifer Sector Area (ASA). The BWS has been issued Water Use Permits for ground water withdrawals totaling 0.79 MGD from the Waialae-East ASYA, which is below the 2 MGD *sustainable yield* for this aquifer system; however, the Honolulu ASA includes the Palolo, Nuuanu and Moanalua ASYAs, which are overdrawn (Wilson Okamoto Corporation, 2008). *Sustainable yield* refers to "the quantity of water that can be extracted from an aquifer indefinitely without diminishing the quantity or quality of the water withdrawn" (State of Hawaii, Department of Land and Natural Resources, Commission on Water Resource Management, 2008). DLNR's Commission on Water Resource Management is monitoring the condition of the aquifer and the BWS will develop a future Watershed Management Plan for East Honolulu.

The Underground Injection Control (UIC) line as determined by the DOH Safe Drinking Water Branch demarcates the boundary and associated restrictions that apply to areas with non-drinking water aquifers or underground sources of drinking water. Injection well activity is more restricted in areas above the UIC line to protect underground sources of drinking water from injected fluids that may contain chemical, physical, radioactive, and biological contamination. The project site is above or *mauka* of the UIC line, which indicates that the underlying groundwater is considered a potential source of drinking water.

There are no freshwater streams, rivers, ponds or other open water bodies located within or immediately adjacent to the project site. There are also no wetlands (or marshes, swamps, bogs, etc.) located within or immediately adjacent to the project site. The perennial Wailupe Stream, which is a Class 2 inland water body, originates in the upper watershed elevations of Wailupe Valley. Wailupe Stream is approximately 8.1 miles in length; however, about 2 miles of its lower reach have been altered. The project site is approximately 0.17 miles (or approximately 900 linear feet) east of Wailupe Stream, which drains to Maunalua Bay. The project site is approximately one mile north of Maunalua Bay, which has a marine water quality classification of Class A. Nonpoint source pollution including sediment-laden runoff from urban activities is considered to be a threat to coastal ecosystems.

Impacts and Mitigation Measures

The project will not result in significant impacts to the underlying aquifer and groundwater resource in the Waialae-East ASYA. The BWS facility does not involve the development of a new potable water source and no additional pumping capacity is proposed as part of the project. The project will not result in long-term changes in use of the project site and no additional groundwater withdrawals are proposed.

No significant impacts to surface water quality are anticipated since the project site is devoid of such resources including wetlands, perennial streams, or other sensitive riparian habitats. Construction of the new reservoir and access road ultimately reduces nonpoint source pollution concerns and the long-term potential for erosion by water and wind.

The project will increase the impermeable surface area at the project site, as the impermeable reservoir and access road will be constructed over the gravel-covered (permeable) portion of the project site. Large increases in impervious surfaces, such as the urbanization of natural environments, can result in impacts to local surface water and groundwater. With pervious surfaces, large quantities of rainwater percolate into the soil. Construction of impervious surfaces (such as concrete or asphalt) over pervious surfaces prevents water from percolating into the soil. As such, converting large pervious surfaces areas into large impervious surface areas can impact surface water quality and increase the amount of stormwater runoff that reaches local surface waters. Additionally, an increase in impervious surface area on a large scale can reduce the amount of stormwater that percolates into the ground and recharges the groundwater aquifer.

In order to mitigate the cumulative effects that urbanization has on surface water quality, the CCH regulates new development and redevelopment projects that disturb at least one acre of land. Projects regulated under the CCH storm water quality program must consider the use of Low Impact Development (LID), source control, and retention/biofiltration in order to minimize the effects of development on stormwater quality. Although the proposed project will result in a disturbed area of less than one acre – and thus will not be regulated under the CCH stormwater quality program – the BWS will consider the use of permanent stormwater BMPs during the design process.

Potential stormwater BMP strategies that could be used at the project site include, but are not limited to:

- Conserve natural areas, soils, and vegetation;
- Minimize impervious surfaces;
- Direct runoff toward landscaped areas;
- Landscape area planning;
- Infiltration trench;
- Dry well;
- Bioretention basin;
- Permeable pavement;
- Vegetated bio-filter, and
- Manufactured treatment device.

Select cutsheets from the CCH *Storm Water BMP Guide* (December 2012) describing the BMP measures listed above are included in Appendix A for reference. The feasibility of permanent BMP measures will be determined during the project’s design phase. Feasibility will depend on factors such as soil conditions (an additional geotechnical study will be performed in support of the design phase of the project), space limitations, cost, and impacts to retaining walls and other structures.

A short-term and temporary impact of the project may occur from the generation of sediment-laden surface runoff during earth-disturbing activities, especially if heavy rains coincide with the activity. A National Pollutant Discharge Elimination System (NPDES) Permit for discharges of pollutants, including storm water runoff is required for the disturbance of one acre or more of total land area pursuant to HAR Title 11, Chapter 55, “Water Pollution Control” effective December 6, 2013. The project site is an area of less than one acre that is not part of a larger common plan of development or sale. DOH will be consulted if it is determined that the NPDES Permit is necessary. DLNR's Division of Forestry and Wildlife (DFW) in its letter dated July 15, 2014 recommended maintaining vegetated areas and diverting water from paved areas to vegetated bioswales to help reduce sediment runoff. The construction contractor will be responsible for implementing a storm water management plan that incorporates runoff and erosion control measures intended to prevent a concentration of runoff from flowing down the paved road and into residential areas. The contractor will also be responsible for ensuring that excavation techniques do not cause excess vibrations. No adverse impact from the project is anticipated after the completion of construction.

2.5. Hazardous Materials and Solid Waste

There are no known threats pertaining to hazardous materials at the project site; however, the development of the BWS facility and single-family homes in Wailupe Valley occurred in an era when asbestos-containing building materials were being manufactured for use and before lead-based paints were banned for use in residential properties and public buildings. The exposure risks to hazardous materials (e.g., asbestos-containing substances, lead-based paint, mercury-containing light fixtures, electrical equipment containing polychlorinated biphenyls, and radioactive smoke detectors) are greatest when materials are intentionally disturbed and handled.

The CCH's Department of Environmental Services, Refuse Division is responsible for solid waste collection, transport and disposal operations on Oahu along with private haulers. Normal operations at the BWS facility do not generate solid waste such that regular solid waste collection service is not provided.

Impacts and Mitigation Measures

Construction activities at the project site would temporarily increase the volume of solid waste including construction debris that must be transported offsite for disposal. The BWS is expected to ensure that appropriate waste management and disposal practices are implemented by the construction contractor.

2.6. Natural Hazards

Natural hazards that may threaten life and property on Oahu include tsunami inundation, tropical cyclones, earthquakes, volcanic activity, floods, drought, wildfires, sea level rise, high wind and landslides. In general, the exposure to natural hazards from unpredictable events is no greater at the project site than at other locations on Oahu. Earthquakes, hurricanes and storms have resulted in power outages for extended periods in localized areas of Oahu.

Tsunami evacuation zone maps for the State of Hawaii identify low lying areas where excavation is recommended since extensive damage to life and property may occur from seismic sea waves. The project site is outside the tsunami evacuation zone (Hawaii State Civil Defense, n.d.).

The project site is within Zone X according to the Flood Insurance Rate Map Panel No. 15003C0386G for Hawaii (effective date January 19, 2011) prepared by the Federal Emergency Management Agency. The Zone X designation refers to inundation areas of low-to-moderate risk that are outside the 0.2 percent annual chance (or 500-year) floods. The National Flood Insurance Program (NFIP) does not regulate development within Zone X. The Flood Hazard Assessment Report for the project site is provided in Appendix B.

Based on comments from the CCH, Department of Planning and Permitting (DPP), dated September 11, 2015, the project is located downslope of the Ailuna Leighton slide area. After a large rain storm in 1988, the ground underlying a number of residential properties along Ailuna and Leighton Street began to slide. Damage was caused to a number of properties, eventually resulting in the condemnation of 13 properties. In 1994, a Circuit Court jury awarded a total of $6.7 million to property owners who claimed that a leaking sewer line hastened the sliding of the slope. The CCH claimed that the landslide was a pre-existing condition caused by a land shift that was occurring for thousands of years (Witty, 1996). The homes have since been demolished, and the CCH now owns 13 lots along Ailuna and Leighton Street.

Because of concerns over soil stability in the area, the *Preliminary Geotechnical Engineering Study, Aina Haina Reservoir No. 2* (Hirata & Associates, 2011) was prepared to help determine the feasibility of siting the proposed reservoir at the project site. The study involved drilling two borings and one probe hole at the project site and one boring at the Wailupe Community Park in order to determine subsurface soil conditions at the project site. All three borings and the probe hole encountered basalt at relatively shallow depths: between 1.5 and 2.5 feet. A copy of the geotechnical study is included in Appendix C.

Threats from wildfires are unlikely but possible since there is ample vegetation within nearby areas. Drought conditions and high winds could exacerbate the fire hazard. Many wildfires are caused by human actions of an intentional nature or as a result of negligence.

Impacts and Mitigation Measures

There are known concerns regarding slope stability in the Aina Haina area. However, soil borings revealed relatively shallow depths to basalt at the project site and the portion of the Wailupe Community Park directly adjacent to the project site. The preliminary geotechnical study concluded that, because of the shallow depth to basalt, construction of the proposed reservoir is feasible at the project site. The BWS will perform an additional geotechnical study during the design phase of the project to ensure that the project does not result in adverse effects to nearby structures.

The threats to humans and property from unpredictable natural events will always be present. Proposed activities at the project site would not affect the occurrence of naturally occurring hazards. Project actions would increase the potable water storage capacity of the affected system to better meet the needs of the community during an emergency that temporarily incapacitates the transmission of water from existing sources.

2.7. Floral and Faunal Resources

The project site was previously disturbed for the construction of the BWS facility and is within a developed urban area.

During the pre-assessment comment period, the U.S. Fish and Wildlife Service (FWS) indicated in its letter dated July 28, 2014 that it reviewed pertinent information in its files and concluded that no federally listed species or designated critical habitat occurs in the immediate vicinity of the project site. DLNR's DFW indicated in its letter dated July 15, 2014 that it has no objections to the project.

Impacts and Mitigation Measures

No species listed by the FWS or in the Endangered Species Act are expected to be affected by the proposed action, especially since the new reservoir will be an enclosed concrete structure that would not result in potential nesting sites or habitat for listed waterbirds. The letter from DFW includes the recommendation to use flat lens lighting to minimize the potential impacts of facility lighting on wildlife such as seabirds and the use of shade tree species to mitigate visual impacts.

Project actions may involve the necessary removal of onsite vegetation consisting of introduced, non-native floral species. DFW recommends maintaining a vegetated condition at the project site to help reduce sediment runoff and using bioswales to reduce sediment transport. The proposed project may include landscaping with trees in areas around the new reservoir, which would help to reduce the heat-island effects from urban sites as noted by DFW.

Based on comments received from the DFW, flat lens cut-off lighting will be utilized if the project requires the addition of any outdoor lighting. DFW has indicated that the use of flat lens cut off lighting will reduce the potential risk of the facility attracting migratory seabird species such as the wedge tailed shearwater. Existing vegetation will be preserved to the extent practical to maintain a vegetated condition at the project site. The feasibility of using shade trees to mitigate visual impacts and the heat island effect, and the use of bioswales to mitigate impacts to storm water quality will be considered during design of the project. Based on DFW comments, the BWS will utilize native Hawaiian plants to the extent feasible. The feasibility of these mitigation measures will depend on factors such as available space, soil conditions, budget, constructability, and maintenance requirements.

2.8. Archaeological, Architectural and Cultural Resources

Lands in Wailupe Valley may have been utilized for the cultivation of sweet potato, coconut, orange, *hala*, *ipu*, and *piligrass* according to the limited information that exists about the land use and settlement patterns of the established Hawaiian population prior to the first encounters with European voyagers in 1778. The land division process that began with the Organic Acts of 1845 and 1846 ultimately resulted in Land Commission Awards to residents and individuals who could substantiate use of the lands they were claiming. In 1924, Robert Hind purchased 2,090 acres of land in Wailupe Valley for the Hind-Clarke Dairy. In the post-World War II era and after the dairy business was sold, the Wailupe Valley lands were developed into residential subdivisions. Single-family homes in the surrounding area were mostly built in the 1950s, 1960s and 1970s.

The project site is not listed on the State or National Register of Historic Places and is within a geographic area that has experienced a long history of land disturbance and changes in land usage. No properties on the State and National Register of Historic Places are immediately adjacent to the project site. The nearest listed property is approximately one mile southeast of the project site near the junction of East Hind Drive with Kalanianaole Highway.

State Site Number	Site Name
80-14-9804	Carl and Francis Bayer Residence

Site preparation such as grading, excavation and trenching for the BWS reservoir, pump station and subsurface utility systems occurred before archaeological surveys were conducted. Record drawings indicate that the concrete structures were constructed in 1950 and placed into service in 1951. Grading and related construction activities were accomplished for Wailupe Valley Elementary School, which opened in September 1958. The property became Wailupe Community Park after the school closed in June 2009.

Because the project site was developed before there were statutory requirements for archaeological study or monitoring, there are no known archaeological studies previously performed at the project site. Because of this lack of studies, and because the project proposes excavation of a portion of the Wailupe Community Park, the State Historic Preservation Division (SHPD) recommended preparation of an Archaeological Inventory Survey (AIS) in support of the proposed project. An AIS has been prepared and reviewed by the SHPD.

Preparation of the AIS involved research on the traditional and historic settings of the project site, research of previous archaeological surveys in the vicinity of the project site, a reconnaissance level survey of the existing BWS facility, and limited subsurface testing within the Wailupe Community Park. The AIS documented two historic resources within the project site. The sites were given the designations State Inventory of Historic Places Site #50-80-15-7764 and #50-80-15-7936.

<u>Site #50-80-15-7764</u>

Site -7764 encompasses the BWS facility at 855 Alamuku Street. A reconnaissance-level survey (RLS) of site -7764 was performed as a part of the AIS. According to the AIS, the pump station building was designed by the early 20th century Hawaii architect, Hart Wood, who was one of the founders of Hawaii's regionalist design movement. The AIS states that the facility as a whole is an "exemplary example of a period related to a movement in the field of architectural design exclusive to Hawaii, during the WW II era." The AIS determined that site -7764 is eligible for listing in the Hawaii and National Register of Historic Places under Criteria "C" as an "excellent site example that embodies distinctive characteristics of a historic period, Hawaii-specific architectural design type, and as a representative BWS building type".

<u>Site #50-80-15-7936</u>

Site -7936 is located on the Wailupe Community Park parcel at 939 Hind Iuka Drive. Site -7936 consists of a mortared dressed-basalt retaining wall and concrete ditch along the property boundary with the BWS parcel at 855 Alamuku Street. The retaining wall and concrete ditch are likely associated with the former Wailupe Valley Elementary School. The AIS assessed site -7936 to be significant under Criteria "D" for its "potential to yield information important about the development of Wailupe Valley and construction of historic Aina Haina's public infrastructure."

A copy of the *Archaeological Inventory Survey Report for the Propposed Aina Haina 170’ Potable Reservoir No. 2 Project in Wailupe Ahupuaʻa, Kona District, Oʻahu Island, Hawaiʻi* is included in Appendix E.
Traditional and cultural practices are not known to have occurred at the project site within recent times because access to the premises is restricted to authorized BWS personnel via padlocked gates and the BWS facility has an intrusion detection system that is remotely monitored. Consultation was sought from several agencies and organizations: SHPD, Oahu Burial Council, Office of Hawaiian Affairs, Department of Hawaiian Home Lands, Association of Hawaiian Civic Clubs, Royal Hawaiian Academy of Traditional Arts, Aina Haina Community Association, and Kuliouou-Kalani Iki Neighborhood Board.

Impacts and Mitigation Measures

The project does not propose alterations to the Aina Haina 170’ Reservoir No.1 or the pump station building at site -7764. 7936 will be removed as part of the proposed project. However, the AIS determined that the site has been adequately documented and that no further documentation is required. As such, the AIS concluded that the proposed project will not have an adverse effect on site -7764.

The retaining wall and drainage structure that comprise site -7936 will be removed as part of the proposed project. However, the AIS determined that the site has been adequately documented and that no further documentation is required.

There are no known archaeological and cultural resources at the project site that would be endangered by project actions. No impacts to archaeological resources are anticipated because project actions would affect lands that have been previously disturbed and altered for urban development, including subsurface infrastructure.

Nonetheless, in the event that any unexpected historic remains or other potentially significant subsurface resources are encountered during the various phases of construction (e.g., excavation and trenching), the contractor will be required to halt construction activities and to immediately notify SHPD of the discovery. The BWS will prevent the disturbance or taking of any discovered archaeological, historic or cultural resources to the extent possible by instituting the described mitigation measures and enforcing their implementation by its contractors. Thus, project actions are expected to have no adverse impacts on the exercise of gathering rights, access or other customary activities by native Hawaiian or other ethnic group.

2.9. Visual Resources

The visual character of Wailupe Valley is dominated by single-family homes, churches, parks and public use facilities. Wailupe Valley encompasses the northeastern portion of the Aina Haina community. The Aina Haina area is characterized by suburban residential neighborhoods that were mostly developed in the 1950s, 1960s and 1970s; some municipal and institutional land uses (e.g., parks, libraries, schools, and churches); and commercial uses at the Aina Haina Valley Shopping Center, which is located along Kalanianaole Highway.

The BWS facility contributes to a line of adjacent building elements along Alamuku Street. There is onsite vegetation that buffers or softens the visual impact of the BWS facility (see Site Photographs in Appendix D).

Impacts and Mitigation Measures

The proposed project represents a continuation of existing urban development that would not significantly alter the visual character along Alamuku Street. Visual impacts of the new reservoir may be mitigated by various measures such as painting the reservoir a green color similar to the existing Aina Haina 170' Reservoir No. 1 and pump station building, and planting trees or other landscaping to shield the concrete structures. Comparative views of the BWS facility are included in Appendix D. No impacts to scenic vistas or view planes are anticipated to occur from the proposed project. If tree planting is proposed, the DFW suggests consultation the Kaulunani Urban and Community Forestry Program. The decision whether or not to install landscaping will be made during the design phase of the project.

At this time, no new lighting is anticipated as a part of this project. However, if it is later determined that exterior lighting is required, the BWS will consider the use of flat-lens lighting in order to mitigate any impacts due to lighting.

2.10. Noise

The project site is located in a developed urban area where the primary noise source is related to vehicular traffic along Alamuku Street, which is a two-lane residential connector roadway owned by the CCH. In general, there is low background noise in the vicinity of the project site.

Impacts and Mitigation Measures

Audible noise from demolition and construction activity is expected to be intermittent and unavoidable since construction vehicles, heavy equipment and impact tools generate noise as part of normal operations. The mitigation of noisy activities to inaudible levels will not be practical in all cases due to the intensity and exterior nature of the work. Ambient noise levels in the vicinity of the project site will therefore increase during construction periods. Quieter construction activities, such as building erection and equipment installation, may not be audible. Construction noise is temporary in nature and will cease upon completion of the project.

Project activities shall comply with the provisions of HAR Title 11, Chapter 46, “Community Noise Control.” The noise regulations require a noise permit if the noise level from construction activity is expected to exceed allowable levels stated in the Chapter 11-46 rules. It shall be the contractor’s responsibility to minimize noise by properly maintaining noise mufflers and other noise-attenuating equipment and to maintain noise levels within regulatory limits. If construction activities occur outside of the allowable timeframes designated for the noise permit (i.e., nighttime, Sunday, holiday) and exceed allowable noise levels, a noise variance must be obtained prior to commencement of construction activities, as required. The construction contractor will obtain the appropriate permit or approvals (e.g., Notice of Intent to Construct, Community Noise Permit, or Noise Variance). The BWS will ensure that the contractor complies with all permit conditions.

Potential noise impacts will also be mitigated by performing the majority of construction work during daytime hours (as opposed to night work), thereby avoiding the creation of construction noise impacts during nighttime hours. Daytime work will ensure minimal impacts to existing users adjacent to and in the vicinity of the project site.

The new reservoir and appurtenant facilities will operate in a similar manner to the existing Aina Haina 170’ Reservoir No. 1 and pumping equipment at the project site. Normal operation of the reservoirs and pumps may not be audible such that no mitigation is warranted.

2.11. Site Access, Circulation and Traffic

Vehicular access to the project site is via a 12-foot wide asphalt-concrete driveway with a padlock-secured gate along Alamuku Street. Concrete retaining walls delineate the boundaries of the BWS facility. Perimeter chain link fencing topped with barbed wire provides an additional deterrent to unauthorized entry. The BWS facility has an intrusion detection system consisting of alarms and video cameras that are remotely monitored. BWS personnel infrequently access the project site utilizing BWS vehicles as part of normal operations.

Kalanianaole Highway (State Route 72) is roughly one mile south of the project site. It is the primary arterial route connecting Aina Haina to the primary urban center and

to Hawaii Kai. Residential roadways provide access from Kalanianaole Highway to the project site. There are no known traffic concerns in the vicinity of the project site and residential traffic in the surrounding area is observed to be low.
Municipal bus and paratransit services on Oahu are under the purview of the CCH's Department of Transportation Services (DTS) and Oahu Transit Services, Inc. There is bus service to the Aina Haina area via Kalanianaole Highway to the following residential connector roadways: East Hind Drive, West Hind Drive, Hao Street, Hind Iuka Drive, and Ani Street. There are no bus stops along Alamuku Street; the nearest bus stops are located along Hind Iuka Drive.

Impacts and Mitigation Measures

No offsite road improvements are required as part of the proposed project and the existing driveway for the BWS facility will remain unchanged. The transportation of equipment and material to the site along with the removal of debris and construction waste from the site may cause intermittent and temporary inconveniences to residents who live in the immediate vicinity. The Honolulu Police Department (HPD) indicated in its letter dated July 23, 2014 that it "anticipates possible short-term impacts to neighborhood vehicular and pedestrian traffic on the roadway of Alamuku Street." Appropriate traffic control devices including warning signs, lights, barricades, cones, and other safety equipment will be installed and maintained by the contractor during the construction period as recommended by HPD. Traffic control will be directed by construction personnel or by law enforcement personnel, when necessary. HPD also recommends notifying the neighborhood board and affected homeowners of any traffic issues related to local ingress and egress within the area. No traffic lane closures or traffic detours are expected in conjunction with project activities; however, a traffic control plan shall be prepared prior to the commencement of the proposed project if lane closures or traffic detours are deemed necessary. The temporary closure of any portion of a CCH street or sidewalk for construction work requires a street usage permit from DTS. BWS will ensure that the access driveway to the project site is safe for pedestrians and bicyclists to cross. Any damage to the roadway and sidewalk area caused by construction activities will be restored to its original condition or better.

The majority of construction work and the moving of heavy equipment or construction-related supplies will be scheduled during daytime hours (as opposed to night work). The DTS recommends that transport of any construction materials and equipment should occur during off-peak traffic hours (8:30 a.m. to 3:30 p.m) in order to minimize disruption to traffic. At night and when work is not occurring, all associated construction equipment will be secured and appropriately sited to prevent obstructions to traffic.

It will be determined during the design phase whether the operation or transportation of any oversized and/or overweight vehicles and loads will be required during construction. The transport of oversized and/or overweight materials and equipment on State highway facilities requires a permit from the State of Hawaii, Department of Transportation (DOT).

Bus routes, bus stops and paratransit operations are not expected to be impacted by project actions. The temporary increase in traffic due to vehicles and equipment accessing the project site will cease upon the completion of construction activities. The operation of the new reservoir at the project site will not increase vehicular traffic or affect site access and circulation patterns such that no mitigation is warranted. BWS personnel will continue to infrequently access the project site for monitoring and maintenance purposes as part of normal operations.

2.12. Utilities (Water, Wastewater, Drainage)

The project site is developed and contains the BWS facility that was placed into service in 1951. The BWS facility contains an existing 0.5 MG reservoir and two pump units. The site is connected to the BWS municipal water system and the CCH's municipal sewer system. Drainage system infrastructure at the project site includes aboveground drainage channels and underground drain lines. The *Water System Standards* of the BWS require washout and overflow drainage lines for reservoirs. Stormwater runoff and discharges associated with current operations are conveyed to the CCH's municipal stormwater drainage system.

The BWS operates a "public water system" as defined in §11-20-1, HAR. As such, the BWS must comply with the *Rules Relating to Public Water Systems* as outlined in Chapter 11-20, HAR.

Impacts and Mitigation Measures

The proposed Aina Haina 170' Reservoir No. 2 will be connected to water, sewer, and drainage system infrastructure. The proposed project includes the installation of a water line that connects the new reservoir to the existing 16-inch influent-effluent line that currently supplies the Aina Haina 170' Reservoir No. 1. New washout and overflow drainage lines will be installed for the Aina Haina 170' Reservoir No. 2. The BWS will ensure that measures are taken so that the project does not result in damage to neighboring properties due to leaks. Any construction related damages will be investigated and addressed by the BWS.

Utility services to the project site may be disrupted during periods of work; however, this impact is considered short term and temporary. There are no long-term impacts associated with establishing new utility connections.

The project proposes construction of impermeable surfaces (concrete reservoir and paved perimeter) over existing permeable surfaces. Increasing the impermeable surface area at the project site will result in increased stormwater runoff flows. However, the proposed increase in impermeable surface area is small and is not expected to have an impact on existing drainage utilities. The DFW recommends exploring the use of vegetated bio-swales to reduce stormwater flows and improve stormwater quality. Bio-swales are vegetated areas designed to reduce stormwater velocity and promote percolation of stormwater (which reduces the quantity of stormwater that flows to drainage systems). The option of using bioswales will be explored during the design phase of the project.

A short-term and temporary impact of the project would occur from the generation of sediment-laden surface runoff during construction and demolition work. BMPs will be incorporated into a storm water management plan. Appropriate erosion control BMPs will be used to minimize the amount of soil transported in stormwater runoff during construction activities. All construction activities will comply with applicable Federal, State and County regulations and rules for erosion control as previously discussed in Section 2.4, Water Resources. The construction of the new reservoir and access road will increase impervious areas; however, the anticipated impact will be offset by incorporating design methods that reduce runoff from the site and promote groundwater recharge.

2.13. Power and Communications

Electrical power in the project area is provided by Hawaiian Electric Company, Inc. (HECO) via underground distribution lines. Telecommunications service in the project area is provided by Hawaiian Telcom and Oceanic Time Warner Cable via underground duct lines. The BWS facility receives power and communications service via underground duct lines to the pump station building. Control and monitoring systems for the Aina Haina 170' Reservoir No. 1 are already located in the pump station building.

Impacts and Mitigation Measures

Electrical, control, and monitoring systems for the new reservoir will be installed within the pump station building at the project site. Reportedly, the existing system has adequate capacity for additional controls such that no major construction is necessary to house the electrical, control, and monitoring systems for the Aina Haina 170' Reservoir No. 2.

Proposed demolition and construction activity has the potential to disrupt power and communication systems to the site but these effects are expected to be short-term and temporary. The proposed project will be coordinated with HECO and other service providers. The new reservoir and appurtenant facilities do not represent a substantial increase in energy consumption since the existing BWS facility already receives power and communications service for current operations at the project site. There are no long-term impacts associated with establishing new service connections for power and communications service.

2.14. Socio-Economic Characteristics

The project site is located within the CCH's East Honolulu planning region, which is generally characterized as a stable population area that is nearly built out. The CCH anticipates that the East Honolulu planning region will remain relatively stable because there is limited potential for expansion of the housing stock and commercial centers in this region. The census tract areas of Wailupe, Kuliouou and Aina Haina-Hawaii Loa Ridge have characteristically high (e.g., around and above $100,000) median household and family income. In 2010, the same census tract areas had a resident population of 12,039 inhabitants and 4,035 households (State of Hawaii Department of Business, Economic Development and Tourism, 2013).

Single-family homes in Aina Haina were mostly built in the 1950s, 1960s and 1970s. Schools in the project area include Aina Haina Elementary School and Holy Nativity School. The former Wailupe Valley Elementary School opened in September 1958 and closed in June 2009.

The project site is not occupied by BWS staff on a daily basis. BWS personnel infrequently travel to the project site as part of normal operations.

Impacts and Mitigation Measures

The proposed project, which will improve the reliability and storage capacity of the affected system, will not affect population levels, housing or schools. The BWS envisions no staffing increase from the installation of the new 0.5 MG reservoir and appurtenant facilities. The various phases of construction will create short-term jobs for people in design and construction.

2.15. Emergency Service Facilities and Shelters

Law enforcement is provided by HPD. The nearest HPD substation relative to the project site is located in Waikiki.

Fire protection services are provided by the Honolulu Fire Department (HFD). HFD's Station 23 is located along Kalanianaole Highway approximately one mile southeast from the project site.
Emergency service providers include critical care providers such as hospitals and clinics. The Island Urgent Care Clinic located across from Kahala Mall is approximately three miles southeast from the project site.

Aina Haina Elementary School is a designated hurricane evacuation shelter. It is located about one mile southwest of the project site. This shelter can accommodate and provide limited support to persons with special health needs.

Impacts and Mitigation Measures

No significant adverse impacts to police, fire, medical or emergency shelter services will occur from the proposed project. As indicated in its letter dated July 22, 2014, the HFD "determined that there will be no significant impact to fire department services" from the project.

2.16. Recreational Resources

The CCH's DPR operates and maintains County park facilities including Wailupe Community Park, which is adjacent to the project site. The Wailupe Community Park is located at the site of the old Wailupe Valley Elementary School, which consists of a number of single-story buildings. Existing playground equipment is located within 20 feet of the boundary of the Project Site.

Other recreational resources in the Aina Haina area include the Wailupe Valley Neighborhood Park, Aina Haina Nature Preserve, Aina Haina Community Park, Wailupe Beach Park, Nehu Park, and Kawaikui Beach Park.

Impacts and Mitigation Measures

The proposed project includes the acquisition of approximately 0.03 acres of land from the CCH's Wailupe Community Park parcel. The BWS will be mindful of existing structures (e.g., nearby playground equipment) and uses at Wailupe Community Park. At this time, it is believed that construction of the proposed project can occur from within BWS property. However, if construction activities must take place within the Wailupe Community Park property, the BWS will ensure that the existing playground equipment will not be damaged. The BWS will continue to consult with the DPR, which operates

Wailupe Community Park, throughout project to avoid or minimize the impacts of the proposed project in regards to public park facilities and services.

The proposed project creates no additional demand for recreational facilities such that no mitigation is warranted.

3. RELATIONSHIP TO PLANS, POLICIES, AND CONTROLS

3.1. State Land Use District

The State Land Use Law (Chapter 205, HRS) is intended to preserve, protect, and encourage the development of lands in the State for uses which are best suited to the public health and welfare for Hawaii's people. All lands in the State are classified into four land use districts by the State of Hawaii, Land Use Commission: Urban, Agricultural, Conservation, and Rural. Urban areas are characterized by residential neighborhoods, commercial enterprises, industrial development, and community facilities including public buildings. The project site is entirely located within the Urban District. The BWS facility at 855 Alamuku Street in Wailupe Valley is a permitted use within the Urban District.

3.2. Hawaii State Plan

The Hawaii State Plan (Chapter 226, HRS) outlines broad goals, policies and objectives to serve as guidelines for the future growth and development of the State. The excerpts below are Hawaii State Plan objectives, policies, and priority guidelines that pertain to the proposed project in Honolulu, Oahu. The BWS is a semi-autonomous government agency that manages Oahu's municipal water resources and distribution system to meet the needs of customers now and in the future. The proposed project to construct a new 0.5 MG potable water storage reservoir responds to the objectives and policies of the Hawaii State Plan with regards to water systems. The proposed increase in potable water storage capacity will improve the overall reliability and storage capacity of the existing water system to ensure that it continues to serve the needs of the affected community. The new reservoir would be sited adjacent to the existing 0.5 MG reservoir at the BWS facility in Wailupe Valley. The BWS has considered its facility needs along with the impacts of the proposed project on the surrounding community and the physical environment.

> *§226-11 Objectives and policies for the physical environment--land-based, shoreline, and marine resources.*
>
> *(a) Planning for the State's physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of the following objectives:*
>
> *(1) Prudent use of Hawaii's land-based, shoreline, and marine resources.*
>
> *(2) Effective protection of Hawaii's unique and fragile environmental resources.*
>
> *(b) To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of this State to:*
>
> *(3) Take into account the physical attributes of areas when planning and designing activities and facilities.*

(8) Pursue compatible relationships among activities, facilities, and natural resources.

§226-13 Objectives and policies for the physical environment--land, air, and water quality.

(a) Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives:

(1) Maintenance and pursuit of improved quality in Hawaii's land, air, and water resources.

(b) To achieve the land, air, and water quality objectives, it shall be the policy of this State to:

(2) Promote the proper management of Hawaii's land and water resources.

(3) Promote effective measures to achieve desired quality in Hawaii's surface, ground, and coastal waters.

(4) Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawaii's people.

(5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.

§226-14 Objective and policies for facility systems--in general.

(a) Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives.

(b) To achieve the general facility systems objective, it shall be the policy of this State to:

(1) Accommodate the needs of Hawaii's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans.

(2) Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities.

(3) Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user.

§226-16 Objectives and policies for facility systems - water.

(a) Planning for the State's facility systems with regard to water shall be directed towards achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capacities.

(b) To achieve the facility systems water objective, it shall be the policy of this State to:
(4) Assist in improving the quality, efficiency, service, and storage capabilities of water systems for domestic and agricultural use.

§226-26 Objectives and policies for socio cultural advancement – public safety.
(a) *Planning for the State's socio-cultural advancement with regard to public safety shall be directed towards the achievement of the following objectives:*
(1) *Assurance of public safety and adequate protection of life and property for all people.*
(2) Optimum organizational readiness and capability in all phases of emergency management to maintain the strength, resources, and social and economic wellbeing of the community in the event of civil disruptions, wars, natural disasters, and other major disturbances.

§226-27 Objectives and policies for socio cultural advancement – government.
(a) Planning the State's socio-cultural advancement with regard to government shall be directed towards the achievement of the following objectives:
(1) Efficient, effective, and responsive government services at all levels in the State.
(b) To achieve the government objectives, it shall be the policy of this State to:
(1) Provide for necessary public goods and services not assumed by the private sector.
(5) Assure that government attitudes, actions, and services are sensitive to community needs and concerns.

3.3. City and County of Honolulu General Plan

The CCH's General Plan sets forth broad statements of social, economic, environmental, and design objectives and policies which are desired over the long-term. The excerpts below are General Plan policies and objectives that pertain to the proposed project. The new 0.5 MG reservoir would help to ensure the continued delivery of water service to the affected community and is consistent with surrounding urban development. The BWS has considered the social, economic and environmental impacts of proposed water system improvements that respond to the needs of the community.

III. <u>Physical Development and Urban Design</u>
Objective A: To protect and preserve the natural environment.
Policy 1: Protect Oahu's natural environment, especially the shoreline, valleys, and ridges, from incompatible development.

Policy 7: Protect the natural environment from damaging levels of air, water, and noise pollution.

Objective B: To preserve and enhance the natural monuments and scenic views of Oahu for the benefit of both residents and visitors.

Policy 3: Locate roads, highways, and other public facilities and utilities in areas where they will least obstruct important views of the mountains and the sea.

V. Transportation and Utilities

Objective C: To maintain a high level of service for all utilities.

Policy 2: Provide improvements to utilities in existing neighborhoods to reduce substandard conditions.

Policy 3: Plan for the timely and orderly expansion of utility systems.

Objective D: To maintain transportation and utility systems which will help Oahu continue to be a desirable place to live and visit.

Policy 1: Give primary emphasis in the capital- improvement program to the maintenance and improvement of existing roads and utilities.

Policy 4: Evaluate the social, economic, and environmental impact of additions to the transportation and utility systems before they are constructed.

VII. Physical Development and Urban Design

Objective A: To coordinate changes in the physical environment of Oahu to ensure that all new developments are timely, well-designed, and appropriate for the areas in which they will be located.

Policy 5: Provide for more compact development and intensive use of urban lands where compatible with the physical and social character of existing communities.

Policy 6: Encourage the clustering of developments to reduce the cost of providing utilities and other public services.

Policy 8: Locate community facilities on sites that will be convenient to the people they are intended to serve.

Objective E: To create and maintain attractive, meaningful, and stimulating environments throughout Oahu.

Policy 5: Require new developments in stable, established communities and rural areas to be compatible with the existing communities and areas.

IX. Health and Education

Objective A: To protect the health of the people of Oahu.

Policy 3: Coordinate City and County health codes and other regulations with State and Federal health codes to facilitate the enforcement of air-, water-,and noise-pollution controls.

3.4. East Honolulu Sustainable Communities Plan

There are eight community-oriented plans for the CCH that are intended to help guide government action and decision-making. The vision of the East Honolulu Sustainable Communities Plan that was adopted in April 1999 is summarized below:

> *Contain the spread of urban development;*
> *Protect agricultural areas;*
> *Limit the potential for population and commercial growth;*
> *Protect and preserve significant scenic values and natural areas;*
> *Expand public access to mountain and shoreline areas; and*
> *Adapt the housing supply to accommodate changing demographics.*

The East Honolulu Sustainable Communities Plan recognizes that the region is nearly built out and its housing stock and infrastructure systems are aging. The project site is within the Urban Community Boundary, which represents the extent of urbanized areas within the East Honolulu district. The proposed project does not involve any new groundwater well development and is consistent with the vision for East Honolulu of minimal population growth and the long-term protection of community resources and adapting to changing community needs. The project supports the established community by providing adequate storage capacity for the existing potable water supply system in accordance with BWS standards and improving the overall reliability of the affected system.

3.5. City and County of Honolulu Land Use Ordinance

The LUO regulates land use in accordance with adopted land use policies, including the CCH's General Plan and the Development/Sustainable Community Plans. The zoning for the project site is R-7.5 Residential District. The DPP lists the following land use considerations in its letter dated August 4, 2014:

- A Public Infrastructure Map revision will be required for the proposed new reservoir.
- The LUO classifies the use as "Public Uses and Structures," which are allowed in all zoning districts.

The proposed reservoir is considered to be a public use or structure, in accordance with the following description from the LUO:

> *Uses conducted by or structures owned or managed by the federal government, the State of Hawaii or the city to fulfill a governmental function, activity or service for public benefit and in accordance with public policy.*

3.6. State Coastal Zone Management Program

Hawaii's Coastal Zone Management (CZM) program, established pursuant to Chapter 205A, HRS, as amended, is administered by the State of Hawaii, Office of Planning and provides for the beneficial use, protection, and development of the State's coastal zone. The CZM area consists of the entire state of Hawaii. The objective of the act is to protect, preserve, and restore recreational, historic, and scenic resources as well as implementing the state's ocean resources management plan and protecting coastal ecosystems. The act involves a system of permits to manage development within the coastal areas and encourages public participation.

Through the CZM program and pursuant to the Hawaii Coastal Zone Management Act (Chapter 205A, HRS, as amended), all counties have enacted ordinances establishing Special Management Areas (SMAs). Any significant development within the SMA requires a SMA permit from the appropriate County. On Oahu, the SMA permit is administered by the DPP and acted upon by the City Council pursuant to Chapter 25, Revised Ordinances of Honolulu. The project site is not located within the SMA.

The proposed project is limited to a BWS-owned property that is away from coastal recreation areas. The project does not affect the use of or access to coastal or other public recreational opportunities. The installation of the second 0.5 MG reservoir at the existing BWS facility will be consistent with the CZM objectives and policies pursuant to Section 205A-2, HRS.

(1) Recreational Resources;
(A) Provide coastal recreational opportunities accessible to the public.

(2) Historic resources;
(A) Protect, preserve, and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

(4) Coastal ecosystems;
(A) Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

(5) Economic uses;
(A) Provide public or private facilities and improvements important to the State's economy in suitable locations.

3.7. Department of Health, Water Quality Standards (Chapter 11-54, HAR)

The State Water Quality Standards are established pursuant to Chapter 342D, HRS. The DOH is delegated authority to administer the State water quality program pursuant to §342D-4. Administrative rule for implementation of the State water quality program is promulgated through Chapters 11-54 and 11-55 HAR.
In its comment letter dated September 1, 2015, the Clean Water Branch (CWB) of the DOH commented that the rules set forth in Chapter 11-54 and 11-54, HAR. In particular, the CWB specified sections 11-54-1.1, 11-54-3, and 11-54-4 through 8. Applicable sections of the administrative rule are included in this section. For brevity, specific criteria and tables are omitted. This section includes discussion of the broader goals of the State water quality program and how they apply to the project.

§11-54-1.1. General policy of water quality antidegradation.

(a) Existing uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.

(b) Where the quality of the waters exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the director finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the state's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the director shall assure water quality adequate to protect existing uses fully. Further, the director shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control.

(c) Where existing high quality waters constitute an outstanding resource, such as waters of national and state parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected.

(d) In those areas where potential water quality impairment associated with a thermal discharge is involved, the antidegradation policy and implementing method shall be consistent with section 316 of the Clean Water Act.

§11-54-3. Classification of water uses.

(a) The following use categories classify inland and marine waters for the purposes of applying the standards set forth in this chapter, and for the selection or definition of appropriate quality parameters and uses to be protected in these waters. Storm water discharge into State waters

shall be allowed provided it meets the requirements specified in this section and the basic water quality criteria specified in Section 11-54-4.

(b) Inland Waters

(2) Class 2. The objective of class 2 waters is to protect their use for recreational purposes, the support and propagation of aquatic life, agricultural and industrial water supplies, shipping, and navigation. The uses to be protected in this class of waters are all uses compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation in and on these waters. These waters shall not act as receiving waters for any discharge which has not received the best degree of treatment or control compatible with the criteria established for this class. No new treated sewage discharges shall be permitted within estuaries. No new industrial discharges shall be permitted within estuaries, with the exception of:

(A) Acceptable non-contact thermal and drydock or marine railway discharges within Pearl Harbor, Oahu;

(B) Storm water discharges associated with industrial activities (defined in 40 C.F.R. sections 122.26(b)(14) and (b)(15), except (b)(15)(i)(A) and (b)(15)(i)(B)) which meet, at the minimum, the basic water quality criteria applicable to all waters as specified in section 11-54-4(a), and all applicable requirements specified in chapters 11-55, titled "Water Pollution Control"; and

(C) Discharges covered by National Pollutant Discharge Elimination System (NPDES) general permit, approved by the U.S. Environmental Protection Agency and issued by the Department in accordance with 40 C.F.R. section 122.28 and all applicable requirements specified in chapter 11-55, titled "Water Pollution Control".

§11-54-4. Basic water quality criteria applicable to all waters.

(a) All waters shall be free of substances attributed to domestic, industrial, or other controllable sources of pollutants, including:

(1) Materials that will settle to form objectionable sludge or bottom deposits;

(2) Floating debris, oil, grease, scum, or other floating materials;

(3) Substances in amounts sufficient to produce taste in the water or detectable off-flavor in the flesh of fish, or in amounts sufficient to produce objectionable color, turbidity or other conditions in the receiving waters;

(4) High or low temperatures, biocides, pathogenic organisms, toxic, radioactive, corrosive, or other deleterious substances at levels or in combinations sufficient to be toxic or harmful

to human, animal, plant, or aquatic life, or in amounts sufficient to interfere with any beneficial use of the water;

(5) Substances or conditions or combinations thereof in concentrations which produce undesirable aquatic life; and

(6) Soil particles resulting from erosion on land involved in earthwork, such as the construction of public works; highways; subdivisions; recreational, commercial, or industrial developments; or the cultivation and management of agricultural lands.

(c) The requirements of paragraph (a)(6) shall be deemed met upon a showing that the land on which the erosion occurred or is occurring is being managed in accordance with soil conservation practices acceptable to the applicable soil and water conservation district and the director, and that a comprehensive conservation program is being actively pursued, or that the discharge has received the best degree of treatment or control, and that the severity of impact of the residual soil reaching the receiving body of water is deemed to be acceptable.

§11-54-5. <u>Uses and specific criteria applicable to inland waters.</u> Inland water areas to be protected are described in section 11-54-5.1, corresponding specific criteria are set forth in section 11-54-5.2; water body types are defined in section 11-54-1.

§11-54-5.1. <u>Inland water areas to be protected.</u>

(a) Freshwaters.

(1) Flowing waters: perennial streams and rivers, intermittent streams, springs and seeps, and man-made ditches and flumes that discharge into any other waters of the State.

(C) Class 2.: All flowing waters in areas not otherwise classified.

All flowing waters in classes 1 and 2 in which water quality criteria exceeds the standards specified in this chapter shall not be lowered in quality unless it has been affirmatively demonstrated to the director that the change is justifiable as a result of important economic or social development and will not interfere with or become injurious to any assigned uses made of, or presently in, those waters. This statement of antidegradation policy does not limit the applicability of the policy in section 11-54-1.1 to the whole chapter.

The proposed project is not located adjacent to any waterbodies. However, stormwater runoff from the project site enters the CCH municipal storm sewer system and discharges into Wailupe Stream, which is designated an Inland Class 2 at the point of discharge.

As discussed in Section 2.4 above, the project will result in an increase in impermeable area. However, because the increase in impermeable area will be less than one acre, the project will not result in significant impacts to stormwater quantity or quality. Nevertheless, the use of permanent BMP and LID measures will be considered during design. BMP and LID feasibility will be dependent on soil conditions, space limitations, cost, impacts to other structures (e.g., reservoir and retaining walls), and maintenance considerations.

Construction activities such as soil disturbance and material storage may also result in temporary impacts to stormwater runoff quality. The construction contractor will be required to implement temporary BMPs to mitigate this impact. If required by the CWB, an NPDES permit will be obtained for any discharges related to construction.

Given the mitigation measures stated above and the relatively small area covered by the proposed project (less than one acre), the project will not result in any significant impacts to the water quality of any State waterbodies. The existing uses of State waterbodies will be maintained. The project will not entail any thermal discharges. The proposed project will not affect recreational uses or the propagation of fish, shellfish or wildlife. Temporary BMP measures during construction will prevent the discharge of 1) materials that will settle to form objectionable sludge or bottom deposits, 2) floating debris, oil, grease, scum, or other floatable materials, 3) substances in amounts sufficient to produce taste in the water or detectable off-flavor in the flesh of fish, 4) high or low temperatures, biocides, pathogenic organisms, toxic, radioactive, corrosive, or other deleterious substances at levels or in combinations sufficient to be toxic or harmful to humans, animal plant, or aquatic life, or in amounts sufficient to interfere with any beneficial uses of the water, 5) substances or conditions or combinations thereof in concentrations which produce undesirable aquatic life, or 6) soil particles resulting from erosion on land involved in earthwork, such as the construction of public works, highways, subdivisions, recreational, commercial, or industrial developments, or the cultivation and management of agricultural lands.

4. POSSIBLE ALTERNATIVES

4.1. No-Action

The Aina Haina 170' Reservoir No. 2 would not be constructed as a result of maintaining status quo. The total reservoir capacity of the affected system would therefore remain at 1.5 MG. There would be no new connections to on-site drainage infrastructure and the flat, vacant area would continue to remain vacant for the foreseeable future. The design and operation of the Aina Haina 170' Reservoir No. 1 and pump station at the project site would remain unchanged.

No action implies that there would be no commitment of funding or capital improvement costs and no effort to construct a new reservoir that would address a storage need for the affected system. It is important to note that the storage shortfall does not represent an actual restriction to existing BWS customers under typical conditions; BWS standards require additional storage capacity to accommodate actual usage in the system. This excess storage can be used during unusual circumstances (e.g., power outages) or to accommodate unusually high demand for a short period of time; the additional storage capacity increases reliability of the potable water system to conform to BWS water system standards.

As a result of the no-action alternative, customers in the service area will continue to be susceptible to interruptions in water service during unusual circumstances, such as power outages. The affected system would not comply with BWS standards for storage requirements as a result of no action.

4.2. Delayed Action

A delayed action implies that a project of similar scope and size to the proposed action would occur at an unspecified future date. The environmental impacts resulting from a delayed action are generally expected to be the same as the proposed action so long as environmental conditions remain similar to the evaluated conditions described in this EA.

Construction of a new reservoir at a later date may result in increased construction costs due to inflation, changes in economic conditions or the labor supply, and extend storage capacity levels below BWS standards for the area. Building materials and labor costs tend to increase with time. A delayed action may therefore necessitate a greater funding commitment for water system improvements. Hence, a delayed action is not favorable from the perspective of the BWS.

4.3. Alternate Location

A new 0.5 MG reservoir constructed at an alternate location somewhere within the affected 170' System would avoid impacts to Wailupe Community Park and surrounding residential properties. The new reservoir could be constructed at an existing BWS facility or at a new facility.

The Niu Valley 170’ Reservoir is the only other reservoir in the affected 170’ system; therefore, the BWS facility that houses the Niu Valley 170’ Reservoir would be a logical alternative location. The Niu Valley 170’ Reservoir facility (herein referred to as the “alternate site”) is located on two BWS-owned parcels (TMKs 3-7-011: 013 and 3-8-014: 029) on a ridge overlooking Niu Valley.

An additional 0.5 MG reservoir could possibly be accommodated at the alternate site; however, this would involve significant modifications of the alternate site. The BWS facility at the alternate site is cut into the hillside above Niu Valley, and there is currently no level area for placement of a second reservoir. As such, constructing a second reservoir at this facility would involve significant excavation of a large portion of the hillside and construction of retaining walls. This would incur a significant additional cost on the project. Additionally, this area has a history of rockfall issues. Further studies would be required to determine whether expansion of the facility would increase the risk of rockfall to the residential homes located below the alternate site.

Also, the proposed project involves construction of a 0.5 MG reservoir, whereas the alternate site houses a 1.0 MG reservoir. Two reservoirs of dissimilar size and capacity are difficult to operate as opposed to two identically-sized reservoirs. The BWS could construct a second 1.0 MG reservoir that has a similar capacity, spillway elevation and dimensions as the Niu Valley 170’ Reservoir. This option would result in excess storage capacity and would involve a greater funding commitment for a larger, enclosed, reinforced-concrete reservoir structure as compared to the proposed action.

Because the Aina Haina 170’ Reservoir facility has an existing level area suitable for placement of a second 0.5 MG reservoir, that location is preferred to the alternate site.

As another option, the BWS could acquire land and construct a completely new facility to house the needed 0.5 MG reservoir. Open land in this area of the size needed is difficult to find. This option is cost-prohibitive since it requires the acquisition of prime, expensive land of substantial size, the construction of new water main connections, new utility connections (e.g., electricity, telecommunications, and drainage), and perhaps an access road. Furthermore, any new site that has not already been developed for use is expected to involve grading and excavation, which may result in greater impacts on the environment as compared to the proposed action. The options to site a new reservoir at an alternate location are therefore possible but less desirable than the proposed action.

Consequently, the BWS has concluded that the proposed action is a more practical and cost-effective use of existing resources.

4.4. Construct New Reservoir on Existing Site (the Preferred Alternative)

The proposed action involves siting a new 0.5 MG reservoir at an existing BWS facility in Wailupe Valley and upon land that was already graded and prepared for use. A geologic survey of the affected area confirmed shallow cut-and-fill conditions with relatively shallow depths to basalt. It is anticipated that a conventional foundation on the underlying basalt stratum can support the proposed concrete reservoir. There are no indications of settlement or poor soil conditions at the project site. The proposed BWS project will not alter or affect the integrity of the existing reservoir and pump station building. Both structures were built in the 1950s, are well maintained, and will remain in service after construction of the proposed improvements. Traditional and cultural practices are not known to have occurred on the property within recent times because access to the project site is restricted to authorized BWS personnel via padlocked gates.

The proposed Aina Haina 170' Reservoir No. 2 will provide additional reservoir capacity that improves the reliability of the affected system in fulfillment of project objectives. Installing the new reservoir at an existing facility is a prudent use of public resources since the supporting infrastructure is already in place and can accommodate a second reservoir.

Demolition and replacement of the affected portion of the retaining wall and concrete gutter along the rear property line is expected to be necessary as part of the project. Project activities are expected to generate short-term environmental impacts such as fugitive dust, noise, intermittent traffic, solid waste, and potential disruptions to utility services that would cease upon project completion. BMPs will be used to mitigate these impacts to the extent practical. The new reservoir with similar capacity, spillway elevation and dimensions as the Aina Haina 170' Reservoir No. 1 will be consistent with the existing character and views of urban development along Alamuku Street. The proposed action is therefore the preferred alternative that addresses project objectives with minimal environmental impacts.

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5. PERMITS AND APPROVALS

Although exact permitting and approval requirements will be determined during the design phase, the following list contains permits and approvals that may be required for the proposed project:

State of Hawaii

- National Pollutant Discharge Elimination System Permit
- Community Noise Permit
- Community Noise Variance
- Non-Covered and/or Covered Source Permit (Air Quality)
- Lane Use Permit for Construction Work
- Oversized and Overweight Vehicles on State Highways Permit

City and County of Honolulu

- Building Permit
- Grubbing, Grading, and Stockpiling Permit
- Erosion Control Plan/Best Management Practices
- Indirect Drain Connection License
- Industrial Wastewater Discharge Permit
- Street Usage Permit for Construction
- Public Infrastructure Map (PIM) Amendment
- Subdivision Application

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6. DETERMINATION

The BWS has issued a FONSI determination for the proposed project, which is not expected to have a significant impact on the physical or human environment. The supporting rationale for this finding as set forth in HAR Title 11, Chapter 200, Section 12 is discussed below.

(1) Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;

Land acquisition, the installation of a new reservoir along with its connection to onsite draining infrastructure, the extension of an access road within the project site, and the realignment of a portion of the retaining wall will not endanger any natural or cultural resources. The construction contractor shall stop work and contact SHPD immediately in the event any unanticipated buried archaeological or cultural resources are encountered.

(2) *Curtails the range of beneficial uses of the environment;*

No beneficial uses of the environment will be curtailed as a result of the proposed project, which represents a facility improvement for the BWS potable water supply and distribution system for the East Honolulu communities of Wailupe Peninsula, Aina Haina, Niu Valley and Kuliouou. The installation of the new 0.5 MG reservoir at the existing BWS facility in Wailupe Valley is a continuation of the beneficial use of the project site for a public purpose.

(3) 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 proposed project would be in conformance with State Environmental Policy, inclusive of its individual policies, goals, and guidelines for population growth; natural resources; biological resources; transportation; energy; and culture, as discussed in the individual resource categories throughout this EA.

(4) Substantially affects the economic welfare, social welfare, and cultural practices of the community or State;

The proposed project does not substantially or negatively affect the economic or social welfare and cultural practices of the community or State. The project creates short-term jobs for people in design and construction. The installation of the new 0.5 MG reservoir and appurtenant facilities is not expected to negatively affect the cultural practices of the community or State.

(5) Substantially affects public health;

Public health will not be adversely affected during the demolition and construction phases of the proposed project. Short-term and temporary effects such as surface runoff, fugitive dust, noise, intermittent traffic, solid waste, and potential disruptions to utility services are expected to cease upon project completion. The implementation of construction BMPs will minimize temporary impacts. Completion of the project would increase potable water storage capacity for the affected system and improve the overall reliability and redundancy of this water system to better meet the needs of the affected community.

(6) Involves substantial secondary impacts, such as population changes or effects on public facilities;

No substantial secondary impacts such as population shifts are anticipated from the proposed project, which represents a continuation of normal water system service by the BWS. The increase in potable water storage capacity allows the water system to better accommodate short periods of unusually high water demand. The proposed improvements help to maintain service during power outages.

(7) Involves a substantial degradation of environmental quality;

The proposed project is not expected to degrade environmental quality. Environmental impacts that may occur during the various phases of construction will be mitigated through the implementation of construction BMPs, as appropriate. Appropriate mitigation measures have been identified throughout this EA.

(8) Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions;

The proposed project that improves the reliability and redundancy of the water system represents a long-term commitment by the BWS to provide municipal water and distribution services to the community. The proposed project is not part of or associated with a supplemental future action.

(9) Substantially affects a rare, threatened, or endangered species, or its habitat;

No species listed by the FWS or in the Endangered Species Act are expected to be affected by the proposed project. The project site does not contain habitat for proposed, candidate, or listed threatened or endangered species.

(10) Detrimentally affects air or water quality or ambient noise levels;

Short-term impacts to air quality, water quality or ambient noise levels may occur during construction and demolition. No State or Federal air quality or water quality standards should be violated during or after demolition and construction. Environmental impacts will be mitigated through proper construction techniques and compliance with applicable DOH rules and regulations. The new 0.5 MG potable water storage reservoir and appurtenant facilities are not expected to negatively impact ambient air quality and background noise levels since proposed improvements represent a continuation of current functions and activities at the project site.

(11) 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 project site is not situated within an environmentally sensitive area and is not anticipated to affect such areas.

(12) Substantially affects scenic vistas and view planes identified in county or state plans or studies; or

The new 0.5 MG reservoir will not obstruct or affect scenic vistas and view planes. Landscaping may further reduce the visual impact of the proposed reservoir.

(13) Requires substantial energy consumption.

The new reservoir is not anticipated to cause a substantial increase in energy consumption since it represents a continuation of current operations that already receive power and communications service.

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7. PUBLIC AGENCY REVIEW AND CONSULTATION

7.1. Pre-Assessment Consultation

The consulted agencies, organizations, and individuals are listed below. There were thirteen (13) formal responses to the pre-assessment consultation letter, as indicated by the ✓ below. Comments and responses are included in Appendix F.

Federal Agencies

✓ U.S. Fish and Wildlife Service

State of Hawaii

Department of Land and Natural Resources
- Commission on Water Resource Management
- ✓ State Historic Preservation Division
- Oahu Island Burial Council
- ✓ Division of Forestry and Wildlife
- ✓ Land Division
- ✓ Engineering Division

Department of Health
- Office of Environmental Quality Control
- Clean Air Branch
- ✓ Clean Water Branch
- ✓ Environmental Planning Office
- Environmental Management Division
- Indoor and Radiological Health Branch

Office of Hawaiian Affairs

Department of Hawaiian Home Lands

Department of Education
- Honolulu District Office

Hawaii State Public Library System
- Hawaii and Pacific Section, Documents Center
- Aina Haina Public Library

Senator Sam Slom (District 9)

Representative Mark Hashem (District 18)

City and County of Honolulu

Department of Budget and Fiscal Services

✓ Department of Design and Construction

Department of Environmental Services

✓ Department of Planning & Permitting

City and County of Honolulu (continued)

✓ Department of Parks and Recreation
✓ Department of Transportation Services
✓ Honolulu Fire Department
✓ Honolulu Police Department
Councilmember Stanley Chang (Honolulu City Council District 4)
Neighborhood Commission Office
Kuliouou-Kalani Iki Board No. 2

Utilities

Hawaiian Electric Company

Organizations and Associations

Aina Haina Community Assocation
Association of Hawaiian Civic Clubs
Royal Hawaiian Academy of Traditional Arts

Neighboring or Nearby Property Owners and Recorded Lessees

3-6-016: 024
3-6-016: 025
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3-6-016: 032
3-6-016: 034
3-6-016: 035
3-6-016: 036
3-6-016: 037
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3-6-018: 058
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3-6-018: 060
3-6-018: 061
3-6-018: 062
3-6-018: 063
3-6-018: 064

7.2. Draft EA Consultation

The Following agencies, organizations and individuals were consulted during the public review period of the Draft EA. A total of 18 of these parties formally replied with comment letters, as indicated by the ✓ below. Comments and responses are included in Appendix G.

Federal Agencies

U.S. Fish and Wildlife Service

State of Hawaii

Department of Land and Natural Resources
- Commission on Water Resource Management
- ✓ State Historic Preservation Division
- Oahu Island Burial Council
- ✓ Office of Conservation and Coastal Lands
- ✓ Division of Forestry and Wildlife
- ✓ Land Division
- ✓ Engineering Division

Department of Health
- ✓ Office of Environmental Quality Control
- ✓ Clean Air Branch
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Office of Hawaiian Affairs

✓ Department of Hawaiian Home Lands

Department of Education
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3-6-018: 064

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APPENDIX A

CCH Storm Water BMP Guide (por.)

Storm Water BMP Guide

FINAL

December 2012

By:
City and County of Honolulu
Department of Planning and Permitting

E Mālama I Ka Wai Ola
Protect our waters…
FOR LIFE

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Acronyms and Abbreviations

BMP	Best Management Practice
cfs	cubic feet per second
cu-ft	cubic feet
ENV	Department of Environmental Services, City and County of Honolulu
EPA	Environmental Protection Agency, United States
ft	feet
hr	hour
in	inches
LID	Low Impact Development
min	minutes
sec	seconds
SPCC	Spill Prevention Control and Countermeasure
sq-ft	square feet
WQF	Water Quality Flow
WQV	Water Quality Volume

INTRODUCTION

The City and County of Honolulu Rules Relating to Storm Drainage Standards (*Rules*) specifies that regulated new development and redevelopment projects include Low Impact Development (LID) Site Design Strategies, Source Control Best Management Practices (BMPs), and Post-Construction Treatment Control BMPs to meet water quality criteria. This Storm Water BMP Guide provides general guidelines to support their implementation. More detailed information may be found in the *City and County of Honolulu Storm Water BMP Manual, New Development and Redevelopment*, which may be found on the City's website.

Document Organization

Chapter 1 provides descriptions of the five site design strategies that must be considered for regulated projects if applicable

Chapter 2 provides the minimum requirements for the 12 source control BMPs that must be considered for regulated projects if applicable.

Chapter 3 provides design guidelines for those Treatment Control BMPs which are considered most appropriate for the City and County of Honolulu. It includes numeric sizing criteria to calculate the Water Quality Volume (WQV) and Water Quality Flow Rate (WQF), general design requirements for all Treatment Control BMPs that include infiltration as a pollutant removal/treatment mechanism, and specific BMP design and sizing information.

Reference are provided at the end of the document.

1. SITE DESIGN STRATEGIES

Low Impact Development (LID) is a storm water management strategy concerned with maintaining or restoring the natural hydrologic functions of a site to achieve natural resource protection objectives and fulfill environmental regulatory requirements. LID employs a variety of natural and built features that reduce the rate of runoff, filter out its pollutants, and facilitate the infiltration of water into the ground. By reducing water pollution and increasing groundwater recharge, LID helps to improve the quality of receiving surface waters and stabilize the flow rates of nearby streams.

The goal of LID site design is to reduce the hydrologic impact of development and to incorporate techniques that maintain or restore the site's hydrologic and hydraulic functions. The optimal LID site design minimizes runoff volume and preserves existing flow paths. On the following pages are presented the five strategies considered applicable for new development and redevelopment projects.

CONSERVE NATURAL AREAS, SOILS, AND VEGETATION

The conservation of natural areas, soils, and vegetation helps to retain numerous functions of predevelopment hydrology, including rainfall interception, evapotranspiration, and infiltration. Maximizing these functions will thereby reduce the amount of runoff that must be treated. Protection of mature trees and vegetation provides habitat, prevents erosion, captures significant rainfall, provides summer shading, and reduces runoff volume and velocity which protects and enhances downstream water quality. Specific measures are:

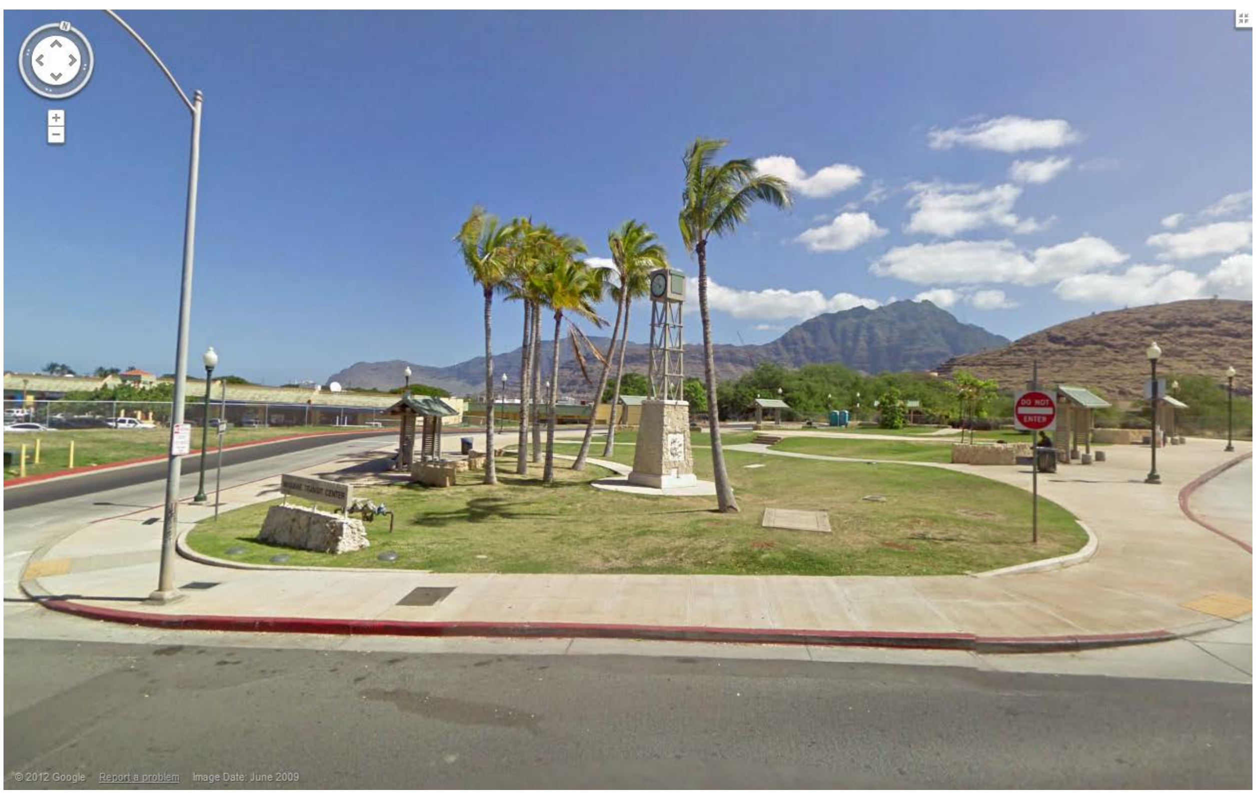
- Preserve/protect riparian buffers
- Preserve/protect wetlands
- Preserve/protect natural flow pathways
- Preserve/protect steep slopes
- Preserve/protect sensitive environmental areas.
- Preserve/protect undisturbed vegetated areas/corridors.
- Preserve native trees and restrict disturbance of soils beneath tree canopies.
- Limit construction activities and disturbances to areas with previously disturbed soils.
- Avoid disturbing vegetation and soil on slopes and near surface waters.
- Leave an undisturbed buffer along both sides of natural streams.

Waaloa Way

MINIMIZE IMPERVIOUS SURFACES

The increased volume, increased velocity, and discharge duration of storm water runoff from developed areas has the potential to accelerate downstream erosion and impair stream habitat in natural drainages. Studies have demonstrated a direct correlation between the degree of imperviousness of an area and the degradation of its receiving waters. Impervious surfaces (such as pavement and concrete) can neither absorb water nor remove pollutants, and thus the natural purification characteristics are lost. Reducing impervious surfaces to the minimum amount needed retains the permeability of the project site, allowing natural processes to filter and reduce non-point sources of pollution. Specific measures are:

- Use open space or hybrid street plan instead of grid and curvilinear
- Reduce sidewalk widths
- Maximize utilization of compact car spaces in parking areas
- Reduce parking stalls in areas near Transit Centers
- Incorporate shared parking areas and driveways
- Reduce driveway sizes
- Consider clustering buildings that require less driveways and pathways;

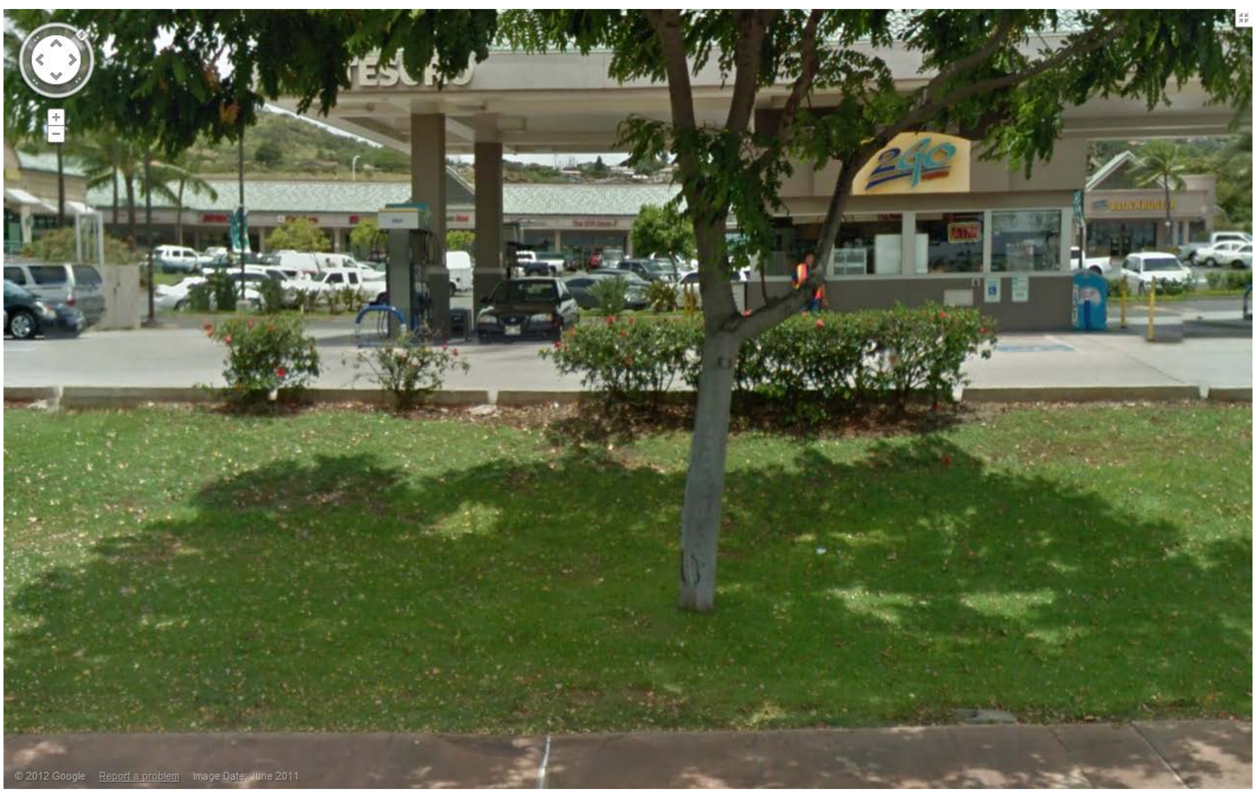


Waianae Transit Center

DIRECT RUNOFF TO LANDSCAPED AREAS

Any impervious surface that drains into a catch basin, area drain, or other conveyance structure is a “directly connected impervious area (DCIA).” As storm water runoff flows across parking lots, roadways, and paved areas, the oils, sediments, metals and other pollutants are collected and concentrated. If this runoff is collected by a drainage system and carried directly along impervious gutters or in closed underground pipes, it has no opportunity for filtering by plant material or infiltration into the soil. It also increases in speed and volume, which may cause higher peak flows downstream, and may require larger capacity storm drain systems, increasing flood and erosion potential. Solutions that reduce DCIA prevent runoff, detain or retain surface water, attenuate peak runoff rates, benefit water quality and convey storm water. Specific measures are:

- Design roof drains to flow to vegetated areas
- Direct flow from paved areas to stabilized landscaped/vegetated areas
- Grade paved areas to achieve sheet flow to landscaped areas
- Break up flow directions from large paved surfaces



Kapolei Marketplace

2. SOURCE CONTROL BMPS

Proactively controlling pollutants at their source is fundamental to effective stormwater quality management. There are a number of items that can be routinely designed into a project that function as source controls once a project is completed. They include such items as marking new drain inlets and posting informational signs; improving landscape planning and efficient irrigation methods; using water quality friendly building materials; properly designing outdoor material and trash storage areas; and permanently protecting slopes and channels from erosion. They also include design features for specific workplace or other activity areas such as vehicle washing areas, outdoor processing areas, maintenance bays, and fueling areas.

Design of BMPs to control workplace exposure to pollutants is guided by two general principles:

- Prevent storm water from contacting work areas. Work and storage areas should be designed to prevent storm water runoff from passing through shipping areas, vehicle maintenance yards, and other work places before it reaches storm drains. The objective is to prevent the discharge of water laden with grease, oil, heavy metals and process fluids to surface waters or sensitive resource areas.
- Prevent pollutants from contacting surfaces that come into contact with storm water runoff. Precautionary measures should be employed to keep pollutants from contacting surfaces that come into contact with runoff. This means controlling spills and reviewing operational practices and equipment to prevent pollutants from coming into contact with storm or wash water runoff.

The most common Source Control BMPs are the following, and are presented herein:

- Landscaped areas
- Automatic irrigation systems
- Storm drain Inlets
- Vehicle/equipment fueling
- Vehicle/equipment repair
- Vehicle/equipment washing/cleaning
- Loading docks
- Outdoor trash storage
- Outdoor material storage
- Outdoor work areas
- Outdoor process equipment operations
- Parking areas

The following information is provided for each of the above-listed BMPs:

- Brief description/approach
- Design guidelines
- Operations & Maintenance recommendations

LANDSCAPED AREAS

Description / Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the maximum extent possible, maximize natural water storage and infiltration opportunities, anMinimumd protect slopes and channels.

Design Guidelines

- Conserve Natural Areas to the extent possible
- Maximize Natural Water Storage and Infiltration Opportunities to the extent possible
- Protect Slopes and Channels

O&M Recommendations

- Do not use pesticides and fertilizers during wet weather or when rain is forecast, and minimize their use during dry weather.
- Do not blow or rake leaves, grass, or garden clippings into the street, gutter, or storm drain.
- Do not apply any chemicals (insecticide, herbicide, or fertilizer) directly to surface waters, unless the application is approved and permitted by the state.
- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures on exposed soils.
- Check irrigation schedules so pesticides will not be washed away and to minimize non-storm water discharge.

3. TREATMENT CONTROL BMPS

Treatment Control BMPs are engineered technologies designed to remove pollutants from storm water runoff prior to discharge to the storm drain system or receiving waters. This chapter addresses BMP numeric sizing criteria, general requirements for infiltration BMPs, and individual BMP fact sheets.

NUMERIC SIZING CRITERIA

This section presents the methodology for calculating the Water Quality Volume (WQV) and Water Quality Flow Rate (WQF), which are used to size the majority of the Treatment Control BMPs.

Water Quality Volume

The Water Quality Volume (WQV) is calculated using the following equation:

$$\boldsymbol{WQV = PCA \times 3630}$$

Where:	WQV	=	water quality design volume (cubic feet)
	P	=	design storm runoff depth (inches)
	C	=	volumetric runoff coefficient
	A	=	total drainage area (acres)

As specified in the *Rules*, a design storm runoff depth of 1 inch shall be used. The volumetric runoff coefficient shall be calculated using the following equation as developed by EPA for smaller storms in urban areas:

$$\boldsymbol{C = 0.05 + 0.009I}$$

Where:	C	=	volumetric runoff coefficient
	I	=	percent of impervious cover, expressed as a percentage

A graph presenting the relationship between the percent of impervious cover and the unit water quality design volume for a 1-inch runoff depth is shown in Figure 1.

Water Quality Flow

The design water quality flow rate (WQF) is calculated using the Rational Formula:

$$\boldsymbol{WQF = CiA}$$

Where:	WQF	=	water quality design flow rate (cubic feet per second)
	C	=	runoff coefficient
	i	=	peak rainfall intensity (inches per hour)
	A	=	total drainage area (acres)

As specified in the *Rules*, a peak rainfall intensity of 0.4 inches per hour shall be used. The runoff coefficient shall be determined from Table 1 below, based on the drainage area, and shall be, at a minimum, the midpoint of the given range of values. The higher value should be used if soil conditions indicate that pervious areas will have little infiltration/interception potential. For drainage areas containing multiple land uses, the following formula may be used to compute a composite weighted runoff coefficient:

$$C_c = \left(\sum_{i=1}^{n} C_i A_i \right) \Big/ A_t$$

Where: C_c = composite weighted runoff coefficient
$C_{1,2,\ldots n}$ = runoff coefficient for each land use cover type
$A_{1,2,\ldots n}$ = drainage area of each land use cover type (acres)
A_t = total drainage area (acres)

Table 1: Runoff Coefficients for Water Quality Flow Calculations

Type of Drainage Area	Runoff Coefficient
Business	
Downtown areas	0.70 – 0.95
Neighborhood areas	0.50 – 0.70
Residential	
Single-family areas	0.30 – 0.50
Multi-units, detached	0.40 – 0.60
Multi-units, attached	0.60 – 0.75
Suburban	0.25 – 0.40
Apartment dwelling areas	0.50 – 0.70
Industrial	
Light areas	0.50 – 0.80
Heavy areas	0.60 – 0.90
Parks, cemeteries	0.10 – 0.25
Playgrounds	0.20 – 0.40
Railroad yards	0.20 – 0.35
Unimproved areas	0.10 – 0.30
Lawns	
Sandy soil, flat, ≤ 2%	0.05 – 0.10
Sandy soil, average 2-7%	0.10 – 0.15
Sandy soil, steep ≥ 7%	0.15 – 0.20
Heavy soil, flat, ≤ 2%	0.13 – 0.17
Heavy soil, average 2-7%	0.18 – 0.22
Heavy soil, steep ≥ 7%	0.25 – 0.35
Streets	
Asphaltic	0.70 – 0.95
Concrete	0.70 – 0.95
Brick	0.75 – 0.85
Drives and walks	0.75 – 0.95
Roofs	0.75 – 0.95

A graph presenting the relationship between the weighted runoff coefficient and the unit water quality design flow rate is shown in Figure 2.

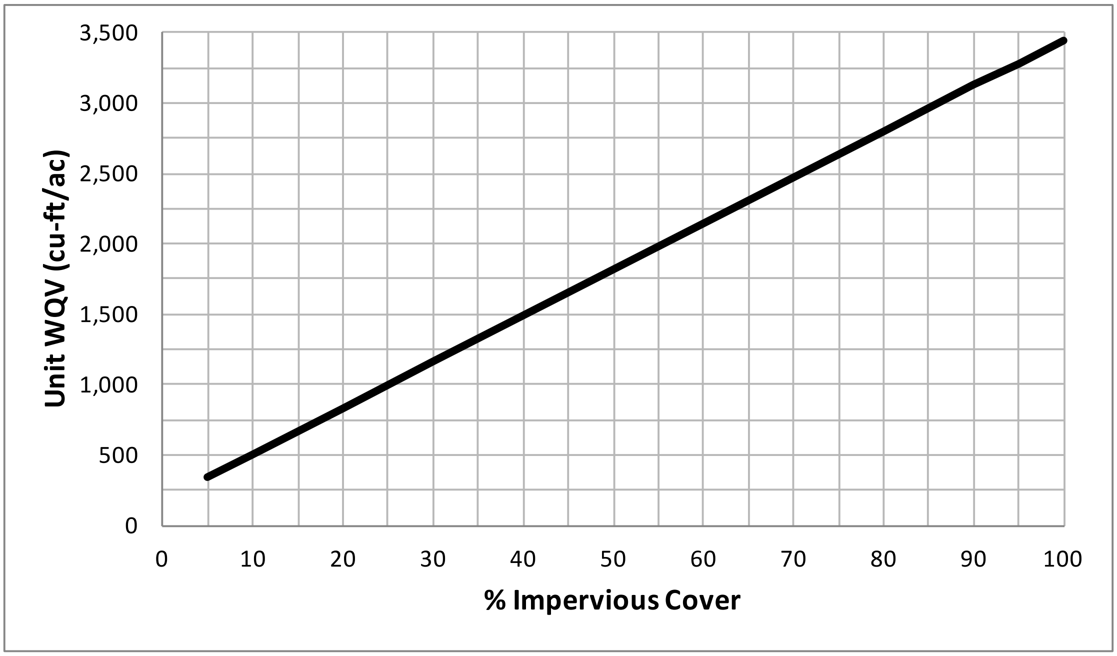


Figure 1: Unit Water Quality Volume for 1 inch Runoff Depth

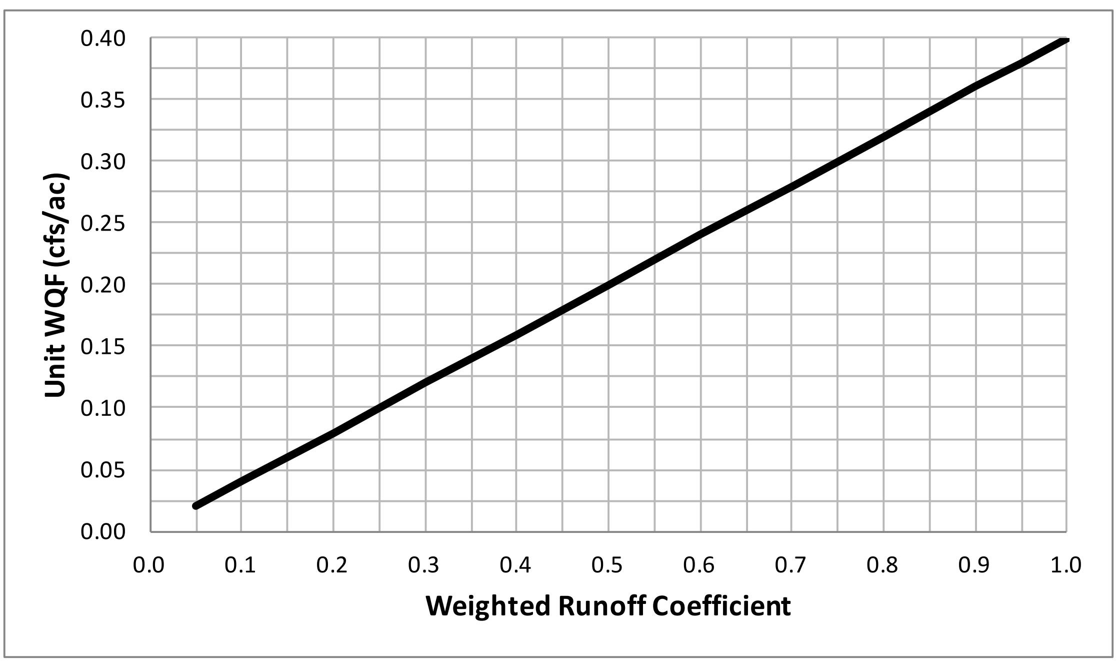


Figure 2: Unit Water Quality Flow

GENERAL INFILTRATION REQUIREMENTS

LID Retention BMPs rely on the soil's ability to infiltrate storm water runoff. This section outlines the design requirements applicable to all infiltration facilities.

Soil Types and Textures

The soil types within the subsoil profile, extending a minimum of 3 feet below the bottom of the proposed facility, should be identified to verify the infiltration rate or permeability of the soil. The infiltration rate, or permeability, measured in inches per hour, is the rate at which water passes through the soil profile during saturated conditions. Although the units of infiltration rate and hydraulic conductivity of soils are similar, there is a distinct difference between these two quantities. They cannot be directly related unless the hydraulic boundary conditions are known, such as hydraulic gradient and the extent of lateral flow of water, or can be reliably estimated. Minimum and maximum infiltration rates establish the suitability of various soil textural classes for infiltration. Each soil texture and corresponding hydrologic properties within the soil profile are identified through analysis of a gradation test of the soil boring material. Table 2 presents a list of the infiltration rates for the soil textures of the U.S. Department of Agriculture Textural Triangle, presented in Figure 3.

Table 2: Typical Soil Infiltration Rates[a]

Texture Class	Hydrologic Soil Group	Infiltration Rate (in/hr)
Sand	A	8.00
Loamy sand	A	2.00
Sandy loam	B	1.00
Loam	B	0.50
Silt loam	C	0.25
Sandy clay loam	C	0.15
Clay loam	D	0.09
Silty clay loam	D	< 0.09
Clay	D	< 0.05

[a] Source: ASCE, 1998

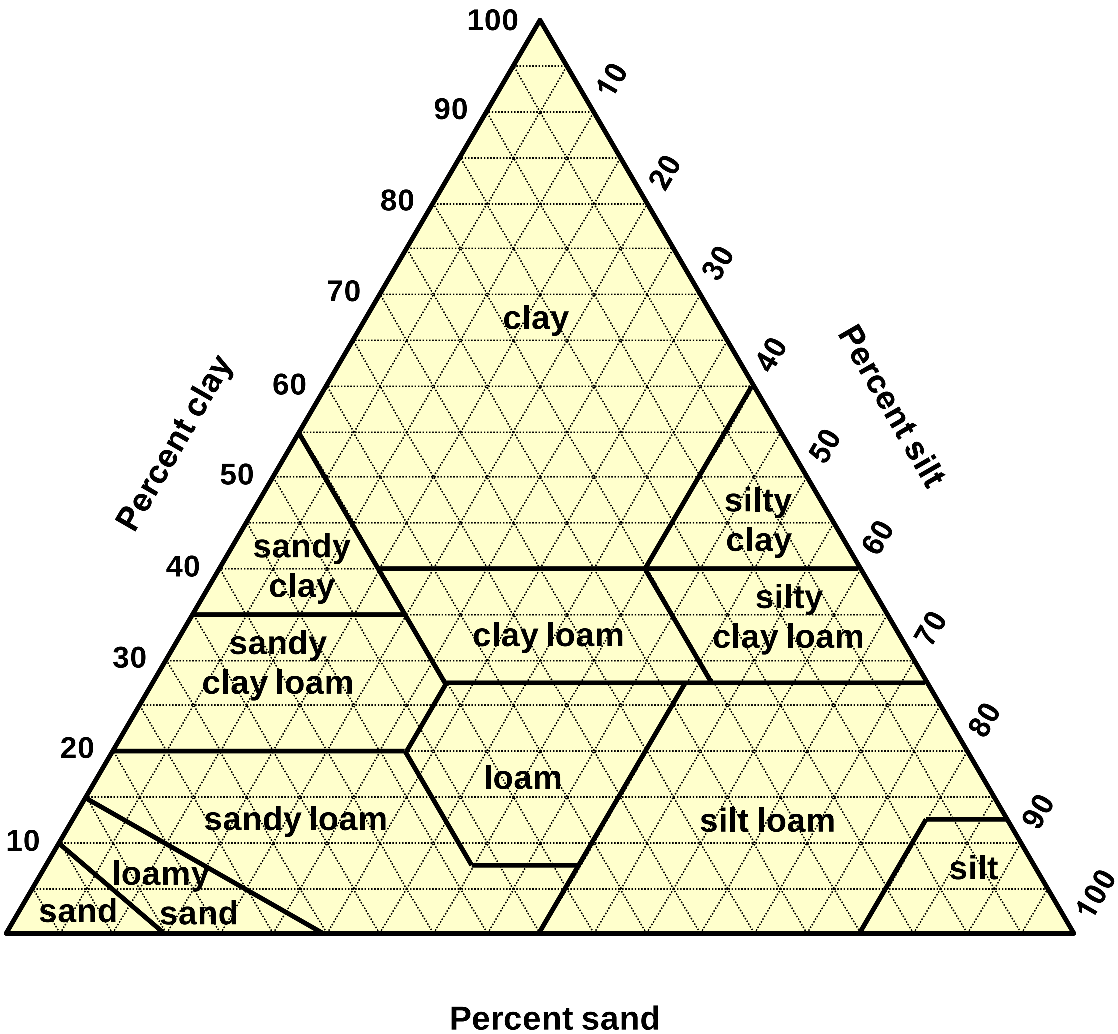


Figure 3: USDA Soils Textural Triangle

Soil textures acceptable for use with infiltration systems include those with infiltration rates equal to or above 0.50 inches per hour (a soil texture indicative of loam). Soil textures with rates less than 0.50 inches per hour are not suitable as it increases the risk of the BMP not draining properly and creating localized areas of standing water. It is important to note however, that Hydrologic Soil Group (HSG) “D” soils (e.g., clay loam, silty clay loam, and silty clay) in Oahu have been shown to perform better than their counterparts in the Continental United States. As a result, locations with HSG “D” soils should not be automatically rejected as candidate sites for infiltration BMPs without the opinion of a licensed professional engineer with geotechnical expertise.

Field Investigations

While the infiltration rates in Table 2 may be used with the written opinion of a licensed professional engineer with geotechnical expertise, soil investigations and infiltration tests are strongly recommended to accurately determine the local soil characteristics and capacity for infiltration.

Soil Lithology and Depth to Groundwater

An initial soil investigation is recommended to adequately evaluate soil lithology and determine if there are potential problems in the soil structure that would inhibit the rate or quantity of infiltration desired; or if there are potential adverse impacts to structures, slopes or groundwater that could result from locating the device nearby.

Geotechnical test pits or borings should be dug to a minimum of 5 ft deep below the proposed device invert, or as determined by the licensed professional engineer with geotechnical expertise. A test pit allows visual observation of the soil horizons and overall soil conditions both horizontally and vertically in that portion of the site. Although the use of soil borings is permitted at the recommendation of a geotechnical professional, it is discouraged as a substitute for test pits as visual observation is narrowly limited in a soil boring and the soil horizons cannot be observed in-situ, but must be observed from the extracted borings.

The soil profiles should be carefully logged to determine variations in the subsurface profile. The number of recommended test pits/borings is provided in Table 3. Samples should be collected from the soil profiles at different horizons and transported to a laboratory for soil indices testing, plasticity, and chemical testing. In addition, the test pits or samples from borings should be examined for other characteristics that may adversely affect infiltration. These include evidence of significant mottling (indicative of high groundwater), restrictive layer(s), and significant variation in soil types, either horizontally or vertically.

Table 3: Test Pit/Boring Requirements for Infiltration

Facility	Size	Recommended No. of Test Pits/Borings
Infiltration Basin, Subsurface Infiltration, Dry Well, Bioretention Basin, Permeable Pavement	< 2,500 sq-ft	1
	2,500 – 20,000 sq-ft	2
	20,000 – 30,000 sq-ft	3
	30,000 – 40,000 sq-ft	4
	> 40,000 sq-ft	1 test per 10,000 sq-ft
Infiltration Trench	< 100 ft	1
	100 – 200 ft	2
	200 – 300 ft	3
	> 300 ft	1 test per 100 ft

An initial indication of the seasonal high groundwater water table elevation should be determined by using a piezometer or other accepted geotechnical means. The piezometer should be installed to a depth of at least 20 ft below the proposed device invert using the direct push or other suitable method. Initial groundwater levels shall be recorded at least 24 hours after installation. The geotechnical professional will make a determination whether the groundwater elevation determined after 24 hours can be considered to be a reasonable indication of the seasonal high water table for the site.

Permeability Testing

Infiltration rate tests are used to help estimate the maximum sub-surface vertical infiltration rate of the soil below a proposed infiltration facility (e.g., infiltration trench or infiltration basin). The tests are intended to simulate the physical process that will occur when the facility is in operation; therefore a saturation period is required to approximate the soil moisture conditions that may exist prior to the onset of a runoff event. Laboratory tests are strongly discouraged, as a homogeneous laboratory sample does not represent field conditions. Infiltration tests should be conducted in the field. Tests should not be conducted in the rain or within 24 hours of significant rainfall events (greater than 0.5 inches).

There are a variety of infiltration field test methodologies to determine the infiltration rate of a soil, the two most coming being the Falling Head Percolation Test and the Double-Ring Infiltrometer Test. The actual testing protocols and methods used for a specific project should be determined by a licensed professional engineer with geotechnical expertise. However, the number of permeability tests is pre-established by the City and is provided in Table 4.

Table 4: Permeability Test Requirements for Infiltration

Facility	Size	Recommended No. of Permeability Tests
Infiltration Basin, Subsurface Infiltration, Dry Well, Bioretention Basin, Permeable Pavement	no manmade soils present	1 test per 2,500 sq-ft
	manmade soils present	1 test per 1,000 sq-ft
Infiltration Trench	no manmade soils present	1 test per 100 ft
	manmade soils present	1 test per 50 ft

Design Infiltration Rates

To account for uncertainties and inaccuracies in testing, a correction (i.e., safety) factor shall be applied to the assumed or measured infiltration rate to produce a design infiltration rate for BMP sizing calculations. Minimum safety factors shall be as follows:

Table 5: Infiltration Rate Factors of Safety

Method	Min. Factor (F_s)
Without recommended no. of Test Pits or recommended no. of Permeability Tests	5
With recommended no. of Test Pits only	4
With recommended no. of Permeability Tests only	3
With recommended no. of Test Pits and recommended no. of Permeability Tests	2

On the following pages are fact sheets for each Treatment Control BMP specified in the *Rules*. The following information is provided for each BMP:

- Brief description
- Pretreatment considerations

- BMP category
- Expected pollutant removals
- Minimum design criteria
- Feasibility criteria
- Step-by-step sizing procedure
- Area requirements
- Sizing example
- Other design considerations
- Typical schematic

The sizing procedures are based on simple dynamic and static principles and therefore may result in larger BMPs than are necessary. More rigorous sizing methods (such as detailed routing methods or continuous simulation models) may be used with City approval.

BMPs not included herein, such as Stormwater Wetlands, Wet Ponds, and proprietary devices, may be used with written City approval.

To facilitate comparison of the BMP characteristics, a summary of the BMP categories and expected pollutant removals is presented in Tables 6 and 7, respectively.

To assist with determining infeasibility, a summary of infeasibility criteria for LID Retention BMPs and LID Biofiltration BMPs is presented in Tables 8 and 9, respectively.

Table 6: Treatment Control BMP Categories

BMP	Retention	Biofiltration	Other
Infiltration Basin	●		
Infiltration Trench	●		
Subsurface Infiltration	●		
Dry Well	●		
Bioretention Basin	●		
Permeable Pavement	●		
Green Roof		●	
Vegetared Bio-Filter		●	
Enhanced Swale		●	
Downspout Disconnection		●	
Vegetated Swale		●	
Vegetated Buffer Strip		●	
Tree Box Filter		●	
Harvesting / Reuse			●
Detention Basin			●
Manufactured Treatment Device			●
Sand Filter			●

Table 7: Treatment Control BMP Expected Pollutant Removals

BMP	Nutrients	Sediment	Trash	Pathogens	Pesticides	Oil & Grease	Metals	Organic Compounds
Infiltration Basin	H	H	H	H	H	H	H	H
Infiltration Trench	H	H	H	H	H	H	H	H
Subsurface Infiltration	H	H	H	H	H	H	H	H
Dry Well	H	H	H	H	H	H	H	H
Bioretention Basin	H	H	H	H	H	H	H	H
Permeable Pavement	H	H	L	H	H	H	H	H
Green Roof	M	H	H	M	M	H	M	M
Vegetated Bio-Filter	M	H	H	M	U	H	H	H
Enhanced Swale	M	H	H	U	U	M	M	U
Downspout Disconnection	L	M	M	M	U	M	M	U
Vegetated Swale	L	M	L	L	U	M	M	U
Vegetated Buffer Strip	L	M	M	L	U	M	M	M
Tree Box Filter	M	H	H	M	U	H	H	H
Harvesting / Reuse	H	H	L	H	H	H	H	H
Detention Basin	L	M	H	L	U	M	L/M	U
Manufactured Treatment Device	L	M/H	H	L	L	M/H	L	L
Sand Filter	L/M	H	H	M	U	H	M/H	M/H

H = High, M = Medium, L = Low, U = Unknown

Table 8: Infeasibility Criteria for LID Retention BMPs

Exemption Criteria	Infiltration Basin	Infiltration Trench	Subsurface Infiltration	Dry Well	Bioretention Basin	Permeable Pavement
Soils beneath basin invert have measured infiltration rates less than 0.5 in/hr	●	●	●	●	●	●
Unable to maintain a distance of at least 3 ft from BMP invert to seasonally high groundwater table	●	●	●	●	●	●
Site has known man-made plumes or contaminated soils	●	●	●	●	●	●
Site has high potential for concentrated pollutant/chemical spills	●	●	●	●	●	●
Site is up-gradient of ephemeral streams (i.e. habitat type change downstream)	●	●	●	●	●	●
Site is up-gradient of known shallow landslide-prone area	●	●	●	●	●	●
Unable to maintain a distance of at least 50 ft to the nearest groundwater well used for drinking water	●	●	●	●	●	●
Unable to maintain a distance of at least 35 ft to the nearest septic system	●	●	●	●	●	●
Unable to maintain a distance of at least 20 ft to the nearest building foundation	●	●	●		●	
Unable to maintain a distance of at least 10 ft to the nearest building foundation				●		
Unable to maintain a distance of at least 100 ft to the nearest down-gradient building foundation	●	●	●	●	●	
Unable to maintain a distance of at least 10 ft to the nearest property line	●	●	●	●	●	
Unable to divert flows in excess of WQDS around BMP, and unable to create safe overflow mechanism for flows in excess of WQDS	●	●	●		●	
Excavation would disturb iwi kupuna or other archaeological resources	●	●	●		●	
Site has high potential for oil and/or grease spills						●
Site has high potential to receive sand and/or sediment loads						●
Unable to maintain a pavement slope no greater than 5%						●
Pavement would be above a utility vault						●
Pavement is expected to receive more than 1,000 average daily trips						●
Other justification for an exemption proposed by the developer/agent and is acceptable to the City	●	●	●	●	●	●

Table 9: Infeasibility Criteria for LID Biofiltration BMPs

Exemption Criteria	Vegetated Bio-Filter	Green Roof	Enhanced Swale	Downspout Disconnect	Vegetated Swale	Vegetated Filter Strip	Tree Box Filter
Unable to divert flows in excess of WQDS around BMP, and unable to create safe overflow mechanism for flows in excess of WQDS	●		●		●	●	
Excavation would disturb iwi kupuna or other archaeological resources	●		●		●	●	●
Invert of underdrain layer is below seasonally high groundwater table	●		●				
Site does not receive enough sunlight to support vegetation	●				●	●	
Site lacks sufficient hydraulic head to support BMP operation by gravity	●		●				●
Roof is for a single family residential dwelling		●					
Space is unavailable due to renewable energy, electrical, and mechanical systems		●					
Slope on roof exceeds 20% (11 degrees)		●					
Slope of receiving vegetated area exceeds 5%				●			
Diverted runoff drains within 10 feet of a retaining wall				●			
Diverted runoff drains within 10 feet of property line				●			
Concentrated flow cannot be established naturally					●		
Sheet flow cannot be established naturally						●	
Entrance at surface not possible							●
Residential and no planting strip							●
No curb and gutter							●
Other justification for an exemption proposed by the developer/agent and is acceptable to the City	●	●	●	●	●	●	●

INFILTRATION BASIN

Description

An infiltration basin is a shallow impoundment with no outlet, where storm water runoff is stored and infiltrates through the basin invert and into the soil matrix.

BMP Category	
Retention	●
Biofiltration	○
Other	○

Halawa District Park

Expected Pollutant Removals	
Nutrients	High
Sediment	High
Trash	High
Pathogens	High
Pesticides	High
Oil & Grease	High
Metals	High
Organic Compounds	High

Minimum Design Criteria

Design Parameter	Units	Value
Invert Slope	%	0
Maximum Interior Side Slope (length per unit height)		3:1
Drawdown (drain) Time	hours	48
Minimum Soil Infiltration Rate	inches/hr	0.5
Minimum Freeboard	feet	1.0
Minimum Depth from basin invert to groundwater table	feet	3

Feasibility Criteria

See Table 9.

Sizing Procedure

1. Use the procedure presented previously to compute the Volumetric Runoff Coefficient and Water Quality Volume.

2. Calculate the maximum allowable water storage depth (d_{max}) using the underlying soil infiltration rate (k) and the required drawdown time (t):

$$\boldsymbol{d_{max} = kt/(F_s \times 12)}$$

Where:
d_{max} = Maximum storage depth (ft)
k = Soil infiltration rate (in/hr)
t = Drawdown (drain) time (hrs)

F_s = Infiltration rate Factor of Safety (see Chapter 4)

3. Select a design ponding depth no greater than the maximum allowable depth calculated in Step 2.

$$\boldsymbol{d_p \le d_{max}}$$

Where:
d_p = Design Ponding Depth (ft)
d_{max} = Maximum storage depth from step 2 (ft)
k = Soil infiltration rate (in/hr)

4. Calculate the basin bottom surface area (A_b):

$$\boldsymbol{A_b = WQV/(d_p + kT/12F_s)}$$

Where:
A_b = Bottom surface area (sq-ft)
WQV = Water Quality Volume from Step 1(cu-ft)
d_p = Design ponding Depth from Step 3 (ft)
k = Soil infiltration rate (in/hr)
T = Fill time (time for the BMP to fill with water, hrs)
F_s = Infiltration rate Factor of Safety (see Chapter 4)

5. Select a basin bottom width (w_b), and calculate the basin bottom length (l_b):

$$\boldsymbol{l_b = A_b/w_b}$$

Where:
l_b = Bottom length (ft)
A_b = Bottom surface area from Step 4 (sq-ft)
w_b = Bottom width (ft)

6. Calculate the total area occupied by the BMP excluding pretreatment (A_{BMP}) using the basin bottom dimensions, embankment side slopes, and freeboard:

$$\boldsymbol{A_{BMP} = [w_b + 2z(d_p + f)] \times [l_b + 2z(d_p + f)]}$$

Where:
A_{BMP} = Area occupied by BMP excluding pretreatment (sq-ft)
w_b = Bottom width from Step 5 (ft)
z = Basin interior side slope (length per unit height)
d_p = Design Ponding Depth from Step 3 (ft)
f = Freeboard (ft)
l_b = Bottom length from Step 5 (ft)

If the calculated area does not fit in the available space, either reduce the drainage area, increase the ponding depth (if it's not already set to the maximum depth), and/or reduce the Infiltration rate factor of safety (if minimum number of test pits and permeability tests have not been performed) and repeat the calculations.

Pretreatment Considerations

Infiltration facilities are highly susceptible to clogging and premature failure from sediment, trash, and other materials. Suitable pretreatment systems maintain the infiltrate rate of the device without frequent and intensive maintenance. For measured soil infiltration rates below 3 in/hr, pretreatment is strongly recommended, and the pretreatment device should be sized for at least 25% of the WQV. For measured soil infiltration rates greater than 3 in/hr, pretreatment is mandatory to minimize groundwater contamination risks, and the pretreatment device must be sized for at least 50% of the WQV if the measured soil infiltration rate is below 5 in/hr and 100% of the WQV if the measured soil infiltration rate is greater than 5 in/hr. Pretreatment may be achieved with vegetated swales, vegetated filter strips, sedimentation basins or forebays, sedimentation manholes, and manufactured treatment devices.

Area Requirements
An infiltration basin requires a footprint equivalent to 7% - 20% of its contributing impervious drainage area, excluding pretreatment. The lower value reflects the maximum allowable infiltration rate and minimum allowable factor of safety, while the upper value reflects the minimum allowable infiltration rate and maximum allowable factor of safety.

Sizing Example
Calculate the size of an infiltration basin serving a 1-acre residential development. Assume the following design parameters:

Design Parameter	Units	Value
Percent Impervious Cover, I	%	70
Design Storm Depth, P	inches	1
Basin Fill Time, T	hours	2
Drawdown (drain) Time, t	hours	48
Basin Interior Side Slope (length per unit height), z		3
Soil Infiltration Rate, k	inches/hr	1.0
Infiltration Rate Factor of Safety, F_s		2
Freeboard, f	ft	1

1. Calculate the volumetric runoff coefficient (C) and Water Quality Volume (WQV):

$$\boldsymbol{C = 0.05 + 0.009I}$$
$$\boldsymbol{C = 0.05 + 0.009 \times 70}$$
$$\boldsymbol{C = 0.68}$$

$$\boldsymbol{WQV = PCA \times 3630}$$
$$\boldsymbol{WQV = 1 \times 0.68 \times 1 \times 3630}$$
$$\boldsymbol{WQV = 2{,}468\ cubic\ feet}$$

2. Calculate the maximum allowable water storage depth in the basin (d_m):

$$\boldsymbol{d_{max} = kt/12F_s}$$
$$\boldsymbol{d_{max} = 1.0 \times 48/(12 \times 2)}$$
$$\boldsymbol{d_{max} = 2.0\ feet}$$

3. Select a design ponding depth (d_p) no greater than the maximum allowable depth:

$$d_p = 2.0\ feet$$

4. Calculate the basin bottom surface area (A_b):

$$A_b = WQV/(d_d + kT/12F_s)$$
$$A_b = 2{,}468/[2.0 + 1.0 \times 2.0/(12 \times 2)]$$
$$A_b = 1{,}185\ square\ feet$$

5. Set the basin bottom width (w_b) to 25 feet, and calculate the basin bottom length (l_b):

$$l_b = A_b/w_b$$
$$l_b = 1{,}185/25$$
$$l_b = 47.4\ feet$$

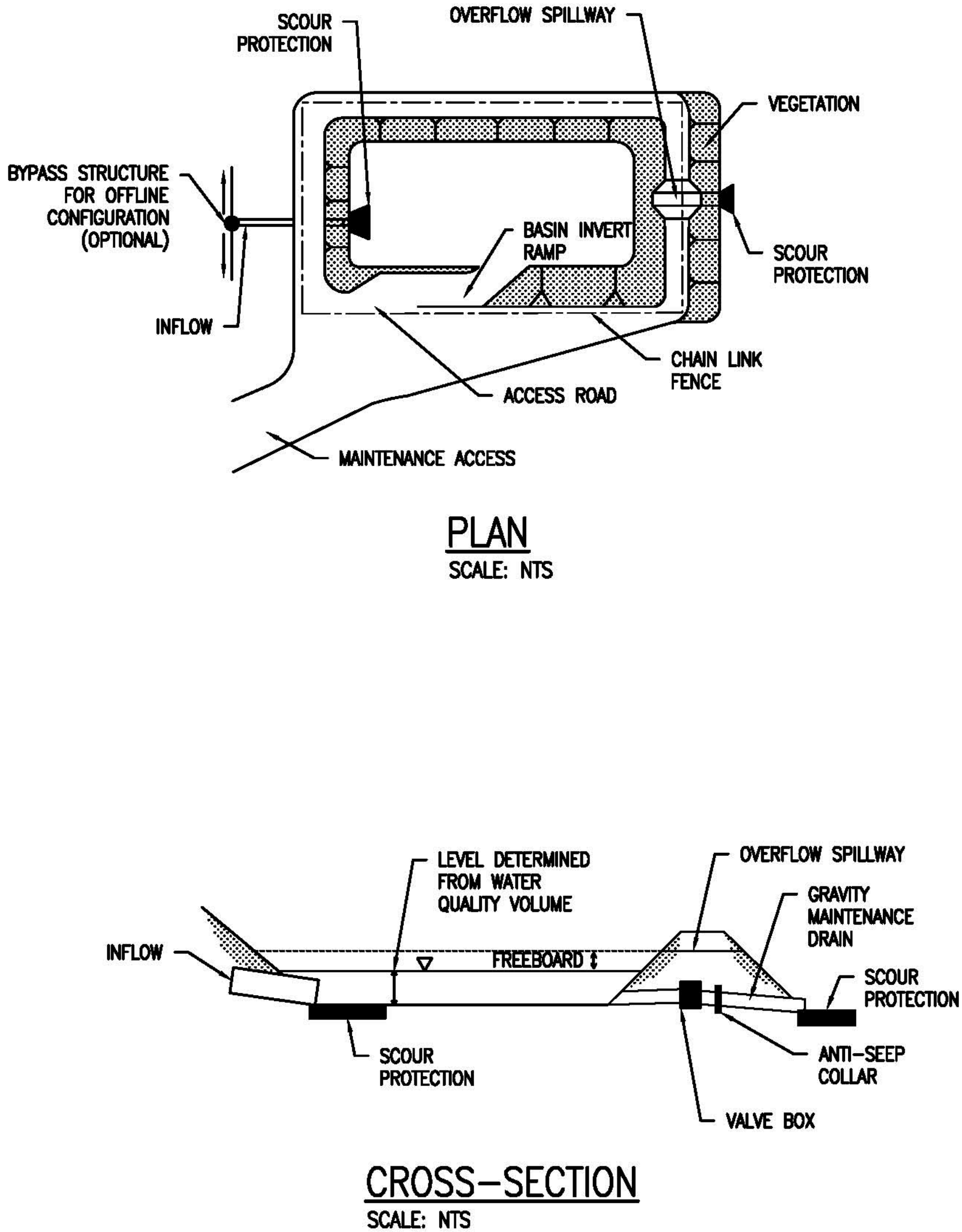
6. Calculate the total area excluding pretreatment (A_{BMP}):

$$A_{BMP} = \left[w_b + 2z\left(d_p + f\right)\right] \times \left[l_b + 2z\left(d_p + f\right)\right]$$
$$A_{BMP} = [25 + 2 \times 3(2 + 1)] \times [47.4 + 2 \times 3(2 + 1)]$$
$$A_{BMP} = 2{,}812\ square\ feet$$

Other Design Considerations

- If a temporarily-filled pond creates a potential public safety issue, perimeter fencing may be considered. A vegetative screen around the basin to restrict direct view from adjacent properties may improve the aesthetics of the site and public acceptance of the facility.
- If feasible, include vehicle access to the basin invert for maintenance.
- If the area around the basin has a recreational use, a safety shelf around the perimeter of the basin can be included for times when the basin is flooded.
- The infiltration basin should be designed with an outlet structure to pass peak flows during a range of storm events, as well as with an emergency spillway to pass peak flows around the embankment during extreme storm events that exceed the combined infiltration capacity and outlet structure capacity of the facility.
- To help ensure maintenance of the design permeability rate over time, a 6 inch layer of sand may be placed on the bottom of an infiltration basin. This sand layer can intercept silt, sediment, and debris that could otherwise clog the top layer of the soil below the basin. The sand layer will also facilitate silt, sediment, and debris removal from the basin and can be readily restored following removal operations.
- Observation wells are recommended. They will indicate how quickly the basin dewaters following a storm and it will provide a method of observing how quickly the basin fills up with sediments.

Figure 4: Schematic of an Infiltration Basin



INFILTRATION TRENCH

Description

An infiltration trench is a rock-filled trench with no outlet, where storm water runoff is stored in the void space between the rocks and infiltrates through the bottom and into the soil matrix.

BMP Category	
Retention	●
Biofiltration	○
Other	○

City of Bellingham, WA (cob.org/services/environment/lake-whatcom)

Expected Pollutant Removals	
Nutrients	High
Sediment	High
Trash	High
Pathogens	High
Pesticides	High
Oil & Grease	High
Metals	High
Organic Compounds	High

Minimum Design Criteria

Design Parameter	Units	Value
Maximum Trench Depth	feet	8
Maximum Trench Width	feet	25
Maximum Top Backfill Layer Thickness	inches	6
Maximum Bottom Sand Layer Thickness	inches	12
Drawdown (drain) Time	hours	48
Minimum Soil Infiltration Rate	inches/hr	0.5
Trench Rock Size	inches	1.5 – 3.0
Minimum Depth from trench invert to groundwater table	feet	3

Feasibility Criteria

See Table 9.

Sizing Procedure

1. Use the procedure presented previously to compute the Volumetric Runoff Coefficient and Water Quality Volume.

2. Calculate the maximum allowable water storage depth (d_{max}) using the underlying soil infiltration rate (k) and the required drawdown time (t):

$$d_{max} = kt/(F_s \times 12)$$

Where:	d_{max}	=	Maximum storage depth (ft)
	k	=	Soil infiltration rate (in/hr)
	t	=	Drawdown (drain) time (hrs)
	F_s	=	Infiltration rate Factor of Safety (see Chapter 4)

3. Select a ponding depth (optional), trench rock (or alternative material) depth, and sand layer depth (optional) such that the total effective storage depth is no greater than the maximum allowable depth calculated in Step 2:

$$d_t = d_p + l_b n_b + l_s n_s \leq d_{max}$$

Where:	d_t	=	Total effective water storage depth (ft)
	d_p	=	Ponding depth (ft)
	l_b	=	Backfill material thickness (depth) (ft)
	n_b	=	Backfill material porosity
	l_s	=	Sand layer thickness (depth) (ft)
	n_s	=	Sand porosity
	d_{max}	=	Maximum storage depth from Step 2 (ft)

4. Calculate the trench surface area (A_{BMP}):

$$A_{BMP} = WQV/(d_t + kT/12F_s)$$

Where:	A_{BMP}	=	BMP surface area excluding pretreatment (sq-ft)
	WQV	=	Water Quality Volume from Step 1(cu-ft)
	d_t	=	Total effective water storage depth from Step 3 (ft)
	k	=	Soil infiltration rate (in/hr)
	T	=	Fill time (time for the BMP to fill with water, hrs)
	F_s	=	Infiltration rate Factor of Safety (see Chapter 4)

If the calculated area does not fit in the available space, either reduce the drainage area, increase the ponding depth or trench rock depth or sand layer depth (if the total effective depth is not already equal to the maximum depth), and/or reduce the Infiltration rate factor of safety (if minimum number of test pits and permeability tests have not been performed) and repeat the calculations.

Pretreatment Considerations

Infiltration facilities are highly susceptible to clogging and premature failure from sediment, trash, and other materials. Suitable pretreatment systems maintain the infiltrate rate of the device without frequent and intensive maintenance. For measured soil infiltration rates below 3 in/hr, pretreatment is strongly recommended, and the pretreatment device should be sized for at least 25% of the WQV. For measured soil infiltration rates greater than 3 in/hr, pretreatment is mandatory to minimize groundwater contamination risks, and the pretreatment device must be sized for at least 50% of the WQV if the measured soil infiltration rate is below 5 in/hr and 100% of the WQV if the measured soil infiltration rate is greater than 5 in/hr. Pretreatment may be achieved with vegetated swales, vegetated filter strips, sedimentation basins or forebays, sedimentation manholes, and manufactured treatment devices.

Area Requirements

An infiltration trench requires a footprint equivalent to 2% - 20% of its contributing impervious drainage area, excluding pretreatment. The lower value reflects the maximum allowable infiltration rate, minimum allowable factor of safety, and minimal ponding, while the upper value reflects the minimum allowable infiltration rate, maximum allowable factor of safety, and no ponding.

Sizing Example

Calculate the size of an infiltration basin serving a 1-acre residential development. Assume the following design parameters:

Design Parameter	Units	Value
Percent Impervious Cover, I	%	70
Design Storm Depth, P	inches	1.0
Trench Fill Time, T	hours	2
Drawdown (drain) Time, t	hours	48
Backfill porosity, n_b		0.35
Sand porosity, n_s		0.40
Soil Infiltration Rate, k	inches/hr	1.0
Infiltration Rate Factor of Safety, F_s		2

1. Calculate the volumetric runoff coefficient (C) and Water Quality Volume (WQV):

$$\boldsymbol{C = 0.05 + 0.009I}$$
$$\boldsymbol{C = 0.05 + 0.009 \times 70}$$
$$\boldsymbol{C = 0.68}$$

$$\boldsymbol{WQV = PCA \times 3630}$$
$$\boldsymbol{WQV = 1 \times 0.68 \times 1 \times 3630}$$
$$\boldsymbol{WQV = 2,468\ cubic\ feet}$$

3. Calculate the maximum allowable water storage depth of the infiltration trench (d_m):

$$\boldsymbol{d_{max} = kt/12F_s}$$
$$\boldsymbol{d_{max} = 1.0 \times 48/(12 \times 2)}$$
$$\boldsymbol{d_{max} = 2.0\ feet}$$

4. Select a ponding depth (d_p), trench rock depth (d_r), and optional sand layer depth (d_s) such that the total effective storage depth (d_t) is no greater than the maximum allowable depth:

$$\boldsymbol{d_p = 0.0\ feet}$$

$$l_b = 5.0\ feet$$
$$l_s = 0.5\ feet$$

$$d_t = d_p + l_b n_b + l_s n_s$$
$$d_t = 0.0 + 5.0 \times 0.35 + 0.5 \times 0.40$$
$$d_t = 1.95\ feet$$

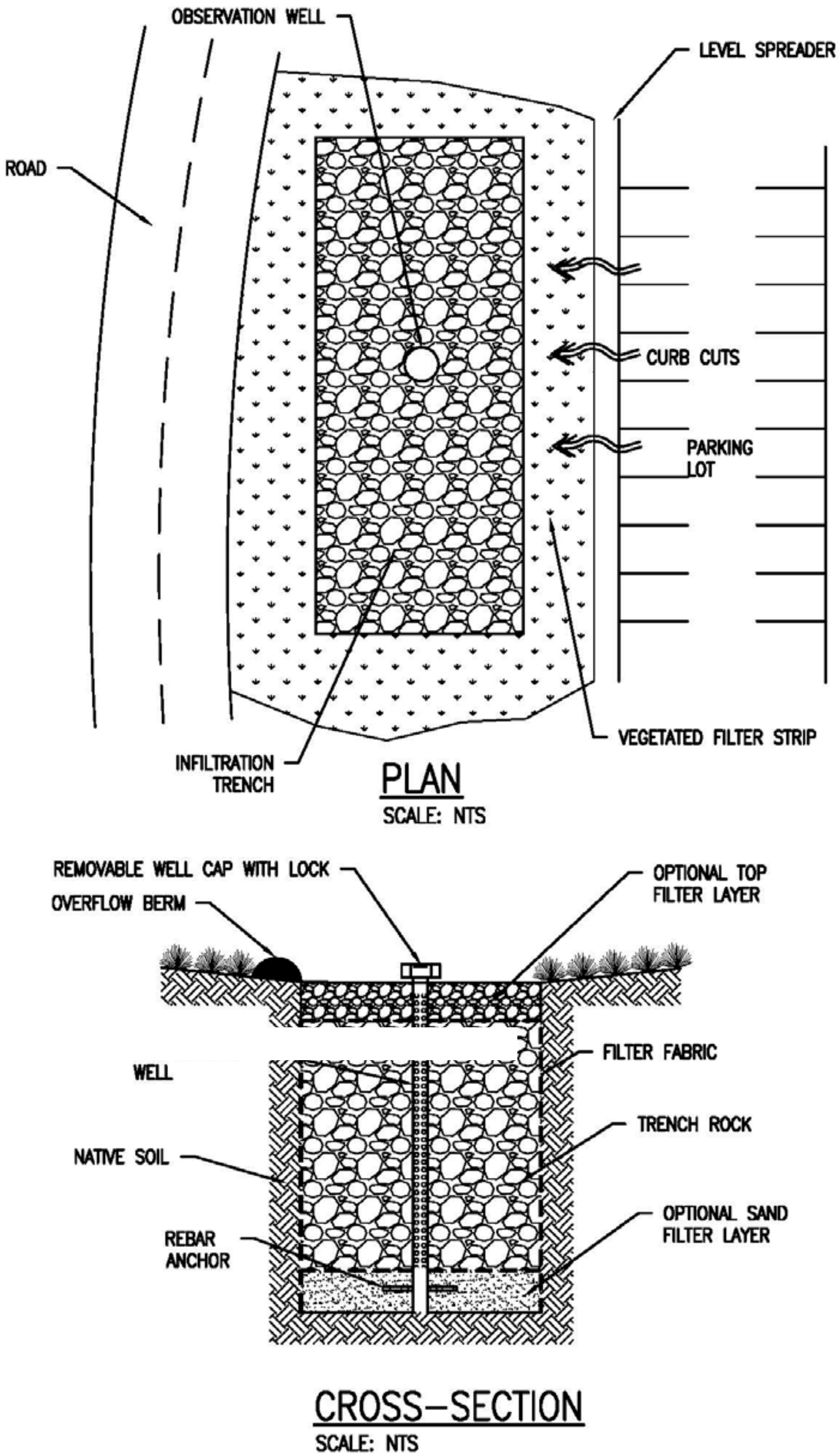
5. Calculate the BMP surface area excluding pretreatment (A_{BMP}):

$$A_{BMP} = WQV/(d_t + kT/12F_s)$$
$$A_{BMP} = 2{,}468/[1.95 + 1.0 \times 2.0/(12 \times 2)]$$
$$A_{BMP} = 1{,}214\ square\ feet$$

Other Design Considerations

- Observation wells are recommended at 50 foot intervals over the length of the infiltration trench. They will indicate how quickly the trench dewaters following a storm and it will provide a method of observing how quickly the trench fills up with sediments.
- Infiltration trenches should not be deeper than the longest surface area dimension. Otherwise, they meet the EPA definition of Class V Injection Wells under the federal Underground Injection Control (UIC) Program, and are subject to applicable federal and state requirements.
- Vegetation may be planted over the infiltration trench provided that adequate soil media is provided above the trench.
- There must be an overflow route for storm water flows that overtop the facility or in case the infiltration facility becomes clogged.

Figure 5: Schematic of an Infiltration Trench



DRY WELL

Description

A dry well is a subsurface aggregate-filled or prefabricated perforated storage facility, where roof runoff is stored and infiltrates into the soil matrix.

BMP Category	
Retention	●
Biofiltration	○
Other	○

Courtesy www.brickstoremuseum.org

Expected Pollutant Removals	
Nutrients	High
Sediment	High
Trash	High
Pathogens	High
Pesticides	High
Oil & Grease	High
Metals	High
Organic Compounds	High

Minimum Design Criteria

Design Parameter	Units	Value
Drawdown (drain) Time	hours	48
Minimum Soil Infiltration Rate	inches/hr	0.5
Aggregate Size (if used)	inches	1.0 – 3.0
Minimum Depth from well invert to groundwater table	feet	3

Feasibility Criteria

See Table 9.

Sizing Procedure

1. Use the procedure presented previously to compute the Volumetric Runoff Coefficient and Water Quality Volume.

2. Calculate the maximum allowable water storage depth (d_{max}) using the underlying soil infiltration rate (k) and the required drawdown time (t):

$$\boldsymbol{d_{max}} = \boldsymbol{kt}/(\boldsymbol{F_s} \times \mathbf{12})$$

Where:
- d_{max} = Maximum storage depth (ft)
- k = Soil infiltration rate (in/hr)
- t = Drawdown (drain) time (hrs)
- F_s = Infiltration rate Factor of Safety (see Chapter 4)

3. Select a ponding depth (optional) and dry well backfill material depth such that the total effective storage depth is no greater than the maximum allowable depth calculated in Step 2:

$$d_t = d_p + l_b n_b \leq d_{max}$$

Where: d_t = Total effective water storage depth (ft)
d_p = Ponding depth (ft)
l_b = Backfill material thickness (depth) (ft)
n_b = Backfill material porosity
d_{max} = Maximum storage depth from Step 2 (ft)

4. Calculate the BMP surface area (A_{BMP}):

$$A_{BMP} = WQV/(d_t + kT/12F_s)$$

Where: A_{BMP} = BMP surface area (sq-ft)
WQV = Water Quality Volume from Step 1(cu-ft)
d_t = Total effective water storage depth from Step 3 (ft)
k = Soil infiltration rate (in/hr)
T = Fill time (time for the BMP to fill with water, hrs)
F_s = Infiltration rate Factor of Safety (see Chapter 4)

If the calculated area does not fit in the available space, either reduce the drainage area, increase the ponding depth or rock depth (if the total effective depth is not already equal to the maximum depth), and/or reduce the infiltration rate factor of safety (if minimum number of test pits and permeability tests have not been performed) and repeat the calculations.

Pretreatment Considerations

Roof gutter guards or leaf gutter screens are required for roof runoff to reduce dry well clogging from sediment, leaves, and other organic material. If the dry well receives non-roof runoff, pretreatment must be provided by vegetated swales, vegetated filter strips, or manufactured treatment devices.

Area Requirements

A dry well requires a footprint equivalent to 2% - 20% of its contributing impervious drainage area. The lower value reflects the maximum allowable infiltration rate, minimum allowable factor of safety, and minimal ponding, while the upper value reflects the minimum allowable infiltration rate, maximum allowable factor of safety, and no ponding.

Sizing Example

Calculate the size of a dry well serving the roof runoff from a 3,000 square-foot commercial building. Assume the following design parameters:

Design Parameter	Units	Value
Percent Impervious Cover, I	%	100
Design Storm Depth, P	inches	1.0
Dry well Fill Time, T	hours	2

Drawdown (drain) Time, t	hours	48
Backfill material porosity, n_b		0.35
Soil Infiltration Rate, k	inches/hr	1.0
Infiltration Rate Factor of Safety, F_s		2

1. Calculate the volumetric runoff coefficient (C) and Water Quality Volume (WQV):

$$\boldsymbol{C = 0.05 + 0.009I}$$
$$\boldsymbol{C = 0.05 + 0.009 \times 100}$$
$$\boldsymbol{C = 0.95}$$

$$\boldsymbol{WQV = PCA \times 3630}$$
$$\boldsymbol{WQV = 1 \times 0.95 \times (3{,}000/43{,}560) \times 3630}$$
$$\boldsymbol{WQV = 238\ cubic\ feet}$$

3. Calculate the maximum allowable water storage depth of the dry well (d_{max}):

$$\boldsymbol{d_{max} = kt/12F_s}$$
$$\boldsymbol{d_{max} = 1.0 \times 48/(12 \times 2)}$$
$$\boldsymbol{d_{max} = 2.0\ feet}$$

4. Select a ponding depth (d_p) and backfill material depth (l_b) such that the total effective storage depth (d_t) is no greater than the maximum allowable depth:

$$\boldsymbol{d_p = 0.0\ feet}$$
$$\boldsymbol{l_b = 5.5\ feet}$$

$$\boldsymbol{d_t = d_p + l_b n_b}$$
$$\boldsymbol{d_t = 0.0 + 5.5 \times 0.35}$$
$$\boldsymbol{d_t = 1.925\ feet}$$

5. Calculate the BMP surface area:

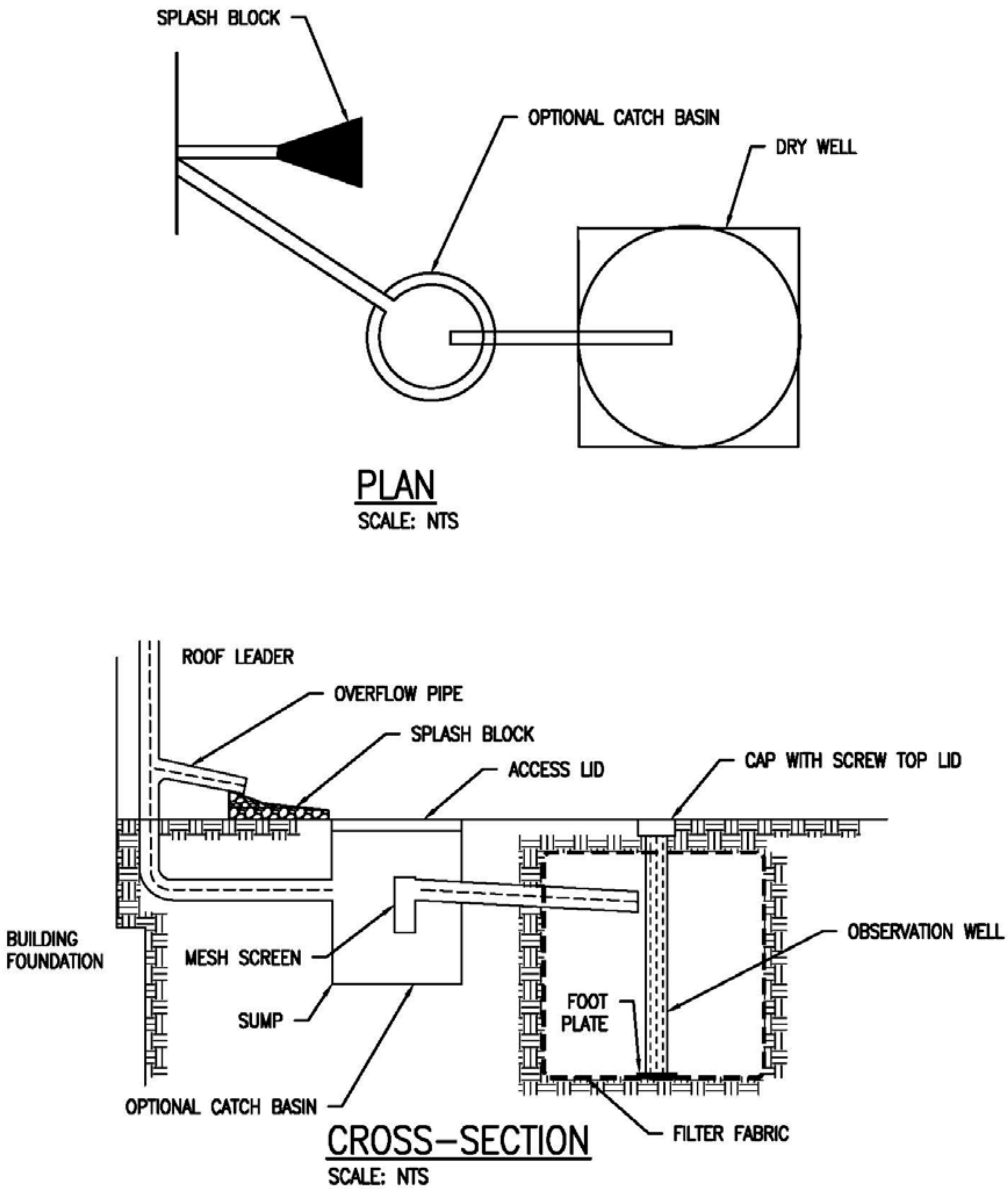
$$\boldsymbol{A_{IMP} = WQV/(d_t + kT/12F_s)}$$
$$\boldsymbol{A_{IMP} = 238/[1.925 + 1.0 \times 2.0/(12 \times 2)]}$$
$$\boldsymbol{A_{IMP} = 118\ square\ feet}$$

Other Design Considerations

- Dry wells are typically deeper than they are wide or long, and therefore meet the EPA definition of Class V Injection Wells under the federal Underground Injection Control (UIC) Program, and are subject to applicable federal and state requirements.
- The dry well must be able to safely convey overflows to either vegetated areas or the storm drain system.

- The design may include an intermediate box with an outflow higher to allow sediments to settle out. Water would then flow through a mesh screen and into the dry well.
- Trees and other large vegetation should be planted away from drywells such that drip lines do not overhang infiltration beds

Figure 7: Schematic of a Dry Well



BIORETENTION BASIN

Description

Sometimes referred to as a Rain Garden, a Bioretention Basin is an engineered shallow depression that collects and filters storm water runoff using conditioned planting soil beds and vegetation. The filtered runoff infiltrates through the basin invert and into the soil matrix.

BMP Category	
Retention	●
Biofiltration	○
Other	○

Expected Pollutant Removals	
Nutrients	High
Sediment	High
Trash	High
Pathogens	High
Pesticides	High
Oil & Grease	High
Metals	High
Organic Compounds	High

Heei State Park (www.huihawaii.org)

Minimum Design Criteria

Design Parameter	Units	Value
Mulch Thickness	inches	2 – 4
Planting Soil Depth	feet	2 – 4
Drawdown (drain) Time	hours	48
Maximum Interior Side Slope (length per unit height)		3:1
Maximum Ponding Depth	inches	12
Minimum depth from basin invert to groundwater table	feet	3
Minimum Freeboard	feet	1.0
Minimum Soil Infiltration Rate	inches/hr	0.5

Feasibility Criteria

See Table 9.

Sizing Procedure

1. Use the procedure presented previously to compute the Volumetric Runoff Coefficient and Water Quality Volume.

2. Calculate the maximum allowable water storage depth (d_{max}) using the underlying soil infiltration rate (k) and the required drawdown time (t):

$$\boldsymbol{d_{max} = kt/(F_s \times 12)}$$

Where:			
	d_{max}	=	Maximum storage depth (ft)
	k	=	Soil infiltration rate (in/hr)
	t	=	Drawdown (drain) time (hrs)
	F_s	=	Infiltration rate Factor of Safety (see Chapter 4)

3. Select a ponding depth, planting media thickness (depth), and reservoir layer thickness (depth, optional) such that the total effective storage depth is no greater than the maximum allowable depth calculated in Step 2:

$$\boldsymbol{d_t = d_p + l_m n_m + l_r n_r \le d_{max}}$$

Where:			
	d_t	=	Total effective water storage depth (ft)
	d_p	=	Ponding depth (ft)
	l_m	=	Planting media thickness (depth) (ft)
	n_m	=	Planting media porosity
	l_r	=	Reservoir layer thickness (depth) (ft)
	n_r	=	Reservoir layer porosity
	d_{max}	=	Maximum storage depth from Step 2 (ft)

4. Calculate the basin bottom surface area (A_b):

$$\boldsymbol{A_b = WQV/(d_t + kT/12F_s)}$$

Where:			
	A_b	=	Bottom surface area (sq-ft)
	WQV	=	Water Quality Volume from Step 1(cu-ft)
	d_t	=	Total effective water storage depth from Step 3 (ft)
	k	=	Soil infiltration rate (in/hr)
	T	=	Fill time (time for the BMP to fill with water, hrs)
	F_s	=	Infiltration rate Factor of Safety (see Chapter 4)

5. Select a basin bottom width (w_b), and calculate the basin bottom length (l_b):

$$\boldsymbol{l_b = A_b/w_b}$$

Where:			
	l_b	=	Bottom length (ft)
	A_b	=	Bottom surface area from Step 4 (sq-ft)
	w_b	=	Bottom width (ft)

6. Calculate the total area occupied by the BMP excluding pretreatment (A_{BMP}) using the basin bottom dimensions, embankment side slopes, and freeboard:

$$\boldsymbol{A_{BMP} = [w_b + 2z(d_p + f)] \times [l_b + 2z(d_p + f)]}$$

Where:			
	A_{BMP}	=	Area occupied by BMP excluding pretreatment (sq-ft)
	w_b	=	Bottom width from Step 5 (ft)

z	=	Basin interior side slope (length per unit height)
d_p	=	Design Ponding Depth from Step 3 (ft)
f	=	Freeboard (ft)
l_b	=	Bottom length from Step 5 (ft)

If the calculated area does not fit in the available space, either reduce the drainage area, increase the ponding depth or planting soil depth or gravel depth (if the total effective depth is not already equal to the maximum depth), and/or reduce the Infiltration rate factor of safety (if minimum number of test pits and permeability tests have not been performed) and repeat the calculations.

Pretreatment Considerations

Infiltration facilities are highly susceptible to clogging and premature failure from sediment, trash, and other materials. Suitable pretreatment systems maintain the infiltrate rate of the device without frequent and intensive maintenance. For measured soil infiltration rates below 3 in/hr, pretreatment is strongly recommended, and the pretreatment device should be sized for at least 25% of the WQV. For measured soil infiltration rates greater than 3 in/hr, pretreatment is mandatory to minimize groundwater contamination risks, and the pretreatment device must be sized for at least 50% of the WQV if the measured soil infiltration rate is below 5 in/hr and 100% of the WQV if the measured soil infiltration rate is greater than 5 in/hr. Pretreatment may be achieved with vegetated swales, vegetated filter strips, sedimentation basins or forebays, sedimentation manholes, and manufactured treatment devices.

Area Requirements

A bioretention basin requires a footprint equivalent to 4% - 13% of its contributing impervious drainage area, excluding pretreatment. The lower value reflects the maximum allowable infiltration rate and minimum allowable factor of safety, while the upper value reflects the minimum allowable infiltration rate and maximum allowable factor of safety.

Sizing Example

Calculate the size of a bioretention basin serving a 1-acre residential development. Assume the following design parameters:

Design Parameter	Units	Value
Percent Impervious Cover, I	%	70
Design Storm Depth, P	inches	1.0
Basin Fill Time, T	hours	2
Drawdown (drain) Time, t	hours	48
Basin Interior Side Slope (length per unit height), z		3
Planting Media Porosity, n_m		0.25
Reservoir layer porosity, n_r		0.30
Soil Infiltration Rate, k	inches/hr	1.0
Freeboard, f	ft	1.0

Infiltration Rate Factor of Safety, F_s		2

1. Calculate the volumetric runoff coefficient (C) and Water Quality Volume (WQV):

$$\boldsymbol{C = 0.05 + 0.009I}$$
$$\boldsymbol{C = 0.05 + 0.009 \times 70}$$
$$\boldsymbol{C = 0.68}$$

$$\boldsymbol{WQV = PCA \times 3630}$$
$$\boldsymbol{WQV = 1 \times 0.68 \times 1 \times 3630}$$
$$\boldsymbol{WQV = 2,468\ cubic\ feet}$$

2. Calculate the maximum allowable water storage depth in the basin (d_{max}):

$$\boldsymbol{d_{max} = kt/12F_s}$$
$$\boldsymbol{d_{max} = 1.0 \times 48/(12 \times 2)}$$
$$\boldsymbol{d_{max} = 2.0\ feet}$$

3. Select a ponding depth (d_p), planting media depth (l_m), and optional reservoir layer depth (l_r) such that the total effective storage depth (d_t) is no greater than the maximum allowable depth:

$$\boldsymbol{d_p = 0.67\ feet}$$
$$\boldsymbol{l_m = 4.0\ feet}$$
$$\boldsymbol{l_r = 1.0\ feet}$$

$$\boldsymbol{d_t = d_p + l_m n_m + l_r n_r}$$
$$\boldsymbol{d_t = 0.67 + 4.0 \times 0.25 + 1.0 \times 0.30}$$
$$\boldsymbol{d_t = 1.97\ feet}$$

4. Calculate the basin bottom surface area (A_b):

$$\boldsymbol{A_b = WQV/(d_t + kT/12F_s)}$$
$$\boldsymbol{A_b = 2,468/[1.97 + 1.0 \times 2.0/(12 \times 2)]}$$
$$\boldsymbol{A_b = 1,204\ square\ feet}$$

5. Set the basin bottom width (w_b) to 25 feet, and calculate the basin bottom length (l_b):

$$\boldsymbol{l_b = A_b/w_b}$$
$$\boldsymbol{l_b = 1,204/25}$$
$$\boldsymbol{l_b = 48.2\ feet}$$

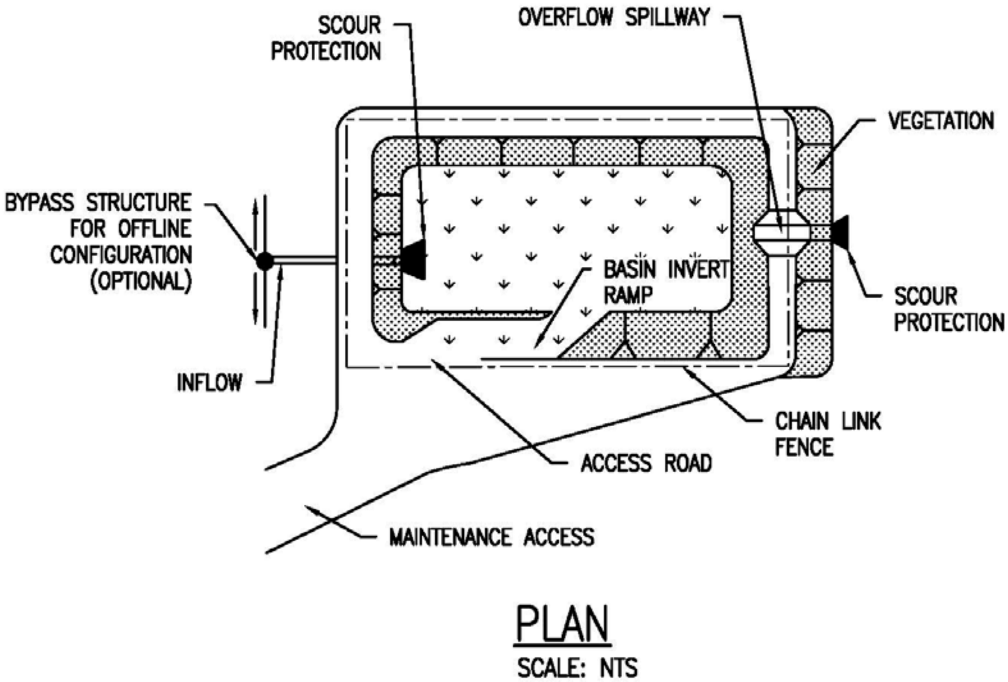
6. Calculate the total area excluding pretreatment (A_{BMP}):

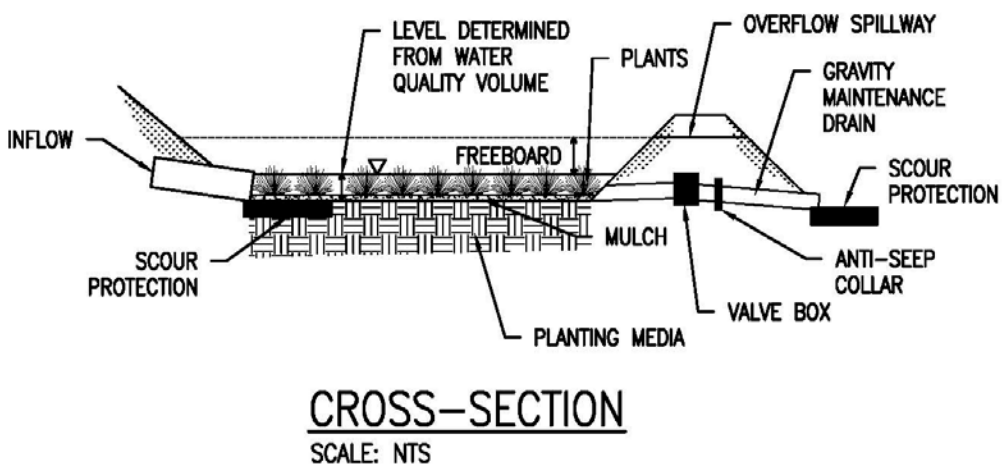
$$\boldsymbol{A_{BMP} = [w_b + 2z(d_p + f)] \times [l_b + 2z(d_p + f)]}$$
$$\boldsymbol{A_{BMP} = [25 + 2 \times 3(0.67 + 1)] \times [48.2 + 2 \times 3(0.67 + 1)]}$$
$$\boldsymbol{A_{BMP} = 2,037\ square\ feet}$$

Other Design Considerations

- The plantings should emulate a terrestrial forest community ecosystem. Native species should be selected, taking into account the local climate, expected water depth in the basin, and expected tolerances to pollutant loads and varying soil moistures. The trees should be smaller ones similar to those found in the forest understory, since it is more difficult to perform maintenance with the tall trees that are normally part of the forest canopy. Ground cover, such as grasses or legumes, should be planted after the trees and shrubs are in place.
- An overflow device (e.g., domed riser, spillway) must be included to safely convey runoff from large storm events when the surface/subsurface capacity is exceeded.
- If a mulch layer is used on the surface of the planting bed, consideration should be given to problems caused by flotation during storm events.
- Observation wells are recommended. They will indicate how quickly the basin dewaters following a storm and it will provide a method of observing how quickly the basin fills up with sediments.

Figure 8: Schematic of a Bioretention Basin





PERMEABLE PAVEMENT

Description

Sometimes referred to as pervious pavement or porous pavement, permeable pavement refers to any porous, load-bearing surface that allows for temporary rainwater storage in an underlying aggregate layer until it infiltrates into the soil matrix. It includes pervious concrete, porous asphalt, interlocking paver blocks, and reinforced turf and gravel filled grids.

BMP Category	
Retention	●
Biofiltration	○
Other	○

Expected Pollutant Removals	
Nutrients	High
Sediment	High
Trash	Low
Pathogens	High
Pesticides	High
Oil & Grease	High
Metals	High
Organic Compounds	High

UH Hale Halawai Overflow Parking

Minimum Design Criteria

Design Parameter	Units	Value
Maximum Depth of Reservoir Layer	feet	3
Drawdown (drain) Time	hours	48
Minimum depth from reservoir invert to groundwater table	feet	3
Minimum Soil Infiltration Rate	inches/hr	0.5

Feasibility Criteria

See Table 9.

Sizing Procedure

1. Use the procedure presented previously to compute the Volumetric Runoff Coefficient and Water Quality Volume.

2. Calculate the maximum allowable water storage depth (d_{max}) using the underlying soil infiltration rate (k) and the required drawdown time (t):

$$d_{max} = kt/(F_s \times 12)$$

Where: d_{max} = Maximum storage depth (ft)
k = Soil infiltration rate (in/hr)
t = Drawdown (drain) time (hrs)
F_s = Infiltration rate Factor of Safety (see Chapter 4)

3. Select a pavement course thickness (l_p) and reservoir course thickness (l_r) such that the total effective storage depth (d_t) is no greater than the maximum allowable depth:

$$\boldsymbol{d_t = (l_p n_p + l_r n_r)/12 \le d_{max}}$$

Where: d_t = Total effective water storage depth (ft)
l_p = Pavement course thickness (in)
n_p = Pavement course porosity
l_r = Reservoir course thickness (in)
n_r = Reservoir course porosity
d_{max} = Maximum storage depth from Step 2 (ft)

4. Calculate the BMP surface area (A_{BMP}):

$$\boldsymbol{A_{BMP} = WQV/(d_t + kT/12F_s)}$$

Where: A_{BMP} = BMP surface area (sq-ft)
WQV = Water Quality Volume from Step 1(cu-ft)
d_t = Total effective water storage depth from Step 3 (ft)
k = Soil infiltration rate (in/hr)
T = Fill time (time for the BMP to fill with water, hrs)
F_s = Infiltration rate Factor of Safety (see Chapter 4)

If the calculated area does not fit in the available space, either reduce the drainage area, increase the pavement course depth or reservoir course depth or gravel depth (if the total effective depth is not already equal to the maximum depth), and/or reduce the Infiltration rate factor of safety (if minimum number of test pits and permeability tests have not been performed) and repeat the calculations.

Pretreatment Considerations
Pretreatment is not required as long as the permeable pavement does not receive run-on from other surfaces. If it does, pretreatment is necessary to prevent premature failure due to clogging with fine sediment, and may be achieved with gravel filter strips, vegetated buffer strips, or vegetated swales.

Area Requirements
Permeable pavement requires a footprint equivalent to 5% - 18% of its contributing impervious drainage area. The lower value reflects the maximum allowable infiltration rate and minimum allowable factor of safety, while the upper value reflects the minimum allowable infiltration rate and maximum allowable factor of safety.

Sizing Example
Calculate the size of a section of permeable pavement serving the runoff from a 1-acre parking lot. Assume the following design parameters:

Design Parameter	**Units**	**Value**
Percent Impervious Cover, I	%	100
Design Storm Depth, P	inches	1.0
Reservoir Layer Fill Time, T	hours	2
Drawdown (drain) Time, t	hours	48
Pavement Course Porosity, n_p		0.15
Reservoir Course Porosity, n_r		0.35
Soil Infiltration Rate, k	inches/hr	1.0
Infiltration Rate Factor of Safety, F_s		2

1. Calculate the volumetric runoff coefficient (C) and Water Quality Volume (WQV):

$$\boldsymbol{C = 0.05 + 0.009I}$$
$$\boldsymbol{C = 0.05 + 0.009 \times 100}$$
$$\boldsymbol{C = 0.95}$$

$$\boldsymbol{WQV = PCA \times 3630}$$
$$\boldsymbol{WQV = 1 \times 0.95 \times 1 \times 3630}$$
$$\boldsymbol{WQV = 3,449\ cubic\ feet}$$

2. Calculate the maximum allowable water storage depth (d_{max}):

$$\boldsymbol{d_{max} = kt/12F_s}$$
$$\boldsymbol{d_{max} = 1.0 \times 48/(12 \times 2)}$$
$$\boldsymbol{d_{max} = 2.0\ feet}$$

3. Select a pavement course thickness (l_p) and reservoir course thickness (l_r) such that the total effective storage depth (d_t) is no greater than the maximum allowable depth:

$$\boldsymbol{l_p = 12.0\ inches}$$
$$\boldsymbol{l_r = 24.0\ inches}$$

$$\boldsymbol{d_t = \left(l_p n_p + l_r n_r\right)/12}$$
$$\boldsymbol{d_t = (12 \times 0.15 + 24 * 0.35)/12}$$
$$\boldsymbol{d_t = 0.85\ feet}$$

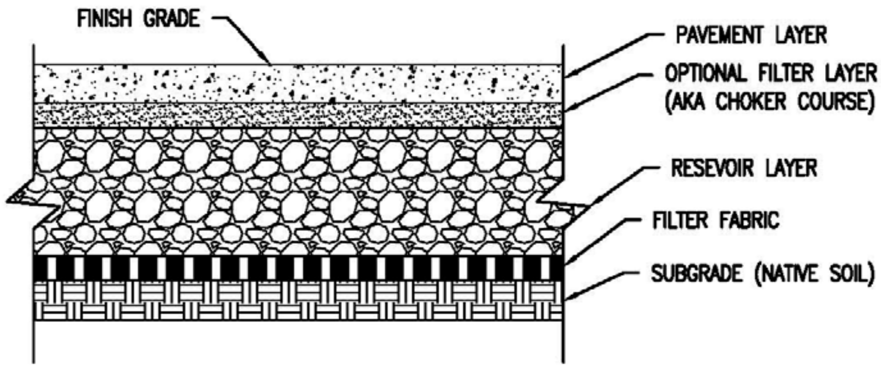
4. Calculate the pavement surface area:

$$\boldsymbol{A_{IMP} = WQV/[d_t + (kT/12F_s)]}$$
$$\boldsymbol{A_{IMP} = 3,449/[0.85 + (1.0 \times 2/12 \times 2)]}$$
$$\boldsymbol{A_{IMP} = 3,695\ square\ feet}$$

Other Design Considerations

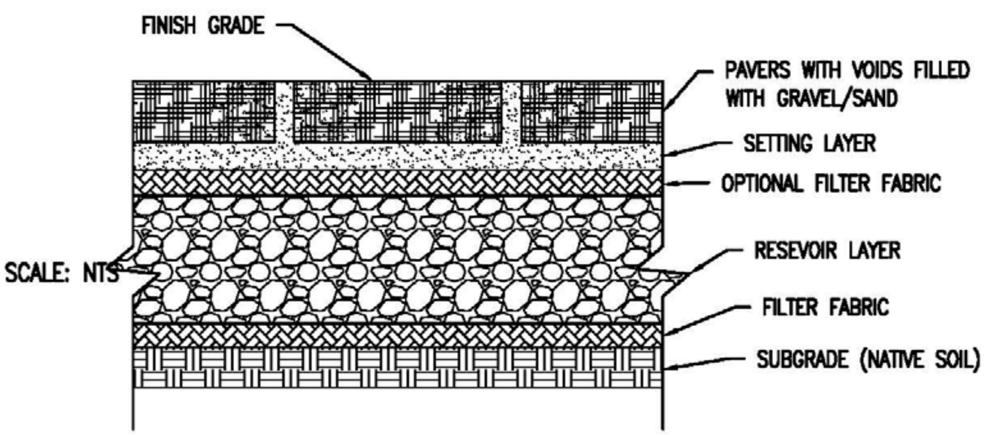
- All porous paving and permeable paver with storage bed systems must include measures that will allow runoff from the design storm to enter the storage bed in the event that the porous or permeable paver surface course becomes clogged or otherwise incapable of conveying the maximum design storm runoff to the bed.
- Additional design details on specific pavement systems are provided by the National Asphalt Pavement Association, the National Ready Mix Concrete Association, the Interlocking Concrete Pavement Institute, and the American Association of State Highway and Transportation Officials.
- Perforated pipes along the bottom of the bed may be used to evenly distribute runoff over the entire bed bottom. Pipes should lay flat along the bed bottom and provide for uniform distribution of water. Depending on size, these pipes may provide additional storage volume.
- Flows in excess of the design capacity of the permeable pavement system will require an overflow system connected to a downstream conveyance or other storm water runoff BMP.

Figure 9: Schematic of a Permeable Pavement



TYPICAL SECTION– PERVIOUS CONCRETE OR POROUS ASPHALT

SCALE: NTS



TYPICAL SECTION – PERMEABLE PAVERS

VEGETATED BIO-FILTER

Description

Sometimes referred to as a Bioretention Filter, Storm Water Curb Extension or Planter Box, a Vegetated Bio-Filter is an engineered shallow depression that collects and filters storm water runoff using conditioned planting soil beds and vegetation. The filtered runoff discharges through an underdrain system.

BMP Category	
Retention	○
Biofiltration	●
Other	○

Expected Pollutant Removals	
Nutrients	Medium
Sediment	High
Trash	High
Pathogens	Medium
Pesticides	Unknown
Oil & Grease	High
Metals	High
Organic Compounds	High

Waikikii

Minimum Design Criteria

Design Parameter	Units	Value
Planting Soil Coefficient of Permeability	feet/day	1.0
Mulch Thickness	inches	2 – 4
Planting Soil Depth	feet	2 – 4
Drawdown (drain) Time	hours	48
Maximum Ponding Depth	inches	12
Minimum Underdrain Diameter	inches	6

Feasibility Criteria

See Table 10.

Sizing Procedure

1. Use the procedure presented previously to compute the Volumetric Runoff Coefficient and Water Quality Volume.

2. Select values for the planting media depth (l_m) and maximum ponding depth (d_p).

3. Use Darcy's Law to calculate the required Filter Bed Surface Area:

$$A_b = \frac{WQV \times l_m}{k(l_m + d_p/24)(t/24)}$$

Where:
A_b = Filter bed surface area (sq-ft)
WQV = Water Quality Volume from Step 1 (cu-ft)
l_m = Planting media depth from step 2 (ft)
k = Planting media permeability coefficient (ft/day)
d_p = Maximum ponding depth, from Step 2 (in)
t = Filter bed drain time (hr)

4. Select a filter bed width (w_b), and calculate the filter bed length (l_b):

$$l_b = A_b / w_b$$

Where:
l_b = Filter bed length (ft)
A_b = Filter bed surface area from Step 3 (sq-ft)
w_b = Filter bed width (ft)

5. Calculate the total area occupied by the BMP excluding pretreatment (A_{BMP}) using the filter bed dimensions, embankment side slopes, and freeboard:

$$A_{BMP} = [w_b + 2z(d_p + f)] \times [l_b + 2z(d_p + f)]$$

Where:
A_{BMP} = Area occupied by BMP excluding pretreatment (sq-ft)
w_b = Filter bed width from Step 4 (ft)
z = Filter bed interior side slope (length per unit height)
d_p = Maximum Ponding Depth from Step 2 (ft)
f = Freeboard (ft)
l_b = Filter bed length from Step 4 (ft)

If the calculated area does not fit in the available space, either reduce the drainage area, reduce the planting soil depth (if it's not already set to the minimum), and/or increase the ponding depth (if it's not already set to the maximum depth), and repeat the calculations.

Pretreatment Considerations
Pretreatment should be provided where sediments or trash may cause a concern or decreased BMP functionality, and when space permits. Pretreatment may be achieved with vegetated swales, vegetated buffer strips with pea gravel or stone diaphragm, or manufactured treatment device.

Area Requirements
A vegetated bio-filter requires a footprint equivalent to 3.3% - 3.8% of its contributing impervious drainage area, excluding pretreatment. The lower value reflects the minimum planting media depth and maximum ponding depth, while the upper value reflects the maximum planting media depth and minimum ponding depth.

Sizing Example
Calculate the size of a vegetated bio-filter serving a 1-acre residential development. Assume the following design parameters:

Design Parameter	Units	Value
Percent Impervious Cover, I	%	70
Design Storm Depth, P	inches	1.0
Planting Soil Coefficient of Permeability, k	feet/day	1.0
Drawdown (drain) Time, t	hours	48
Interior Side Slope (length per unit height), z		0
Freeboard, f	ft	0.5

1. Calculate the volumetric runoff coefficient and Water Quality Volume (WQV):

$$\boldsymbol{C = 0.05 + 0.009I}$$
$$\boldsymbol{C = 0.05 + 0.0039 \times 70}$$
$$\boldsymbol{C = 0.68}$$

$$\boldsymbol{WQV = PCA \times 3630}$$
$$\boldsymbol{WQV = 1 \times 0.68 \times 1 \times 3630}$$
$$\boldsymbol{WQV = 2,468\ cubic\ feet}$$

2. Select a planting soil depth (d_s) and ponding depth (d_p):

$$\boldsymbol{d_s = 2.0\ ft}$$
$$\boldsymbol{d_p = 6\ in}$$

3. Calculate the Filter Bed Surface Area (A_{BMP}):

$$\boldsymbol{A_{BMP} = WQV \times d_s / \left[k\left(d_s + \left(d_p/24\right)\right)(t/24)\right]}$$
$$\boldsymbol{A_{BMP} = 2,468 \times 2/\left[1\left(2 + (6/24)\right)(48/24)\right]}$$
$$\boldsymbol{A_{BMP} = 1,097\ square\ feet}$$

4. Set the bottom width (w_b) to 6 feet, and calculate the bottom length (l_b):

$$\boldsymbol{l_b = A_b/w_b}$$
$$\boldsymbol{l_b = 1,097/6}$$
$$\boldsymbol{l_b = 182.8\ feet}$$

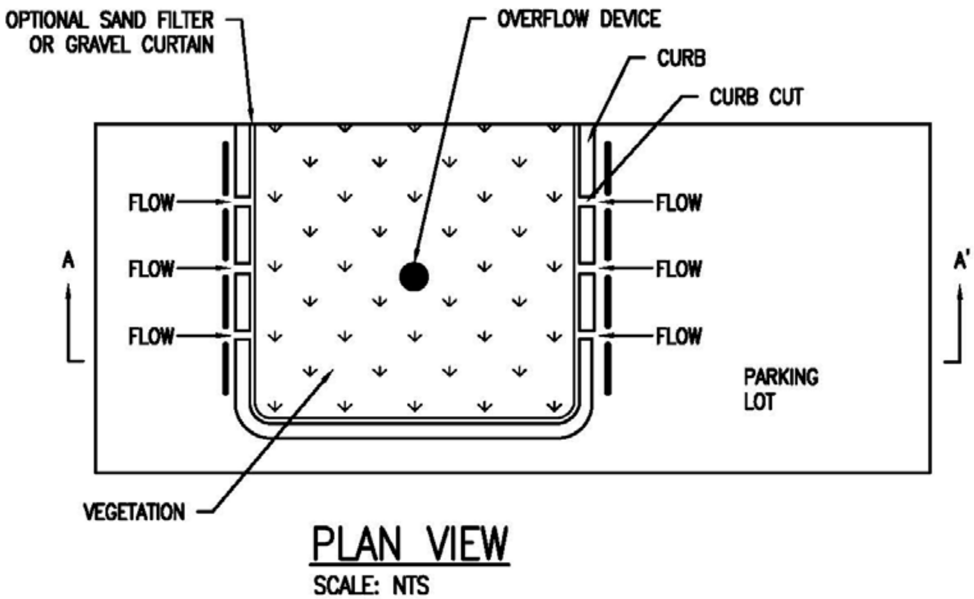
5. Calculate the total area excluding pretreatment (A_{BMP}):

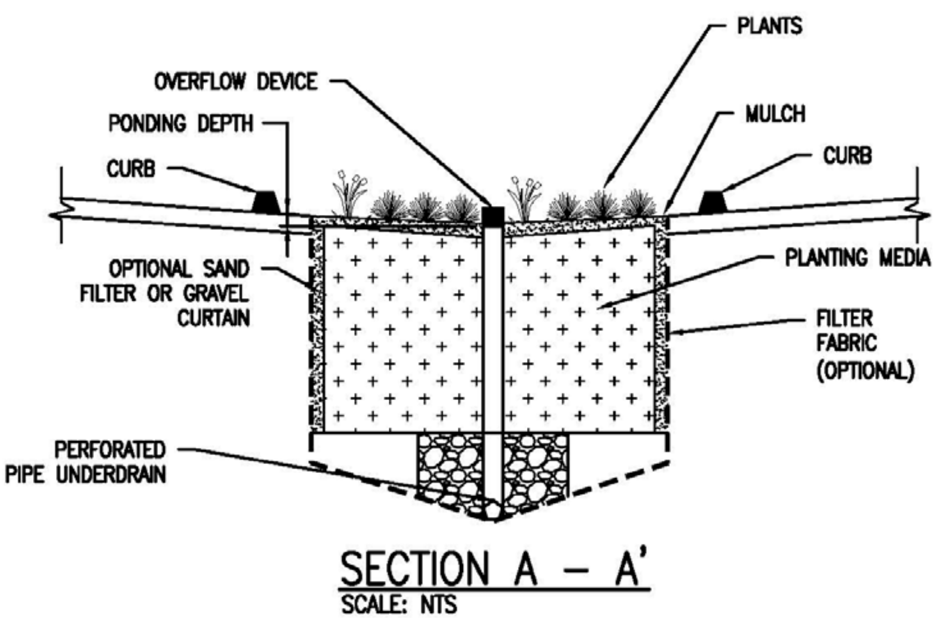
$$\boldsymbol{A_{BMP} = \left[w_b + 2z\left(d_p + f\right)\right] \times \left[l_b + 2z\left(d_p + f\right)\right]}$$
$$\boldsymbol{A_{BMP} = [6 + 2 \times 0(0.5 + 0.5)] \times [182.8 + 2 \times 0(0.5 + 0.5)]}$$
$$\boldsymbol{A_{BMP} = 1,097\ square\ feet}$$

Other Design Considerations

- An overflow device (e.g., domed riser, inlet structure) must be included to safely convey runoff from large storm events when the surface/subsurface capacity is exceeded.
- If a mulch layer is used on the surface of the planting bed, consideration should be given to problems caused by flotation during storm events.
- A cleanout pipe should be tied into the end of all underdrain pipe runs

Figure 11: Schematic of a Vegetated Bio-Filter





MANUFACTURED TREATMENT DEVICE

Description

Sometimes referred to as hydrodynamic or vortex separators, a manufactured treatment device is a proprietary water quality structure utilizing settling, filtration, adsorptive/absorptive materials, vortex separation, vegetative components, or other appropriate technology to remove pollutants from storm water runoff.

BMP Category	
Retention	○
Biofiltration	○
Other	●

Expected Pollutant Removals	
Nutrients	Low
Sediment	Med/High
Trash	High
Pathogens	Low
Pesticides	Low
Oil & Grease	Med/High
Metals	Low
Organic Compounds	Low

???

Minimum Design Criteria

Design Parameter	Units	Value
Minimum TSS Removal	%	80

Feasibility Criteria

Manufactured treatment devices are considered infeasible for any of the following conditions:

- Bottom of BMP is below seasonally high groundwater table
- Unable to operate off-line and unable to operate in-line w/ safe overflow mechanism
- Excavation would disturb iwi kupuna or other archaeological resources

Sizing Procedure

Follow the manufacturer's guidelines for appropriate sizing calculations and selection of appropriate device/model.

Pretreatment Considerations

No pretreatment is required.

Area Requirements

The footprint requirements for proprietary manufactured treatment devices vary by manufacturer.

Sizing Example

No example is provided as sizing procedures vary by manufacturer, and presenting any specific product might be interpreted as an endorsement.

Other Design Considerations

- The device must provide a TSS removal rate of 80%, verified by a Technology Acceptance and Reciprocity Partnership (TARP) state or by other third party testing organizations, provided that such verification is conducted in accordance with the protocol “Stormwater Best Management Practices Demonstration Tier II Protocol for Interstate Reciprocity”.
- All manufactured treatment devices must be able to safely overflow or bypass flows in excess of the storm water quality design storm to downstream drainage systems.

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APPENDIX B

Flood Hazard Assessment Report

State of Hawaii

FLOOD HAZARD ASSESSMENT REPORT

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD ZONE DEFINITIONS

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD – The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zone A, AE, AH, AO, V, and VE. The Base Flood Elevation (BFE) is the water-surface elevation of the 1% annual chance flood. Mandatory flood insurance purchase applies in these zones:

- **Zone A:** No BFE determined.
- **Zone AE:** BFE determined.
- **Zone AH:** Flood depths of 1 to 3 feet (usually areas of ponding); BFE determined.
- **Zone AO:** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined.
- **Zone V:** Coastal flood zone with velocity hazard (wave action); no BFE determined.
- **Zone VE:** Coastal flood zone with velocity hazard (wave action); BFE determined.
- **Zone AEF:** Floodway areas in Zone AE. The floodway is the channel of stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without increasing the BFE.

NON-SPECIAL FLOOD HAZARD AREA – An area in a low-to-moderate risk flood zone. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

- **Zone XS (X shaded):** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- **Zone X:** Areas determined to be outside the 0.2% annual chance floodplain.

OTHER FLOOD AREAS

- **Zone D:** Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

PROPERTY INFORMATION

COUNTY:	HONOLULU
TMK NO:	(1) 3-6-016-040
PARCEL ADDRESS:	855 ALAMUKU ST HONOLULU, HI 96821
FIRM INDEX DATE:	JANUARY 19, 2011
LETTER OF MAP CHANGE(S):	NONE
FEMA FIRM PANEL(S):	15003C0386G
PANEL EFFECTIVE DATE:	JANUARY 19, 2011

PARCEL DATA FROM:	APRIL 2014
IMAGERY DATA FROM:	MAY 2006

IMPORTANT PHONE NUMBERS

County NFIP Coordinator
City and County of Honolulu
Mario Siu-Li, CFM (808) 768-8098

State NFIP Coordinator
Carol Tyau-Beam, P.E., CFM (808) 587-0267

Disclaimer: The Department of Land and Natural Resources (DLNR) assumes no responsibility arising from the use of the information contained in this report. Viewers/Users are responsible for verifying the accuracy of the information and agree to indemnify the DLNR from any liability, which may arise from its use.

If this map has been identified as 'PRELIMINARY' or 'UNOFFICIAL', please note that it is being provided for informational purposes and is not to be used for official/legal decisions, regulatory compliance, or flood insurance rating. Contact your county NFIP coordinator for flood zone determinations to be used for compliance with local floodplain management regulations.

APPENDIX C

Preliminary Geotechnical Engineering Study, Aina Haina Reservoir No. 2

PRELIMINARY GEOTECHNICAL ENGINEERING STUDY
AINA HAINA RESERVOIR NO. 2
ALAMUKU STREET
TMK: 3-6-016: 040

for

THE LIMTIACO CONSULTING GROUP

HIRATA & ASSOCIATES, INC.
W.O. 11-5177
October 25, 2011

Hirata & Associates
Geotechnical Engineering
Hirata & Associates, Inc.
99-1433 Koaha Pl
Aiea, HI 96701
tel 808.486.0787
fax 808.486.0870

October 25, 2011
W.O. 11-5177

Mr. John Katahira
The Limtiaco Consulting Group
680 Iwilei Road, Suite 430
Honolulu, Hawaii 96817

Dear Mr. Katahira:

Re: Preliminary Geotechnical Engineering Study
Aina Haina Reservoir No. 2
Alamuku Street
TMK: 3-6-016: 040

This letter report presents the results of our preliminary geotechnical engineering study performed for the proposed Aina Haina 170 Reservoir No. 2 in Honolulu, Oahu, Hawaii. This study was performed in general conformance with the scope of services presented in our proposal dated May 16, 2011. Our services included the following:

- A visual reconnaissance of the site to observe existing conditions which may affect the project. The general location of the project site is shown on the enclosed Location Map, Plate 1.
- A review of available in-house soils information pertinent to the site and the proposed project.
- Drilling and sampling three exploratory borings and one probe hole to depths ranging from approximately 3 to 25 feet. The approximate exploratory boring and probe hole locations are shown on the enclosed Boring Location Plan, Plate 2, and the soils encountered in the borings are described on the Boring Logs, Plates 6.1 through 6.4.
- Laboratory testing of selected soil samples. Test results are presented on the Boring Logs (Plates 6.1 through 6.4). Due to the shallow depths at which basalt was encountered, only limited laboratory testing was performed as part of this study.
- Engineering analyses of the field and laboratory data.
- Preparation of this letter report presenting the findings of our research and exploratory borings, laboratory testing, and addressing the suitability of the site for the construction of a new 0.5 MG reservoir from a geotechnical viewpoint.

PROJECT CONSIDERATIONS

Information regarding the proposed project was provided by personnel from your office, and the Honolulu Board of Water Supply.

The proposed project will include the construction of a second 0.5 MG reservoir at the existing Board of Water Supply Aina Haina 170 Reservoir No. 1 site. The proposed reservoir will have the same dimensions as the existing 0.5 MG reservoir and will also include a 12-foot wide service road around the reservoir. We understand that if the land area on the existing site is inadequate for the proposed reservoir, additional land may be available on the adjacent former site of the Wailupe Valley Elementary School.

Our scope of services included of performing a preliminary geotechnical engineering study to determine the suitability of the existing site for the proposed reservoir, from a geotechnical viewpoint. Design of the proposed reservoir will require an additional geotechnical investigation.

SITE CONDITIONS

The project site is located on the northeast side of Alamuku Street, between its intersections with Hind Iuka Drive and Ailuna Street, in Honolulu, Oahu, Hawaii. The site is bordered on the north by the former Wailupe Valley Elementary School, and on the southwest by Alamuku Street. The remaining sides are bordered by residential structures.

The existing 0.5 MG reservoir is situated in the central portion of the property, with a booster pump building located on the southwest side of the existing reservoir, along Alamuku Street. No visible signs of distress, such as significant cracking, was observed along the exterior of the reservoir and building.

Access to the reservoir is provided by an approximately 12-foot wide driveway off Alamuku Street, extending from the southern corner of the property to the rear of the reservoir. A cut slope, ranging from approximately 12 to 16 feet in height with a gradient of about 1H:1V, extends along the eastern and northern sides of the driveway. The slope was covered by light to moderate vegetation. Clayey material with boulders or rock outcrops were observed on the slope face.

The proposed second reservoir will be located on the western side of the existing reservoir. This area is relatively level and covered by gravel.

Total relief over the property is approximately 42 feet, with ground elevations ranging from about +131 in the west to +173 in the east. Grade changes are accommodated by retaining walls extending along the perimeter of the property.

A retaining wall, with a maximum height of about 6 to 8 feet, is situated along the northern property line near the proposed reservoir and separates the former elementary school site and the reservoir site. Retaining walls along the northwestern property line near the proposed reservoir have maximum heights ranging from approximately 7 feet at the rear of the property to approximately 13 feet near Alamuku Street. Two retaining walls, separated by an approximately 20-foot wide bench, are situated along the southwestern property line near the proposed reservoir. The lower retaining wall has a maximum height of approximately 13 feet, while the upper retaining wall has a maximum height of approximately 8 feet.

FIELD INVESTIGATION

The site was explored on September 19 and 20, 2011 by performing a visual reconnaissance of the site and drilling three test borings to depths ranging from about 16.5 to 25 feet with a Mobile B80 truck-mounted drill rig. In addition, one probe hole was drilled to a depth of about 3 feet.

During drilling operations, the soils were continuously logged by our field engineer and classified by visual examination in accordance with the Unified Soil Classification System. The boring logs indicate the depths at which the soils or their characteristics change, although the change could actually be gradual. If the change occurred between sample locations, the depth was interpreted based on field observations. Classifications and sampling intervals are shown on the boring logs. A Boring Log Legend is presented on Plate 3. The Unified Soil Classification and Rock Weathering Classification Systems are shown on Plates 4 and 5, respectively. The soils encountered are logged on Plates 6.1 through 6.4.

Borings and the probe hole were located in the field by measuring/taping offsets from existing site features shown on the plans. Surface elevations at boring locations were estimated based on the Revised Plot Plan provided by The Limtiaco Consulting Group received on August 17, 2011. The accuracy of the boring and probe hole locations shown on Plate 2 and the elevations shown on Plates 6.1 through 6.4 are therefore approximate, in accordance with the field methods used.

Representative soil samples, as well as rock core samples, were recovered from the borings for selected laboratory testing and analyses. Representative samples were recovered by driving a 3-inch O.D. split tube sampler a total of 18 inches with a 140-pound hammer dropped from a height of 30 inches. The number of blows required to drive the sampler the final 12 inches are recorded at the appropriate depths on the boring logs, unless noted otherwise.

Core samples of rock were obtained by drilling with an NX core barrel having an inside diameter of 2.1 inches. Recovery percentages for each core run are shown on the enclosed Boring Logs.

The rock quality designation (RQD) for the core runs are also shown on the Boring Logs. This is a modified core recovery percentage which takes into account the number of fractures observed in the core samples. Only pieces of core 4 inches in length or longer, as measured along the centerline, were included in the determination of this modified core recovery percentage. Fractures caused by drilling or handling were ignored.

The following is a general correlation between RQD percentages and rock quality.

RQD (%)	Description of Rock Quality
0 - 25	Very Poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 - 100	Excellent

Reference: Tunnel Engineering Handbook, Second Edition, edited by J.O. Bickel, T.R. Kuesel, and E.H. King, 1996.

SOIL CONDITIONS

Boring B1 and probe hole P1 were covered by approximately 3 inches of gravel underlain by a geotextile fabric. Boring B2 was drilled through approximately 2 inches of asphaltic concrete over 6 inches of base material.

The near surface soils underlying the gravel and pavement sections in the borings and the probe hole drilled at the reservoir site were classified as fill consisting of brown clayey silt mixed with sand, gravel, and trash debris. The clayey silt fill was generally in a medium stiff condition, extending to depths ranging from about 1.5 to 2.5 feet.

The surface soil in boring B3, drilled at the former elementary school site, was classified as medium stiff, brown clayey silt, extending to a depth of about 2 feet.

Underlying the near surface soils was gray, slightly to moderately weathered basalt in a medium hard to hard condition. NX coring resulted in core recoveries ranging from 30 to 97 percent, and RQD values ranging from 20 to 83 percent. The lower core recovery values were due to seams of highly to completely weathered basalt encountered within the basalt stratum. The highly to completely weathered basalt seams were in a dense to medium hard condition.

Neither groundwater nor seepage water was encountered in our exploratory borings.

PRELIMINARY DISCUSSIONS AND FINDINGS

Variable Subgrade Conditions - Based on the sloping nature of the topography of the general area, variable subgrade conditions, including cut and fill conditions, are anticipated in the proposed reservoir area.

The Revised Part Plot Plan dated January, 1952 provided by your office indicated that prior to grading of the site, the original topography in the proposed reservoir area sloped down to the southwest, ranging from approximate elevation +142 to +158. The proposed development of this area, including a garage and new structure, was not completed. However, the site was leveled and retaining walls, as described in the *Site Conditions* section of this letter report, were used to accommodate the grade changes. Based on as-built plans, finish grades in this area are approximately +150 to +152. As a result, we believe that the proposed reservoir site presently consists of shallow cut and fill conditions.

Based on the Revised Part Plot Plan, the original elevation at boring B1 prior to grading of the site was +147. Approximately 2.5 feet of fill was encountered in boring B1, and the existing elevation based on as-built plans is approximately +150. As a result, our exploratory boring generally confirms the thickness of the previous placement of fill in this area.

The original elevations at boring B2 and probe hole P1 prior to grading of the site were +156 and +151, respectively. Based on finish grades of approximately +150 to +152, previous site grading consisted of shallow fills or cuts. Our exploratory boring and probe hole generally confirms the relatively shallow depths to basalt in these areas.

Surcharge Loads On Existing Retaining Walls - The proposed reservoir will be located behind the existing retaining walls along the northwestern and southwestern property lines. Due to the proximity of the proposed reservoir to the existing retaining walls, new foundations may impose additional surcharge loads on the retaining walls.

We anticipate that the proposed reservoir will be supported on conventional shallow foundations bearing on the underlying basalt stratum. A 12-foot wide service road will extend around the perimeter of the proposed reservoir, resulting in a minimum setback distance of 12 feet from the retaining walls. Based on existing retaining wall heights, ranging from 7 to 13 feet along the northwestern property line and 8 feet for the upper retaining wall along the southwestern property line, and new footing embedment depths of about 1 to 2 feet, it appears that new footings will be embedded below the 45-degree plane extending upward from the bottom edge of existing retaining wall foundations.

Due to the approximately 20-foot bench between the upper and lower retaining walls along the southwestern property line and the proposed 12-foot wide service road, the proposed reservoir will be setback a minimum 32 feet from the lower retaining wall along the southwestern property line. As a result, it appears that new footings will be embedded below the 45-degree plan extending upwards from the bottom edge of this existing retaining wall foundation.

Site Grading - Site grading in the northern portion of the proposed reservoir will require cuts into the existing cut slope. Clayey material with boulders or rock outcrops were observed on the slope face. New retaining walls may be required to accommodate grade changes along the northern portion of the proposed service road. As an alternative, permanent cut slopes may be also considered.

In addition, the proposed service road may extend into the elementary school and the existing retaining wall along the northern property line may need to reconstructed. Boring B3, drilled at the former elementary school site behind the existing retaining wall, encountered basalt at relatively shallow depths.

Seepage - Based on discussions with residents in the area, during periods of heavy rain, water was observed flowing near the corner of the lower retaining wall along the southwestern property line, and as a result, the potential for seepage under the site was discussed.

Neither groundwater nor seepage water was encountered in our exploratory borings. However, during periods of heavy rain, seasonal seepage in the basalt stratum can be anticipated as surface water percolates into the ground. Weepholes were not observed on the face of the lower retaining wall along the southern property line, however, based on as-built plans, a 6-inch subdrain is situated behind the retaining wall footing. The effectiveness of the subdrain should be confirmed.

Properties on the west side of Ailuna Street have experienced ground movement, and as a result, residential structures have been demolished or abandoned. We understand that there are ongoing geotechnical studies in these areas, and based on discussions with the neighborhood board, it is believed that seepage conditions may exist in these areas. Due to the relatively shallow depths to basalt encountered in our exploratory borings, it is our opinion that the potential for ground movement at the proposed reservoir site due to ground movement appears to be minimal.

CONCLUSIONS AND OPINIONS

Based on the results of our exploratory fieldwork, it is our opinion that from a geotechnical viewpoint, the property is feasible for development of the proposed reservoir.

Medium hard to hard basalt, with dense to medium hard weathered seams were encountered at relatively shallow depths. Conventional shallow foundations founded directly on the basalt stratum is anticipated for support of the proposed reservoir. New foundations should be embedded below a 45-degree plane extending upward from the bottom edge of existing retaining wall foundations.

If required, conventional shallow foundations may be used for support of new or reconstructed retaining walls along the northern property line.

A more detailed investigation of the site, including additional exploratory test borings, laboratory testing, and analyses, should be prepared for the final design.

LIMITATIONS

The boring logs indicate the approximate subsurface soil conditions encountered only at those times and locations where our borings were made, and may not represent conditions at other times and locations.

This report was prepared specifically for The Limtiaco Consulting Group and their sub-consultants in support of the due diligence study for the proposed Aina Haina 170 Reservoir No. 2 in Honolulu, Oahu, Hawaii. The boring logs, laboratory test results, and conclusions and opinions presented in this letter report are for preliminary evaluation purposes only, and are not intended for use in the final design or for use in developing cost estimates by contractors.

Our conclusions and opinions are based upon the site materials observed, the preliminary design information made available, the data obtained from our site exploration, our engineering analyses, and our experience and engineering judgement. The conclusions and opinions in this letter report are professional opinions which we have strived to develop in a manner consistent with that level of care, skill, and competence ordinarily exercised by members of the profession in good standing, currently practicing under similar conditions in the same locality. We will be responsible for those conclusions and opinions, but will not be responsible for the interpretation by others of the information developed. No warranty is made regarding the services performed, either express or implied.

Respectfully submitted,

HIRATA & ASSOCIATES, INC.

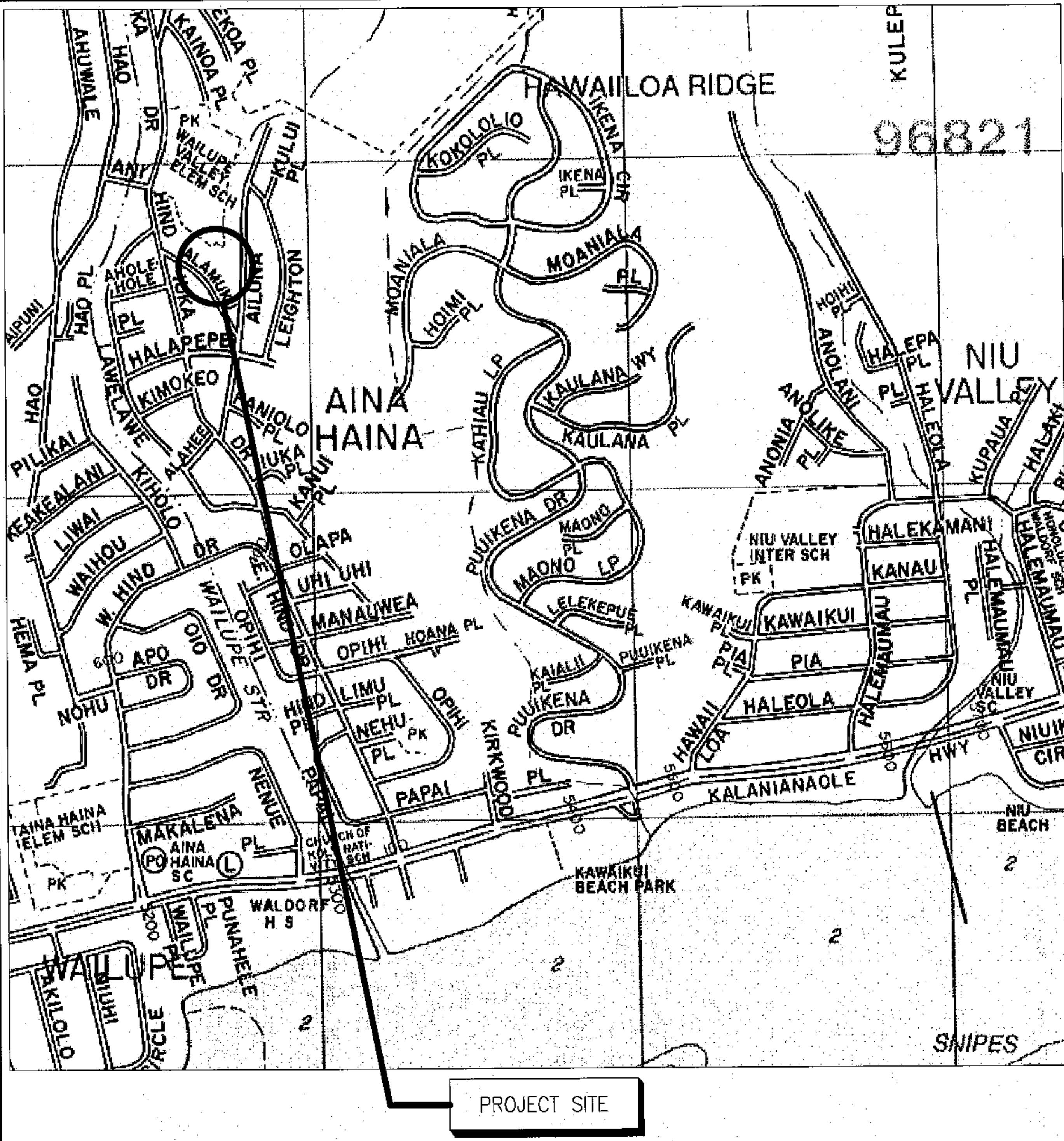
Nathan K. Tanaka, Project Engineer

Rick Yoshida, Project Manager

RICK I.K. YOSHIDA
LICENSED PROFESSIONAL ENGINEER
No. 11118-C
HAWAII, U.S.A.

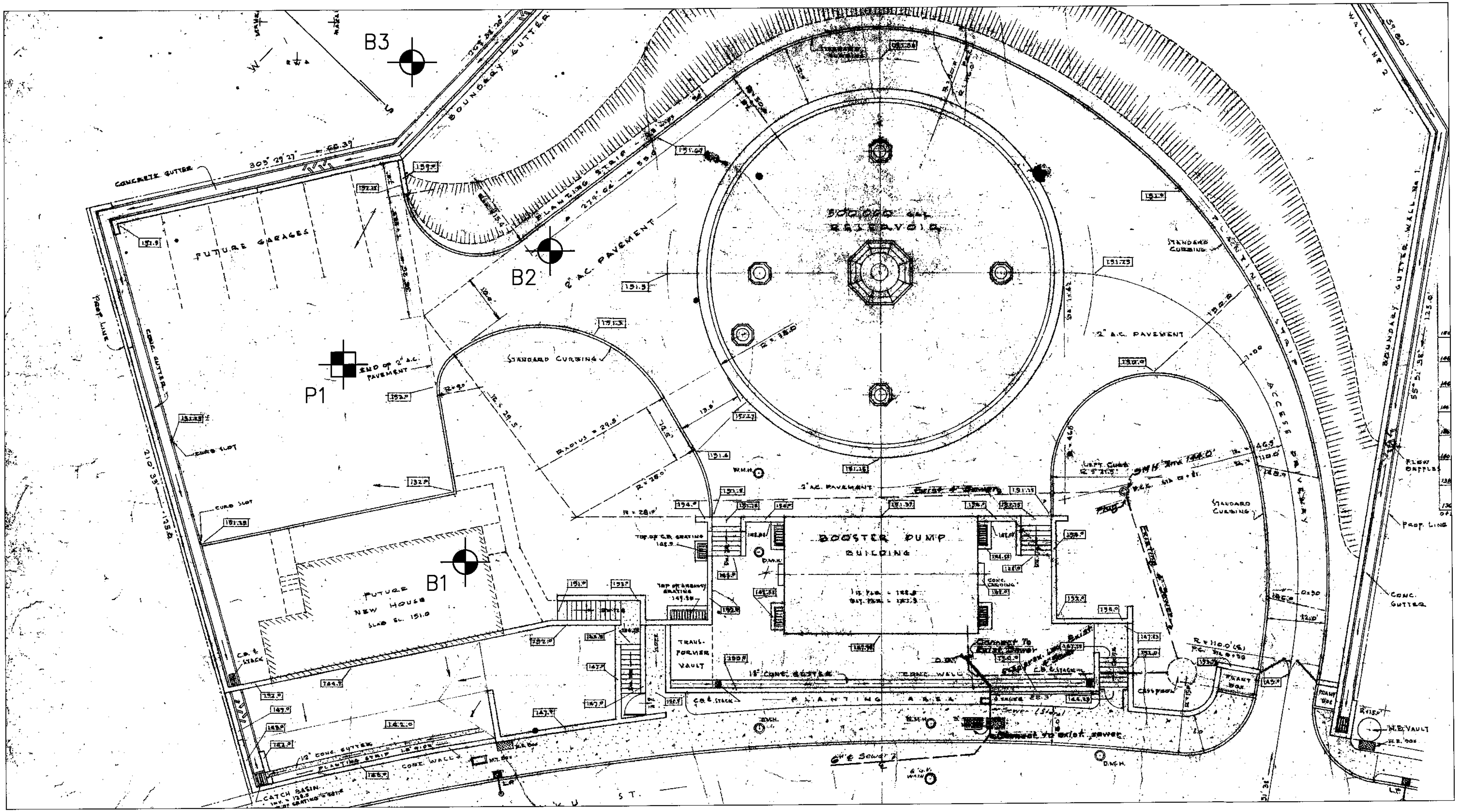
This work was prepared by me or under my supervision
Expiration Date of License:
April 30, 2012

Enc:
- Location Map .... Plate 1
- Boring Location Plan .... Plate 2
- Boring Log Legend .... Plate 3
- Unified Soil Classification System .... Plate 4
- Rock Weathering Classification System .... Plate 5
- Boring Logs .... Plates 6.1 through 6.4



Reference: Bryan's Sectional Maps, 2010 Edition
(Copyright J.R. Clere, used with permission)

W.O. 11-5177	Aina Haina Reservoir No. 2
Hirata & Associates, Inc.	LOCATION MAP Plate 1



LEGEND:

Approximate location of borings

Approximate location of probe hole

Reference: Revised Plot Plan provided by The Limtiaco Consulting Group received on August 17, 2011.

GRAPHIC SCALE:
0 10 20 40 FT.
1" = 20'

W.O. 11-5177	Aina Haina Reservoir No. 2
Hirata & Associates, Inc.	BORING LOCATION PLAN Plate 2

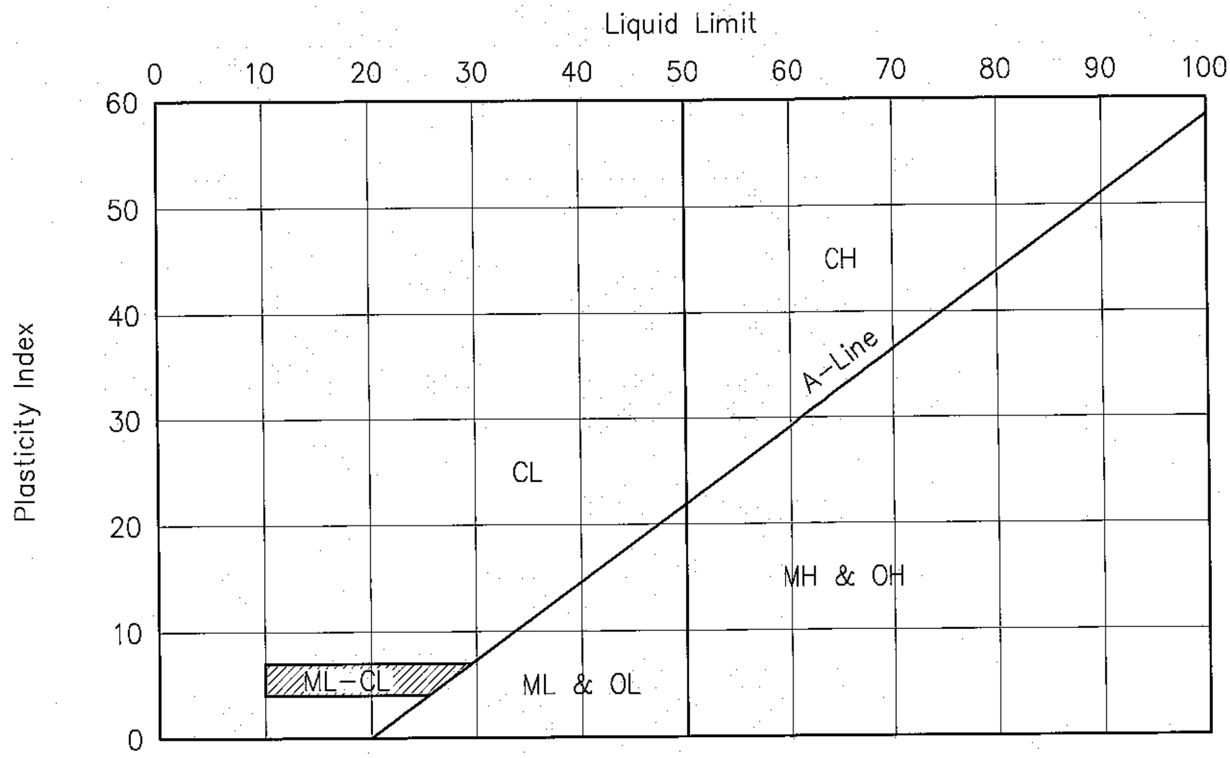
MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of the material is LARGER than No. 200 sieve size.)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size.)	CLEAN GRAVELS (Little or no fines.)	GW	Well graded gravels, gravel–sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel–sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amt. of fines.)	GM	Silty gravels, gravel–sand–silt mixtures.
			GC	Clayey gravels, gravel–sand–clay mixtures.
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 sieve size.)	CLEAN SANDS (Little or no fines.)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amt. of fines.)	SM	Silty sands, sand–silt mixtures.
			SC	Clayey sands, sand–clay mixtures.
FINE GRAINED SOILS (More than 50% of the material is SMALLER than No. 200 sieve size.)	SILTS AND CLAYS (Liquid limit LESS than 50.)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50.)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils.
				FRESH TO MODERATELY WEATHERED BASALT
				VOLCANIC TUFF / HIGHLY TO COMPLETELY WEATHERED BASALT
				CORAL

SAMPLE DEFINITION		
2" O.D. Standard Split Spoon Sampler	Shelby Tube	RQD Rock Quality Designation
3" O.D. Split Tube Sampler	NX / 4" Coring	Water Level

W.O. 11-5177	Aina Haina Reservoir No. 2
Hirata & Associates, Inc.	BORING LOG LEGEND

Plate 3

PLASTICITY CHART



GRADATION CHART

COMPONENT DEFINITIONS BY GRADATION	
COMPONENT	SIZE RANGE
Boulders	Above 12 in.
Cobbles	3 in. to 12 in.
Gravel	3 in. to No. 4 (4.76 mm)
Coarse gravel	3 in. to 3/4 in.
Fine gravel	3/4 in. to No. 4 (4.76 mm)
Sand	No. 4 (4.76 mm) to No. 200 (0.074 mm)
Coarse sand	No. 4 (4.76 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and clay	Smaller than No. 200 (0.074 mm)

W.O. 11-5177	Aina Haina Reservoir No. 2
Hirata & Associates, Inc.	UNIFIED SOIL CLASSIFICATION SYSTEM Plate 4

Grade	Symbol	Description
Fresh	F	No visible signs of decomposition or discoloration. Rings under hammer impact.
Slightly Weathered	WS	Slight discoloration inwards from open fractures, otherwise similar to F.
Moderately Weathered	WM	Discoloration throughout. Weaker minerals such as feldspar decomposed. Strength somewhat less than fresh rock but cores cannot be broken by hand or scraped by knife. Texture preserved.
Highly Weathered	WH	Most minerals somewhat decomposed. Specimens can be broken by hand with effort or shaved with knife. Core stones present in rock mass. Texture becoming indistinct but fabric preserved.
Completely Weathered	WC	Minerals decomposed to soil but fabric and structure preserved (Saprolite). Specimens easily crumbled or penetrated.
Residual Soil	RS	Advanced state of decomposition resulting in plastic soils. Rock fabric and structure completely destroyed. Large volume change.

Reference: Soils Mechanics, NAVFAC DM-7.1, Department of the Navy, Naval Facilities Engineering Command, September, 1986.

W.O. 11-5177	Aina Haina Reservoir No. 2
Hirata & Associates, Inc.	ROCK WEATHERING CLASSIFICATION SYSTEM Plate 5

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 11-5177

BORING NO.	B1	DRIVING WT.	140 lb.	START DATE	9/20/11
SURFACE ELEV.	150±*	DROP	30 in.	END DATE	9/20/11

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Clayey SILT (ML) – Brown, moist, medium stiff, with sand, gravel, and trash debris. (Fill) Covered by 3 inches of gravel over a geotextile fabric.
5						BASALT (WS–WM) – Gray, hard, vesicular, slightly to moderately weathered, with highly to completely weathered seams. Begin NX coring at 2.5 feet. 30% Recovery from 2.5 to 7.5 feet. RQD = 20%
						90% Recovery from 7.5 to 12.5 feet. RQD = 83%
10						
						73% Recovery from 12.5 to 16.5 feet. RQD = 23%
15						
						End boring at 16.5 feet.
20						
25						Neither groundwater nor seepage water encountered.
						* Elevations based on Revised Plot Plan provided by The Limtiaco Consulting Group received on August 17, 2011.
30						

Plate 6.1

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 11-5177

BORING NO. B2 | DRIVING WT. 140 lb. | START DATE 9/20/11

SURFACE ELEV. 152± | DROP 30 in. | END DATE 9/20/11

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Clayey SILT (ML) – Brown, moist, medium stiff, with sand and gravel. (Fill) Covered by 2 inches of AC over 6 inches of base material.
			94/7"	89	23	BASALT (WM) – Gray, dense to medium hard, vesicular, moderately weathered, with highly to completely weathered seams.
			50/2"	No Recovery		
5						
			74/11"	73	44	
10						
						Less weathered from 12 feet. Begin NX coring at 12 feet. 87% Recovery from 12 to 17 feet. RQD = 67%
15						
						72% Recovery from 17 to 20 feet. RQD = 31%
20						End boring at 20 feet.
25						Neither groundwater nor seepage water encountered.
30						

Plate 6.2

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 11-5177

BORING NO. B3 | DRIVING WT. 140 lb. | START DATE 9/19/11
SURFACE ELEV. 160± | DROP 30 in. | END DATE 9/19/11

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Clayey SILT (MH) – Brown, moist, medium stiff.
2						BASALT (WS–WM) – Gray, hard, vesicular, slightly to moderately weathered, with highly weathered seams.
5						Begin NX coring at 5 feet. 97% Recovery from 5 to 10 feet. RQD = 50%
10						90% Recovery from 10 to 15 feet. RQD = 57%
15						77% Recovery from 15 to 20 feet. RQD = 50%
20						68% Recovery from 20 to 25 feet. RQD = 50%
25						End boring at 25 feet. Neither groundwater nor seepage water encountered.
30						

Plate 6.3

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 11-5177

BORING NO. P1 | DRIVING WT. 140 lb. | START DATE 9/20/11

SURFACE ELEV. 152± | DROP 30 in. | END DATE 9/20/11

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Clayey SILT (ML) – Brown, moist, medium stiff, with sand and gravel. (Fill) Covered by 3 inches of gravel over a geotextile fabric.
						BASALT (WM) – Gray, medium hard, moderately weathered.
						End boring at 3 feet.
5						
10						Neither groundwater nor seepage water encountered.
15						
20						
25						
30						

Plate 6.4

APPENDIX D

Site Photographs

Photo 1. View of the BWS facility from Alamuku Street

Photo 2. View of the location for the proposed reservoir from Alamuku Street

Photo 3. The location of the proposed reservoir is in the foreground and the Aina Haina 170' Potable Reservoir No. 1 is in the background.

Photo 4. The location of the proposed reservoir is in the foreground and the Wailupe Community Park is in the background.

EXISTING

PROPOSED - NO LANDSCAPING

PROPOSED - WITH LANDSCAPING

Photo 5. Comparitive views of the BWS facility from Alamuku Street.

APPENDIX E

Archaeological Inventory Survey Report for the
Proposed Aina Haina 170’ Potable Reservoir No. 2 Project in
Wailupe Ahupuaa, Kona District, Oahu Island, Hawaii

SCS Project Number 1646-2 AIS

ARCHAEOLOGICAL INVENTORY SURVEY REPORT FOR THE PROPOSED AINA HAINA 170’ POTABLE RESERVOIR NO. 2 PROJECT IN WAILUPE AHUPUA‘A, KONA DISTRICT O‘AHU ISLAND, HAWAI‘I [TMK: (1) 3-6-016:040 AND 3-6-019:012 POR.]

Prepared by:
Elizabeth Pestana, B.A.
and
Robert L. Spear, Ph.D.
April 2015
Revised
May 2016

Prepared for:
The Limtiaco Consulting Group
1622 Kanakanui Street
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SCIENTIFIC CONSULTANT SERVICES Inc.

1347 Kapiolani Blvd., Suite 408 Honolulu, Hawai`i 96814

ABSTRACT

Limtiaco Consulting Group contracted Scientific Consultant Services Inc., (SCS), on behalf of Board of Water Supply (BWS), to conduct an archaeological inventory survey (AIS) study at the Aina Haina 170’ Reservoir No. 1 & pump station facility, on land owned by BWS and City and County of Honolulu (CCH). The SHPD requested an AIS be conducted in support of the proposed Aina Haina 170’ Potable Reservoir No. 2 Project (Log. No. 2014.03211, Doc. No. 1406GC08). In concert with the AIS, a reconnaissance level survey (RLS) was accomplished by Mason Architects Inc. (MAI) under contract with SCS in support of the project. The project area is a 0.9613-acre property at 855 Alamuku Street. The project area includes the Aina Haina BWS reservoir pump station (Parcel 040), and a 0.03-acre portion of CCH land (Parcel 012); the Parcel 012 area is referred to as the “Transferable Land Portion” of the project area based on BWS maps. The project area is adjacent to Wailupe Valley Neighborhood Park in ‘Āina Haina, Wailupe Valley, Wailupe Ahupua‘a, Kona District, O‘ahu, Hawai‘i [TMK: (1) 3-6-016:040 and 3-6-019:012 por.].

The BWS 170’ Potable Reservoir No. 2 project involves the installations of a new 0.5-million-gallon potable water reservoir, new drainage infrastructure, modification of existing infrastructure (including utilities and grading).

The current AIS involved archival research of the project area and vicinity, including historic and archaeological background, and previous archaeological investigations. It also included a 100% surface survey of the project area; and testing involving excavations of eight shovel probes and one control unit in Parcel 012. In addition to the AIS, Mason Architects conducted architectural reconnaissance level survey (RLS) for evaluation of the BWS Aina Haina facility structures. The current AIS, in combination with the RLS, newly documented two historic resources which were designated as State Inventory of Historic Places (Site) Site # 50-80-15-7764 and Site # 50-80-15-7936. Site # 50-80-15-7764 comprises mid-20th Century architectural structures of the Aina Haina BWS facility, consisting of the pump station building and associated reservoir component enclosure structure. Site # 50-80-15-7764 is located in TMK: (1) 3-6-016:040. Site # 50-80-15-7936 includes two features consisting of a dressed basalt rock retaining wall (Feature 1) and a concrete ditch (Feature 2) within Parcel 012. Limited subsurface testing yielded no identification of buried cultural features or artifacts/cultural materials.

Per Hawai‘i Administrative Rules (HAR) §13-284-6, Site # 50-80-15-7764 is assessed as significant under criterion ‘c’ (an excellent example of historic regional architecture); additionally, this Site is Hawai‘i Register eligible under criterion ‘C’ per HAR §13-198-8 (distinctive/characteristic of a type, period, or method of construction). Site # 50-80-15-7936 is assessed as significant under criterion ‘d’ (has yielded, or potential to yield information important to the history or prehistory Hawai‘i). Site # 50-80-15-7936 is sufficiently documented as a result of the current AIS and no further work is recommended for Features 1 and 2 within the current project area. As the proposed project will have no adverse effects on Site # 50-80-15-7764, no further archaeological work is recommended for the site. However, any future projects proposed within or near Site # 50-80-15-7764 or the undocumented portions of Site # 50-80-15-7936 outside the current AIS project area should be submitted to the SHPD for review.

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

Scientific Consultant Services Inc. (SCS) conducted an archaeological inventory survey (AIS) in support of the Board of Water Supply's (BWS) proposed Aina Haina 170' Potable Reservoir No. 2 Project. SCS completed the AIS under contract with Limtiaco Consulting Group. The AIS was requested by the SHPD in order to identify, document, assess, and make recommendations concerning potential historic properties within the project area (September 8, 2014; Log No. 2014.03211, Doc. No. 1406GC08). The project area involves two parcels owned by different entities. The first involves TMK: (1) 3-6-016:040 which is owned by the BWS and includes the Aina Haina 170' Potable Reservoir No. 1 and booster pump station facility. This parcel totals 0.9613 acres. The second parcel is identified as TMK: (1) 3-6-019:012 which is on land owned by the City and County of Honolulu (CCH). It is also identified as the "Transferable Land Portion" of the project area based on BWS maps and documents. This 0.03-acre portion of the parcel is adjacent to Wailupe Valley Neighborhood Park. Both parcels are within ʻĀina Haina, Wailupe Valley, Wailupe Ahupuaʻa, Kona District, Oʻahu, Hawaiʻi (Figures 1 and 2).

The project area is largely a previously-developed BWS facility. The proposed improvements involve only a portion of this facility, which is described in this report as the Area of Potential Effect (APE) for the project (Figures 3 and 4). As the project will not affect the entirety of the facility, the AIS focused only on the APE for the proposed improvements, specifically construction of a new 0.5-million gallon enclosed reservoir (identified as Aina Haina 170' Potable Reservoir No. 2) and an access road. The APE, as shown in Figures 3 and 4, consists primarily of an unimproved section of Parcel 040 (owned by BWS) located at 855 Alamuku Street, and portion of Wailupe Valley Neighborhood Park at 939 Hind Iuka Drive which may be acquired from CCH for this project (see Figures 2-4). The proposed improvements include construction of the reservoir, installation of new drainage infrastructure and connections to existing utility lines, realignment of an existing CMU wall and fencing, grading, and possibly extension of the existing maintenance road to encompass the new potable reservoir. The anticipated trenching depth is approximately 6 ft. below surface. The acquisition of the additional acreage (portion of Parcel 012) will require grading, cutting and excavation to meet the current grade of the existing reservoir facility.

Figure 1: USGS topo Map (Koko Head, 1999) showing the location of the project area.

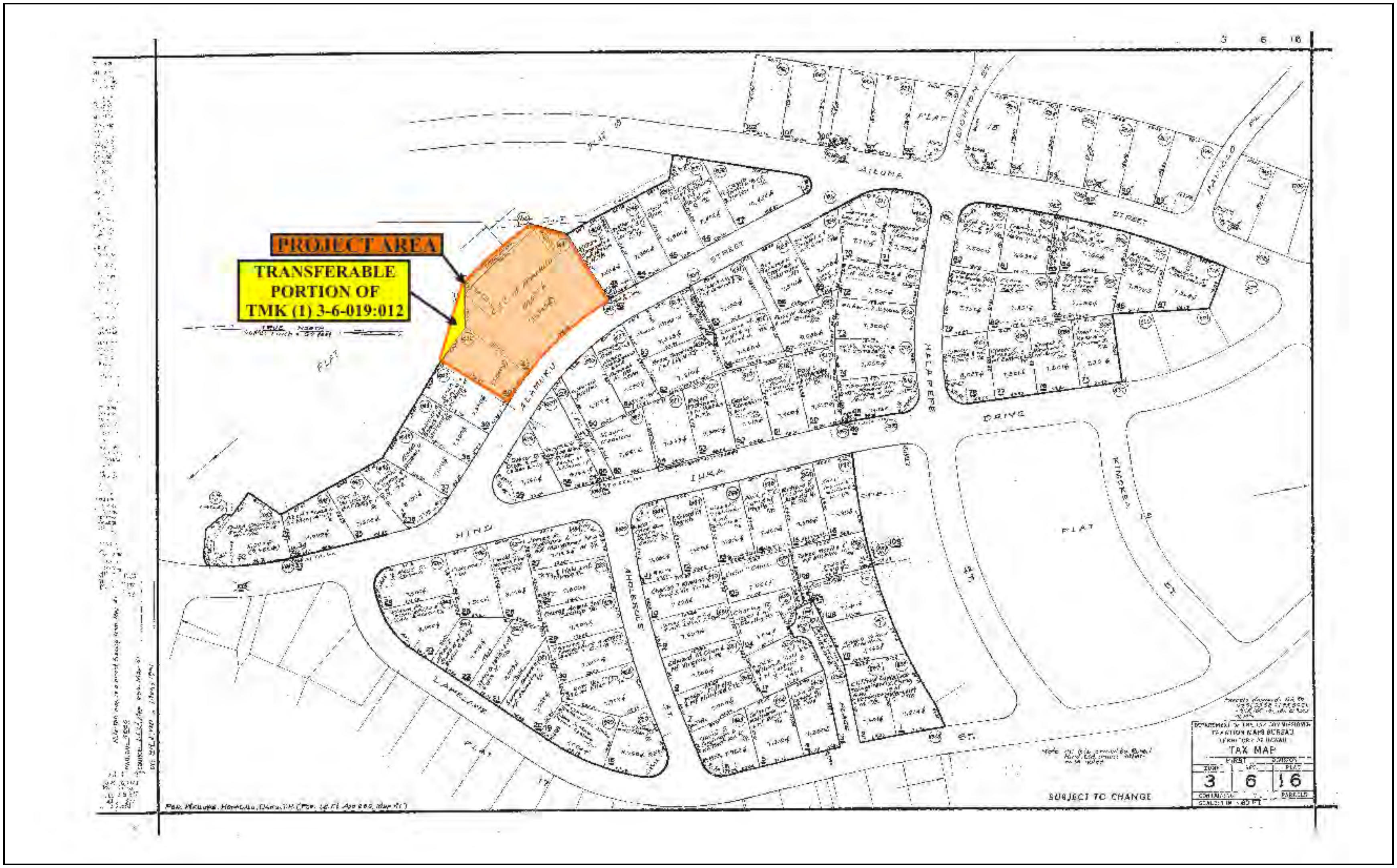

Figure 2: Tax Map Key (TMK) highlighting the project area, including TMK: (1) 3-6-016:40 (orange); and TMK: (1) 3-6-019:012 por. (yellow) which is referred to as the "Transferrable Land Portion" of the facility project Area.

Figure 3: Google earth Satellite image (Imagery Date 1/29/2013) indicating the project area and area of potential affect (APE) (adapted from Google earth 7.1.2.2041, 2013; accessed February 2015).

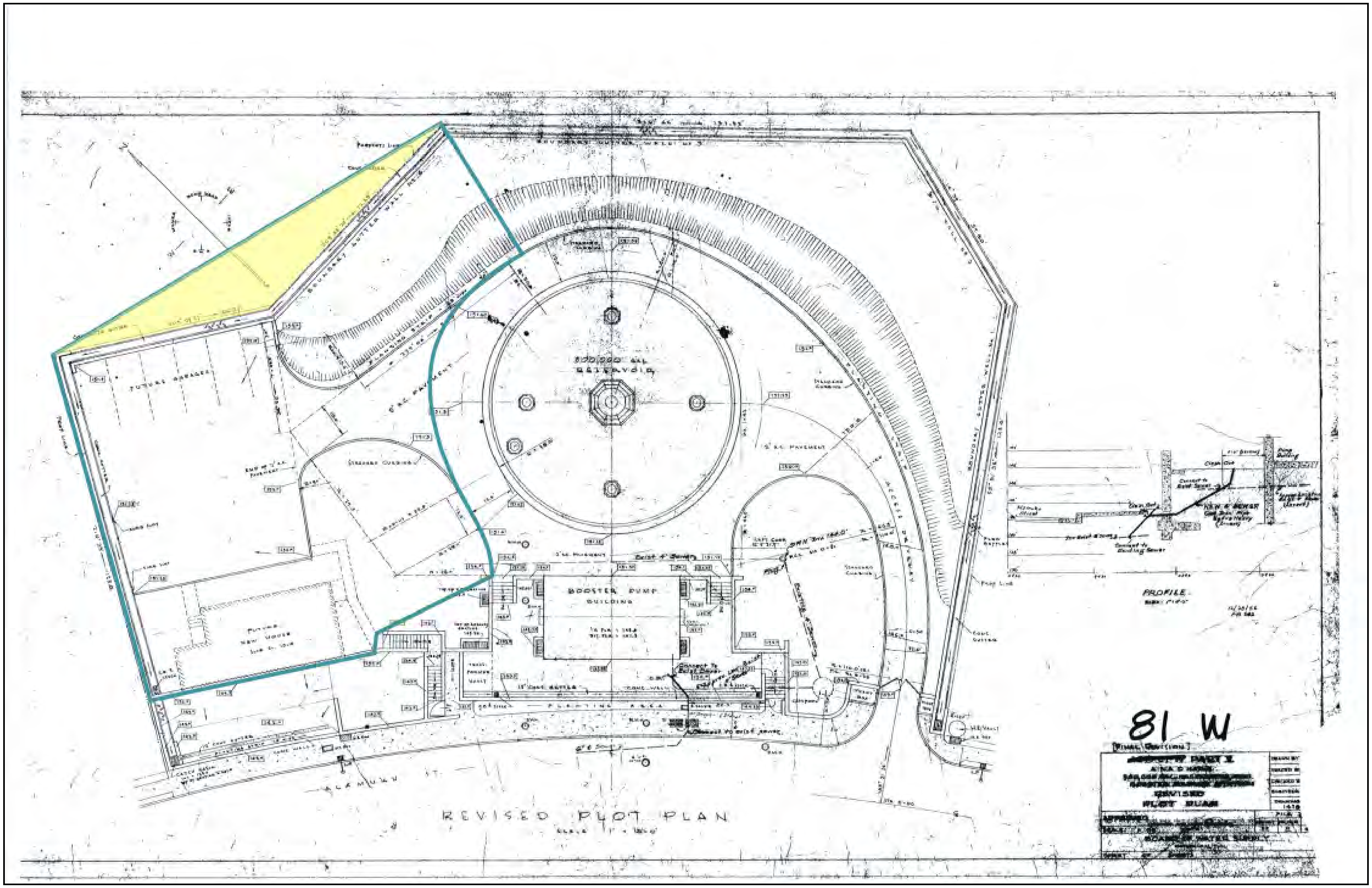

Figure 4: Engineer site plan of the BWS Facility indicating the APE (blue) and "Transferrable Land Portion" (yellow) within the project area (plan drawing No. 1471; adapted from Board of Water Supply construction plan drawing, May 14, 1951).

The current AIS involved 100% pedestrian surface survey of the entirety of the facility project area (0.9613-acre) [TMK: (1) 3-6-016:040, and limited subsurface testing of the 0.03-acre “Transferable Land Portion” of the APE [TMK: (1) 3-6-019:012 por.]. The decision to conduct testing within the 0.03-acre Parcel 12 portion of the APE and not the larger portion in Parcel 040 reflects information regarding previous disturbance and/or development differences between these two areas. The Parcel 012 portion occurs at a higher grade than the Parcel 040 portion of the APE, as the latter has been substantially lowered through prior grading and installation of the BWS facility. In contrast, Parcel 012 was assessed as having potential to yield intact subsurface cultural and/or natural deposits that had not been seriously truncated or removed and subsequently built up through deposition of fill. The AIS newly identified a single archaeological historic property which was designated as Site 50-80-15-7936, consisting of a mortared dressed-basalt retaining wall (Feature 1) and a concrete ditch (Feature 2). Site 50-80-15-7936 extends beyond the current AIS boundaries and interpreted to be associated with former Wailupe Valley Elementary School (established ca. 1956-1958).

In conjunction with the AIS, which focused primarily on potential archaeological historic properties, a Reconnaissance Level Survey (RLS) was conducted which focused on potential architectural historic properties within the existing BWS facility project area (TMK: [1] 3-6-016:040). The RLS documentation is provided in Appendix A; and includes identification, description, photographs, and Hawaii and National Register of Historic Places evaluations for the Aina Haina 170’ Potable Reservoir No. 1 and Booster Pump Station Building which were newly designated as Site # 50-80-15-7764.

Fieldwork was conducted on February 3-4, 2015, by SCS archaeologists Elizabeth Pestana, B.A., and Erica Lee, B.A., under the direct supervision of Robert L. Spear, Ph.D., Principal Investigator. The purpose of the archaeological investigation was to identify and document all archaeological historic properties greater than 50 years in age within the project area and to gather sufficient information to evaluate their significance in accordance with criteria established in Hawaii Administrative Rules (HAR)§13-275-6 pertaining to government projects. In addition to the survey results and site descriptions, this report summarizes the environmental setting, relevant historical background information, previous archaeological investigations, field and laboratory methods, project area stratigraphy and test results, site significance assessments, a project effect determination, and mitigation recommendations for archaeological resources within the project area.

PROJECT AREA

The project area is bounded on the south by Alamuku Street within TMK: (1) 3-6-016:040, and on the north by an undeveloped portion of Wailupe Valley Neighborhood Park (formerly Wailupe Elementary school) within TMK: (1) 3-6-019:012. A single family residential neighborhood surrounds the northeastern portion of the project area.

The larger of the two project parcels (TMK: (1) 3-6-016:040) contains the BWS's 170' potable reservoir and booster pump station building which were built into sloping terrain (Figure 5). A series of concrete retaining walls support the multi-tiered landscape north to south across the parcel (Figure 6). An asphalt driveway (12-foot wide) within the eastern portion of this parcel is accessed from Alamuku Street and leads to the access road encircling the reservoir tank structure in east quadrant of the project property. The booster pump station building is in the central-south side of the project parcel; a concrete stairway extends to the basement of the building. The northwest portion of the BWS project parcel, included in the APE, is a level gravel-covered surface area with sparse grass, lined by the access road curbing, which is bordered by retaining walls (Figures 7 and 8; also see Figure 6).

The "Transferable Land" portion of the project area, identified as TMK: (1) 3-6-019:012, consists of a 0.03-acre portion of Wailupe Valley Neighborhood Park (see Figure 3). This portion of the project area consists of a triangular swath of an open grass field, and is delimited from the BWS parcel by a concrete retaining wall along the north boundary of the BWS property line in TMK: (1) 3-6-016:040. Landscape features in this portion of the project area include a low mortared basalt rock wall topped with chain-link fencing, and a narrow concrete-lined ditch that abuts and is parallel to the retaining wall within the southern boundary of the Wailupe Valley Neighborhood Park parcel (Figures 9 and 10; also see Figure 3).

ENVIRONMENTAL SETTING

GEOLOGY

The island of O‘ahu ranks third in size of the eight main islands in the Hawaiian Archipelago. The Wai‘anae and Ko‘olau Mountain Range were formed by two volcanoes. Through the millennia the constant force of water carved fertile amphitheater-headed valleys and rugged

Figure 5: Overview of the Aina Haina BWS facility fronted by Alamuku Street, depicting the booster pumping station building and parcel boundary retaining walls. View to East.

Figure 6: Overview depicting the Aina Haina BWS facility structures and layout, and project facility landscape. View to South

Figure 7: Overview depicting the level, open area of the southern portion of the APE in Aina Haina BWS project facility parcel. View to Southeast.

Figure 8: Overview depicting the level area with curbing in the south portion of the APE, in the Aina Haina BWS facility project area. View to Southwest.

Figure 9: Overview depicting the Transferable Land Portion of the project area at Wailupe Valley Neighborhood Park, and adjacent BWS facility bounded by fenced concrete retaining wall (north portion of the APE). View to West.

Figure 10: Overview depicting the adjacent Transferable Land Portion of the project area at Wailupe Valley Neighborhood Park, and BWS facility project parcel (background). View to West.

passes eroded at lower elevations providing access from one side of the island to another (Macdonald and Abbott 1970). According to Stearns (1966:86-87), numerous volcanic eruptions created a number of today's well-known landmarks, including the Mōkapu Peninsula, on the windward side of O‘ahu; and Ka‘au Crater, Kaimukī Dome, and Diamond Head Crater, in the vicinity of the project area. Soon after the Diamond Head eruption, a thin black lava flow occurred on the southeast side of Diamond Head forming the area currently known as Black Point, which is located along the shoreline southeast of Kalaniana‘ole Highway at some distance from the current project area.

HYDROLOGY

The project area is located within the Wailupe watershed between elevations of 140 to 165 feet above mean sea level at the mouth of Wailupe Valley. At the toe of the valley's east range, the coastline is approximately 1,650 meters (1.02 miles) to the south, and east of the Wailupe Peninsula. The Wailupe watershed covers roughly 3.4 square miles of land between the Wiliwilinui Ridge and Hawai‘i Loa Ridge, the majority of which is conservation land in the *mauka* (inland) reaches and urbanized area in the lower portion of the valley. The natural topography surrounding the project location is moderately sloped from northeast to southwest (see Figures 1 and 2). Three streams–Wailupe, Laulaupoe, and Kuluʻī–occur more than 1 km north and upslope in the upper watershed above the project area.

CLIMATE, SOILS, AND VEGETATION

The East Honolulu region of Leeward Oʻahu has a mild to moderately temperate climate. Air temperature data for the project area and Wailupe Valley indicates highs in the mid-70 degrees Fahrenheit and lows in the upper 30 degrees Fahrenheit, with hotter temperatures occurring in the months of June through October (Armstrong 1973; Giambelluca et al. 2013). Rainfall is most frequent in the months of October through January. Mean annual rainfall in the project area is approximately 984 mm (38 inches) (www.rainfall.geography.hawaii.edu; Giambelluca et al. 2014).

The USDA soil class in the project area is the Lualualei series (LPE) characterized as 3 to 35 percent slopes with medium to rapid runoff and moderate to severe erosion hazard (Figure 11). This soil class is composed of a limited topsoil and very rocky underlying subsoil (Foote et al. 1972).

Vegetation within the project area consists of a limited variety of decorative, introduced flora common throughout the suburban landscape, primarily trees, shrubs, and short grass. These include several Banyan (*Ficus benghalensis*) trees in the interior, and *Haole koa* (*Leucaena leucocephala*) and brush plants near or around the perimeter. Vegetation in the 0.03-acre "Transferable Land" portion of the project area in Wailupe Valley Neighborhood Park consist of short grass and a single plumeria (*Frangipani* sp.) tree (see Figure 10).

CULTURAL AND HISTORIC BACKGROUND

The name Wailupe identifies specific geographical features of this locale including *ahupuaʻa*, beach, former fishpond, gulch, stream, spring and valley of this particular area. The literal translation given (Pukui et al. 1974:225) is "'kite water', (kites were only flown in prescribed places; this was one of them." Wailupe Ahupuaʻa extends *mauka*/*makai* from the Koʻolau Mountain Range to the sea at the cusp of Maunalua Bay, encompassing the shores of Wailupe Beach Park and Kawaikuʻi Beach Park. Beyond the peak of the Koʻolau Mountains, it is bounded by Waimānalo Ahupuaʻa.

Wailupe Ahupuaʻa *mauka* contains three gulches including the most prominent, Wailupe Gulch, that follows Wailupe Stream and a small tributary to the northwest; another small stream named Waialiʻi (translated literally, means ʻwater of the cheifs'), above the ʻĀina Haina subdivision (as shown on some early maps) at the western boundary of the *ahupuaʻa*. A northeastern branch of Wailupe Gulch leads to Laulaupoe Gulch (which translates as 'leaf wrapping' [*laulau*], as in the wrapping for preparation and/or presentation of food; and 'round' [*poe*]). Kuluʻī Gulch, literally translated means amaranth (a type of shrub). A rock called Pukoakahalauaola, was thought to be a marker of the boundary between Waiʻalae and Wailupe Ahupuaʻa; as pū koʻa means 'coral head', it's assumed that the rock may have been a coral block (O'Hare et al. 2009:15).

Wailupe Ahupuaʻa *makai* is a modest shoreline of beach that, in some areas, may or may not be visible depending on the tide. Wailupe Beach Park is at the immediate west corner of Wailupe Peninsula and the former Wailupe Fishpond. Several smaller fishponds were located along and near the shoreline including Kaualua, that was connected to Wailupe fishpond, an is thought to be alternately called Punakou, according to Boundary Commission Testimony (O'Hare et al. 2009:15). Punakou Pond was fed by one of a number of springs within Wailupe Ahupuaʻa called Puhikani.

TRADITIONAL SETTING

Recent re-evaluation of archaeological radiocarbon dates and paleo-environmental coring data combined suggests that initial settlement of Oʻahu occurred between A.D. 940–1130 (Athens et al. 2014). Kirch's (2011) earlier treatise indicates that archaeological data has suggested O`ahu Island was likely first settled between A.D. 1100 and 1200 by Polynesians sailing most likely from central East Polynesia (Kirch 2011:22).

In 1985, Kirch (1985:69; 107-108) hypothesized that the settlement pattern of initial colonization and occupation of the Hawaiian Islands occurred on the windward shoreline areas of the main islands, with populations eventually settling into drier leeward areas at later periods. He based this hypothesis on archaeological evidence from known sites reflecting the earliest intensive human activity on Oʻahu, which were documented before 1985. He argues that coastal settlement remained dominant as populations began exploiting and living in the upland/dry (*kula*) zones. Also that greater population expansion to inland areas began about the AD 12th Century, and continued through the AD 16th Century (Kirch 1985:69).

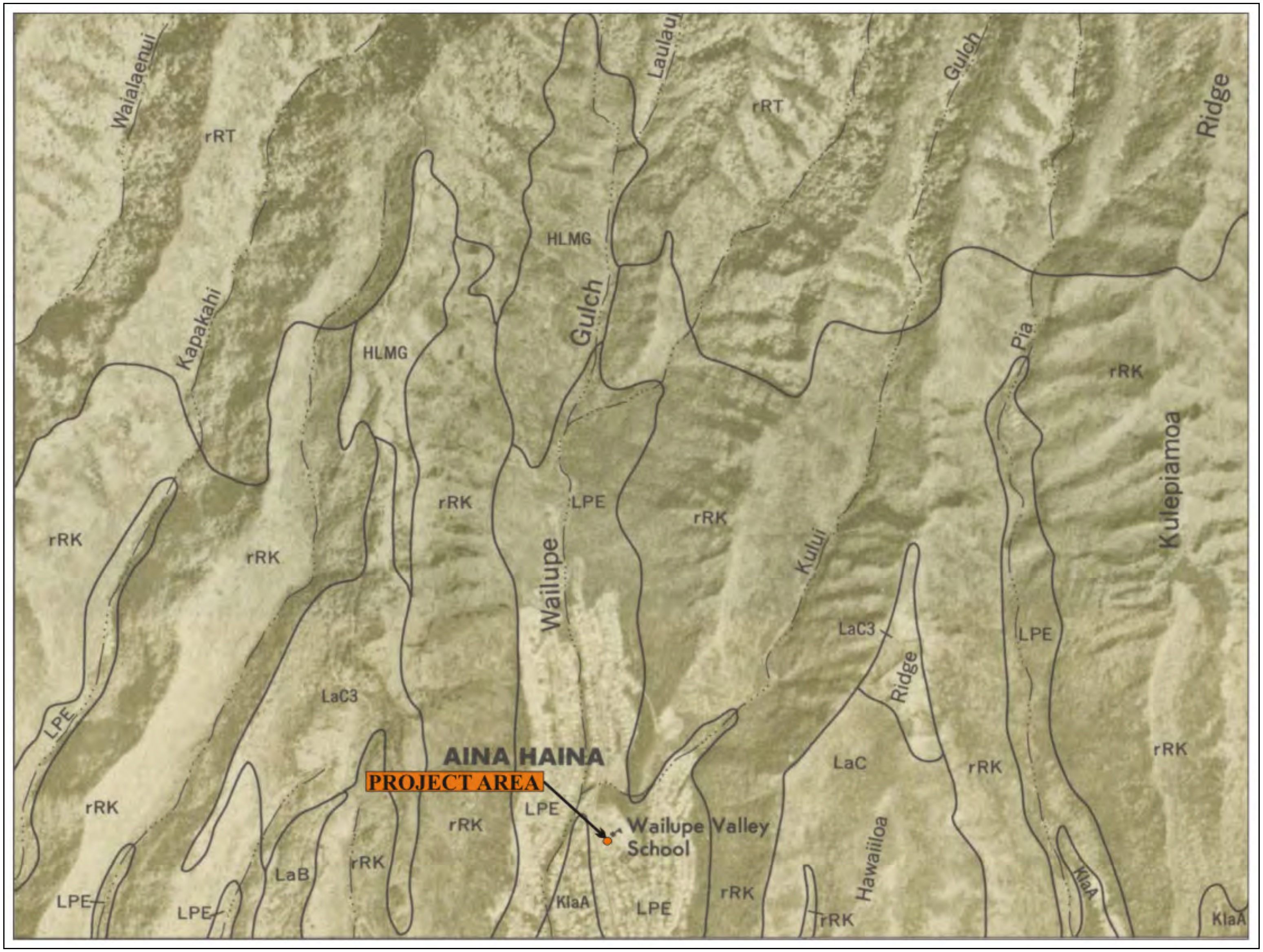

Figure 11: Soil Survey Map Showing the Project Area Location and USDA Agricultural Soils Category (Foote et al. 1972: Map Sheet 67).

More recently, Athens et al. (2014), have generated a Baysian model for initial settlement based on paleo-environmental data and carefully defined set of archaeological radiocarbon dates. This model estimates that initial settlement occurred between AD 940-1130, and most probably between AD 1000 to 1100.

As Hawaiian culture developed, land became the property of the ruling class, or *aliʻi ʻai moku* (the *aliʻi* who eats the island/district), which he held in trust for the gods (Kirch 1985). His title of *aliʻi ʻai moku* ensured rights and responsibilities to the land, but did not confer absolute ownership. The king kept the parcels he wanted, his higher chiefs received large parcels from him and, in turn they, distributed smaller parcels to lesser chiefs. The *makaʻāinana* (commoners) worked the individual plots of land (Kirch and Sahlins 1992 vol.1:25).]

In general, several terms, such as *moku*, *ahupuaʻa*, *ʻili* or *ʻiliʻāina* were devised to describe various land sections. A *moku* (district) contained smaller land divisions (*ahupuaʻa*), which customarily continued inland from the ocean and upland into the mountains. Extended household groups living within the *ahupuaʻa* were, therefore, able to harvest from both the land and the sea. As the Hawaiian economy was based on agricultural production, marine exploitation, animal husbandry and also utilized forest resources. Ideally, this allowed each *ahupuaʻa* to be self-sufficient by supplying needed resources from different environmental zones (Lyons 1875:111). The *ʻili ʻāina,* or *ʻili,* were smaller land divisions next in importance to the *ahupuaʻa* and were administered by the chief who controlled the *ahupuaʻa* in which the *ʻili* were located (Lyons 1875:33; Lucas 1995:40). The *moʻoʻāina* were narrow strips of land within an *ʻili*. Post-Māhele, the land holding of a tenant, or *hoa ʻāina,* residing in an *ahupuaʻa* was called a *kuleana* (Lucas 1995:61). Oral accounts indicate that the division of Oʻahu's lands into districts (*moku*) and sub-districts was solidified by the *aliʻi nui* (high chief), Māʻili-kūkahi during the early part of the 16th century (Kamakau 1961:53-56; Cordy 2002:23). Oʻahu contained six districts including Waiʻanae, ʻEwa, Waialua, Koʻolauloa, Koʻolaupoko, and Kona at the time of contact. The current project area is located in the Kona District.

Large scale or intensive agricultural endeavors were implemented in association with habitation. Coastal lands were used for settlement and taro was cultivated in near-coastal reaches and in the uplands. On the southeast coast of Oʻahu, taro cultivation was confined to valleys with streams or springs that would water the terraces. The staple crop in Waiʻalae and Wailupe valleys was sweet potatoes, which were planted in the valley floors, on hillsides, and in the coastal strip (Handy 1940:155-6).

HISTORIC SETTING OF SOUTHEASTERN O‘AHU AREA

Early Western visitors to O‘ahu described the southeast coast as well-cultivated and well-populated. Several of these descriptions are provided below.

In 1789, Captain Nathaniel Portlock anchored in Maunalua Bay to take on fresh water which was brought to the ship in calabashes.

Portlock described the coastal setting as:

> …the bay all around has a beautiful appearance, the low land and vallies being in a high state of cultivation, and crowded with plantations of taro, sweet potatoes, sugar cane, &c., interspersed with a great number of cocoa-nut trees, which renders the prospect truly delightful. (Portlock 1789:73-4)

In 1828 Levi Chamberlain toured southeastern O‘ahu, including Wai‘alae and described the area as:

> …a grove of cocoanut trees and a number of branching kou trees, among which stand the grass huts of the natives, having a cool appearance, overshadowed by the waving tops of the cocoanuts, among which the trade winds sweep unobstructed. (Chamberlain 1956:28-9)

In 1865 Henry Willis Baxley described the region as:

> Further along the shore, the few hamlets of Waialae are seen nestled in a grove. And a short distance beyond, the grass huts of Wailupe cluster near the high hill of Mauna Loa, from the southern foot of which a ridge extends still further southwardly to the bold and lofty cape named Coco Head, the eastern boundary of the beautiful bay of Waialae, of which Diamond Head, already described, forms the western. (Baxley 1865:124)

THE MĀHELE (1848-1851)

In the 1840s, a drastic change in the traditional land tenure resulted in a division of island lands and a system of private ownership based on Western law. Once Article IV of the Board of Commissioners to Quiet Land Titles was passed in December 1845, the legal process of private land ownership began in earnest. The land division, called the Great Māhele, began in 1848. Guided by foreign advisors, the king divided lands formerly held in common and administered by chiefs and their konohiki (land managers). The Māhele allocated lands to the king (called crown lands); to the *ali'i* (chiefs); and to the government (called government lands) to be awarded to commoners who worked the land as active tenants.

The Māhele was followed in 1850 by the Kuleana Act which established fee simple ownership of land. Under this Act (so named because the land holding of a tenant residing in an *ahupua'a* was called a *kuleana* [Lucas 1995:61]), lands were made available for the *maka'āinana* (the commoners, who actually cultivated and lived on the lands). Historical land tenants were required to document their claims to specific parcels in order to gain permanent title. Once granted, these Land Claim Awards (LCAs) of *kuleana* plots or parcels were entirely independent of the traditional *ahupua'a* in which it was situated and it could also be sold to parties with no historical ties to the area, including foreigners.

In 1854, Wailupe was awarded to Kamaha (LCA 6175), son of the former *konohiki*. Kamaha returned half the *ahupua'a* to the King who accepted for his half Wailupe Fishpond and a single acre of *kula* (dry) land (Barrère 1994 from O'Hare *et al*. 2009:35). Kamaha's half consisted of the remaining land within the mouth of the valley and *kula* land near the coast.

Land Claim Award (LCA) records from the mid-1800s indicate that the Wailupe shoreline included a shallow reef modified with the construction of rock walls; that the inland area included brackish water swamps enclosed by sand berms, similar to early berms associated with the larger Wailupe Fishpond; and that the *kula* lands in the lower valley were cultivated in *'uala* (sweet potato). The LCA records also indicate that many of the *kula* lands in the valley floor had been parceled by the early 1900s. Several small parcels with patches of *'uala*, coconut, orange, *hala*, gourd, and *pili* grass were scattered along the major streams within the valley (Barrère 1994 from O'Hare *et al*. 2009). A1925 Land Court Application map (LCAp map 656; shown in Figure 12) depicting the "Ili of Wailupe" shows that the substantial portion of land *mauka* of the coastal government road (now Kalaniana'ole Highway) was part of LCA 6175, Apana 1. LCA documentation for Wailupe Ahupua'a identifies 37 awarded land claims out of a total of 57 applications (Waihona 'Aina, Mahele database waihona.com, accessed 1/20/2016; Appendix B). These awarded claims generally consisted of 1.5 acre lots (Barrère 1994 from O'Hare *et al*. 2009). The project area is entirely within LCA 6175:1 (2102.34 acres),and west of the smaller LCA parcels largely clustered along the Wailupe Stream in the 'Āina Haina Valley area (see Figure 12).

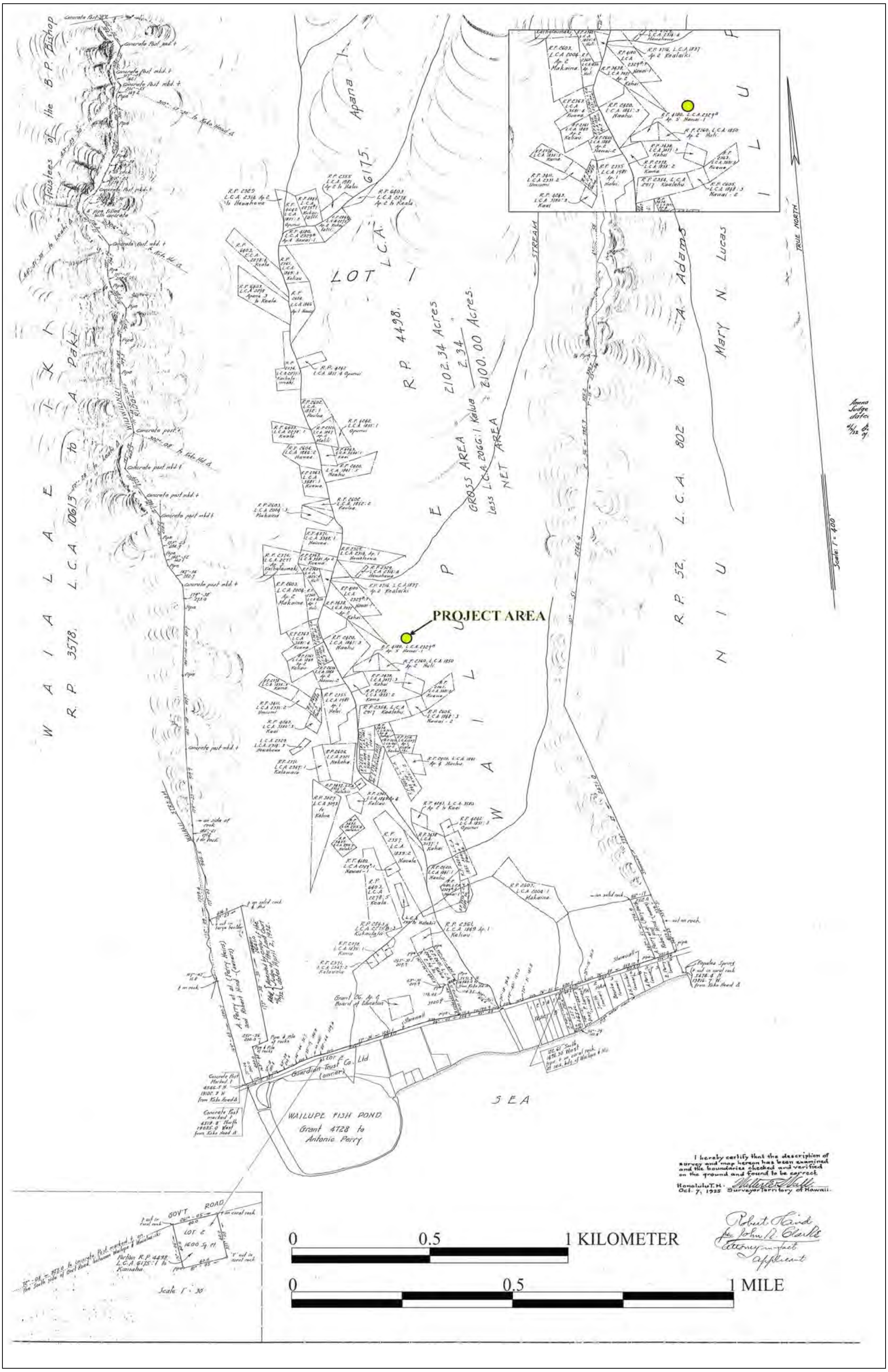

Figure 12: Portion of Land Court Application Map No. 656 (Hawai`i Land Survey 1925) of Wailupe Ahupua‘a for Robert Hind, Indicating LCA Parcels within LCA 6175:1.

In the 1881 edition of Thomas Thrum's *Hawaiian Almanac and Annual*, a single sugar plantation was listed in the "district of Waialae," the Niu Plantation. This plantation is not listed in subsequent annuals, suggesting that the plantation was short-lived; similarly, an attempt to grow pineapple in the 1920s was also short-lived. By the beginning of the 20^{th} century the influx of westerners, particularly prospective residents, led to the subdivision of the most of land adjacent to Kalanianaʻole Highway. In 1925, prominent ranching mogul of the time, Robert Hind, largely in partnership with native associate John Kirkwood Clarke, invested in acquiring a large portion of Wailupe, which included establishment of the Hind-Clark Dairy on former Waialae Ranch holdings.

PREVIOUS ARCHAEOLOGY IN THE VICINITY OF THE PROJECT AREA

A modest number of archaeological studies have been conducted in Wailupe Ahupuaʻa compared with other areas within Kona (Honolulu) District. No previous archaeological research has been conducted in the current project area. Most of the previous archaeological projects in the ʻĀina Haina/Wailupe region have focused on properties to the south, along the coastline, and on the ridges north of the project area. Four projects have been conducted within a mile of the project area, the nearest being within a quarter of a mile away. Archaeological studies in the general vicinity of the project area within ʻĀina Haina/Wailupe are summarized below and are shown on topographic map in Figure 13.

Among the sites nearest in proximity to the current project is the "Aina-Haina Burial Cave," which is believed to be associated with J. Gilbert McAllister's Site 54, Kawauoha Heiau. The burial cave was initially documented in native testimony, Unu of Kawauoha, which states:

> Hear ye, ye Land Commissioners: I am writing concerning my coconut trees which were planted by my kupunas. There were eight of them. Most of them have been cut down. My kupunas made the unu (alter) of Kawauoha and when it was completed they sacrificed a man and planted those coconuts. Here is this explanation at the time my kupunas were sent the pig by the wahine of Peleioholani, my kupunas received it and then sacrificed the pig and the man. This is the thing concerning the coconuts [Sterling and Summers 1978:275].

The earliest archaeological data from the vicinity of the current project area was recorded by J. Gilbert McAllister (1933) during his island-wide survey of archaeological sites on Oʻahu.

Figure 13: Koko Head Topo Map Indicating Locations of Previous Archaeological Studies in the Project Area Vicinity.

Sterling and Summers (1933) include McAllister's Site 56 (now Site 50-80-15-56), identified as Wailupe Fishpond, and his Site 55 (now Site 50-80-15-55), identified as Kaunua Kahekili Heiau.

> McAllister describes Wailupe Fishpond as follows:Site 56. The pond is 41 acres in area. The wall is approximately 2,500 feet long. The west side is a broad sandy area, at least 50 feet wide, through which four outlets (makaha) now pass. The remainder of the wall is 12 feet wide, with waterworn basalt faced higher on the outside than within. The central part is of a dirt and sand fill [in Sterling and Summers 1933: 274].

An informant had told McAllister of a *heiau* located in Waiʻalae Iki. In his Site description McAllister notes the condition Kaunua Kahekili heiau as:

> Site 55. Punahoa of Keahia says that Kaunua Kahekili was a very large heiau. It was located on the top of the ridge which divides Wailupe and Waialae, on the highest and most pronounced knoll. The Site was formerly planted in pineapples, but now the heiau is overgrown with high grass and weeds and the pineapples are on the sloping ground which surrounds it. Many large rocks embedded in the earth are all that remain of the structure [Sterling and Summers 1978:275-6].

In 1974, Bishop Museum's Kenneth Moore conducted a walk through survey of the Makai plateau of Hawaii Loa Ridge within the Niu Ahupuaʻa, in an area near the east boundary of Wailupe Ahupuaʻa (see Figure 13). Recorded features included earthen terraces, one bi-faced core-filled wall, and an unmodified rock shelter. Moore interpreted the features as likely associated with traditional cultural activities dating to the historic ranching period; no site numbers were assigned.

In 1984, Chiniago Inc. conducted an archaeological reconnaissance study of a 2-acre residential parcel in ʻĀina Haina, West of Wailupe Circle on the *makai* (ocean) side of Kalanianaʻole Highway (Barrera 1984). The study included a surface survey and excavation of 12 auger pits, each extending over 1 m in depth. No archaeological deposits or features were identified.

In 1987, Bishop Museum carried out archaeological survey of a 5-acre parcel in Niu Valley (McMahon 1988). The study documented habitation features, consisting of two walls. Excavation of three backhoe trenches yielded no evidence of subsurface cultural deposits or features. No site number was assigned.

In 1992, Research Systems Cooperative conducted an archaeological survey for a proposed well and access road in Wailupe Gulch (Bordner 1992). Previous to Bordner's survey, the area had been subject to bulldozing, existing features sustained considerable impacts. Among the feature remnants identified were short wall sections and terraces with associated retaining walls. Considerable damage to the features from the previous bulldozing disturbance hindered determination of feature functions and age.

In 1994, SCS conducted an archaeological assessment of 1,100 meters of trail corridor of the Wiliwilinui Trail Alignment, on Waiʻalae Iki Ridge (Chaffee and Spear 1994). They documented a World War II era concrete and metal bunker and a wall, which were designated as Site #50-80-14-4811. They noted that the bunker abuts a seven to eight course high cobble wall on its left side, extending 10 meters, and was buttressed by a large retaining boulder. The wall as interpreted as a soil retention wall, and appears to correlate with the approximate location of McAllister's Site 55 (Kaunua Kahekili Heiau), based on an overlay of his map in Sterling and Summer's (1978) *Sites of Oahu* with Chaffee and Spear's (1994) site map for Site 4811 (see Figure 13). If correct, it may be argued that the soil retention boulder and cobble stone built wall documented by Chafee and Spear (1994) is the same possible Kaunua Kahekili Heiau remnant identified by O'Hare and Shideler (2009).

In 2001-2002, CSH conducted archaeological monitoring for the installation of a gas main (Hammatt and Bush 2001) and a water main (Bush and Hammatt 2002), extending from ʻAinakoa Avenue to West Hind Drive, including a section of Wailupe Ahupuaʻa toward the east end of Wailupe Peninsula. No sites were documented during monitoring for either the gas or water main. However, pockets of [Jaucas] sand were encountered below fill layers in trench excavations during the gas main installation work. A horseshoe and a *poi* pounder fragment were found in the water main excavations. Additionally, basalt boulders encountered in excavations in the Wailupe section were thought to be associated with the former Wailupe Fishpond wall. No further data were collected regarding the source of these boulders.

In 2008, CSH conducted conducted an archaeological inventory survey for a proposed private residence on a 0.14-acre parcel (Fong and Hammatt 2008). The project parcel was located on the west side of Hawai‘i Loa Ridge off of East Hind Drive. The surface survey documented unmodified rock overhangs, but no features or artifacts.

In 2009, Cultural Surveys Hawai‘i, Inc. (CSH) completed an archaeological literature review and filed inspection study for the Kalaniana‘ole Highway Sewer System Improvements project (O’Hare and Shideler 2009). The project corridor area involved three segments, totaling 14,000 feet long along the highway and near the shoreline from Wai‘alae to Kuli‘ou‘ou. While no Sites were documented as a result of the field inspection, the authors indicated that a high potential existed for subsurface prehistoric to mid-historic era cultural resources in the project area, based on their review of the cultural and historic background resource materials and previous archaeological studies.

In 2013, Archaeological Consultants of the Pacific, Inc., completed archaeological inventory survey of the seawall along the shore of a residence in Wailupe Circle (Beauchan and Kennedy 2013). Subsurface testing involved hand excavation of three trenches on the inland side of the seawall. The exposed portion of the wall designated as Site 50-80-15-0056, Wailupe Fishpond, included two distinct construction sections. The lower section appeared to be a disturbed remnant of the pre-Contact fishpond wall, while the upper section appeared to correlate with a 20th-century construction (ca. 1945) which was constructed atop the earlier wall remnant. Both consisted of dry stacked basalt and coral boulder and cobble construction (Beauchan and Kennedy 2013).

In addition to the aforementioned archaeological studies, the last couple of decades of development in the ‘Āina Haina area has led to identification and archaeological documentation of numerous burial sites in the Wai‘alae Iki and Wailupe valleys, as well as the coastal zone along Kalaniana‘ole Highway. Four archaeological investigations have documented a combination of pre-Contact and historic era burialss in Wailupe Ahupua‘a:

- Site #50-80-15-4848: In 1991, excavations of a sewer trench line resulted in an inadvertent discovery of a human skull and clavicle in fill during Phase II of the Kalaniana‘ole Highway Widening project. The SHPD determined that the remains had introduced and deposited within Kawaiku‘i Beach Park during landscaping of the ground using imported fill-soils (Kawachi 1991).

- Site #50-80-15-4497: In 1994, remains of 14 individuals (MNI=14) were encountered in excavations within the ‘Āina Haina and Niu Valley segments of the Kalaniana‘ole

Highway Widening project corridor. Seven coffin burials consisting of eight individuals were documented; four of the burials, one at Nenue Street and three at East Hind Drive, were identified within Wailupe Ahupuaʻa (Erkelens and Athens 1994).

- Site # 50-80-15-5584: In 1998, a single flexed human burial was encountered in an excavation for the installation of a property boundary fence line within TMK: (1) 3-6-003:032). The burial was relocated elsewhere on the property (Anderson 1998).

- Site # 50-80-15-6401: In 2002, SHPD responded to an inadvertent discovery of human remains at a private residence at 925 Wailupe Place. Two lumbar vertebrae, an iliac fragment of a disarticulated human burial, and various non-human bones, were identified in a sand deposit encircled by boulders. The find was determined to represent a native Hawaiian burial interment (Collins 2002).

EXPECTED FINDINGS WITHIN THE SURVEY AREA

Based on archival and historical research, previous archaeological investigations, and the nature and extent of historic development within or near the project area, potential historic properties may include extant architecture (e.g., booster pumping stations, stone walls), reservoir, culverts or ditches, and buried cultural deposits (see LCA 6175:1b). However, the overall potential to encounter intact subsurface deposits is anticipated to be low due to prior cutting, grading, and/or fill activity within the project area.

FIELD METHODS

Archaeological inventory survey fieldwork was conducted between January 26, 2015 and February 4, 2015, by SCS archaeologist Elizabeth Pestana, B.A., and Erica Lee, B.A., under the direct supervision of, Principal Investigator, Robert L. Spear, Ph.D. A 100% pedestrian survey was conducted on separate occasions for the two project parcels (Parcel 040, 012). In addition, subsurface testing was conducted within project Parcel 012 to address subsurface impacts associated with the proposed construction of the 170’ Potable No. 2 storage tank.

The current AIS was conducted concurrently with the architectural Reconnaissance Level Survey (RLS) in the BWS project parcel (TMK [1] 3-6-016:040). The RLS was conducted by MAI’s Research Section Director, Polly Tice, on January 26, 2015. Surface and subsurface survey was conducted in the project area located within Wailupe Valley Neighborhood Park (TMK [1] 3-6-019:012), on February 3 and 4, 2015, upon obtaining a right-of-entry permit from the City & County of Honolulu (CCH).

The surface survey involved observations of the project landscape, including the built environment (i.e., buildings, roads, reservoir). Digital photographs were taken of the existing booster pump station building and 170’ Potable Reservoir No. 1 features, the facility grounds and landscape features, as well as the location of the proposed new potable reservoir No. 2. Archaeological feature descriptions and measurements (e.g., ditch, stone wall) were recorded on standard archeological feature forms. Mapping was accomplished using a handheld Global Positioning System (GPS) with locational data recorded using Universal Transverse Mercator (UTM) coordinates. The locations of Site # 50-80-15-7764 (reservoir and pumping station building) and Site # 50-80-15-7936 (wall and ditch) are shown on a Google Earth Satellite Image and illustrated in a scaled plan view (see below). A site map was created using an engineering site plan map and GPS points (see below).

Limited subsurface testing for archaeological survey consisted of manual excavations of eight shovel probes (SP-1 through SP-8) averaging approximately 0.31 m in diameter and 43 cm deep; and a single test unit (TU-1) which measured 1.0 m by 0.5 m to a maximum of 42 cm below datum. The subsurface testing focused on examining the construction area for the new 170’ Potable reservoir No. 2. Specific testing within this area took into consideration identification of previously disturbed areas and soil characteristics. To provide sufficient coverage, the shovel probes were placed from 4-6 m apart within a 40 by 8 m area (see below). Subsurface testing was not conducted in the reservoir facility which is characterized as fill-affected land, and because the proposed project will not affect the existing BWS facilities.

Subsurface testing focused on identifying stratigraphy, and potential buried archaeological deposits and features. A level datum was applied for the excavation of the control unit (TU-1). All excavated soils were visually inspected for the presence of cultural materials. Excavation equipment included shovels, trowels, whisk brushes, a line level and datum, metric tape measures and compasses (magnetic north). Soil matrices were recorded using an United States Department of Agriculture (USDA) soil manual and a Munsell (2000) soil color manual. Shovel probes were excavated to an average depth of 43 cmbs, which allowed for adequate identification of project stratigraphy into sterile deposits and the presence/absence of cultural materials and features. The locations of TU-1 and Shovel Probes 1-8 were plotted on a tape and compass, scaled project site map (see below).

LABORATORY METHODS

No artifacts or sample materials were identified for collection. Thus no laboratory analyses were conducted as part of this AIS.

ARCHITECTURAL RECONNAISSANCE LEVEL SURVEY RESULTS

An architectural Reconnaissance Level Survey (RLS) was completed for the BWS Aina Haina 170' Potable Reservoir No. 1 facility. This RLS was conducted by MAI's Research Section Director, Polly Tice, on January 26, 2015. It focused on documentation of the facility's two primary structures–the reservoir enclosure structure and the associated booster pump station building; the RLS results are presented in Appendix A.

ARCHAEOLOGICAL INVENTORY SURVEY RESULTS

The current archaeological inventory survey conducted on 0.9619-acre newly identified a single archaeological historic property within the "Transferable Land Portion" that abuts the Site # 50-80-15-7764 BWS 170' Reservoir No. 1 facility. This newly identified historic property was designated as Site # 50-80-15-7936 and consists of a mortared basalt wall (Feature 1) and a concrete-lined ditch (Feature 2). Site # 50-80-15-7936 occurs within the Wailupe Valley Neighborhood Park and are related to construction of the Wailupe Valley Elementary School in the mid-1950s. The discussion below summarizes the survey findings related to Site # 50-80-15-7764 BWS 170' Reservoir No. 1 facility and to Site # 50-80-15-7936, and a USGS topographic map in Figure 14 indicates their physical locations in the project area.

SITE # 50-80-15-7764

Feature (#): None Assigned
Feature Type: Architecture/Structure
Function: Water Distribution
GPS Coordinates: E 0629273 / N 2354853

Condition: Excellent
Age: 65 years (1956)
Significance: Criterion "c"
Recommendation: No Further Work

Description: The Site # 50-80-15-7764 BWS 170' Reservoir No. 1 facility is enclosed by reinforced, poured concrete walls. In addition to construction of the two primary structures, major land alteration within the facility included grading, construction of leveled parking and access areas, and interior concrete retaining walls defining landscape areas, and the cutting of the

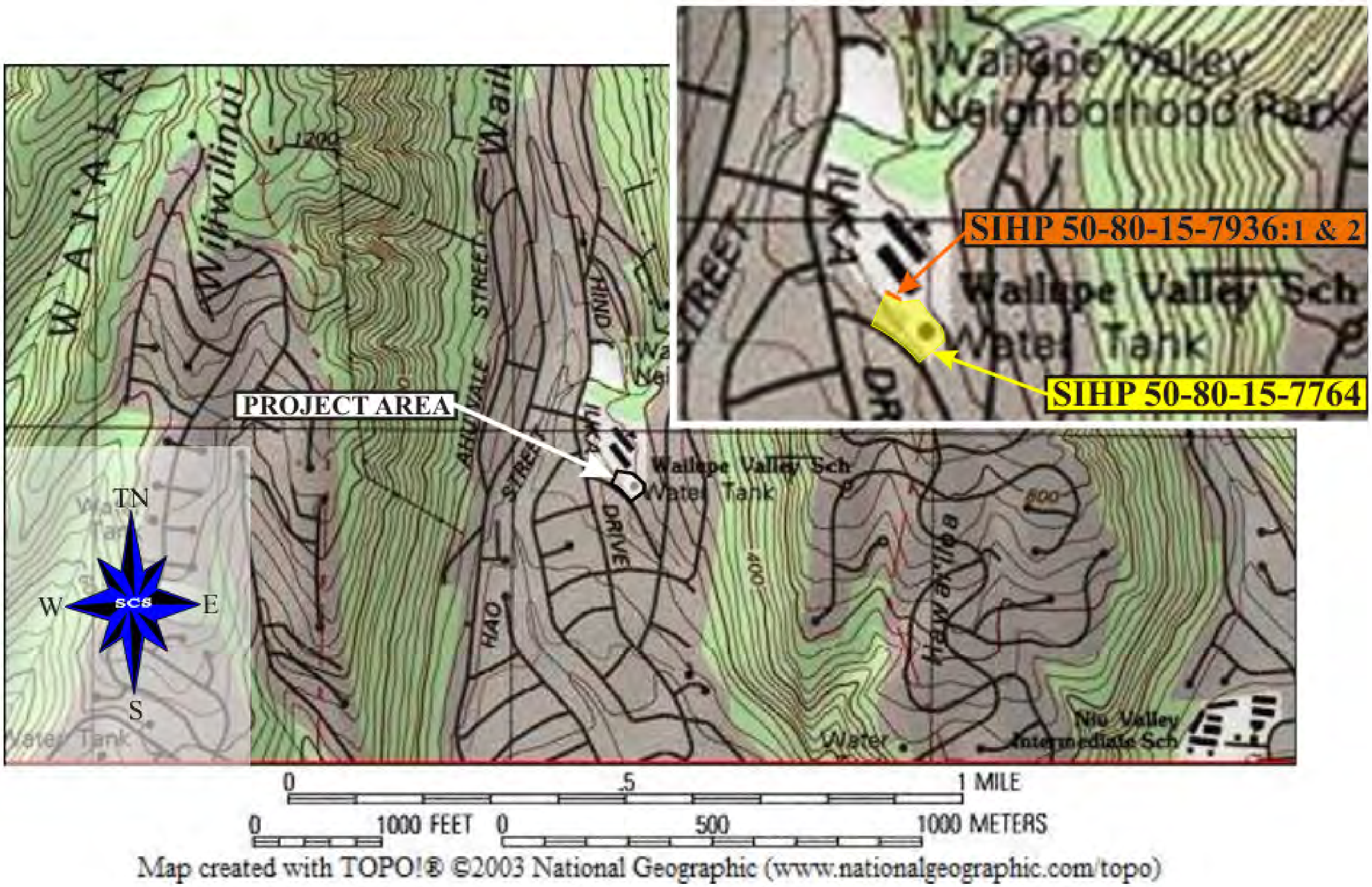

Figure 14: USGS topo map (Koko Head) showing the project area and location of newly-identified historic resources.

slope and the construction of a bedrock and soil embankment (Figure 15). Figures 16-19 illustrate the reservoir enclosure structure and the booster pump station building.

This facility currently functions as the East Honolulu water distribution system facility, servicing lower ʻĀina Haina, Niu, and Kuliʻouʻou. It has been in continuous use since its construction in 1951. The facility remains in good condition, with both the reservoir enclosure and the booster pump station building being identified as being in excellent structural condition and as retaining their integrity of character of design. The interior roads, parking areas, and so forth, also are well maintained, with some upgrades anticipated (e.g., access road).

This facility was designed by early 20th century Hawaiʻi architect, Hart Wood. The booster pump station building functions as the housing for the pumps operating the East Honolulu 170' reservoir/water distribution system. Though access to the interior of the building was not possible during the AIS, the BWS Environmental Impact Statement (EIS) provides the following description:

> "The pumps are housed in an existing two-story building at the project. The first story of the pump station building is located below-grade. The building footprint is approximately 40 feet by 24 feet, and is located roughly 12 feet away from the existing reservoir. Control and monitoring cabinets for the Aina Haina 170' Reservoir No. 1 are also housed in the pump station building." (Limtiaco Consulting Group 2014: Section 1-7).

The RLS evaluated the storage tank enclosure and the booster pump station building, including the landscaping and its integration into the surrounding area. MAI states that these two structures, are "evaluated as significant for the NRHP [National Register of Historic Places] under Criterion C, as one integral property. The complex [facility] is eligible for the distinctive modern design of the booster pumping station, and the thoughtful landscaping of the site that successfully assimilates the facilities into the surrounding residential neighborhood." MAI further states that "If the booster pumping station [building] were demolished, the reservoir would no longer be significant, since its significance is closely tied to the original booster pumping station building, and Hart Wood's distinct regionalist design for the complex."

The proposed upgrades will have no adverse impact to the facility's integrity. The RLS architectural documentation is adequate, and no further architectural documentation is required in support of this project. In addition, no archaeological historic properties were identified within Site # 50-80-15-7764, thus no further archaeological work is recommended.

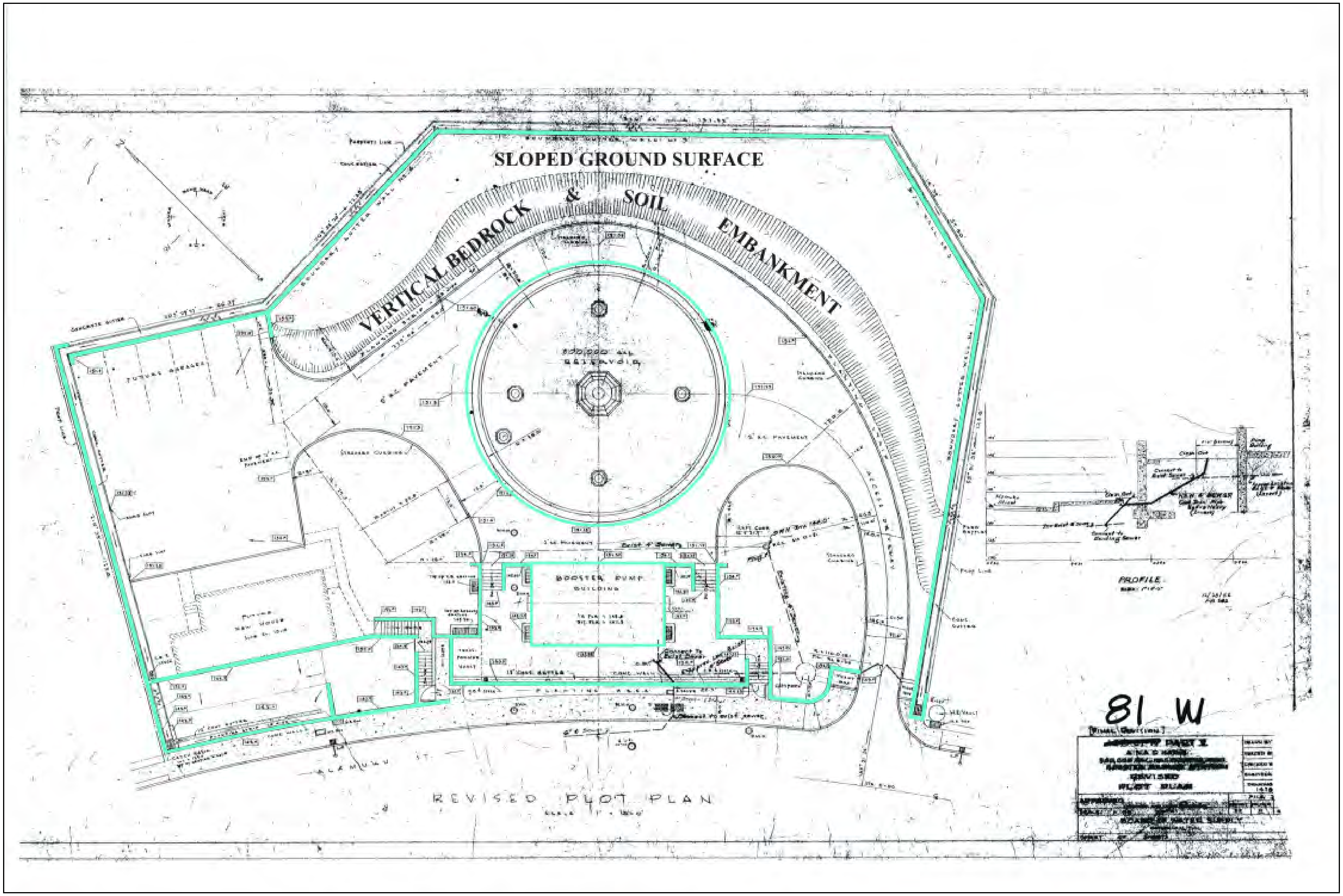

Figure 15: 1951 building plan for the Site # 50-80-15-7936, BWS 170' Facility, with major structures and walls (turquoise) and the bedrock & soil embankment encircling the facility reservoir's east side.

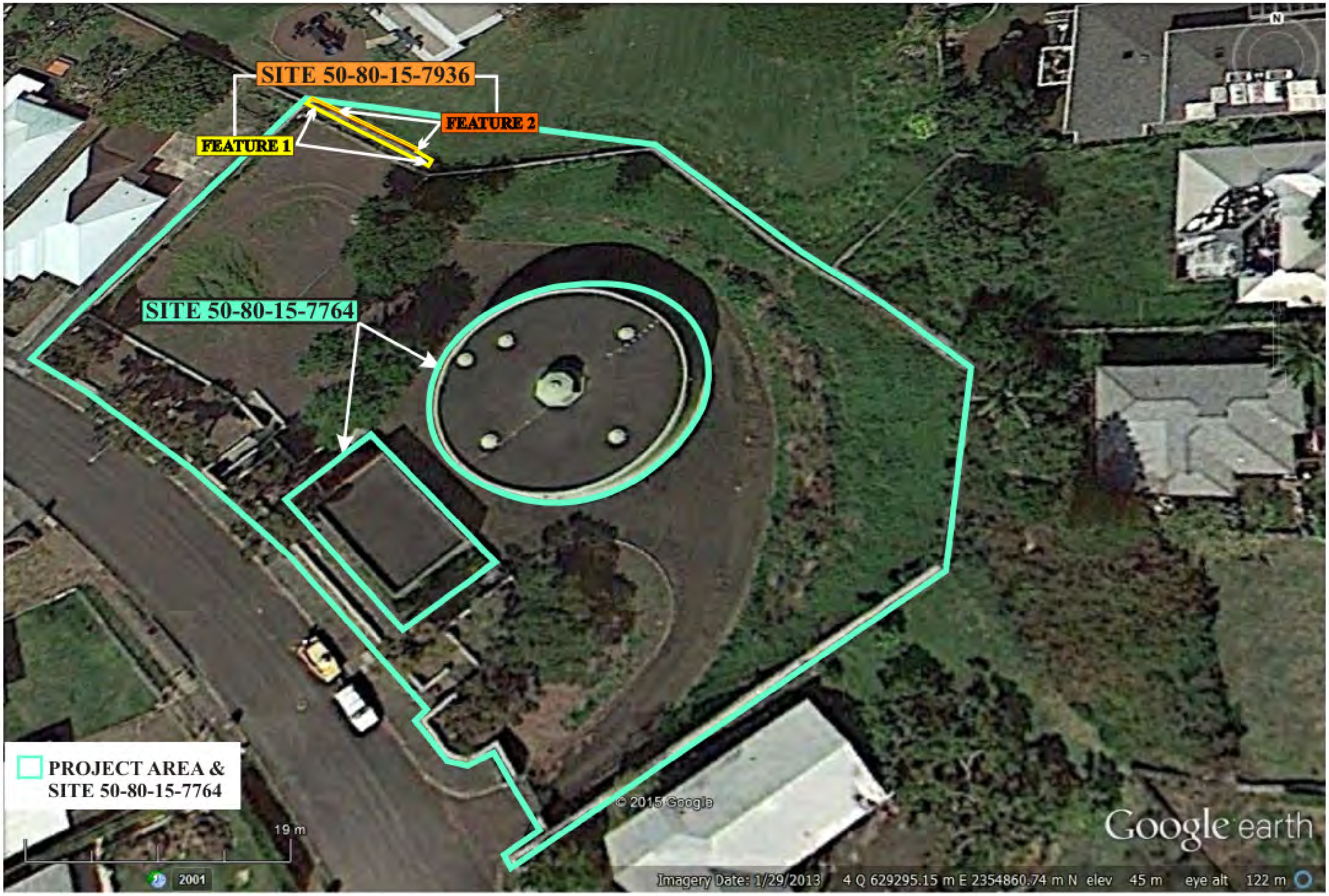

Figure 16: Google earth satellite image (Imagery Date 1/29/2013) showing the Site # 50-80-15-7764, BWS 170' Facility (turquoise), and the Site # 50-80-15-7936, school-related infrastructure–Feature 1 (wall) and Feature 2 (ditch), in the project area (adapted from Google earth 7.1.2.2041, 2013; accessed February 2015).

Figure 17: Overview of the Site # 50-80-15-7764, BWS 170' booster pump station building (foreground) and associated reservoir enclosure structure (background). View to northwest.

Figure 18: View of Site # 50-80-15-7764, BWS 170’ booster pump station building. View to northwest.

Figure 19: Photographic View of Site # 50-80-15-7764, Feature 1, BWS 107' No. 1 Reservoir Storage Tank Enclosure. View to west.

SITE # 50-80-15-7936

Feature (#): 2
Site Function: Boundary/Soil Retention and Drainage
GPS Coordinates: E 0629262 / N 2354901
Site Type: Mortar & Basalt Wall; Concrete Ditch
Condition: Good
Age: Historic (ca. 1956)
Significance: Criterion "d"
Recommendation: No Further Work

Site # 50-80-15-7936 was newly identified during the current within the "Transferable Land Portion" that abuts the Site # 50-80-15-7764 BWS 170' Reservoir No. 1 facility. It consists of a mortared dressed basalt wall (Feature 1) and a concrete-lined ditch (Feature 2). The location of Site # 50-80-15-7936 is shown in Figures 14 and 16. The wall and ditch are identified as infrastructure likely associated with the former Wailupe Valley Elementary School which was constructed ca. 1956.

Description: Feature 1 is a low standing, mortared, dressed basalt rock retaining wall that defines a portion of the boundary between the Site # 50-80-15-7764 reservoir/booster pump station facility on the BWS owned property (TMK: [1] 3-6-016:040) and the Wailupe Valley Neighborhood Park within (TMK: [1] 3-6-019:012) as shown in Figures 3 and 4. The wall is within the portion of the park property which may be acquired by the BWS as part of the current proposed Reservoir No. 2 Installation project.

The Feature 1 wall is built on a slight grade, with the upside facing the Feature 2 ditch and the downslope side facing the BWS facility. The wall's length is oriented east/west (305º / 125º) and abuts the ditch along most of its north face, retaining soil along this side in areas where the ditch does not abut the wall (Figures 20 and 21). The wall measures approximately 56 m in length overall, of which only 18.61 m is within the project area (see Figure 16). The wall varies in height along its length, measuring between 38 to 42 cm above the ground surface on the upslope (park) side, and between 1.0 to 1.20 m on the downslope (facility) side, where it abuts a modern concrete ditch at the ground surface. Its width averages 40 cm at the top of the wall and 50 cm at the base of the wall. As shown in Figure 22, a modern chain link fence has been constructed atop the Feature 1 wall (see Figure 20 and 21).

A 1 m by 0.5 m test unit (see TU 1 discussion) excavated against the upslope side (north side) of the wall revealed the wall's subsurface construction extending to approximately 38-45 cm below datum (cmbd), or 26 to 32 cm below surface (cmbs). the base. This subsurface data indicates a single phase of construction for the wall.

Figure 20: Photographic Overview of Site # 50-80-15-7764 Feature 2, Mortared Dressed Basalt Boundary Rock Wall. View to Southeast.

Figure 21: Overview of Site # 50-80-15-7764, Feature 2, mortared basalt soil retension wall (east end). View to West.

Figure 22: Photographic Overview of SITE # 50-80-15-7764, Feature 3, Concrete Ditch. View to East.

Description: Feature 2 is a linear concrete ditch which exhibits two construction styles. Most of the ditch is U-shaped with a flat base and curbing on either side. The curbs are rectangular in cross-section (see Figures 20 and 22). A smaller portion of the ditch, which occurs at the eastern-end of the project area has a shallow, curved basin-shape and no curbing (see Figure 22). The upper limit of the U-shaped ditch portion with curbing is flush with the ground surface on its upslope side. Its lowest limit extending at least 15 cmbs. The shorter, 0.9 m long, basin-shaped portion slopes downward east to west.

Overall, the ditch extends parallel to the north side of the Feature 1 mortared rock wall throughout its length. It measures 49.54 m long, of which 12.15 m is within the project area. Its east end terminates in the project area, 6.46 m from the east end of the Feature 2 retaining wall (see Figure 3).

A shovel probe excavated adjacent to the eastern terminus of the basin-shaped portion of the ditch yielded no evidence of significant cultural materials. Only fill soils containing non-cultural pieces of coral and basalt gavel were observed.

The U-shaped portion of the Feature 2 ditch with the curbing appears to have been constructed contemporaneously with the Feature 1 wall. The two abut and their construction is seamless. In contrast, the basin-shaped portion of the Feature 2 ditch is likely more recent, both in its construction style and its placement, which overlaps and extends into the pre-existing U-shaped portion (see Figure 22). As such, the U-shaped portion likely was constructed ca. 1956, during initial construction of the former Wailupe Valley Elementary School. In contrast, the basin-shaped portion likely is a modern modification, possibly to address water runoff issues.

SUBSURFACE TESTING

Limited subsurface testing was conducted in the 0.03-acre portion of the project area in order to identify potential buried archaeological deposits, features and artifacts, and to document the subsurface portion of surface architectural features (e.g., the base of wall construction). Testing involved manual excavation of eight shovel probes (SP-1 through SP-8) and one control unit (TU-1).

The shovel probes were placed approximately four to six meters apart across the gently sloping (approximately 12 degrees) in order to document soil stratigraphy and cultural deposits or features. Their locations are shown in Figures 23 and 24. The shovel probes yielded no evidence of buried cultural deposits or features, yielding no to little cultural material (e.g.,

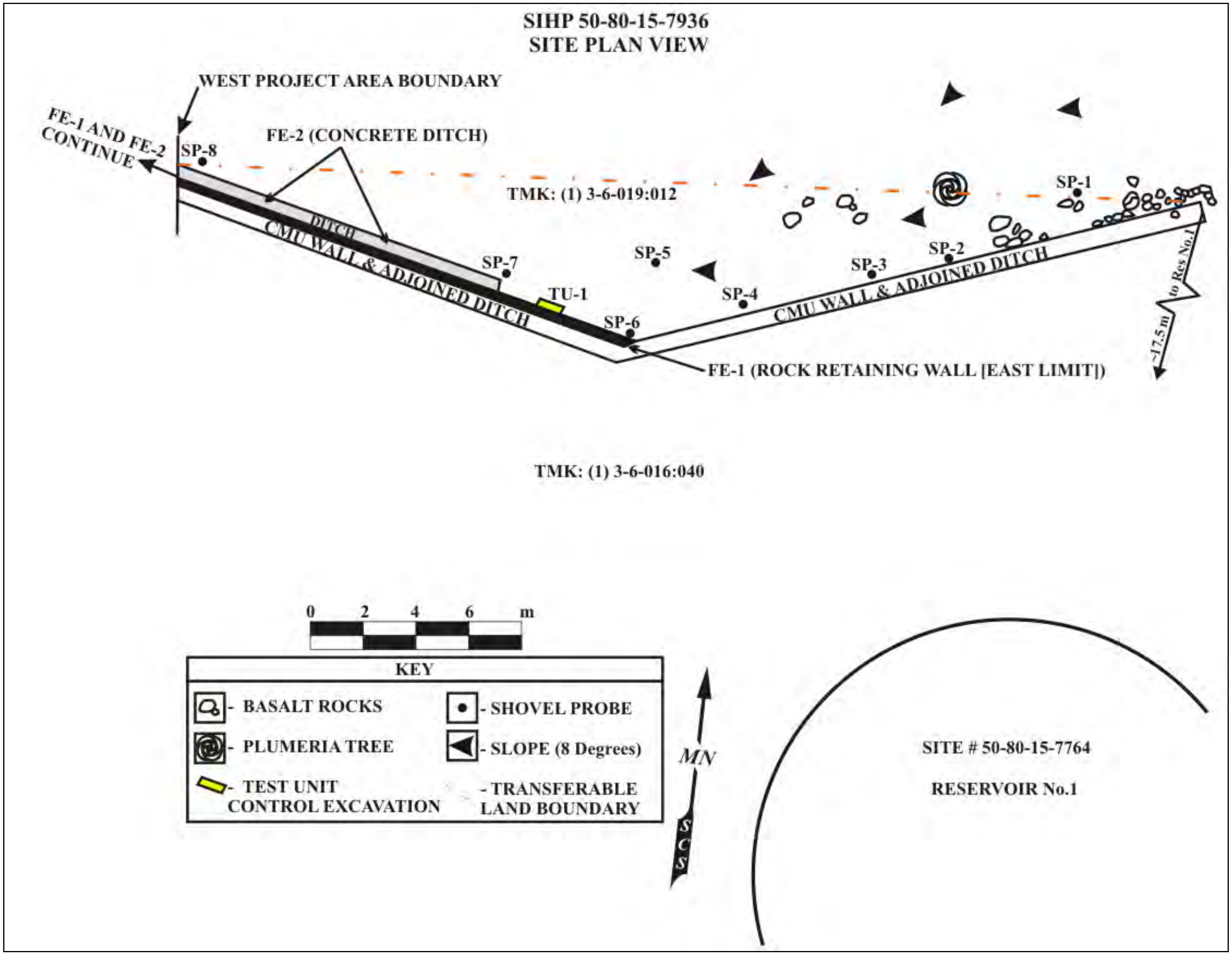

Figure 23: Plan view illustration detailing Site # 50-80-15-7936.

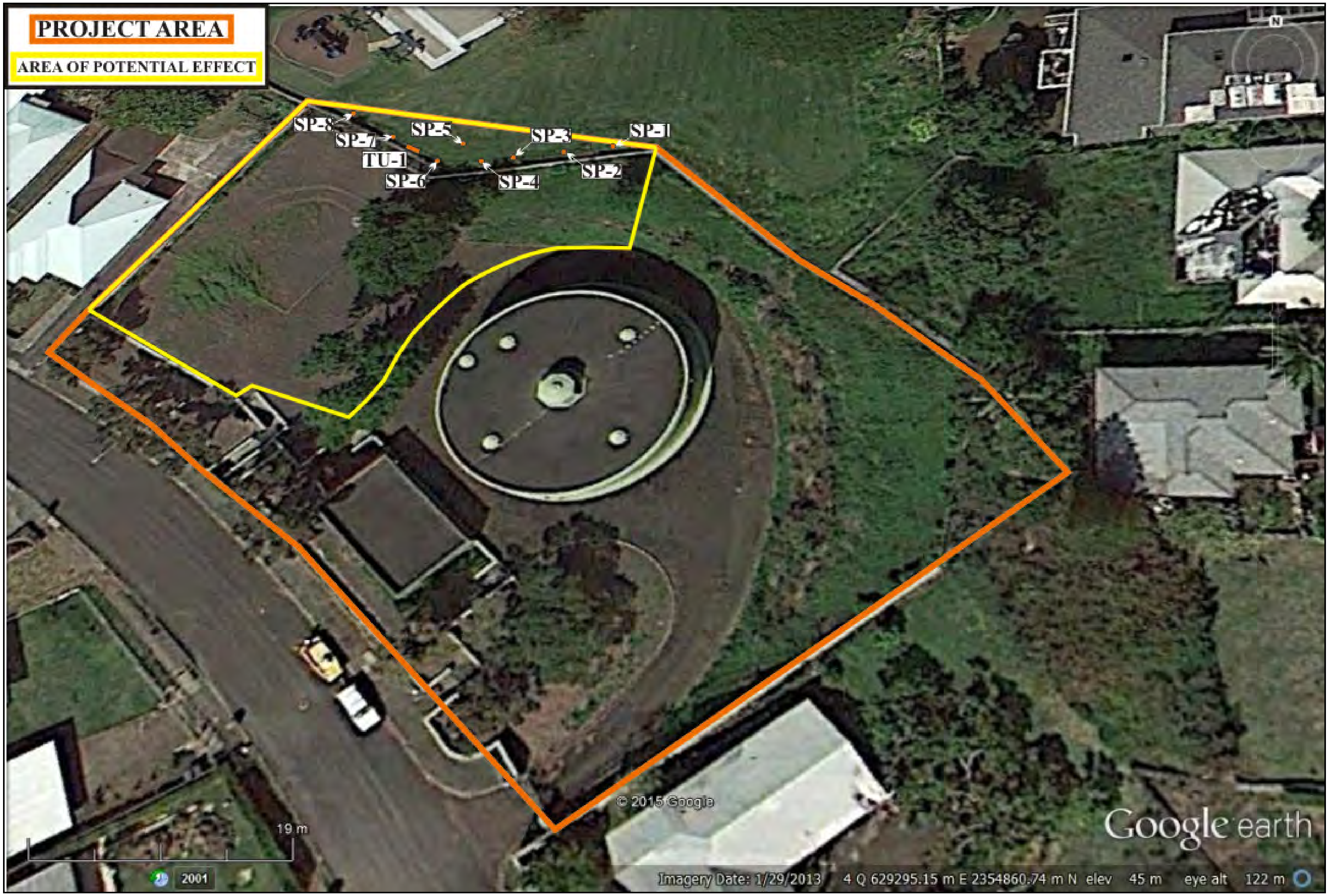

Figure 24: Google earth aerial image depicting the project area and subsurface test locations in the APE.

marine shell, nails, bottle glass, and road gravel). They revealed a fill soil layer underlain by a disturbed, mixed fill/natural rocky soil deposit which overlies an undisturbed natural deposit. Shovel probe excavations terminated approximately 50 cmbs within an extremely rocky substratum or natural deposited identified as being undisturbed and culturally sterile.

Detailed descriptions of the exposed soil stratigraphy and the subsurface cultural materials exposed in the shovel probes are presented below, followed by a discussion of the control unit.

SHOVEL PROBES

SP-1

SP-1 was placed upslope, just within the northeast limit of the project area within the 0.03-acre parcel. It measured approximately 48 cm in diameter and was excavated to 45 cmbs. Two soil layers (Layers I and II) were observed and documented (Figure 25 and 26).

> **Layer I** (0-18 cmbs): dark brown (7.5 YR 3/2, moist) semi-compact, rocky, non-plastic, firm, granular clay loam, with moderate micro roots, and approximately 40 percent sub-angular basalt gravel/cobble (3-6 cm diameter) content. Layer I has a gradual lower boundary. This layer contained debris including roofing tar paper, and a bottle glass (body) fragment identified in the backfill from between approximately 5-13 cmbs. No features were identified. Layer I is as fill topsoil.
>
> **Layer II** (18-45 cmbs)**:** very dark gray (7.5 YR 3/1, moist) firm, rocky, humic crumb clay loam with approximately 25 percent cobble and gravel (5-15 cm diameter) content, and an absence of roots. An isolated circular inclusion of carbonized matter was observed as flecking in the north wall at 20-23 cmbs, but not found in association with any cultural features or artifacts. Cultural items found within Layer II consisted of non-diagnostic ferrous and non-ferrous metal fragments and wire carpentry nails and occurred as a small cluster at approximately 25 cmbs. The upper exposed portion of Layer II, including the location of the metal and nails is previously disturbed.

SP-1 yielded only modern artifacts in Layer I and II, all of which likely relate to 20th-century activities, including development and use of the elementary school grounds, including their current use as a park. These artifacts consist of a piece of roofing paper (11 cm^2), and aqua colored bottle glass (6 cm cross-section body fragment) with a white applied enamel label. Artifacts identified in Layer II were observed in the associated backfill, with the exception of the wire carpentry nails, identified *in situ* at 25 cmbs as a discrete cluster in the SP-1west side-wall.

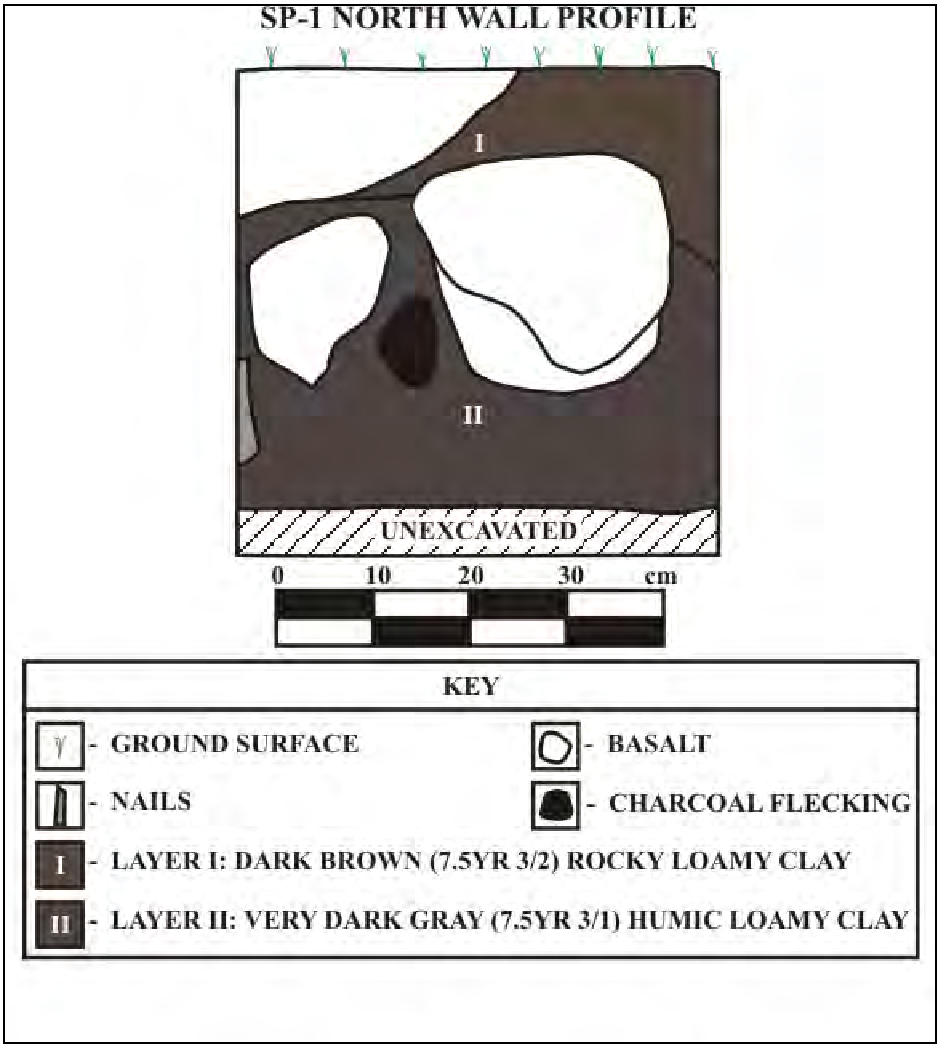

Figure 25: Stratigraphic profile illustration of SP-1 north wall stratigraphy.

Figure 26: View of SP-1 north wall stratigraphy.

SP-2

SP-2 was placed in the upslope area in the northeast portion of the 0.03-acre parcel, adjacent to downslope side of a modern ditch. The excavation measured approximately 35 cm in diameter, and was excavated to a depth of 47 cmbs. Excavation resulted in documentation of three soil layers (Layers I-III) as shown in Figures 27 and 28.

> **Layer I** (0-12 cmbs): mottled dark brown (7.5 YR 3/2-3, moist) semi-compact, firm rocky clay loam with few micro roots, and approximately 25 percent basalt gravel/cobble (2-5 cm diameter) content; gradual lower boundary. Layer I included two partially buried small boulders (25-30 cm diameter) and an underlying boulder observed in the south sidewall. Layer I clay matrices contained sparse debris that consisting of fragmented roofing tar paper observed at 5 cmbs. The boulders observed within Layer I may be associated with a segment of a possible remnant rock alignment that abuts the edge of a modern concrete drainage ditch just inside the parcel boundary; however insufficient data were obtained to assess whether they are natural or cultural in origin. No significant features or cultural materials were identified in this layer. Layer I is fill topsoil.
>
> **Layer II** (12-30 cmbs): dark brown (7.5 YR 3/2, moist) very rocky, firm, friable clay with approximately 80 percent basalt gravel (serge rock, 3-5 cm thick angular basalt). The layer was composed of non-consolidated clay soil predominated by road bedding gravel fill. The lower boundary is clear and slightly wavy. One piece of coral gravel was observed. No significant features or cultural materials were identified in this layer. Layer II is mixed fill/previously disturbed natural soil stratum.
>
> **Layer III** (30-47 cmbs): very dark gray (7.5 YR 3/1, moist) semi-compact, friable, humic clay loam, absence of roots and rock. No features or cultural materials were identified in this layer. Layer III is a natural soil deposit.

SP-3

SP-3 was placed mid-slope within the 0.03-acre parcel, adjacent to a modern concrete drainage. The excavation measured approximately 54 cm in diameter and terminated at 5 cmbs due to the extremely rocky soil conditions in this location; upon completion of testing, relocation of SP-3 was determined to be unnecessary. Only one soil layer (Layer I) was documented (Figures 29 and 30).

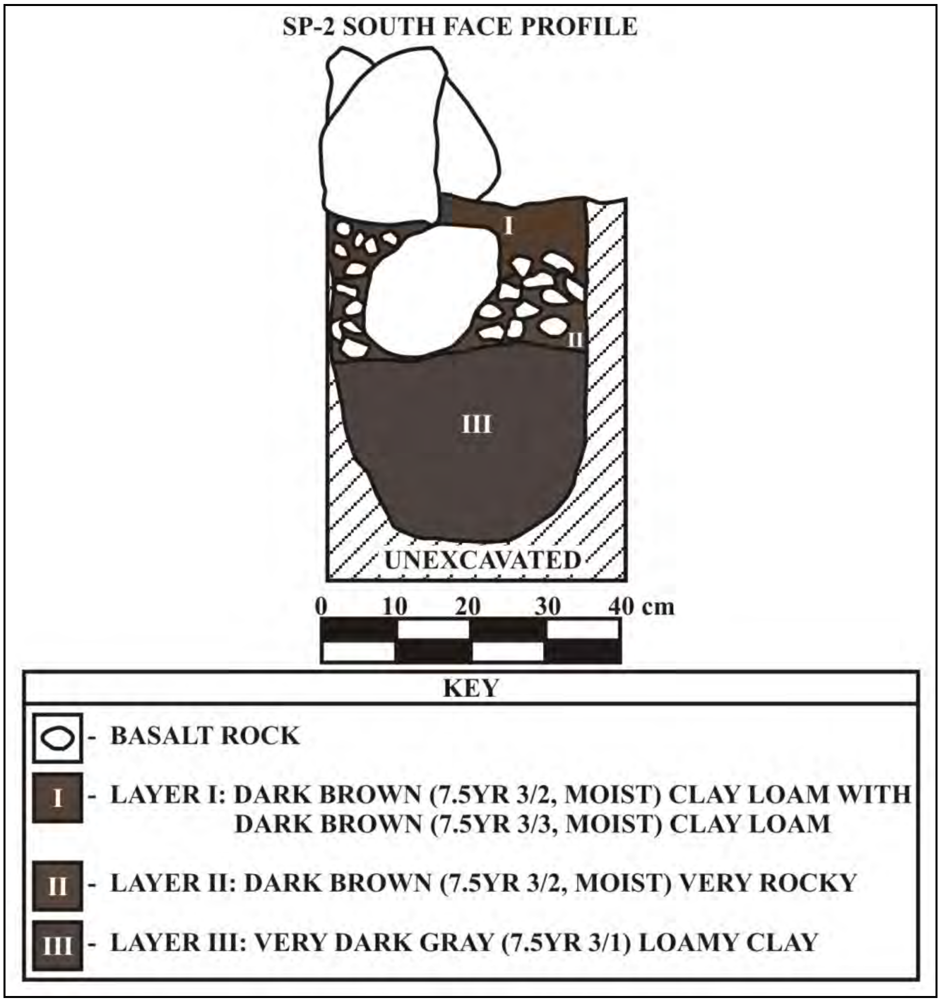

Figure 27: Stratigraphic profile of SP-2 south wall.

Figure 28: View of SP-2 south wall stratigraphy.

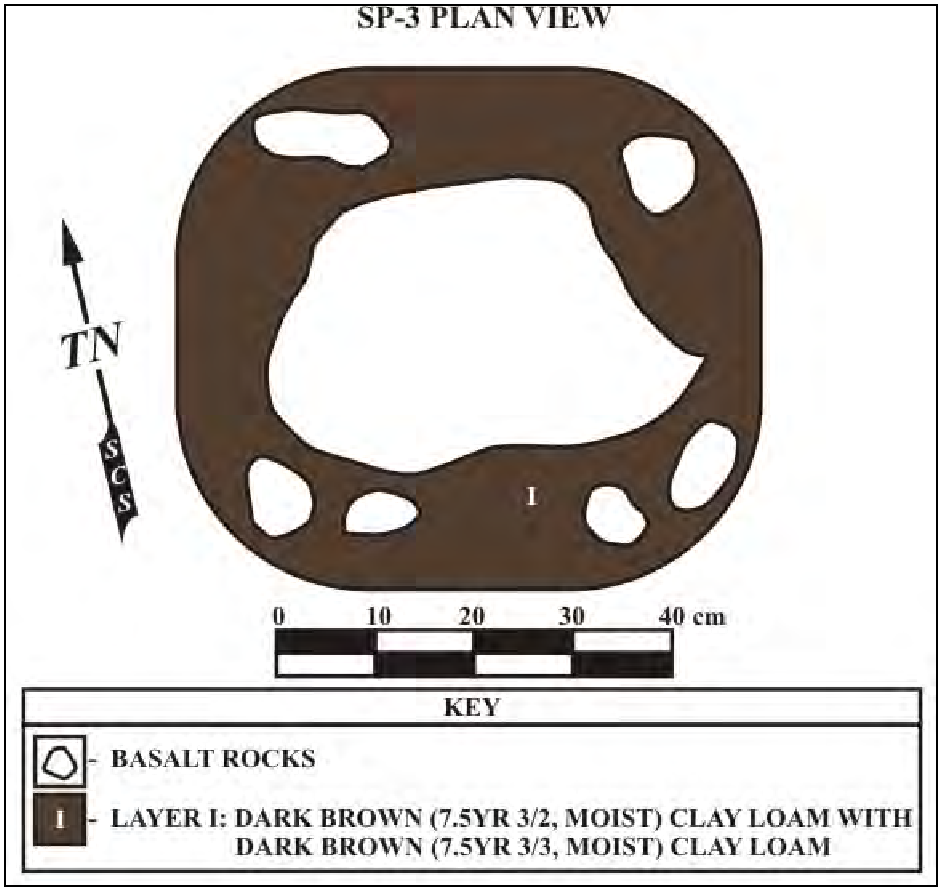

Figure 29: SP-3 Plan View illustration of extremely rocky subsurface deposit.

Figure 30: View of SP-3 extremely rocky subsurface soil conditions.

Layer I (0-5 cmbs): dark brown with mottles (7.5 YR 3/2 with 3/3, moist) semi-compact, extremely rocky friable granular clay loam with micro roots, and approximately 90 percent basalt boulder/cobble (15-45 cm diameter) content. No cultural features or historic material were identified. Layer I is a mixed fill topsoil.

SP-4

SP-4 was placed near the base of the slope within the 0.03-acre parcel, adjacent to a modern concrete ditch. The excavation measured approximately 40 cm in diameter, and 55 cm in depth. Three soil layers (Layers I-III) were documented (Figures 31 and 32).

Layer I (0-10 cmbs): dark brown (7.5 YR 3/2, moist) semi-compact, rocky, slightly friable clay loam, with moderate micro roots, and, approximately 40 percent sub-angular basalt cobble/gravel (3-6 cm diameter) content, and some coral gravel inclusions. The lower boundary is clear and wavy. No features or significant cultural deposits were identified. Layer I is fill topsoil.

Layer II (10-23/45 cmbs): dark brown (7.5 YR 3/2, moist) semi-compact, rocky, loamy clay, with micro roots, and approximately 40 percent basalt cobble (3-6 cm diameter) content; and abrupt wavy lower boundary. No features or significant cultural deposits were identified. Layer II is fill soil.

Layer III (10-23/55 cmbs): very dark gray (7.5 YR 3/1, moist) semi-compact, consolidated clay-loam with little to no rock content. Layer III is a previously disturbed natural soil deposit, significantly impacted (truncated) by Layer II (see Figure 31).

SP-5

SP-5 was placed at the base of the slope within the 0.03-acre parcel. The excavation measured approximately 40 cm in diameter, and reached 50 cmbs. Three soil layers (Layers I-III) were documented (Figures 33 and 34).

Layer I (0-5 cmbs): dark brown (7.5 YR 3/2, moist) semi-compact, rocky, silty clay-loam with few micro roots, and approximately 25 percent basalt gravel/cobble (2-4 cm diameter) content; and distinct wavy boundary. No significant features or cultural materials were identified in this layer. Layer I is fill topsoil.

Layer II (5-20/23 cmbs): dark yellowish brown (10 YR 3/4, dry) semi-compact, rocky clay-loam, with few micro roots, and approximately 20 percent gravel and rock content; and diffuse (indistinct) lower boundary. One piece of coral gravel was observed. No features or significant cultural materials were identified. Layer II is a previously disturbed natural soil stratum.

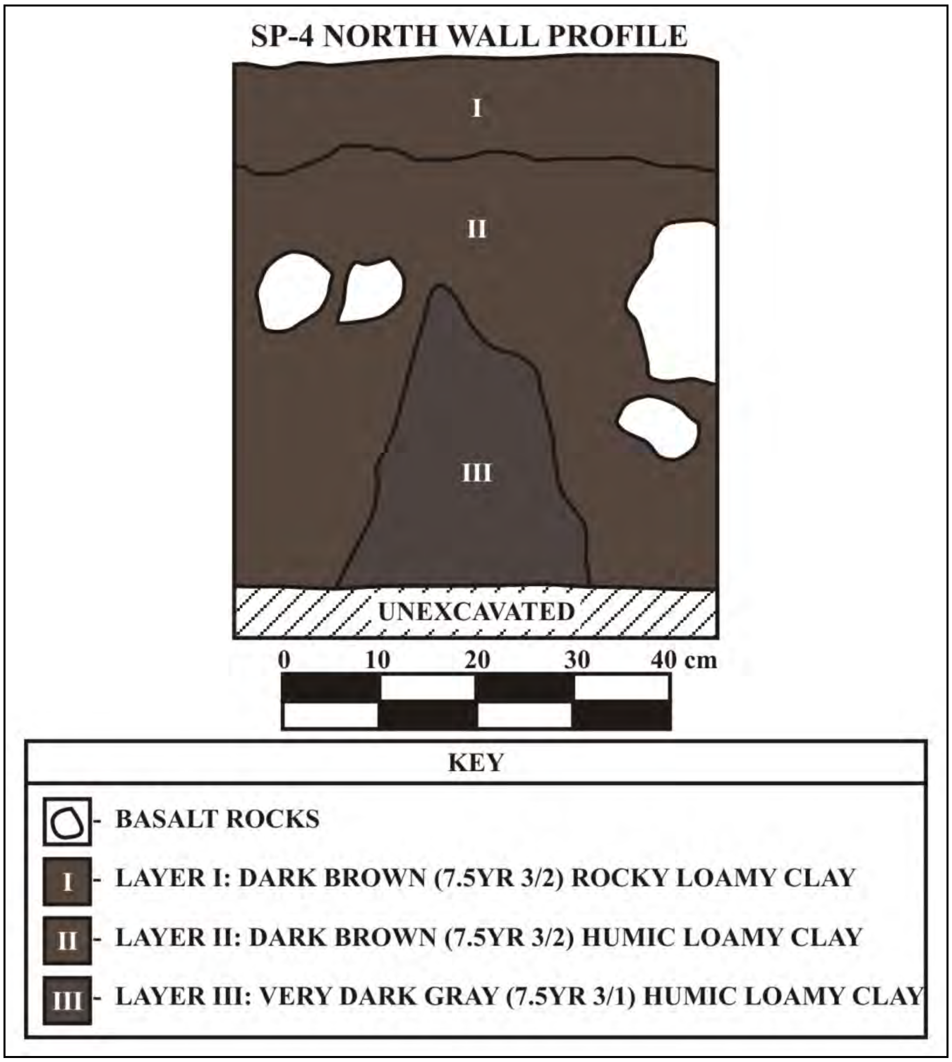

Figure 31: Stratigraphic profile of SP-4 north wall.

Figure 32: View of SP-4 north wall stratigraphy.

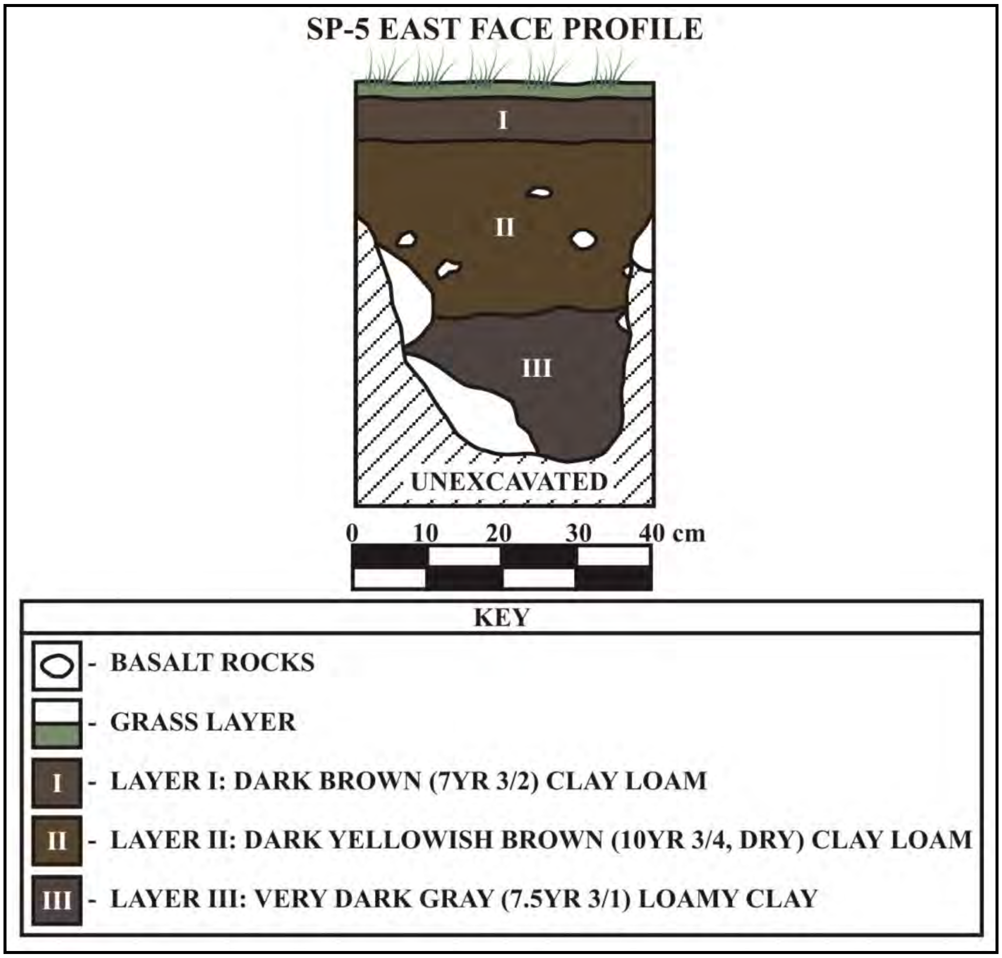

Figure 33: Stratigraphic profile of SP-5 east wall.

Figure 34: View of SP-5 east wall stratigraphy.

Layer III (20/23-50 cmbs): very dark gray (7.5 YR 3/1, dry) semi-compact, clay with approximately 15 percent rock content; and, is underlain by rock. This layer was composed of a fairly consolidated, firm clay. One marine shell (bivalve) fragment and coral gravel were observed in backfill from this layer. No significant features or cultural materials were identified. Layer III is a previously disturbed natural soil deposit.

SP-6

SP-6 was placed at the base of the slope within the 0.03-acre parcel. The excavation measured approximately 45 cm in diameter, and reached a depth of 44 cmbs. Three soil layers (Layers I through III) were documented (Figures 35 and 36).

Layer I (0-5 cmbs): mottled dark brown (7.5 YR 3/2, moist) semi-compact, rocky, friable silty clay-loam with few micro roots, and approximately 25 percent basalt gravel/cobble (2-4 cm diameter) content; and wavy lower boundary. No significant features or cultural materials were identified in this layer. Layer I is a fill topsoil.

Layer II (5-20/23 cmbs): dark yellowish brown (10 YR 3/4, dry) semi-compact, firm silty, granular clay-loam, with few micro roots, and approximately 20 percent rock content. Some coral gravel was observed in this layer; and indistinct boundary. No features or significant cultural materials were identified. Layer II is fill topsoil.

Layer III (20/23-50 cmbs): very dark gray (7.5 YR 3/1, dry) semi-compact, rocky, firm, fairly consolidated clay with approximately 15 percent rock content. No significant features or cultural materials were identified. Layer III is a previously disturbed natural soil deposit.

SP-7

SP-7 was placed at the base of slope near the northwestern limit of the 0.03-acre project area and adjacent to the Site # 50-80-15-7764, Feature 2 concrete ditch (see Figures 23 and 24). The excavation measured approximately 40 cm in diameter, and reached a depth of 50 cmbs. Three soil layers (Layers I-III) were documented (Figures 37 and 38).

Layer I (0-5 cmbs): mottled dark brown (7.5 YR 3/2-3, moist) semi-compact, rocky, friable silty clay-loam with few micro roots, and approximately 30 percent basalt gravel/ cobble/saprolite (2-4 cm diameter) content. Lower boundary is clear and wavy. A modern ceramic tile fragment was observed in the west wall of this layer. No significant features or cultural materials were identified in this layer. Layer I is fill.

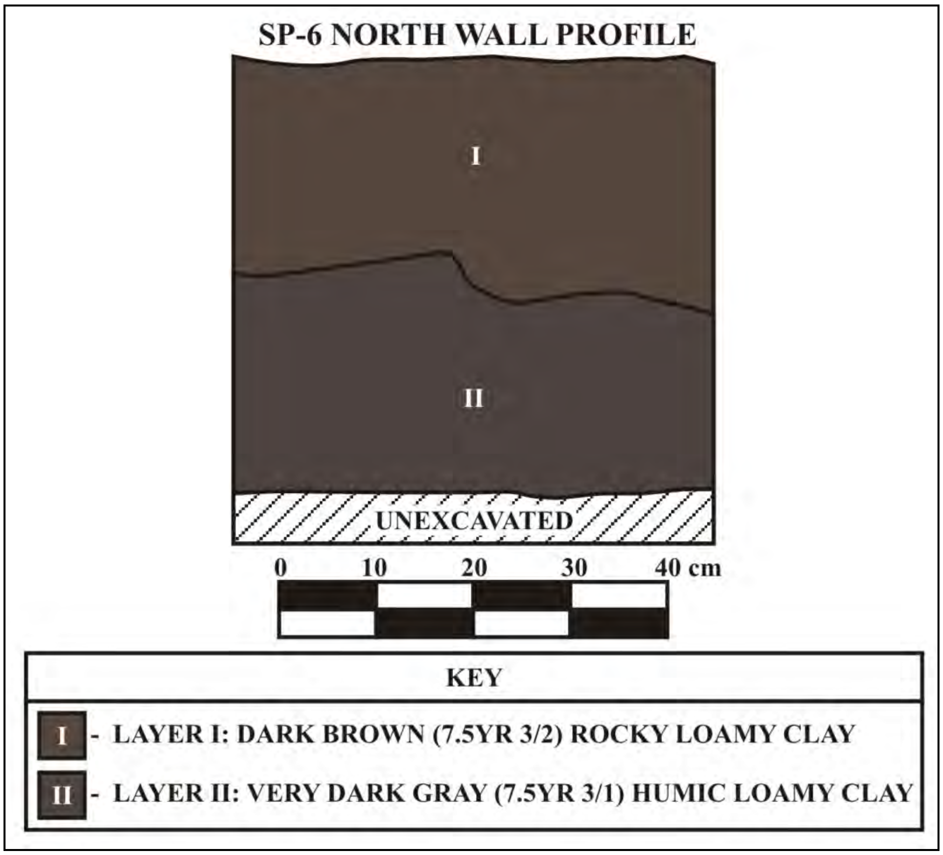

Figure 35: Stratigraphic profile illustration of SP-6 north wall.


Figure 36: View of SP-6 north wall stratigraphy.

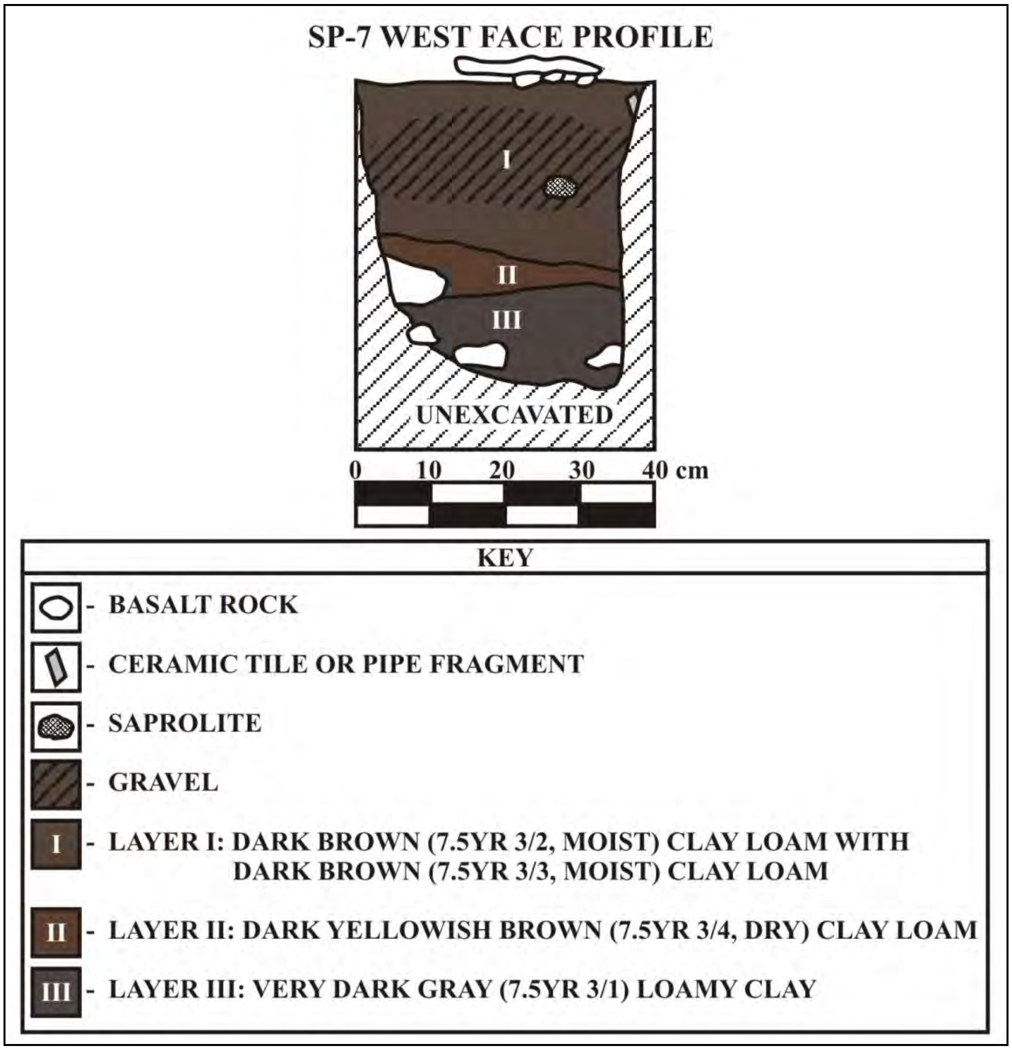

Figure 37: Stratigraphic profile illustration of SP-7 west wall.

Figure 38: View of SP-7 west (Southwest) wall stratigraphy.

Layer II (5-20/23 cmbs): dark yellowish brown (10 YR 3/4, dry) semi-compact, firm, granular clay-loam, with few micro roots, and approximately 20 percent rock content. No features or significant cultural materials were identified. Layer II is a mixed fill and natural soil deposit.

Layer III (20/23-50 cmbs): very dark gray (7.5 YR 3/1, dry) semi-compact, rocky, silty, semi-consolidated, firm clay-loam, approximately 25 percent rock content consisting of angular saprolitic cobbles. No significant features or cultural materials were identified. Layer III is a mixed fill and natural soil deposit.

SP-8

SP-8 was placed at the base of slope near the northwestern limit of the 0.03-acre portion of the project area. SP-8 measured approximately 40 cm in diameter and was excavated to 50 cmbs. Two soil layers (Layers I-II) were documented (Figures 39 and 40).

Layer I (5-20/23 cmbs): dark yellowish brown, dry) semi-compact, humic clay-loam, with few micro roots, and approximately 20 percent rock content, including small (angular) coral and basalt cobbles (3-8 cm thick). No features or significant cultural materials were identified. Layer I is a fill.

Layer II (20/23-50 cmbs): very dark gray (7.5 YR 3/1, moist) semi-compact, non-plastic, semi-consolidated clay, absent of roots, with little rock content. No features or cultural materials were identified. Layer II is a natural soil deposit.

CONTROL UNIT

Test Unit-1

A control unit (TU-1) was excavated at Site # 50-80-15-7764 Feature 1, a mortared rock retaining wall. TU-1 was excavated by hand to exposed and document the buried portion of this wall. It was placed to abut the north face of Feature 1 at its east end, centered between SP-6 and SP-7 (Figure 41; see Figures 23 and 24). TU-1 measured 1.0 meter by 0.50 meter, and was excavated to a depth of 37-42 cmbd. Excavation exposed three soil layers (Layers I-III) and revealed a lower, but not basal, a course of the rock wall (Figures 42 through 44). Soil stratigraphy descriptions and profiles are presented below for the east and south walls in TU-1.

Layer I (0-12 cmbd): dark brown (7.5 YR 3/3, moist) semi-compact, rocky, friable silty clay-loam with approximately 15 percent basalt and coral gravel/cobble (2-4 cm diameter), absence of roots; diffuse lower boundary. No features or cultural materials were present. Layer I is fill.

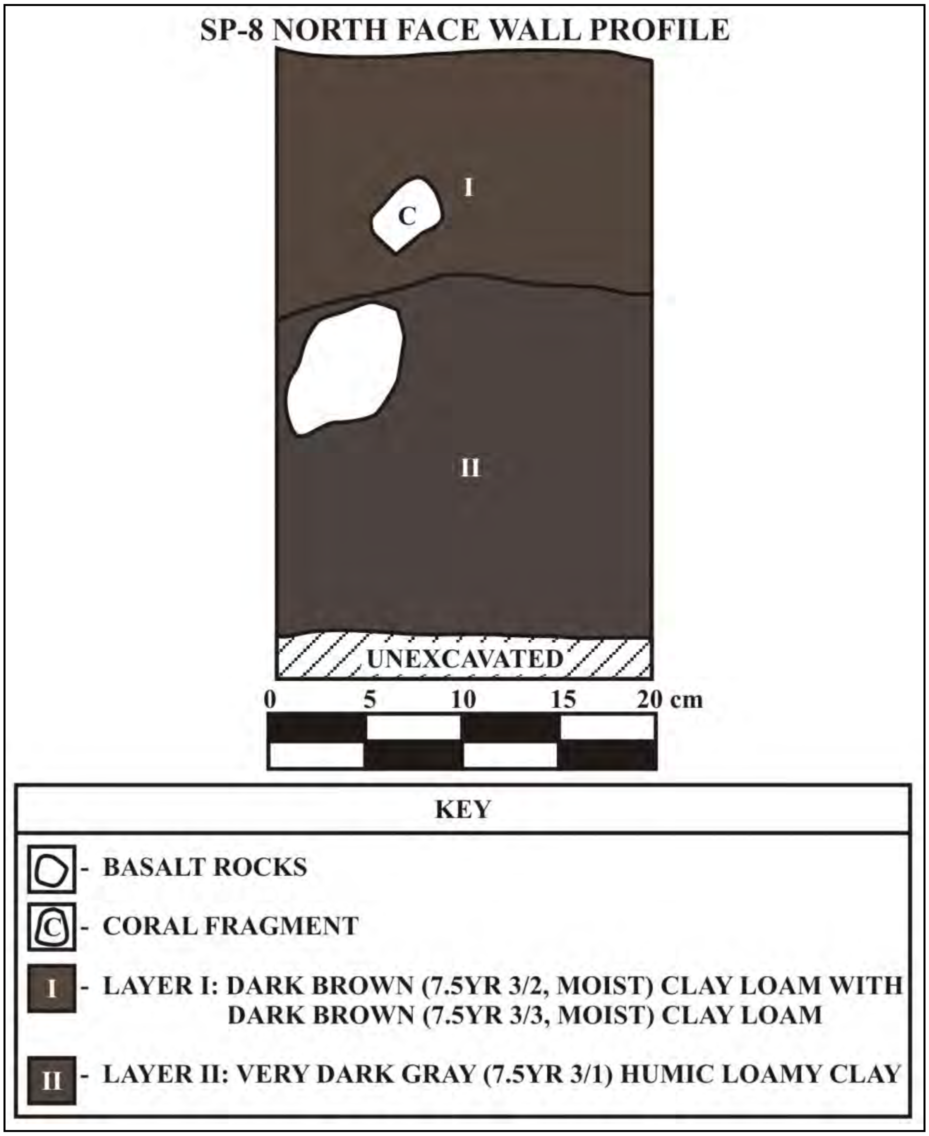

Figure 39: Stratigraphic profile illustration of SP-8 north wall.

Figure 40: View of SP-8 north wall stratigraphy.


Figure 41: Overview of TU-1, pre-excavation, at Site # 50-80-15-7764- Feature 1.

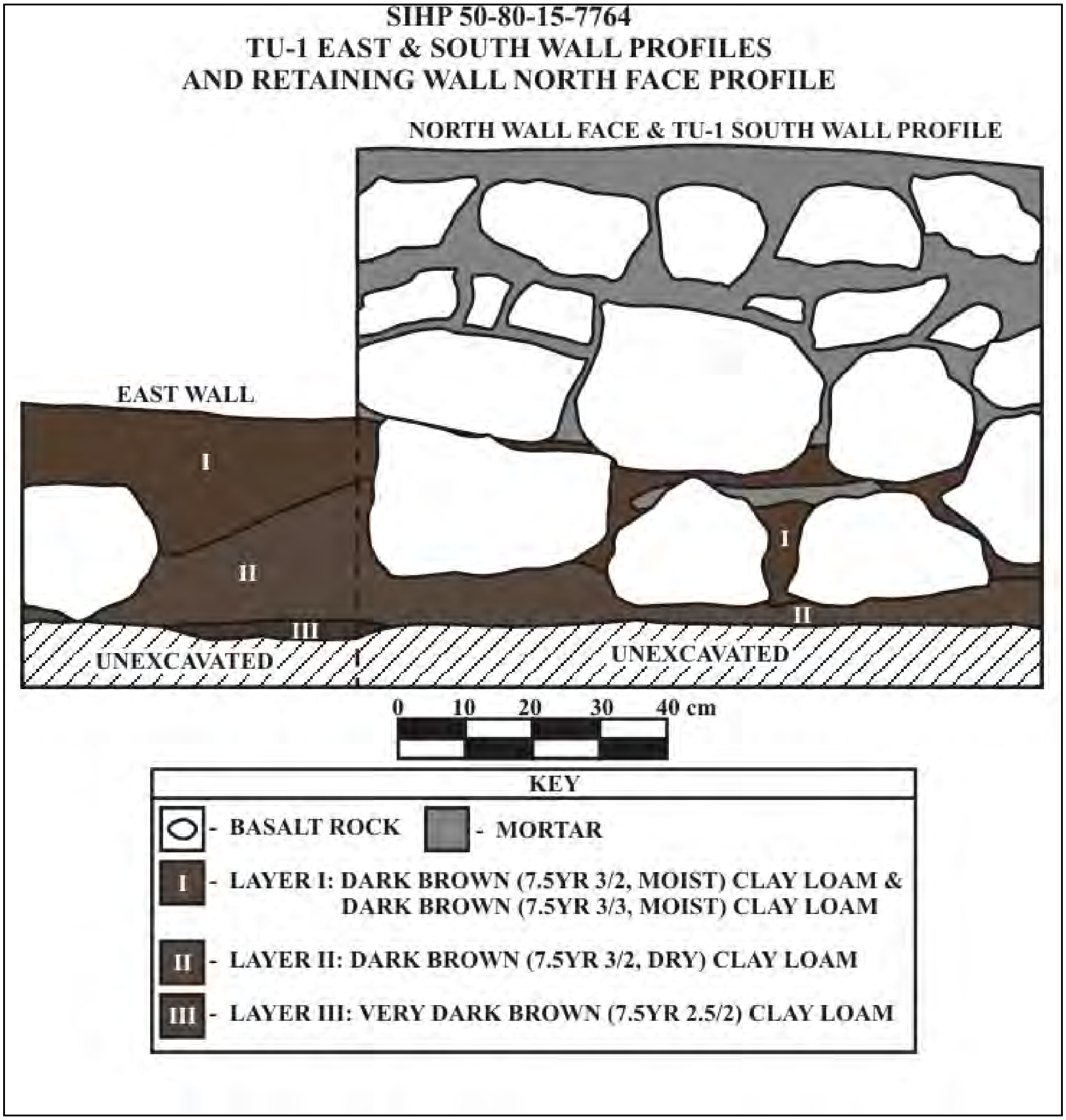

Figure 42: Stratigraphic profile illustration of TU-1 east and south wall's, and Site # 50-80-15-7764- Feature 1, mortared rock wall North Face, and subsurface construction.

Figure 43: View of TU-1 south wall stratigraphy, and Site # 50-80-15-7764- Feature 1, mortared rock wall north face. Note subsurface construction.

Figure 44: View of TU-1 east wall stratigraphy, at Site # 50-80-15-7764- Feature 1, mortared rock wall north face. Note subsurface construction (Right Frame).

Layer II (12-37/42 cmbd): dark brown (7.5 YR 3/4, dry) semi-compact, silty, firm, granular clay-loam, absence of roots, approximately 15 percent basalt and coral gravel/cobble (2-4 cm diameter); and smooth lower boundary. No features or significant cultural materials were identified. Layer II is a fill.

Layer III (37-42 cmbd): very dark gray (7.5 YR 3/1, dry) semi-compact, semi-consolidated rocky clay with approximately 25 percent rock content and some coral gravel. This layer was composed of fairly consolidated clay. No significant features or cultural materials were identified. Layer III is a previously disturbed/truncated natural soil deposit.

DISCUSSION AND CONCLUSIONS

This archaeological inventory survey (AIS) was completed for the 0.9619-acre project area for the proposed BWS Aina Haina 170’ Potable Reservoir No.2 Project, located in Wailupe Ahupuaʻa, Kona District, O’ahu Island, Hawai’i [TMK: (1) 3-6-016:040 and 3-6-019:012 por.]. The pedestrian survey and subsurface testing revealed no indications of traditional Hawaiian cultural deposits or features. The identified archaeological resources were a mortared rock wall (Feature 1) and a concrete ditch (Feature 2) designated as components of Site # 50-80-15-7936. This site is interpreted as infrastructure related to the construction and use of Wailupe Valley Elementary School.

This AIS was carried out within County-owned property comprising the BWS Aina Haina 170’ Potable Reservoir No. 1 (0.9319 acres) parcel and a smaller (0.03 acres) portion of the present-day Wailupe Valley Neighborhood Park, formerly part of the Wailupe Valley Elementary School grounds. This AIS was conducted in support of proposed construction and/or alterations related to the BWS facility (Site # 50-80-15-7764), including installation of an additional storage tank and related appurtenances.

The AIS project included archival research relating to cultural and historical background and land use of the area, previous archaeological studies within the project area and vicinity, completion of a 100% surface survey, and limited subsurface testing. In addition, an architectural reconnaissance level survey (RLS) was conducted by Mason Architects to assess and document potential architectural resources contributing to the historical significance of the BWS facility (Site # 50-80-15-7764). This RLS focused on the reservoir tank enclosure structure and the associated booster pump station building.

The pedestrian survey documented the earthen berm, various walls, and other surface features within Site # 50-80-15-7764, BWS facility. It also documented a mortared rock wall (Feature 1) and a concrete ditch (Feature 2) within the 0.03-acre “Transferable Land Portion” of the project area within Wailupe Valley Neighborhood Park, adjacent to the northwest corner of the BWS facility portion of the project area. Subsurface testing within the 0.03-acre portion involved manual excavation of eight shovel probes (SP-1 though SP-8) and one control test unit (TU-1). This testing indicated the presence of fill above a disturbed natural deposit, the absence of any culturally-significant deposits or features, and resulted in the recovery of a small number of modern artifacts related to the construction and/or use of the school and surrounding grounds. In addition, TU-1 provided exposure of the subsurface construction of the mortared rock wall (Feature 1).

SITE SIGNIFICANCE ASSESSMENTS

Site #50-80-15-7764 and Site # 50-80-15-7936 were assessed for significance according to criteria specified in the Hawaii Administrative Rules (HAR) §13-284-6, which states that to be considered significant a historic property must possess integrity of location, design, setting, materials, workmanship, feeling, and association, and meet one or more of the following criteria:

a. Site is associated with events that have made a significant contribution to the broad patterns of our history;

b. Site is associated with the lives of persons significant to our past;

c. Site is an excellent site type; embodies distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual distinction;

d. Site has yielded or has the potential to yield information important in prehistory or history; and

e. Site has cultural significance to an ethnic group; examples include religious structures, burials, major traditional trails, and traditional cultural places.

Site #50-80-15-7764, the Aina Haina 170’ Potable Reservoir 1 and Booster Pumping Station building, was assessed as significant under Criterion “c as an excellent site example that embodies distinctive characteristics of a historic period, Hawai`i-specific architectural design type, and as a representative BWS building type, and it provides information potential for informing Honolulu’s water distribution system. It was also evaluated as eligible for the Hawaii and National Register of Historic Places (see below). Site # 50-80-15- 7936 Feature 1, rock retaining wall; and Feature 2, concrete ditch, were assessed as being significant under Criterion "d" for their potential to yield information important about the development of Wailupe Valley and construction of historic ʻĀina Haina's public infrastructure.

HAWAII AND NATIONAL REGISTER ELIGIBILITY EVALUATIONS

Site # 50-80-15-7764 was evaluated by Mason Architects (MAI) as being eligible for inclusion on both the Hawaii and National Register of Historic Places under Criterion C (see Appendix A). MAI conducted a Reconnaissance Level Survey (RLS) which indicates that the reservoir and pumping station are a single integral property. Hart Wood (one of the founders of Hawaii's regionalist design movement) is identified as the architect/builder and the date of construction was 1951. The booster pumping station building is individually eligible. Together, the reservoir enclosure structure and booster pump station building are an exemplary example of a period related to a movement in the field of architectural design exclusive to Hawaiʻi, during the WW II era.

PROJECT EFFECT

The proposed project will not affect Site # 50-80-15-7764 which will remain in active use. However, portions of Site #50-80-15-7936 (Features 1 and 2) within the project area are likely to be removed during construction.

RECOMMENDATONS

As MAI has determined that the proposed project will not have an adverse effect on Site # 50-80-15- 7764 (Appendix A), no further work is recommended at this time. However, any future project proposed within the boundaries of Site # 50-80-15-7764 should be submitted to SHPD for review. The booster pump station building and reservoir are currently in active use, and will continue to function as a fundamental component in the BWS potable water supply and distribution system, known as the East Honolulu 170' System.

As the current AIS has adequately documented Site # 50-80-15-7936 (mortared basalt rock retaining wall and associated concrete ditch, Feature-1 and Feature-2), no further work is recommended for Features 1 and 2 within the current project area. However, as both extend beyond the project limits, further documentation of Site # 50-80-15-7936 is recommended should a future project be proposed that includes portions of this site. The wall and ditch are likely associated with the former Wailupe Valley Elementary School (established ca. 1958) and are part of the broader built landscape extending outside the project area boundaries, including along the Wailupe Valley Neighborhood Park south parcel boundary.

CURATION

All project documents are currently curated at the SCS Laboratory in Honolulu. No artifacts or sample materials were collected.

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APPENDIX A: RLS DOCUMENTATION

ARCHITECTURE
RESTORATION
RENOVATION
RESEARCH

Mason Architects

April 9, 2015

Jessica Puff
State Historic Preservation Division
Kakuhihewa Building
601 Kamokila Blvd., Suite 555
Kapolei, HI 96707

Re: Board of Water Supply, Aina Haina Reservoir – Reconnaissance Level Survey

Dear Jessica,

Mason Architects, Inc. was hired by Scientific Consultant Services on behalf of Limtiaco Consulting Group for the Board of Water Supply to complete a Reconnaissance Level Survey (RLS) of the Aina Haina Reservoir and Booster Pumping Station. (See correspondence under LOG NO. 2014.03211, DOC NO.1406GC08.) This RLS was undertaken in preparation for the construction of a second concrete reservoir structure on the property.

To follow are the survey parameters, our summary of findings, and an evaluation of the effects of the proposed project. The RLS forms for the Aina Haina Booster Pumping Station and Reservoir are attached. The spreadsheet summary and photographs that are required by SHPD will be submitted on disc once we receive your comments on the enclosed materials.

Survey Parameters and Findings
A total of two facilities (one building and one structure) were surveyed. Research indicates that they were built in 1951. Both facilities were evaluated for NRHP eligibility, and were found to be eligible under Criterion C. Explanations of these findings, and additional detail about the facilities, are found in the attached RLS forms.

Evaluation of Effects of the Proposed Project
According to 36 CFR 800.5 (a)(1) and 800.5(a)(2), respectively:

> *Adverse effects occur when an undertaking may directly or indirectly alter characteristics of a historic property that qualify it for inclusion in the Register. Reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance, or be cumulative also need to be considered.*
>
> *Examples of adverse effects include physical destruction or damage; alteration not consistent with the Secretary of the Interior's Standards; relocation of a property; change of use or physical features of a property's setting; visual, atmospheric, or audible intrusions; neglect resulting in deterioration; or transfer, lease, or sale of a property out of Federal ownership or control without adequate protections.*

The addition of a second reservoir to the Board of Water Supply's property, as shown in the proposed site plan, will not have an adverse affect on the historic property, as explained below.

119 MERCHANT STREET • SUITE 501 • HONOLULU, HI 96813 • VOICE: 808.536.0556 • FAX: 808.526.0577 • INFO@MASONARCH.COM

HAWAII STATE HISTORIC PRESERVATION DIVISION
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

FOR SHPD USE ONLY: **Site #** Click here to enter text. **TMK #** Click here to enter text.

GENERAL INFORMATION

Common / Present Name: Booster Pumping Station
Historic Name: Aina O Haina Booster Pumping Station

Address: 855 Alamuku Street
City/ Town/ Location: Honolulu
County: Honolulu
TMK [(X)-X-X-XXX:XXX)]: (1) 3-6-016:040
Subdivision/Neighborhood: Aina Haina
Latitude: 21.290919°
Longitude: -157.753716°

Original Use: Booster Pumping Station
Current Use: Booster Pumping Station

Architect/ Builder (if known): Hart Wood
Date of Construction (if known): 1951

LOCATION MAP

Prepared By: Polly Tice Consulting Firm: Mason Architects
Address: 119 Merchant Street Suite 501
Telephone Number: 808-536-0556 Email:pt@masonarch.com Date: April 8, 2015

HAWAII STATE HISTORIC PRESERVATION DIVISION
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

FOR SHPD USE ONLY: **Site #** Click here to enter text. **TMK #** Click here to enter text.

CONDITION ASSESSMENT

Category (select all that apply):
- ☒ Building(s)
  - ☐ Residential
  - ☐ Commercial
  - ☐ Educational
  - ☒ Public/Civic
  - ☐ Religious
- ☐ Structure(s)
- ☐ Object(s)
- ☐ Site(s)/Landscape(s)
- ☐ Archaeology or potential for archaeology
  - Describe: _____

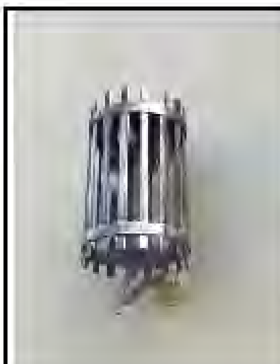
Alterations (additions, etc.) if known: _____

Original Location, if moved: _____
Reason for move (if known): _____

Condition:
- ☒ Excellent
- ☐ Good
- ☐ Fair
- ☐ Deteriorated

Condition Explanation: _____

Eligibility (select all that apply):
- ☒ National Register of Historic Places
- ☒ State Register of Historic Places
  - ☐ Not Eligible
  - ☒ Eligible
  - ☐ Listed
  - ☐ Contributing to Historic District:
  - Name of District:
  - ☐ Unknown



Criteria of Significance (select all that apply)
- ☐ A: Associated with Events
  Event:
- ☐ B: Associated with Significant Person(s)
  Person(s): _____
- ☒ C: Distinctive characteristics of a type, period or method of construction; work of a master; possess high artistic values (Architecture, Engineering, Design)
- ☐ D: Have yielded or may be likely to yield information important to history or prehistory. Explain: _____

2-4

HAWAII STATE HISTORIC PRESERVATION DIVISION
HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

FOR SHPD USE ONLY:	Site #:	TMK #:

DESCRIPTION

Materials (please check those materials that are visible):

Height:
- ☐ Stories: _____
- ☐ Below Ground
- ☐ N/A
- ☒ Other: One story plus basement

Exterior Walls (siding):
- ☐ Aluminum Siding
- ☐ Asbestos
- ☐ Brick
- ☐ Ceramic
- ☒ Concrete
- ☐ Horizontal Wood Siding
- ☐ Log
- ☐ Metal
- ☐ Shingles-Asphalt
- ☐ Shingles-Wood
- ☐ Stone
- ☐ Stucco
- ☐ Vertical Wood Siding
- ☐ Vinyl Siding
- ☐ Engineered Siding
  - ☐ Plywood
  - ☐ OSB
  - ☐ Fiberboard
  - ☐ Fiber Cement
- ☐ Other: _____

Roof:
- ☐ Asphalt, shingle
- ☐ Asphalt, roll
- ☐ Other: _____
- ☐ Metal
- ☐ Slate
- ☒ Built Up
- ☐ Ceramic Tile
- ☐ Wood Shingle
- ☐ None

Foundation:
- ☐ Brick
- ☐ Concrete Block
- ☒ Concrete Slab
- ☐ None – on earth
- ☐ Poured Concrete
- ☐ Raised/Pile
- ☐ Stone
- ☐ Other: _____

Structural Support:
- ☐ Baled Hay
- ☐ Concrete Block
- ☐ Concrete Framed
- ☒ Concrete Poured
- ☐ Frame-wood
- ☐ Frame-metal/steel
- ☐ Brick-load bearing
- ☐ Stone-load bearing
- ☐ Puddled Clay
- ☐ Rammed Earth
- ☐ Sod
- ☐ Other: _____

Windows:
- ☐ Double Hung Sash
- ☐ Single Hung Sash
- ☐ Casement
- ☐ Fixed
- ☐ Stained Glass
- ☐ Replacement
  - ☐ Aluminum
  - ☐ Vinyl
- ☐ Jalousie
- ☐ Ribbon
- ☐ Glass Block
- ☐ None/Unknown
- ☒ Other: Awning and perforated concrete block

Lanai(s):
- ☐ Arcade
- ☐ Balcony
- ☐ Porte-Cochere
- ☐ Recessed
- ☐ Stoop
- ☐ Portico
- ☐ Verandah
- ☐ Wrap-around
- ☒ None
- ☐ Other: _____

Chimney:
- ☐ Brick
- ☐ Concrete
- ☐ Stuccoed Masonry
- ☐ Stone
- ☐ Stove Pipe
- ☐ Siding
- ☒ None
- ☐ Other: _____

3-4

HAWAII STATE HISTORIC PRESERVATION DIVISION
HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

FOR SHPD USE ONLY:	Site #	TMK #

Narrative Description

The booster pumping station is a one-story building with a basement, which is painted green in keeping with other Board of Water Supply buildings. The property, which has a sloping terrain, includes a series of retaining walls and terraces, as well as planting areas, walkways and stairways. The building is constructed of reinforced concrete. It has a flat roof with a parapet topped with copper flashing, and a simple, rectangular floor plan measuring 40' by 24'. Its design is distinctly Modern, with a symmetrical façade, a streamlined façade window, and minimal decoration. The only decorative detail is the metal lantern-like light fixtures on the façade, which flank the central window. Centered above these is a sign made of raised block letters, which states, "Board of Water Supply."

Historic drawings indicate the interior of the building includes a pump room, switch board and gauge board on the northwest side of the first floor. On the southeast side of the building are rooms for parts storage, chlorinator equipment, yard storage, and a small bathroom, as well as a stair leading to the basement.

The building has relatively few windows and doors. The most notable, and in fact the only glazed window, is the narrow band of windows located about mid-height and centered in the front (southwest) façade. This band consists of five steel awning windows; each window has two-lights. On the northwest and southeast ends of the building are ventilation openings in the walls made with perforated concrete block. There are two of these openings, measuring about 3'-6" by 4', on each building end, which flank a central doorway. The doors are flush metal doors. There are no doors or windows on the northeast (rear) side of the building, which faces the circular concrete reservoir.

Adjacent to the pumping station, to the northwest, is an in-ground/sub-grade transformer vault, that is integral to the property. Behind the building to the northeast and across a narrow driveway, is the concrete reservoir (see separate RLS form for information on that structure).

Statement of Significance

The Booster Pumping Station building and its associated Aina Haina 170' Potable Reservoir No. 1, both built in 1951, are evaluated as significant for the NRHP under Criterion C, as one integral property. The complex is eligible for the distinctive modern design of the booster pumping station, and the thoughtful landscaping of the site that successfully assimilates the facilities into the surrounding residential neighborhood. These attributes are testaments to the Board of Water Supply's commitment to good design for public facilities from the 1930s through the 1950s. Designed by Hart Wood - one of the founders of Hawaii's regionalist design movement – this, and other well-conceived booster station/reservoir facilities from this era, were part of the (then) newly established Board of Water Supply's efforts to provide attractive facilities to the public, under its first manager and Chief Engineer, Frederick Ohrt. This and several other booster stations found throughout Honolulu warrant further investigation as a thematic, multiple property nomination.

The booster pumping station is individually eligible. If it were demolished, the associated reservoir structure would no longer be eligible, since its significance is closely tied to the original booster pumping station building, and Hart Wood's design for the complex.

Historic Context:

Hart Wood (1880 – 1957) moved to Hawaii after practicing architecture in Denver and California for over twenty years. He formed a brief partnership with C. W. Dickey in 1919, before starting his own firm. Together, Hart Wood and C.W. Dickey conceived many successful buildings in Honolulu, including the

Alexander & Baldwin and Castle & Cooke buildings, among others. On his own and with Dickey, Wood's design aesthetic blended Asian and Western forms, and helped establish Hawaii's Regionalist design movement. Following his work with Dickey, his solo practice included contracts for private residences, churches, commercial structures, and public buildings, including many for the Board of Water Supply.

Hart Wood received several commissions from the Board of Water Supply as early as the 1930s, including the Pacific Heights Reservoir, the Makiki-Manoa Pumping Station, the Kalihi Uka Pumping Station, and the Nuuanu Aerator. The Board of Water Supply had been established in 1930, to replace the highly political City Waterworks Department, which was fraught with corruption. The first manager and Chief Engineer of the Board of Water Supply was Frederick Ohrt, who successfully ran the Board until 1952. "Ohrt established the principle that the construction necessary to support a utility need not spoil the landscape" (Engineers and Architects of Hawaii, 2015).

Beginning in as early as 1940, architect Hart Wood argued for the privatization of public design work, as an advocate of good design for public projects. Following World War II, the Territory of Hawaii became one of his biggest clients. He received contracts for public schools and hospitals, as well as many more Board of Water Supply buildings in the late 1940s and early 1950s. This included pumping stations such as the Wyllie Street Pumping Station (ca. 1946), Wailupe Pumping Station (ca. 1946), St. Louis Heights Pumping Station (ca. 1949), and Palolo Valley Pumping Station (1950). Wood also designed the lauded Board of Water Supply Administration Building (1957) on Beretania Street, and an addition to the adjacent Board of Water Supply Engineering Building (ca. 1950). By 1950, when the Reservoir and Booster Pumping Station complex designs began, in terms of volume of work, Hart Wood had reached the pinnacle of his career.

The full drawing set for the complex is titled, "Job 81W – Part II Board of Water Supply City and County of Honolulu, Construction – Aina O Haina Booster Pumping Station Including Two Circular Concrete Reservoirs and Appurtenances," and is dated May 14, 1951. (The other reservoir is not on this site – it is located several blocks away.) Designs for the complex began the year previous; elevations and a section are dated as early as September 1950. Revisions and corrections on the drawings are dated 1952-1957.

Most drawings in the set, particularly those for the booster pumping station, are captioned with "Hart Wood – Consulting Architect." The title block on the drawings for the reservoir structure does not have Hart Wood's name or initials, indicating it was designed by Board Of Water Supply engineers. The drawings by Hart Wood's firm are signed with the following initials: drawn by "H.W." (Hart Wood), traced by "H.W." (Hart Wood), and checked by "K.W." and "S.K." (names not known). The drawings were approved by Frederick Ohrt, Manager & Chief Engineer.

The many successful Board of Water Supply buildings and complexes designed by Wood were a testament to his and Frederick Ohrt's longlasting and productive partnership. On the Board of Water Supply Administration building, the authors of "Hart Wood, Architectural Regionalism in Hawaii" commented, "Wood's involvement with the Board of Water Supply and the patron-like manner with which he was treated by Fred Ohrt, longtime head of the Board of Water Supply, would have assured that this important building had Wood's fullest attention. It is symbolic of their dedication to each that Ohrt retired the same year that Wood stopped practicing architecture" (Don Hibbard, Glenn Mason, and Karen Weitze. 2010).

FOR SHPD USE ONLY:	Site #	TMK #

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Mason Architects, Inc. Kalihi Pumping Station – Historic Documentation & Compliance Considerations, prepared for Honolulu Board of Water Supply, under Ronald N.S. Ho & Associates, Inc. March 2014.

HAWAII STATE HISTORIC PRESERVATION DIVISION
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

FOR SHPD USE ONLY: **Site #** Click here to enter text. **TMK #** Click here to enter text.

GENERAL INFORMATION

Common / Present Name: Aina Haina 170' Potable Reservoir No. 1

Historic Name: Aina O Haina 500,000 ga Reservoir

Address: 855 Alamuku Street

City/ Town/ Location: Honolulu

County: Honolulu

TMK [(X)-X-X-XXX:XXX)]: (1) 3-6-016:040

Subdivision/Neighborhood: Aina Haina

Latitude: 21.290919°

Longitude: -157.753716°

Original Use: Reservoir

Current Use: Reservoir

Architect/ Builder (if known): Board of Water Supply

Date of Construction (if known): 1951

LOCATION MAP

Prepared By: Polly Tice
Consulting Firm: Mason Architects
Address: 119 Merchant Street Suite 501

1-4

HAWAII STATE HISTORIC PRESERVATION DIVISION
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

FOR SHPD USE ONLY:	Site # Click here to enter text.	TMK # Click here to enter text.

Telephone Number: 808-536-0556 Email:pt@masonarch.com	Date: April 8, 2015

CONDITION ASSESSMENT

Category (select all that apply):
☐ Building(s)
  ☐ Residential
  ☐ Commercial
  ☐ Educational
  ☐ Public/Civic
  ☐ Religious
☒ Structure(s)
☐ Object(s)
☐ Site(s)/Landscape(s)
☐ Archaeology or potential for archaeology
  Describe: ____

Alterations (additions, etc.) if known: ____

Original Location, if moved: ____
Reason for move (if known): ____

Condition:
☐ Excellent
☒ Good
☐ Fair
☐ Deteriorated
Condition Explanation: ____

Eligibility (select all that apply):
☒ National Register of Historic Places
☒ State Register of Historic Places
  ☐ Not Eligible
  ☒ Eligible
  ☐ Listed
  ☐ Contributing to Historic District:

2-4

HAWAII STATE HISTORIC PRESERVATION DIVISION
HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

FOR SHPD USE ONLY: **Site #** **TMK #**

Name of District:
☐ Unknown

Criteria of Significance (select all that apply)

☐ A: Associated with Events
Event: ____

☐ B: Associated with Significant Person(s)
Person(s): ____

☒ C: Distinctive characteristics of a type, period or method of construction; work of a master; possess high artistic values (Architecture, Engineering, Design)

☐ D: Have yielded or may be likely to yield information important to history or prehistory. Explain: ____

DESCRIPTION

Materials (please check those materials that are visible):

Height
- ☐ Stories: ____
- ☐ Below Ground
- ☐ N/A
- ☒ Other: Approx. 25'

Exterior Walls (siding):
- ☐ Aluminum Siding
- ☐ Asbestos
- ☐ Brick
- ☐ Ceramic
- ☒ Concrete
- ☐ Horizontal Wood Siding
- ☐ Log
- ☐ Metal
- ☐ Shingles-Asphalt
- ☐ Shingles-Wood
- ☐ Stone
- ☐ Stucco
- ☐ Vertical Wood Siding
- ☐ Vinyl Siding
- ☐ Engineered Siding
  - ☐ Plywood
  - ☐ OSB
  - ☐ Fiberboard
  - ☐ Fiber Cement
- ☐ Other: ____

Roof:
- ☐ Asphalt, shingle
- ☐ Asphalt, roll
- ☒ Other: Concrete
- ☐ Metal
- ☐ Slate
- ☐ Built Up
- ☐ Ceramic Tile
- ☐ Wood Shingle
- ☐ None

Foundation:
- ☐ Brick
- ☐ Concrete Block
- ☒ Concrete Slab
- ☐ None – on earth
- ☐ Poured Concrete
- ☐ Raised/Pile
- ☐ Stone
- ☐ Other: ____

Structural Support:
- ☐ Baled Hay
- ☐ Concrete Block
- ☐ Concrete Framed
- ☒ Concrete Poured
- ☐ Frame-wood
- ☐ Frame-metal/steel
- ☐ Brick-load bearing
- ☐ Stone-load bearing
- ☐ Puddled Clay
- ☐ Rammed Earth
- ☐ Sod
- ☐ Other: ____

Windows:

3-4

HAWAII STATE HISTORIC PRESERVATION DIVISION
HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

FOR SHPD USE ONLY:	Site #	TMK #

☐ Double Hung Sash	☐ Replacement	☐ Glass Block
☐ Single Hung Sash	☐ Aluminum	☒ None/Unknown
☐ Casement	☐ Vinyl	☐ Other: _____
☐ Fixed	☐ Jalousie	
☐ Stained Glass	☐ Ribbon	

Lanai(s)

☐ Arcade	☐ Stoop	☒ None
☐ Balcony	☐ Portico	☐ Other: _____
☐ Porte-Cochere	☐ Verandah	
☐ Recessed	☐ Wrap-around	

Chimney

☐ Brick	☐ Stone	☒ None
☐ Concrete	☐ Stove Pipe	☐ Other: _____
☐ Stuccoed Masonry	☐ Siding	

FOR SHPD USE ONLY:	Site #:	TMK #:

Narrative Description

The reservoir structure is constructed of reinforced concrete, with a reinforced concrete cover with a parapet wall. The reservoir is circular in plan; 72' in diameter, and approximately 25' high. At regular intervals are copper roof drains that puncture through the parapet. The reservoir has a continuous concrete curb footing at its base, 2' wide and approximately 4' high. A driveway surrounds the structure. The reservoir is painted green, in keeping with the other facilities in the Board of Water Supply complex.

In front of the reservoir to the southwest and across the narrow driveway, is the booster pumping station (see separate RLS form for information on that building).

Statement of Significance

The Aina Haina 170' Potable Reservoir No. 1 and its associated Booster Pumping Station building, both built in 1951, are evaluated as significant for the NRHP under Criterion C, as one integral property. The complex is eligible for the distinctive modern design of the booster pumping station, and the thoughtful landscaping of the site that successfully assimilates the facilities into the surrounding residential neighborhood. These attributes are testaments to the Board of Water Supply's commitment to good design for public facilities from the 1930s through the 1950s. Designed by Hart Wood - one of the founders of Hawaii's Regionalist design movement – this, and other thoughtfully conceived booster station/reservoir facilities from this era, were part of the (then) newly established Board of Water Supply's efforts to provide attractive facilities to the public, under its first manager and Chief Engineer, Frederick Ohrt. This and several other booster stations found throughout Honolulu warrant further investigation as a thematic, multiple property nomination.

Note: If the booster pumping station were demolished, the reservoir would no longer be significant, since its significance is closely tied to the original booster pumping station building, and Hart Wood's design for the complex.

Historic Context:

Hart Wood (1880 – 1957) moved to Hawaii after practicing architecture in Denver and California for over twenty years. He formed a brief partnership with C. W. Dickey in 1919, before starting his own firm. Together, Hart Wood and C.W. Dickey conceived many successful buildings in Honolulu, including the Alexander & Baldwin and Castle & Cooke buildings, among others. On his own and with Dickey, Wood's design aesthetic blended Asian and Western forms, and helped establish Hawaii's regionalist design movement. Following his work with Dickey, his solo practice included contracts for private residences, churches, commercial structures, and public buildings, including many for the Board of Water Supply.

Hart Wood received several commissions from the Board of Water Supply as early as the 1930s, including the Pacific Heights Reservoir, the Makiki-Manoa Pumping Station, the Kalihi Uka Pumping Station, and the Nuuanu Aerator. The Board of Water Supply had been established in 1930, to replace the highly political City Waterworks Department, which was fraught with corruption. The first manager and Chief Engineer of the Board of Water Supply was Frederick Ohrt, who successfully ran the Board until 1952. "Ohrt established the principle that the construction necessary to support a utility need not spoil the landscape" (Engineers and Architects of Hawaii, 2015).

FOR SHPD USE ONLY:	Site #	TMK #

Beginning in as early as 1940, architect Hart Wood argued for the privatization of public design work, as an advocate of good design for public projects. Following World War II, the Territory of Hawaii became one of his biggest clients. He received contracts for public schools and hospitals, as well as many more Board of Water Supply buildings in the late 1940s and early 1950s. This included pumping stations such as the Wyllie Street Pumping Station (ca. 1946), Wailupe Pumping Station (ca. 1946), St. Louis Heights Pumping Station (ca. 1949), and Palolo Valley Pumping Station (1950). Wood also designed the lauded Board of Water Supply Administration Building (1957) on Beretania Street, and an addition to the adjacent Board of Water Supply Engineering Building (ca. 1950). By 1950, when the Reservoir and Booster Pumping Station complex designs began, in terms of volume of work, Hart Wood had reached the pinnacle of his career.

The full drawing set for the complex is titled, "Job 81W – Part II Board of Water Supply City and County of Honolulu, Construction – Aina O Haina Booster Pumping Station Including Two Circular Concrete Reservoirs and Appurtenances," and is dated May 14, 1951. (The other reservoir is not on this site – it is located several blocks away.) Designs for the complex began the year previous; elevations and a section are dated as early as September 1950. Revisions and corrections on the drawings are dated 1952-1957.

Most drawings in the set, particularly those for the booster pumping station, are captioned with "Hart Wood – Consulting Architect." The title block on the drawings for the reservoir structure does not have Hart Wood's name or initials, indicating it was designed by Board Of Water Supply engineers. The drawings by Hart Wood's firm are signed with the following initials: drawn by "H.W." (Hart Wood), traced by "H.W." (Hart Wood), and checked by "K.W." and "S.K." (names not known). The drawings were approved by Frederick Ohrt, Manager & Chief Engineer.

The many successful Board of Water Supply buildings and complexes designed by Wood were a testament to his and Frederick Ohrt's longlasting and productive partnership. Regarding the Board of Water Supply Administration Building, the authors of "Hart Wood, Architectural Regionalism in Hawaii" commented, "Wood's involvement with the Board of Water Supply and the patron-like manner with which he was treated by Fred Ohrt, longtime head of the Board of Water Supply, would have assured that this important building had Wood's fullest attention. It is symbolic of their dedication to each that Ohrt retired the same year that Wood stopped practicing architecture" (Don Hibbard, Glenn Mason, and Karen Weitze, 2010).

References

Board of Water Supply. Database excerpt dated February 11, 2015.

Board of Water Supply. Oahu's Water History from http://www.bbws.org/cssweb/display.cfm?sid=1106, accessed on February 3, 2015.

Board of Water Supply. The Conservation, Development, and Protection of the Water Resources of the Honolulu Urban Area. Vol. II. Board of Water Supply, City and County of Honolulu. 1948.

Engineers and Architects of Hawaii. EAH History. https://sites.google.com/site/eahawaii2/eahhistory, accessed on February 10, 2015.

Hibbard, Don, Glenn Mason, and Karen Weitze. Hart Wood, Architectural Regionalism in Hawaii. University of Hawaii Press, 2010.

Mason Architects, Inc. Kalihi Pumping Station – Historic Documentation & Compliance Considerations, prepared for Honolulu Board of Water Supply, under Ronald N.S. Ho & Associates, Inc. March 2014.

APPENDIX B: LCA INFORMATION

LCA	Claimant	Island	District	Ahupua‘a	‘Ili	Awarded*
08637	Kaulu: Kauluoa	Oahu	Kona	Wailupe	Kaukauluoa	0
08911	Kaiwikokoole	Oahu	Kona	Wailupe		0
09986	Lono	Oahu?	Kona?	Wailupe?	Kaili	0
01304	Keawekoloua	Oahu	Kona	Wailupe	Pahaiki lalo	1
01305	Kahuaina	Oahu	Kona	Wailupe		1
01307!	Kaewekolona	Oahu	Kona	Wailupe	Pahaiki	x
01835	Kama	Oahu	Kona	Wailupe	Makole, Kahoalii	1
01837	Kealoiki	Oahu	Kona	Wailupe	Kaohia	1
01839	Nanaele/Nauele	Oahu	Kona	Manoa, Wailupe	Kanaloa, Kamuliwai	1
01841	Naehu	Oahu	Kona	Wailupe	Kahiki	1
01846	Pawaa or Nawaa	Oahu	Kona	Wailupe	Waipao, Kaluaoku	1
01847	Malili	Oahu	Kona	Wailupe	Kamuliwai, Pokii	1
01848	Nawai	Oahu	Ewa	Wailupe	Pooku, Mahupuna, Kanuhihalau	1
01849	Keliau	Oahu	Waikiki	Wailupe	Mahana	1
01850	Huli	Oahu	Ewa	Wailupe	Kapakapa, Kaea, Kaiki, Kalokoloa, Kamaikeaho	1
01851	Opunui	Oahu	Kona	Wailupe	Kanalua, Pokii, Kaohia	1
01852	Pauloa	Oahu	Kona	Wailupe	Laulaupoi	1
01981	Haloi	Oahu	Kona	Wailupe	Kamaikeaho, Makole	1

LCA	Claimant	Island	District	Ahupua‘a	‘Ili	Awarded*
02004	Makaina	Oahu	Kona	Wailupe		1
02066	Kalua	Oahu	Kona	Wailupe		1
02067	Kuaiki	Oahu	Kona	Wailupe		0
02263	Pikai	Oahu	Kona	Honolulu, Wailupe		1
02275	Kahinu	Oahu	Kona	Wailupe	Kaohai, Kukala, Punakou, Lalau, Kapuukamanu, Kului. Kanukuwai	0
02275B	Kukaulalii	Oahu	Kona	Wailupe	Kahoalii, Kanakapilau, Kaohia, Puuku, Kahalakane, Kanuhihalau, Kailiia, Papalea	1
02277B	Malo	Oahu	Kona	Wailupe		0
02278	Keala	Oahu	Kona	Wailupe	Pokii	1
02278B	Kalua	Oahu	Kona	Wailupe	Kaiki	0
02280	Kumuhonua	Oahu	Kona	Wailupe	Mahupuna, Papapa	1
02280B	Kalua	Oahu	Kona	Wailupe?		0
02314	Hewahewa	Oahu	Kona	Wailupe	Papalaea, Kekoalii	1
02315	Halekii	Oahu	Kona	Wailupe	Kahoowaha, Halekii	1
02321	Nakaha	Oahu	Kona	Wailupe	Kalokane	1

LCA	Claimant	Island	District	Ahupua‘a	‘Ili	Awarded*
02321B	Kukae	Oahu	Kona	Wailupe	Puokope, Kapuupuu, Kamakela, Waionu, Kaluaa, Kahoalii, Nanai, Nanailuna, Pokii	0
02328	Pololu	Oahu	Kona	Wailupe	Kaohiawaiauau, Mulelehu, Kukuiolono, Kaualua	0
02329	Pueo	Oahu	Kona	Wailupe	Kaualua, Puea, Nawai	0
02329B	Nawai	Oahu	Kona	Wailupe	Kahoalii, Nawai, Kaohai, Meahiwa, Kulaomaliu	1
02330	Pololu	Oahu	Kona	Wailupe		0
02331	Umiumi	Oahu	Kona	Wailupe	Meahiwa, Makole	1
02340	Kumuhonua	Oahu	Kona	Wailupe	Punakou, Kaloili, Kaulaa, Papahoa	1
02347	Kalawaia	Oahu	Kona	Wailupe	Mahuoa, Kalokoloa, Kanalua	1
02701	Wahapoepoe	Oahu	Kona	Wailupe	Kalokolaa	0
02917	Kaalehu	Oahu	Kona	Wailupe	Kailikahi	1
03077	Kahai	Oahu	Kona	Wailupe	Papalea, Kaohia, Kamuliwai, Waoula	1
03093	Kahue	Oahu	Kona	Wailupe	Papalea,	1

LCA	Claimant	Island	District	Ahupua‘a	‘Ili	Awarded*
					Kamakoa, Mooiki	
03322*O	Tute, T.	Oahu	Kona	Honolulu, Manoa, Wailupe	Beretania St., Kahalauluahine, Keahia, Kapuni, Koula	1
03348	Nainea	Oahu	Kona	Wailupe	Kaohia, Punahou	1
03580	Kaai	Oahu	Kona	Wailupe	Kaea, Kamoawa, Kamakoa,	1
03581	Kuewa	Oahu	Kona	Wailupe	Meahiwa, Luanui, Kaluaa	1
03582	Kahue	Oahu	Kona	Wailupe		0
06175	Kamaha	Oahu	Kona	Wailupe		1

Awarded* = 0, 1, x, and blank appear in original documentation without explanation.

APPENDIX F

Pre-Assessment Consultation

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

July 3, 2014

Mr. Loyal Mehrhoff, Field Supervisor
U.S. Department of the Interior
Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, HI 96850

Subject: Pre-Consultation for Environmental Assessment
Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2
Tax Map Key (1) 3-6-016: 040
Honolulu, Oahu, Hawaii

Dear Mr. Mehrhoff,

On behalf of the Honolulu Board of Water Supply (BWS), we wish to inform you that the BWS is proposing to improve its system reliability and redundancy by adding a second 0.5 million gallon reservoir within its existing property at 855 Alamuku Street in Wailupe Valley (see attached location map). The project site is the BWS-owned parcel that abuts single-family residences and Wailupe Community Park (formerly Wailupe Valley Elementary School).

The BWS facility in Wailupe Valley currently houses an existing 0.5 million gallon potable water reservoir (Aina Haina 170' Potable Reservoir No. 1) and pump station building that were constructed in the 1950s. The existing reservoir and pump station are part of the BWS potable water supply and distribution system for the East Honolulu communities of Aina Haina, Niu Valley and Kuliouou.

With the passage of time, water demand in the service area has increased. The BWS has determined that the proposed reservoir is needed to adequately address potable water storage requirements and to improve reliability of the East Honolulu 170' System. The project will increase the total potable water reservoir capacity for the East Honolulu 170' System from 1.5 to 2.0 million gallons. No additional pumping capacity is proposed as part of the project. The new reservoir, which would be known as the Aina Haina 170' Potable Reservoir No. 2, will be designed to have the identical capacity, spillway elevation and dimensions as Aina Haina 170' Potable Reservoir No. 1. The installation of the new reservoir would require new connections to on-site drainage infrastructure. Construction activities would generate short-term effects such as fugitive dust, noise, intermittent traffic, solid waste, and potential disruptions to utility services that would cease upon project completion. Best management practices will be used to mitigate these impacts to the extent practical.

The BWS proposes to install the new reservoir within a flat, vacant area on the western portion of its property. The affected area was previously graded and originally planned for use as a baseyard; however, those plans were abandoned and the previously graded area has remained vacant. A geologic survey of the affected area confirmed shallow cut-and-fill conditions with relatively shallow depths to basalt. It is anticipated that a conventional foundation on the underlying basalt stratum can support the proposed concrete reservoir. There are no indications of settlement or poor soil conditions at the project site.

The proposed project may involve the acquisition of approximately 0.03 acres of unobstructed land from the adjacent Wailupe Community Park site at TMK 3-6-019: 012 in order to comply with the setback requirements specified in the City and County of Honolulu's Land Use Ordinance. The retaining wall and concrete gutter between the two parcels would be realigned accordingly.

We would appreciate any information that you may have on how construction of the additional reservoir at the BWS facility could have possible impacts on important biological, archaeological and historic resources. Additionally, we would appreciate any input and information about potential project impacts on traditional and cultural practices and beliefs of any cultural or ethnic group(s). The name(s) and contact information of knowledgeable individual(s) whom we could contact regarding any such beliefs, practices, or resources that may be affected would be very helpful to us.

An Environmental Assessment (EA) will be prepared for this project pursuant to Chapter 343, Hawaii Revised Statutes. If you wish to provide preliminary input on the project at this time or be a consulted party while the EA is being prepared, please review the enclosed figures and submit your written comments to the address below by Friday, August 8, 2014.

Please send comments to:

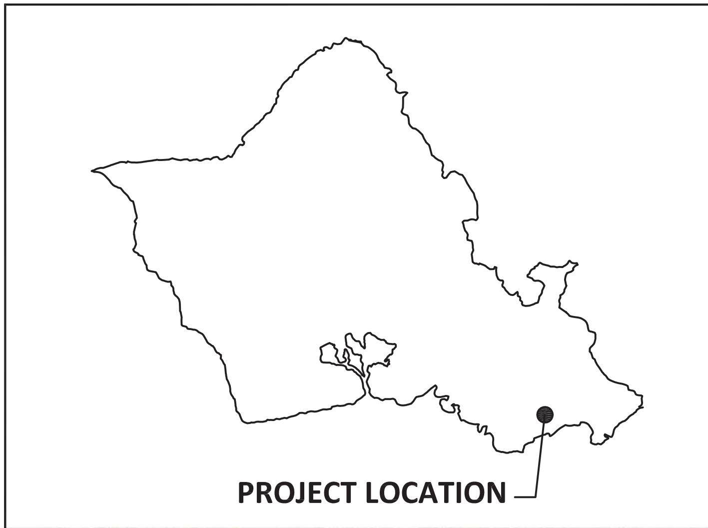
Jason Nakata, Staff Engineer
The Limtiaco Consulting Group
1622 Kanakanui Street
Honolulu, HI 96817

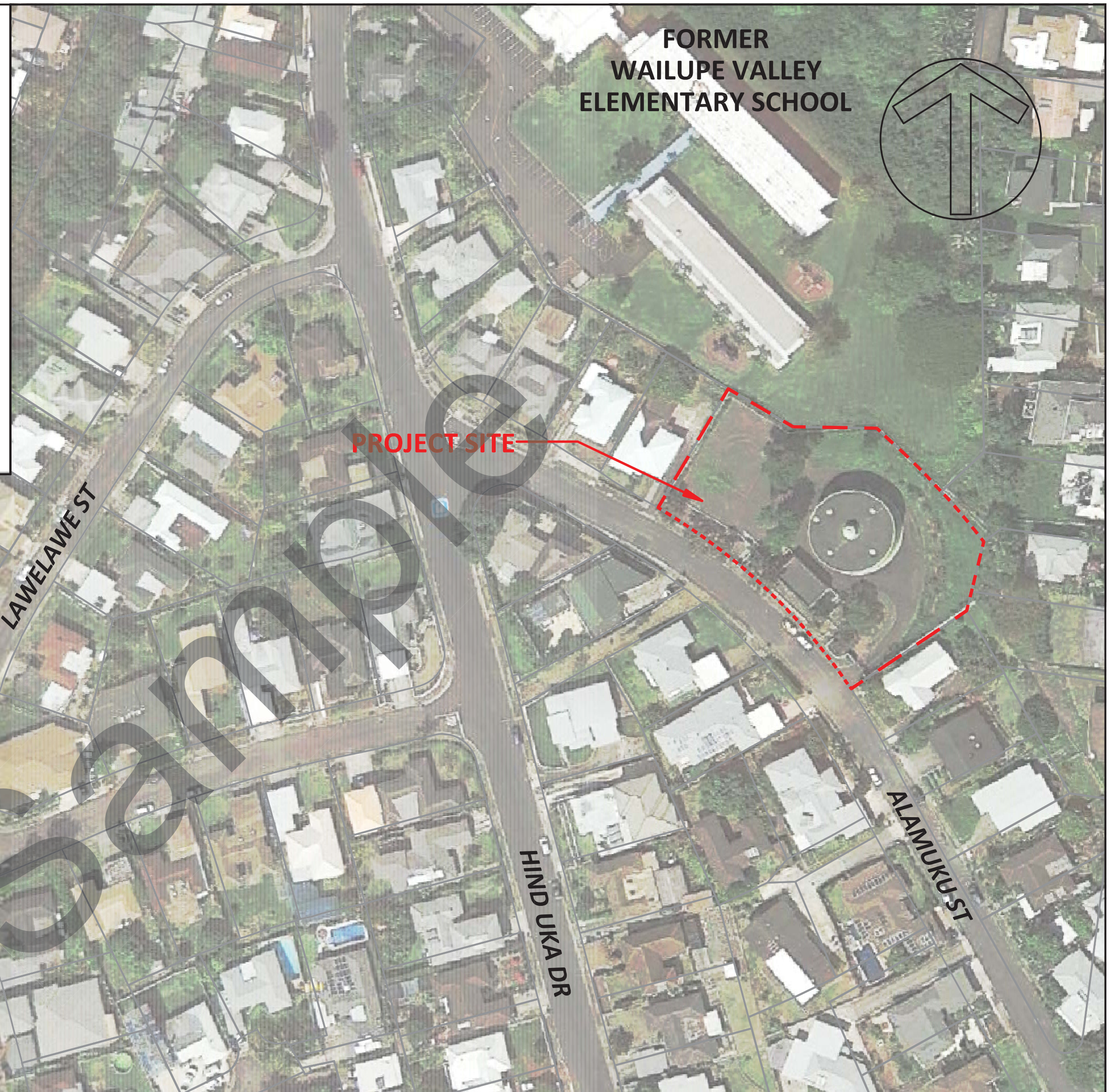
Thank you for your interest and participation in the environmental review process. You will be notified when the Draft EA is completed and available for public review. Should you have any questions, please contact me at (808) 596-7790.

Best regards,
The Limtiaco Consulting Group, Inc.

Jason Nakata
Staff Engineer

Enc
cc: Scot Muraoka, P.E., Honolulu BWS





LEGEND

APPROXIMATE SITE BOUNDARY

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

PROJECT LOCATION

SCALE: NOT TO SCALE | DATE: JUNE 2014

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai`i 96850

07-30-14P03:33 RCVD

In Reply Refer To:
2014-TA-0354

JUL 28 2014

Mr. Jason Nakata
Staff Engineer
The Limitaco Consulting Group
1622 Kanakanui Street
Honolulu, Hawaii 96817

Subject: Technical Assistance for the Board of Water Supply Proposed Construction of Aina Haina Potable Water Reservoir, Wailupe Valley, Oahu

Dear Mr. Nakata:

The U.S. Fish and Wildlife Service (Service) is in receipt of your letter, dated July 7, 2014, in which you requested input on the biological impacts for the proposed construction of an additional Aina Haina 170-foot potable water reservoir at the Board of Water Supply facility in Wailupe Valley, Oahu. The proposed action would install a second 0.5 million-gallon reservoir on the existing property [TMK (1) 3-6-016: 040] to meet the increased potable water demands in the service area. The proposed action would increase the total potable water reservoir capacity for the East Honolulu 170-foot system from 1.5 million gallons to 2.0 million gallons. This response is in accordance with section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 *et seq.*).

We have reviewed the information you provided, and pertinent information in our files. While there are no federally listed species or designated critical habitat in the immediate vicinity, it is likely that the proposed project may inadvertently attractive listed waterbirds to the area, including the endangered Hawaiian stilt (*Himantopus mexicanus knudseni*), Hawaiian coot (*Fulica alai*), Hawaiian moorhen (*Gallinula chloropus sandivicensis*), and Hawaiian duck (*Anas wyvilliana*). In particular, unwanted waterbird attraction could result in failed nesting attempts and adult mortality which creates what is referred to as a "population sink."

To avoid the potential for the site to become an attractive nuisance if it is an open basin, we recommend: (1) no or limited vegetation immediately adjacent to reservoir edges; (2) all standing water be deeper than three feet; and (3) if possible, reservoir edges should have steep sided greater than 45 degree angle to minimize shallow water habitat. Alternately, the use of bird deterrent balls is an acceptable method in creating a more unattractive habitat for waterbirds.

We recommend coordination with our office to develop avoidance and minimization measures for the protection of federally listed species. If, during the construction or operation of this project, it is found that listed Hawaiian waterbird species are being attracted to the site despite avoidance measures, the project manager should contact our office immediately. These measures are unnecessary if this is a closed basin.

If it is determined that the proposed project may affect federally listed species we recommend you contact our office early in the planning process so that we may assist you with the ESA compliance. If the proposed project is funded, authorized, or permitted by a Federal agency, then the Federal agency should consult with us pursuant to section 7(a)(2) of the ESA. If no Federal agency is involved with the proposed project, the applicant should apply for an incidental take permit under section 10(a)(1)(B) of the ESA. A section 10 permit application must include a habitat conservation plan laying out the proposed actions, determine the effects of the action on affected fish and wildlife species and their habitats, and define measures to minimize and mitigate adverse effects.

We hope this information assists you in developing a comprehensive and thorough Environmental Assessment. We appreciate your efforts to conserve listed species. If you have questions about our comments, please contact Michelle Bogardus, Consultation and Habitat Conservation Planning Program (phone: 808-792-9400, fax: 808-792-9581).

Sincerely,

Aaron Nadig
Acting Assistant Field Supervisor
Oahu, Kauai, American Samoa, NWHI

June 1, 2015

Aaron Nadig, Acting Assistant Field Supervisor
U.S. Department of the Interior
Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard
Honolulu, Hawaii 96850

Re: Response to Pre-Assessment Consultation Comments for the Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2
Tax Map Key (1) 3-6-016:040
Honolulu, Oahu, Hawaii

Dear Mr. Nadig,

Thank you for your letter dated July 28, 2014 regarding the pre-assessment consultation for the proposed Honolulu Board of Water Supply (BWS) Aina Haina 170' Potable Reservoir No. 2 project.

We acknowledge that there are no federally listed species or designated critical habitats in the immediate vicinity. With regards to the proposed reservoir possibly attracting listed waterbirds to the area, we would like to clarify that the Aina Haina 170' Reservoir No. 2 will be an enclosed concrete structure; the proposed project will not result in potential nesting sites or habitat for listed waterbirds.

We do not anticipate federal funding for the proposed project, nor any impacts to federally listed species.

Publication of the Draft Environmental Assessment is anticipated for July 2015. We look forward to continued participation of the U.S. Fish and Wildlife Service in the environmental review process. If you have any questions, please contact me at 596-7790.

Best regards,
The Limtiaco Consulting Group, Inc.

Jason S. Nakata
Staff Engineer

cc: Scot Muraoka, Honolulu Board of Water Supply

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

JESSE K. SOUKI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD, STE 555
KAPOLEI, HAWAII 96707

September 8, 2014

Mr. Jason Nakata, Staff Engineer
The Limtiaco Consulting Group
1622 Kanakanui Street
Honolulu, Hawaii 96817

LOG NO: 2014.03211
DOC NO: 1406GC08
Architecture, Archaeology

Dear Sir:

SUBJECT: **Chapter 6E-8 Historic Preservation Review –**
Board of Water Supply – Request for Concurrence of "No Historic Properties Affected"
Installation of new Aina Haina 170' Potable Reservoir No. 2
Waikiki Ahupua'a, Kona District, Island of O'ahu
TMK: (1) 3-6-016:040

Thank you for the opportunity to comment on Limtiaco Consulting Group's request on behalf of the Board of Water Supply (BWS) for concurrence of "no historic properties affected" for the proposed BWS project to install an additional 0.5 million gallon potable water reservoir within their facility at 855 Alamuku Street. We received this submittal on July 11, 2014.

The property is owned by the City and County of Honolulu and consists of 0.93 acres. It includes an existing 0.5 million gallon reservoir and a pump station within a CRM wall and fence enclosure. The proposed project may involve acquiring an additional 0.03 acres of land from the adjacent 6.59-acre City and County of Honolulu Wailupe Community Park (TMK: (1) 3-6-019:012). The scope of work involves the installation of a new 0.5 million gallon potable water reservoir, construction and installation of new drainage infrastructures, trenching for new connections to existing infrastructures and utility lines, realignment of the existing CRM wall and chain link fencing, and possible extension of the existing maintenance road to encompass the new potable reservoir. The anticipated trenching depth is approximately 6 feet. The acquisition of the additional acreage will require grading, cutting and excavation to meet the current grade of the existing reservoir facility.

The submittal indicates that the existing BWS structures began service in 1951, access to the property is restricted to BWS personnel, and that no archaeological historic properties have been previously identified on the facility property. In addition, Limtiaco will notify and consult with surrounding residents and interested groups and organizations about the proposed BWS project and the identification of potential historic properties.

The Aina Haina reservoir pump station is a rectangular concrete structure circa 1950. The front of the structure has ribbon windows, and on the left hand side are open rectangular vents. Just below the flat roof is script reading Board of Water Supply. Based on the information provided, the water pumping station is eligible for the State and National Registers of Historic Places under Criterion C as a contributing element in a Board of Water Supply multi-property nomination. However, the new reservoir will not affect the architectural historic integrity of the station and the existing structures will not be altered.

Our records indicate that no archaeological inventory survey has been conducted, and that no historic properties have been identified within the subject project area. The soils are identified as Lualualei extremely stony clay, 3-6%

slopes. In addition, our geographical information system (GIS) indicates that the property has undergone ground disturbances during the construction of the existing station, CRM walls and irrigation system.

At this time we have insufficient information to concur with Limtiaco's determination of "no historic properties affected." We look forward to finalization of the project area boundaries and acreage and anticipated ground-disturbing activities subject to a decision on possible land acquisition, and to notification of the results of the planned community outreach and consultation concerning potential historic properties within the project area. In addition, SHPD recommends that an **archaeological inventory survey** be conducted of the project area to identify and document any surface and subsurface historic properties that may be present and, if necessary, an appropriate course of mitigation. We also request that a report of the survey findings that meets the standards of Hawaii Administrative Rule §13-276 be submitted to SHPD for review and acceptance prior to initiation of the proposed project.

Please contact Anna Broverman at (808) 692-8023 or at Anna.E.Broverman@hawaii.gov if you have any questions regarding architectural resources. Please contact me at (808) 692-8019 or at Susan.A.Lebo@hawaii.gov if you have any questions or concerns regarding this letter.

Aloha,

Susan A. Lebo

Susan A. Lebo, PhD.
Oahu Lead Archaeologist

cc: Scot Muraoka, P.E., BWS (smuraoka@hbws.org)
Jonathan Suzuki, P.E. BWS (jsuzuki@hbws.org)

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

June 1, 2015

Susan A. Lebo, Ph.D., Oahu Lead Archaeologist
State of Hawaii
Department of Land and Natural Resources
State Historic Preservation Division
601 Kamokila Boulevard, Suite 555
Kapolei, Hawaii 96707
Attn:

Re: **Response to Pre-Assessment Consultation Comments for the Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2 Tax Map Key (1) 3-6-016:040 Honolulu, Oahu, Hawaii**

Dear Ms. Lebo,

Thank you for your letter dated September 8, 2014 regarding the pre-assessment consultation for the proposed Honolulu Board of Water Supply (BWS) Aina Haina 170' Potable Reservoir No. 2 project. Your letter stated that insufficient information was available to concur with a "no historic properties affected" determination and recommended that an archaeological inventory survey be prepared in support of the proposed project.

Based on your recommendation, the *Archaeological Inventory Survey Report for the Proposed Aina Haina 170' Potable Reservoir No. 2 Project in Wailupe Ahupuaa, Kona District, Oahu Island, Hawaii* was prepared in April 2015 and submitted to your office for review. The study included subsurface field investigations at the proposed areas of ground disturbance in the Wailupe Community Park, a reconnaissance of the existing BWS facility, and an architectural analysis of existing structures within the BWS property.

There were no major archaeological finds resulting from the survey, and the report determined that no further archaeological work is required at the project site. The architectural analysis determined that the existing pump station building and reservoir at the project site are eligible for listing in the National Register of Historic Places. However, the report states that the proposed project will not significantly affect these structures since no demolition or alternation of these structures is proposed.

A copy of the draft archaeological inventory survey will be included as part of the Draft Environmental Assessment (EA). A copy of the final archaeological inventory survey will be included with the Final EA.

Publication of the Draft EA is anticipated for July 2015. We look forward to continued participation of the SHPD in the environmental review process. If you have any questions, please contact me at 596-7790.

Best regards,
The Limtiaco Consulting Group, Inc.

Jason S. Nakata
Staff Engineer

cc: Scot Muraoka, Honolulu Board of Water Supply

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

JESSE K. SOUKI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

07-22-14 P02:23 RCVD

July 15, 2014

TO: Jason Nakata, Staff Engineer
The Limtiaco Consulting Group
1622 Kanakanui Street
Honolulu, HI 96817

THROUGH: William J. Aila, Jr.
Chairperson
Department of Land and Natural Resources

FROM: Lisa J. Hadway
Administrator
Division of Forestry and Wildlife

SUBJECT: Pre-Consultation for Environmental Assessment
Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2
Tax Map Key (1) 3-6-016:040
Honolulu, Oahu, Hawaii

We have no objections to the proposed work. In general, we recommend maintenance of a vegetated condition to help to reduce sediment runoff. Diverting water from paved areas to vegetated bio-swales could improve water quality and reduce sediment transport (please do appropriate research to assure that any grass species selected for hydro-seeding are not invasive in nature). Establishment of tree canopy will improve aesthetics and produce shading to help reduce the heat-island effect from urban sites. Use of flat-lens lighting helps to protect the night sky, and minimizes the impacts of facility lighting on wildlife such as seabirds. The Division of Forestry and Wildlife would encourage consideration of all of the above.

The Division of Forestry and Wildlife's Kaulunani Urban and Community Forestry Program is always looking for ways that they can assist with tree establishment and impact mitigation projects in urban areas, if such expertise is of interest to you.

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

June 1, 2015

Lisa Hadway, Administrator
State of Hawaii
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, Hawaii 96813

Re: Response to Pre-Assessment Consultation Comments for the Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2
Tax Map Key (1) 3-6-016:040
Honolulu, Oahu, Hawaii

Dear Ms. Hadway,

Thank you for your letter dated July 15, 2014 regarding the pre-assessment consultation for the proposed Honolulu Board of Water Supply (BWS) Aina Haina 170' Potable Reservoir No. 2 project. We acknowledge that the Division of Forestry and Wildlife (DFW) has no objections to the proposed works.

Your recommendations for implementation of bioswales, tree cover, and flat-lens lighting will be included in the Draft EA, and will be considered further during the project's design phase. Thank you for informing us of the Kaulunani Urban and Community Forestry Program. The Draft EA will include your recommendation to consult with the Kaulunani Urban and Community Forestry Program if tree installation is proposed as part of the project.

Publication of the Draft EA is anticipated for July 2015. We look forward to continued participation of the DFW in the environmental review process. If you have any questions, please contact me at 596-7790.

Best regards,
The Limtiaco Consulting Group, Inc.

Jason S. Nakata
Staff Engineer

cc: Scot Muraoka, Honolulu Board of Water Supply

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 7, 2014

The Limtiaco Consulting Group
Attention: Mr. Jason Nakata
1622 Kanakanui Street
Honolulu, HI 96817

via email: jason.n@tlcghawaii.com

Dear Mr. Nakata,

SUBJECT: Pre-Consultation for Environmental Assessment, Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR) Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comments.

At this time, enclosed are comments from (1) Land Division – Oahu District; and (2) Engineering Division. No other comments were received as of our suspense date. Should you have any questions, please feel free to call Supervising Land Agent Steve Molmen at 587-0439. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

July 9, 2014

MEMORANDUM

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
__Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Consultation for Environmental Assessment, Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2
LOCATION: Tax Map Key (1) 3-6-016: 040; Honolulu, Oahu, Hawaii
APPLICANT: Honolulu Board of Water Supply by its consultant, The Limtiaco Consulting Group

Transmitted for your review and comment on the above-referenced document. We would appreciate your comments on this document.

Please submit any comments by August 6, 2014. If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

( ) We have no objections.
(✓) We have no comments.
( ) Comments are attached.

Signed: TChee
Print Name: Tiny Chee
Date: 7/14/14

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

RECEIVED
'14 JUL 09 ENGINEERING
LAND DIVISION

2014 AUG -5 PM 3:22
DEPT. OF LAND &
NATURAL RESOURCES
STATE OF HAWAII

July 9, 2014

MEMORANDUM

~~TO:~~ From: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
_X_Engineering Division
__Div. of Forestry & Wildlife
__Div. of State Parks
_X_Commission on Water Resource Management
_X_Office of Conservation & Coastal Lands
_X_Land Division – Oahu District
_X_Historic Preservation

~~FROM:~~ TO: Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Consultation for Environmental Assessment, Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2
LOCATION: Tax Map Key (1) 3-6-016: 040; Honolulu, Oahu, Hawaii
APPLICANT: Honolulu Board of Water Supply by its consultant, The Limtiaco Consulting Group

Transmitted for your review and comment on the above-referenced document. We would appreciate your comments on this document.

Please submit any comments by August 6, 2014. If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: [signature]
Print Name: for Carty S. Chang, Chief Engineer
Date: 8/5/14

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/ Russell Y. Tsuji
REF: Pre-Consultation for EA for Proposed BWS Aina Haina 170' Potable Reservoir No. 2
Oahu.040

COMMENTS

( ) We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zone ___.

(X) Please take note that the project site according to the Flood Insurance Rate Map (FIRM), is located in Zone X. The National Flood Insurance Program (NFIP) does not regulate developments within Zone X.

( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ___.

( ) Please note that the project must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken. If there are any questions, please contact the State NFIP Coordinator, Ms. Carol Tyau-Beam, of the Department of Land and Natural Resources, Engineering Division at (808) 587-0267.

Please be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

( ) Mr. Mario Siu Li at (808) 768-8098 of the City and County of Honolulu, Department of Planning and Permitting.

( ) Mr. Frank DeMarco at (808) 961-8042 of the County of Hawaii, Department of Public Works.

( ) Mr. Carolyn Cortez at (808) 270-7253 of the County of Maui, Department of Planning.

( ) Mr. Stanford Iwamoto at (808) 241-4896 of the County of Kauai, Department of Public Works.

( ) The applicant should include project water demands and infrastructure required to meet water demands. Please note that the implementation of any State-sponsored projects requiring water service from the Honolulu Board of Water Supply system must first obtain water allocation credits from the Engineering Division before it can receive a building permit and/or water meter.

( ) The applicant should provide the water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update.

( ) Additional Comments: ______________________________

( ) Other: ______________________________

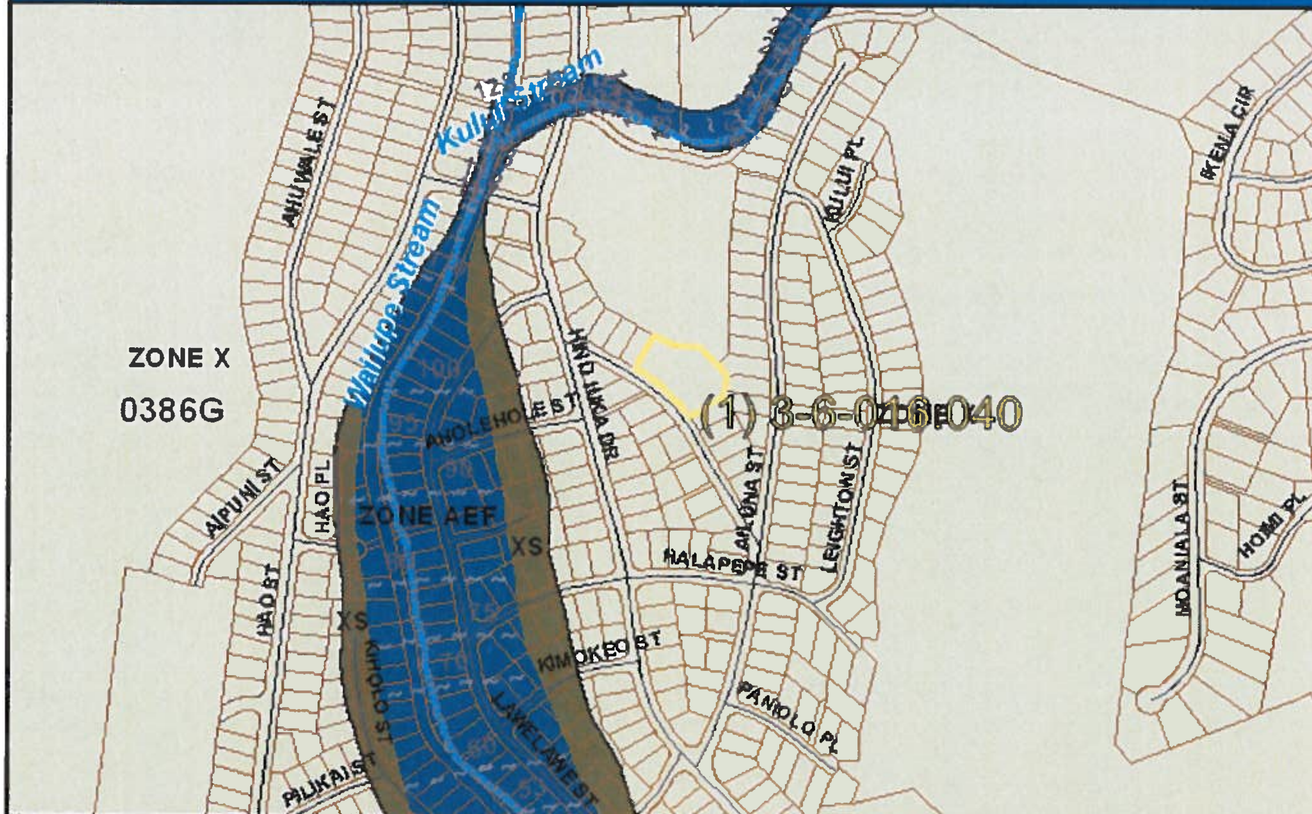
Should you have any questions, please call Mr. Dennis Imada of the Planning Branch at 587-0257.

Signed: Chris Takashige
for CARTY S. CHANG, CHIEF ENGINEER

Date: 8/5/14

State of Hawaii

FLOOD HAZARD ASSESSMENT REPORT



NATIONAL FLOOD INSURANCE PROGRAM

FLOOD ZONE DEFINITIONS

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD – The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zone A, AE, AH, AO, V, and VE. The Base Flood Elevation (BFE) is the water-surface elevation of the 1% annual chance flood. Mandatory flood insurance purchase applies in these zones:

- **Zone A:** No BFE determined.
- **Zone AE:** BFE determined.
- **Zone AH:** Flood depths of 1 to 3 feet (usually areas of ponding); BFE determined.
- **Zone AO:** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined.
- **Zone V:** Coastal flood zone with velocity hazard (wave action); no BFE determined.
- **Zone VE:** Coastal flood zone with velocity hazard (wave action); BFE determined.
- **Zone AEF:** Floodway areas in Zone AE. The floodway is the channel of stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without increasing the BFE.

NON-SPECIAL FLOOD HAZARD AREA – An area in a low-to-moderate risk flood zone. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

- **Zone XS (X shaded):** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- **Zone X:** Areas determined to be outside the 0.2% annual chance floodplain.

OTHER FLOOD AREAS

- **Zone D:** Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

PROPERTY INFORMATION

COUNTY:	HONOLULU
TMK NO:	(1) 3-6-016-040
PARCEL ADDRESS:	855 ALAMUKU ST HONOLULU, HI 96821
FIRM INDEX DATE:	JANUARY 19, 2011
LETTER OF MAP CHANGE(S):	NONE
FEMA FIRM PANEL(S):	15003C0386G
PANEL EFFECTIVE DATE:	JANUARY 19, 2011

PARCEL DATA FROM:	APRIL 2014
IMAGERY DATA FROM:	MAY 2006

IMPORTANT PHONE NUMBERS

County NFIP Coordinator
City and County of Honolulu
Mario Siu-Li, CFM (808) 768-8098
State NFIP Coordinator
Carol Tyau-Beam, P.E., CFM (808) 587-0267

Disclaimer: The Department of Land and Natural Resources (DLNR) assumes no responsibility arising from the use of the information contained in this report. Viewers/Users are responsible for verifying the accuracy of the information and agree to indemnify the DLNR from any liability, which may arise from its use.

If this map has been identified as 'PRELIMINARY' or 'UNOFFICIAL', please note that it is being provided for informational purposes and is not to be used for official/legal decisions, regulatory compliance, or flood insurance rating. Contact your county NFIP coordinator for flood zone determinations to be used for compliance with local floodplain management regulations.

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

June 1, 2015

Russell Y. Tsuji, Land Administrator
State of Hawaii
Department of Land and Natural Resources
Land Division
1151 Punchbowl Street, Room 220
Honolulu, Hawaii 96813

Re: **Response to Pre-Assessment Consultation Comments for the Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2**
Tax Map Key (1) 3-6-016:040
Honolulu, Oahu, Hawaii

Dear Mr. Tsuji,

Thank you for your letter dated August 7, 2014 regarding the pre-assessment consultation for the proposed Honolulu Board of Water Supply (BWS) Aina Haina 170' Potable Reservoir No. 2 project. We have the following responses to your comments:

We acknowledge that the Land Division does not have any comments on the subject project at this time.

We acknowledge the Engineering Division comment that the project site is located within Flood Zone X, and that the National Flood Insurance Program does not regulate development within Zone X.

Publication of the Draft Environmental Assessment is anticipated for July 2015. We look forward to continued participation of the DLNR in the environmental review process. If you have any questions, please contact me at 596-7790.

Best regards,
The Limtiaco Consulting Group, Inc.

Jason S. Nakata
Staff Engineer

cc: Scot Muraoka, Honolulu Board of Water Supply

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LINDA ROSEN, M.D., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
EMD/CWB

07023PCTM.14

July 14, 2014

Mr. Jason Nakata
Staff Engineer
The Limtiaco Consulting Group
1622 Kanakanui Street
Honolulu, Hawaii 96817

Dear Mr. Nakata:

**SUBJECT: Comments on the Pre-Consultation for Environmental Assessment for the Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2 Project
Honolulu, Island of Oahu, Hawaii**

The Department of Health (DOH), Clean Water Branch (CWB), acknowledges receipt of your letter, dated July 3, 2014, requesting comments on your project. The DOH-CWB has reviewed the subject document and offers these comments. Please note that our review is based solely on the information provided in the subject document and its compliance with the Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. You may be responsible for fulfilling additional requirements related to our program. We recommend that you also read our standard comments on our website at: http://health.hawaii.gov/epo/files/2013/10/CWB_Oct22.pdf

1. Any project and its potential impacts to State waters must meet the following criteria:

   a. Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.

   b. Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.

   c. Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).

2. National Pollutant Discharge Elimination System (NPDES) permit coverage is required for pollutant discharges into State surface waters and for certain situations involving storm water (HAR, Chapter 11-55).

a. Discharges into Class 2 or Class A State waters can be covered under an NPDES general permit only if all of the NPDES general permit requirements are met. Please see the DOH-CWB website (http://health.hawaii.gov/cwb/) for the NPDES general permits and instructions to request coverage.

b. All other discharges into State surface waters and discharges into Class 1 or Class AA State waters require an NPDES individual permit. To request NPDES individual permit coverage, please see the DOH-CWB forms website located at: http://health.hawaii.gov/cwb/site-map/clean-water-branch-home-page/forms/

c. NPDES permit coverage for storm water associated with construction activities is required if your project will result in the disturbance of one (1) acre or more of total land area. The total land area includes a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale. NPDES permit coverage is required before the start of the construction activities.

   Land disturbance includes, but is not limited to clearing, grading, grubbing, uprooting of vegetation, demolition (even if leaving foundation slab), staging, stockpiling, excavation into pavement areas which go down to the base course, and storage areas (including areas on the roadway to park equipment if these areas are blocked off from public usage, grassed areas, or bare ground).

3. If your project involves work in, over, or under waters of the United States, it is highly recommend that you contact the Army Corp of Engineers, Regulatory Branch (Tel: 438-9258) regarding their permitting requirements.

   Pursuant to Federal Water Pollution Control Act [commonly known as the "Clean Water Act" (CWA)], Paragraph 401(a)(1), a Section 401 Water Quality Certification (WQC) is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may **result** in any discharge into the navigable waters..." (emphasis added). The term "discharge" is defined in CWA, Subsections 502(16), 502(12), and 502(6); Title 40 of the Code of Federal Regulations, Section 122.2; and Hawaii Administrative Rules (HAR), Chapter 11-54.

4. Please note that all discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 WQC are required, must comply with the State's Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of $25,000 per day per violation.

5. For information regarding potential impacts on traditional and cultural practices and beliefs of any cultural or ethnic groups, it is recommended that you contact the Office of Hawaiian Affairs or the Department of Land and Natural Resources, State Historic Preservation Division for comments on the proposed project.

If you have any questions, please visit our website at: http://health.hawaii.gov/cwb, or contact the Engineering Section, CWB, at (808) 586-4309.

Sincerely,

Alec Wong

ALEC WONG, P.E., CHIEF
Clean Water Branch

CTM:tg

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

June 1, 2015

Alec Wong, P.E., Chief
State of Hawaii
Department of Health
Clean Water Branch
919 Ala Moana Boulevard, Room 301
Honolulu, Hawaii 96814

Re: Response to Pre-Assessment Consultation Comments for the Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2 Tax Map Key (1) 3-6-016:040 Honolulu, Oahu, Hawaii

Dear Mr. Wong,

Thank you for your letter dated July 14, 2014 regarding the pre-assessment consultation for the proposed Honolulu Board of Water Supply (BWS) Aina Haina 170' Potable Reservoir No. 2 project. We have the following responses to the Clean Water Branch's (CWB) comments:

1. We acknowledge that any project and its potential impacts must meet the anti-degradation policy, designated uses, and water quality criteria outlined in the State of Hawaii (State) Water Quality Standards (Chapter 11-54, Hawaii Administrative Rules). The nearest water body – Wailupe Stream – is a "class 2" inland water body.

   The proposed project will conform with the general policy of water quality anti-degradation (§11-54-1.1, Hawaii Administrative Rules) and will not endanger the designated uses of nearby water bodies (§11-54-3, Hawaii Administrative Rules). Implementation of BMPs during construction will mitigate possible impacts to the water quality criteria (§11-54-4, Hawaii Administrative Rules).

2. We acknowledge that a National Pollutant Discharge Elimination System (NPDES) permit must be obtained for discharges of wastewater, including storm water runoff, into State surface waters. Possible NPDES triggers for the proposed project include a disturbed area greater than 1-acre (for stormwater runoff related to construction activities) and discharges associated with hydrotesting; however, exact NPDES permit requirements will be determined during the design and construction phases of the proposed project. The BWS will obtain required NPDES permits prior to any regulated discharge.

3. The proposed project does not involve work in, over, or under waters of the United States or Navigable Waters of the United States. If it is later found that such work is required, we understand that additional permit requirements may be triggered pursuant to Section 401 & 404, Clean Water Act and Section 10, Rivers and Harbors Act. If such work is required, the United States Army Corps of Engineers will first be consulted.

4. We acknowledge that all discharges related to the project must comply with the State water quality standards, regardless of whether or not a CWB permit is required. We understand that noncompliance may be subject to penalties of $25,000 per day per violation.

5. Thank you for your input regarding groups or individuals knowledgeable of potential impacts to traditional and cultural practices and beliefs of any cultural or ethnic groups. We have contacted the Office of Hawaiian Affairs and the State Historic Preservation Division as a part of this pre-assessment consultation and will continue to consult with them through the EA process.

Publication of the Draft EA is anticipated for July 2015. We look forward to continued participation of the CWB in the environmental review process. If you have any questions, please contact me at 596-7790.

Best regards,
The Limtiaco Consulting Group, Inc.

Jason S. Nakata
Staff Engineer

cc: Scot Muraoka, Honolulu Board of Water Supply

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LINDA ROSEN, M.D., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:

EPO 14-141

July 11, 2014

Jason Nakata, Staff Engineer
The Limtiaco Consulting Group
1622 Kanakanui Street
Honolulu, Hawaii 96817

Dear Mr. Nakata:

SUBJECT: Pre-Consultation for Environmental Assessment for the Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2 Tax Map Key (1) 3-6-016: 040, Honolulu, Oahu, Hawaii

On behalf of the Department of Health (DOH), the Environmental Planning Office (EPO) acknowledges receipt of your letters dated July 3, 2014 to Deputy Director Keith Y. Yamamoto, Environmental Management Division Chief Stuart Yamada, and myself. Thank you for allowing us to review and comment on the subject document. The document was routed to the Safe Drinking Water Branch. They will provide specific comments to you if necessary. EPO recommends that you review the standard comments at: http://health.hawaii.gov/epo/home/landuse-planning-review-program/. You are required to adhere to all applicable standard comments.

You may also wish to review the recently revised Water Quality Standards Maps that have been updated for all islands. The new Water Quality Standards Maps can be found at: http://health.hawaii.gov/cwb/site-map/clean-water-branch-home-page/water-quality-standards/.

The EPO suggests that you examine the many sources available on sustainability, including the following:
2014 National Climate Change Report – Highlights for Hawaii:
http://ipcc-wg2.gov/AR5/images/uploads/WGIIAR5-Chap29_FGDall.pdf; and
Intergovernmental Panel on Climate Change (IPCC):
http://ipcc-wg2.gov/AR5/images/uploads/WGIIAR5-Chap29_FGDall.pdf

The DOH encourages everyone to apply these sustainability strategies and principles early in the planning and review of projects.

Mahalo,

Laura Leialoha Phillips McIntyre, AICP
Program Manager, Environmental Planning Office

c. Joanna Seto, Safe Drinking Water Branch

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

June 1, 2015

Laura Leialoha Phillips McIntyre, AICP, Program Manager
State of Hawaii
Department of Health
Environmental Planning Office
P.O. Box 3378
Honolulu, Hawaii 96801

Re: Response to Pre-Assessment Consultation Comments for the Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2 Tax Map Key (1) 3-6-016:040 Honolulu, Oahu, Hawaii

Dear Ms. McIntyre,

Thank you for your letter dated July 11, 2014 regarding the pre-assessment consultation for the proposed Honolulu Board of Water Supply (BWS) Aina Haina 170' Potable Reservoir No. 2 project.

We will review the standard comments of the Clean Air Branch, Clean Water Branch, Hazard Evaluation and Emergency Response Office, Noise Radiation and Indoor Air Quality Branch, Safe Drinking Water Branch, Solid Hazardous Waste Branch and Wastewater Branch. All applicable comments will be addressed in the Draft Environmental Assessment (EA).

Thank you for providing information regarding the new Water Quality Standard Maps and reference material regarding sustainability. They will be considered, and any applicable material will be referenced in the Draft EA.

Publication of the Draft EA is anticipated for July 2015. We look forward to continued participation of the Environmental Planning Office in the environmental review process. If you have any questions, please contact me at 596-7790.

Best regards,
The Limtiaco Consulting Group, Inc.

Jason S. Nakata
Staff Engineer

cc: Scot Muraoka, Honolulu Board of Water Supply

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8480 • Fax: (808) 768-4567
Web site: www.honolulu.gov

KIRK CALDWELL
MAYOR

MARK YONAMINE, P.E.
ACTING DIRECTOR

GERALD HAMADA, P.E.
ACTING DEPUTY DIRECTOR

C5-07-14P02:14 RCVD

August 6, 2014

The Limtiaco Consulting Group
1622 Kanakanui Street
Honolulu, Hawaii 96817

Attn: Jason Nakata

Dear Mr. Nakata:

Subject: <u>Pre-Consultation for Environmental Assessment</u>
<u>Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2</u>
<u>Tax Map Key (1) 3-6-016: 040</u>
<u>Honolulu, Oahu, Hawaii</u>

Thank you for the opportunity to review and comment. The Department of Design and Construction (DDC) has the following comment to offer on the subject project:

The package does not contain sufficient detail (e.g., site topographic survey or schematic design drawings) to allow DDC to assess the impact on the existing park.

Should there be any questions, please contact Clifford Lau, Chief, Facilities Division at 768-8483.

Sincerely,

M. Yonamine

Mark Yonamine, P.E.
Acting Director

MY: cf (570115)

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

June 1, 2015

Robert J. Kroning, P.E., Director
City and County of Honolulu
Department of Design and Construction
650 South King Street, 11th Floor
Honolulu, Hawaii 96813

Re: **Response to Pre-Assessment Consultation Comments for the Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2**
Tax Map Key (1) 3-6-016:040
Honolulu, Oahu, Hawaii

Dear Mr. Kroning,

Thank you for your letter dated August 6, 2014 regarding the pre-assessment consultation for the proposed Honolulu Board of Water Supply (BWS) Aina Haina 170' Potable Reservoir No. 2 project.

Because the Environmental Assessment (EA) occurs during the planning stage of the proposed project, we currently do not have topographic data or schematic design drawings for your review. A topographic survey and design drawings will be prepared during design, which will occur after the EA process is completed. Prior to construction, the BWS will obtain a building permit from the City and County of Honolulu (City), at which time the topographic information and design drawings will be available for review by the City.

Publication of the Draft EA is anticipated for July 2015. We look forward to continued participation of the Department of Design and Construction in the environmental review process. If you have any questions, please contact me at 596-7790.

Best regards,
The Limtiaco Consulting Group, Inc.

Jason S. Nakata
Staff Engineer

cc: Scot Muraoka, Honolulu Board of Water Supply

1622 KANAKANUI STREET HONOLULU, HAWAII 96817
(808) 596-7790 tlcghawaii.com

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 768-8000 • FAX: (808) 768-6041
DEPT. WEB SITE: www.honoluludpp.org • CITY WEB SITE: www.honolulu.gov

KIRK CALDWELL
MAYOR

GEORGE I. ATTA, FAICP
DIRECTOR

ARTHUR D. CHALLACOMBE
DEPUTY DIRECTOR

2014/ELOG-1248

August 4, 2014

08-05-14P03:12 RCVD

Mr. Jason Nakata
Staff Engineer
The Limtiaco Consulting Group
1622 Kanakanui Street
Honolulu, Hawaii 96817

Dear Mr. Nakata:

In response to your pre-consultation notice dated July 3, 2014 for the Board of Water Supply's proposed Aina Haina 170' Potable Reservoir No. 2 (Tax Map Key 3-6-16: 40), we have the following comments:

1. Your review should address the project's conformance with the following City policies and regulations: the General Plan, the East Honolulu Sustainable Communities Plan, the Land Use Ordinance (LUO), and the Public Infrastructure Map (PIM). You should note that a PIM revision will be required for the proposed new reservoir, and that the LUO classifies the use as "Public Uses and Structures," which are allowed in all zoning districts.

2. In addition to the drainage impacts and Wailupe Community Park impacts that your letter already mentions, you should also address impacts on the surrounding area, including visual impacts. We recommend that illustrations be provided showing how the new reservoir will look at ground level from the nearby street, from the adjacent park, and so forth.

3. Please identify the following: The extent of the service area, the sources of growing demand in the service area, and the locations and storage capacities of the other reservoirs in the East Honolulu 170' system.

Should you have any questions, please contact Mike Watkins of our staff at 768-8044.

Very truly yours,

fr George I. Atta, FAICP
Director

GIA:js

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

June 1, 2015

George I. Atta, FAICP, LEED AP, CEI, Director
City and County of Honolulu
Department of Planning and Permitting
650 South King Street, 7th Floor
Honolulu, Hawaii 96813

Re: **Response to Pre-Assessment Consultation Comments for the Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2 Tax Map Key (1) 3-6-016:040, Honolulu, Oahu, Hawaii**

Dear Mr. Atta,

Thank you for your letter dated August 4, 2014 regarding the pre-assessment consultation for the proposed Honolulu Board of Water Supply (BWS) Aina Haina 170' Potable Reservoir No. 2 project. We have the following responses to your comments:

1. The Draft Environmental Assessment (EA) will address the project's conformance with the General Plan, East Honolulu Sustainable Communities Plan, and Land Use Ordinance. We acknowledge that a Public Infrastructure Map revision will be required for the proposed new reservoir. We also acknowledge that the Department of Planning and Permitting (DPP) considers the proposed new reservoir to fall under the category of "Public Uses and Structures", which is allowed in all zoning districts.

2. The Draft EA will address the project's potential impacts on the surrounding community, including visual impacts. Digital renderings of the proposed reservoir from various vantage points will be included in the Draft EA.

3. The extent of the service area, sources of growing demand in the service area, and locations and storage capacities of other reservoirs in the Aina Haina to Kuliouou 170' system will be included in the Draft EA.

Publication of the Draft EA is anticipated for July 2015. We look forward to continued participation of the DPP in the environmental review process. If you have any questions, please contact me at 596-7790.

Best regards,
The Limtiaco Consulting Group, Inc.

Jason S. Nakata
Staff Engineer

cc: Scot Muraoka, Honolulu Board of Water Supply

1622 KANAKANUI STREET • HONOLULU, HAWAII 96817
(808) 596-7790 • tlcghawaii.com

DEPARTMENT OF PARKS & RECREATION

CITY AND COUNTY OF HONOLULU

1000 Uluohia Street, Suite 309, Kapolei, Hawaii 96707
Phone: (808) 768-3003 • Fax: (808) 768-3053
Website: www.honolulu.gov

KIRK CALDWELL
MAYOR

MICHELE K. NEKOTA
DIRECTOR

JEANNE C. ISHIKAWA
DEPUTY DIRECTOR

July 17, 2014

07-13-14P02:44 RCVD

Mr. Jason Nakata, Staff Engineer
The Limtiaco Consulting Group
1622 Kanakanui Street
Honolulu, Hawaii 96817

Dear Mr. Nakata:

SUBJECT: Pre-Consultation for an Environmental Assessment
Proposed Board of Water Supply
Aina Haina 170' Potable Reservoir No. 2
Tax Map Key (1) 3-6-016:040

Thank you for the opportunity to review and comment at the pre-consultation stage of the environmental assessment for the subject Board of Water Supply (BWS) Aina Haina 170' Potable Reservoir No. 2.

The Department of Parks and Recreation (DPR) has no comment on the proposed new reservoir however, please note that there are existing park improvements including children's play apparatus that may represent challenges to BWS' contractor being able to utilize park property for vehicles and equipment required to construct the reservoir.

DPR recommends that BWS contact Todd Hiranaga, District I Manager, at 373-8013 to confirm what access to park property will be permitted during construction.

Should you have any questions, please contact Mr. John Reid, Planner at 768-3017.

Sincerely,

Michele K. Nekota
Director

MKN:jr
(570126)

cc: Scott Muraoka, P.E., BWS
Todd Hiranaga, DPR

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

June 1, 2014

Michelle Nekota, Director
City and County of Honolulu
Department of Parks and Recreation
1000 Uluohia Street, Suite 309
Honolulu, Hawaii 96707

Re: **Response to Pre-Assessment Consultation Comments for the Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2**
Tax Map Key (1) 3-6-016:040
Honolulu, Oahu, Hawaii

Dear Ms. Nekota,

Thank you for your letter dated July 17, 2014 regarding the pre-assessment consultation for the proposed Honolulu Board of Water Supply (BWS) Aina Haina 170' Potable Reservoir No. 2 project.

We acknowledge that the existing park improvements, including children's play apparatus, may present access challenges to the BWS contractor during construction of the proposed project. While this project is still in its early planning phases, construction of the proposed reservoir should be able to be performed within BWS property to minimize disturbance to Wailupe Community Park.

The BWS will coordinate with the City and County of Honolulu, Department of Parks and Recreation (DPR) should construction access through the park be required.

Publication of the Draft Environmental Assessment is anticipated for July 2015. We look forward to continued participation of the DPR in the environmental review process. If you have any questions, please contact me at 596-7790.

Best regards,
The Limtiaco Consulting Group, Inc.

Jason S. Nakata
Staff Engineer

cc: Scot Muraoka, Honolulu Board of Water Supply

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 768-4730 • Internet: www.honolulu.gov

KIRK CALDWELL
MAYOR

MICHAEL D. FORMBY
DIRECTOR

MARK N. GARRITY, AICP
DEPUTY DIRECTOR

TP7/14-570251R

August 6, 2014

Mr. Jason Nakata
Staff Engineer
The Limtiaco Consulting Group
1622 Kanakanui Street
Honolulu, Hawaii 96817

Dear Mr. Nakata:

SUBJECT: Pre-Consultation for Draft Environmental Assessment (DEA) Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2; Tax Map Key (TMK) (1) 3-6-016: 040; Honolulu, Oahu, Hawaii

In response to your letter dated July 3, 2014, we have the following comments:

1. The affected Neighborhood Board, as well as the area residents, businesses, etc., should be kept apprised of the project's details and its impacts on the adjoining local street area network particularly during construction.

2. A street usage permit from the City's Department of Transportation Services shall be obtained for any construction-related work that may require the temporary closure of any traffic lane on a City street.

3. Any construction materials and equipment should be transferred to and from the project site during off-peak traffic hours (8:30 a.m. to 3:30 p.m.) to minimize any possible disruption to traffic on the local streets.

We reserve further comment pending submission of the DEA.

Thank you for the opportunity to review this matter. Should you have any further questions, please contact Michael Murphy of my staff at 768-8359.

Very truly yours,

Michael D. Formby
Director

cc: Scot Muraoka, P.E.
Board of Water Supply

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

June 1, 2015

Michael D. Formby, Director
City and County of Honolulu
Department of Transportation Services
650 South King Street, 3rd Floor
Honolulu, Hawaii 96813

Re: **Response to Pre-Assessment Consultation Comments for the Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2 Tax Map Key (1) 3-6-016:040 Honolulu, Oahu, Hawaii**

Dear Mr. Formby,

Thank you for your letter dated August 6, 2014 regarding the pre-assessment consultation for the proposed Honolulu Board of Water Supply (BWS) Aina Haina 170' Potable Reservoir No. 2 project. We have the following responses to your comments:

1. We have sent consultation letters to the Kuliouou-Kalani Iki Neighborhood Board, Aina Haina Community Association, and property owners adjacent to the project site. The BWS will continue to consult with these parties throughout the Environmental Assessment (EA) process. The EA will acknowledge that the affected residents, businesses, and community organizations should be kept apprised of the project's details and impacts during construction.

2. The need for a street usage permit will not be determined until construction; however, the EA will acknowledge that a street usage permit will be required for any construction-related work that may require the temporary closure of any traffic lane on a City street.

3. The EA will acknowledge that materials and equipment should be transferred to and from the project site during off-peak traffic hours when feasible.

Publication of the Draft EA is anticipated for July 2015. We look forward to continued participation of the DTS in the environmental review process. If you have any questions, please contact me at 596-7790.

Best regards,
The Limtiaco Consulting Group, Inc.

Jason S. Nakata
Staff Engineer

cc: Scot Muraoka, Honolulu Board of Water Supply

HONOLULU FIRE DEPARTMENT
CITY AND COUNTY OF HONOLULU
636 South Street
Honolulu, Hawaii 96813-5007
Phone: 808-723-7139 Fax: 808-723-7111 Internet: www.honolulu.gov/hfd

KIRK CALDWELL
MAYOR

MANUEL P. NEVES
FIRE CHIEF

LIONEL CAMARA JR.
DEPUTY FIRE CHIEF

July 22, 2014

07-23-14P01:11 RCVD

Mr. Jason Nakata, Staff Engineer
The Limtiaco Consulting Group
1622 Kanakanui Street
Honolulu, Hawaii 96817

Dear Mr. Nakata:

Subject: Preconsultation for Environmental Assessment
Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2
Tax Map Key: 1-3-6-016: 040

In response to your letter of July 3, 2014, regarding the above-mentioned subject, the Honolulu Fire Department determined that there will be no significant impact to fire department services.

Should you have questions, please contact Battalion Chief Terry Seelig of our Fire Prevention Bureau at 723-7151 or tseelig@honolulu.gov.

Sincerely,

Keith Yasui

KEITH YASUI
Acting Assistant Chief

KY/SY:bh

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

June 1, 2015

Manuel P. Neves, Fire Chief
City and County of Honolulu
Honolulu Fire Department
636 South Street
Honolulu, Hawaii 96813-5007

Re: **Response to Pre-Assessment Consultation Comments for the Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2 Tax Map Key (1) 3-6-016:040 Honolulu, Oahu, Hawaii**

Dear Mr. Neves,

Thank you for your letter dated July 22, 2014 regarding the pre-assessment consultation for the proposed Honolulu Board of Water Supply (BWS) Aina Haina 170' Potable Reservoir No. 2 project.

We acknowledge that the proposed project will not result in significant impact to fire department services.

Publication of the Draft EA is anticipated for July 2015. We look forward to continued participation of the Honolulu Fire Department in the environmental review process. If you have any questions, please contact me at 596-7790.

Best regards,
The Limtiaco Consulting Group, Inc.

Jason S. Nakata
Staff Engineer

cc: Scot Muraoka, Honolulu Board of Water Supply

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
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PETER B. CARLISLE
MAYOR

LOUIS M. KEALOHA
CHIEF

DAVE M. KAJIHIRO
MARIE A. McCAULEY
DEPUTY CHIEFS

OUR REFERENCE EO-WS

July 23, 2014

07-24-14P02:09 RCVD

Mr. Jason Nakata, Staff Engineer
The Limtiaco Consulting Group
1622 Kanakanui Street
Honolulu, Hawaii 96817

Dear Mr. Nakata:

This is in response to your letter dated July 3, 2014, requesting comments on the Pre-Consultation, Draft Environmental Assessment, for the proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2 project.

The Honolulu Police Department (HPD) anticipates possible short-term impacts to neighborhood vehicular and pedestrian traffic on the roadway of Alamuku Street.

We recommend that adequate personnel be hired to conduct traffic control. Additionally, we recommend that all necessary signs, lights, barricades, cones, and other safety equipment be installed and maintained by the contactor to facilitate the flow of vehicular and pedestrian traffic during construction. The HPD further recommends notifying the neighborhood board and the affected homeowners of any traffic issues related to local ingress and egress within the area. Lastly, the moving of heavy equipment or construction-related supplies should be conducted during nonpeak hours.

If there are any questions, please contact Major Calvin Tong of District 7 (East Honolulu) at 723-3369 or via e-mail at ctong@honolulu.gov.

Sincerely,

LOUIS M. KEALOHA
Chief of Police

By R K. Macadangdang

RANDAL K. MACADANGDANG
Assistant Chief
Support Services Bureau

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

June 1, 2015

Louis M. Kealoha, Chief
City and County of Honolulu
Honolulu Police Department
801 South Beretania Street
Honolulu, Hawaii 96813

Re: Response to Pre-Assessment Consultation Comments for the Proposed Board of Water Supply Aina Haina 170' Potable Reservoir No. 2
Tax Map Key (1) 3-6-016:040
Honolulu, Oahu, Hawaii

Dear Mr. Kealoha,

Thank you for your letter dated July 23, 2014 regarding the pre-assessment consultation for the proposed Honolulu Board of Water Supply (BWS) Aina Haina 170' Potable Reservoir No. 2 project.

We acknowledge that short-term impacts to vehicular and pedestrian traffic may occur during construction of the proposed project. The Environmental Assessment (EA) will consider the use of traffic control personnel, traffic control devices, neighborhood notification, and limiting the moving of heavy equipment to off-peak hours in order to mitigate traffic related impacts.

Publication of the Draft EA is anticipated for July 2015. We look forward to continued participation of the Honolulu Police Department in the environmental review process. If you have any questions, please contact me at 596-7790.

Best regards,
The Limtiaco Consulting Group, Inc.

Jason S. Nakata
Staff Engineer

cc: Scot Muraoka, Honolulu Board of Water Supply

APPENDIX G

Draft Environmental Assessment Consultation

THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

August 18, 2015

Mr. Aaron Nadig, Acting Assistant Field Supervisor
U.S. Department of the Interior
Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard
Honolulu, HI 96850

Re: Draft Environmental Assessment for the
Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2
Tax Map Key (1) 3-6-016:040 and (1) 63-6-019:012
Honolulu, Oahu, Hawaii

Mr. Nadig,

Enclosed for public review is the Draft Environmental Assessment (DEA) for the proposed Honolulu Board of Water Supply (BWS) *Aina Haina 170' Potable Reservoir No. 2* project. The DEA was prepared pursuant to Chapter 343, Hawaii Revised Statutes and Chapter 11-200, Hawaii Administrative Rules.

The BWS has reviewed the DEA prepared for the subject project, and anticipates a Finding of No Significant Impact (FONSI) determination.

We have enclosed one CD copy of the DEA. We are currently soliciting any comments on the DEA and would appreciate the submission of any comments by **September 22, 2015**. Please send your comments to the address provided below.

Please send comments to:

Scot Muraoka, P.E., Project Manager
Honolulu Board of Water Supply
630 S. Beretania Street
Honolulu, HI 96843

Please send a copy of comments to:

Jason Nakata, Staff Engineer
The Limtiaco Consulting Group
1622 Kanakanui Street
Honolulu, HI 96817

Thank you for your interest and participation in the environmental review process. If you would like additional copies of the DEA or have any questions, please contact me at (808) 596-7790.

Best regards,
The Limtiaco Consulting Group, Inc.

Jason S. Nakata

Jason S. Nakata
Staff Engineer

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

KEKOA KALUHIWA
FIRST DEPUTY

JEFFREY T. PEARSON
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD, STE 555
KAPOLEI, HAWAII 96707

November 16, 2015

Mr. Scot Muraoka, Project Manager
Honolulu Board of Water Supply
City and County of Honolulu
630 S. Beretania Street
Honolulu, HI 96843

LOG NO: 2015.03176
DOC NO: 1509GC09
Archaeology

Mr. Russell Y. Tsuji, Administrator
Land Division
Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96809

Dear Sirs:

SUBJECT: **Chapter 6E-8 Historic Preservation Review –**
Board of Water Supply – Draft Environmental Assessment for
Aina Haina 170' Potable Reservoir No. 2 Project
Wailupe Ahupua'a, Kona District, Island of O'ahu
TMK: (1) 3-6-016:041; 3-6-019:012 por

Thank you for the opportunity to review and comment on the aforementioned Draft Environmental Assessment (DEA) for Aina Haina 170' Potable Reservoir No. 2 Project, located within BWS and City and County of Honolulu owned lands identified as TMK: (1) 3-6-016:041 and a portion of (1) 3-6-019:012.

The BWS proposes to install a new 0.5 million gallon potable water reservoir and appurtenant facilities within its property and may involve acquiring an additional 0.03 acres of land from the adjacent 6.59-acre City and County of Honolulu Wailupe Community Park (TMK: (1) 3-6-019:012). The scope of work involves the installation of a new 0.5 million gallon potable water reservoir, construction and installation of new drainage infrastructures, trenching for new connections to existing infrastructures and utility lines, realignment of the existing CRM wall and chain link fencing, and possible extension of the existing maintenance road to encompass the new potable reservoir. The anticipated trenching depth is approximately 6 feet. The acquisition of the additional acreage will require grading, cutting and excavation to meet the current grade of the existing reservoir facility.

The DEA indicates that the existing BWS structures began service in 1951, access to the property is restricted to BWS personnel, and that no archaeological historic properties have been previously identified on the facility property. In addition, Limtiaco will notify and consult with surrounding residents and interested groups and organizations about the proposed BWS project and the identification of potential historic properties.

The Aina Haina reservoir pump station is a rectangular concrete structure circa 1950. The front of the structure has ribbon windows, and on the left hand side are open rectangular vents. Just below the flat roof is script reading Board of Water Supply. Based on the information provided, the water pumping station is eligible for the State and National Registers of Historic Places under Criterion C as a contributing element in a Board of Water Supply multi-property nomination. However, the new reservoir will not affect the architectural historic integrity of the station and the existing structures will not be altered.

The DEA includes an archaeological inventory survey (AIS) in March 2015, conducted by Scientific Consultant Services, Inc. (SCS) (Pestana and Spear 2015). The AIS resulted in the identification of the historic 1951 booster pumping station and reservoir (Site 50-80-15-7764) along with two features. The DEA also includes a reconnaissance level survey (RLS) letter by Mason Architects dated February 19, 20015 (Tice 2015). The results of the RLS indicates that the proposed new reservoir does not preclude the booster pumping station, the reservoir structure, or the overall site design from conveying their historic significance.

SHPD records indicate that a draft archaeological inventory survey (AIS) (Pestana and Spear 2015) in support of the BWS Wailupe project was received by office on April 6, 2015. SHPD has identified major issues and concerns that are need of revisions prior to the acceptance of the AIS report pursuant to Hawaii Administrative Rules §13-276. We have received no new information regarding historic properties within the project limits, and have no further comments regarding this DEA at this time.

Please contact Anna Broverman at (808) 692-8023 or at Anna.E.Broverman@hawaii.gov if you have any questions regarding architectural resources. Please contact me at (808) 692-8019 or at Susan.A.Lebo@hawaii.gov if you have any questions or concerns regarding this letter.

Aloha,

Susan A. Lebo

Susan A. Lebo, PhD.
Archaeology Branch Chief

cc: Jonathan Suzuki, P.E. BWS (jsuzuki@hbws.org)
Jason Nakata, Limitiaco Group (jason.n@tlcghawaii.com)

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

December 10, 2015

12-14-15A10:13 RCVD

Susan A. Lebo, Ph.D., Chief
State of Hawaii
Department of Land and Natural Resources
State Historic Preservation Division
Archaeology Branch
601 Kamokila Boulevard, Suite 555
Kapolei, Hawaii 96707

Dear Dr. Lebo:

Subject: Your Letter Dated November 16, 2015 Regarding the Draft Environmental Assessment for the Aina Haina 170' Reservoir No. 2, Tax Map Key (1) 3-6-13: 40 and (1) 3-6-19: 12, Honolulu, Oahu, Hawaii

Thank you for your letter dated November 16, 2015 regarding the Draft Environmental Assessment for the Aina Haina 170' Reservoir No. 2 project.

We acknowledge that the Aina Haina reservoir pump station is eligible for the State and National Registers of Historic Places under Criterion C as a contributing element in the Board of Water Supply multi-property nomination. We concur that the new reservoir will not affect the architectural historic integrity of the station.

Scientific Consulting Services, Inc. has received your comments on the Archaeological Inventory Survey (AIS) and is currently revising the AIS to address your concerns.

If you have any questions, please contact Scot Muraoka, Long Range Planning Branch of our Water Resources Division, at 748-5942 or via email at smuraoka@hbws.org.

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

cc: J. Nakata, The Limtiaco Consulting Group

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 21, 2015

Scot Muraoka, P.E., Project Manager
Honolulu Board of Water Supply
630 S. Beretania Street
Honolulu, HI 96843

via email: smuraoka@hbws.org

Dear Mr. Muraoka,

SUBJECT: Draft Environmental Assessment for the Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR) Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comments.

At this time, enclosed are comments from (1) Land Division; (2) Office of Conservation & Coastal Lands; (3) Division of Forestry & Wildlife; and (4) Engineering Division. No other comments were received as of our suspense date. Should you have any questions, please feel free to call Supervising Land Agent Steve Molmen at 587-0439. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)

C: Jason Nakata, Staff Engineer
The Limtiaco Consulting Group via email: jason.n@tlcghawaii.com

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 19, 2015

MEMORANDUM

TO: **DLNR Agencies:**
_X_ Div. of Aquatic Resources
__ Div. of Boating & Ocean Recreation
_X_ Engineering Division
_X_ Div. of Forestry & Wildlife
__ Div. of State Parks
_X_ Commission on Water Resource Management
_X_ Office of Conservation & Coastal Lands
_X_ Land Division – Oahu District
_X_ Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Draft Environmental Assessment for the Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2
LOCATION: Tax Map Key (1) 3-6-016:040 and (1) 3-6-019:012
APPLICANT: City and County of Honolulu Board of Water Supply, by its consultant The Limtiaco Consulting Group

Transmitted for your review and comment on the above-referenced document. We would appreciate your comments on this document which can be found here:

1. Go to: https://sp01.ld.dlnr.hawaii.gov/LD
2. Login: Username: LD\Visitor Password: 0pa$$word0 (first and last characters are zeros)
3. Click on: Requests for Comments
4. Click on the subject file "Draft Environmental Assessment for the Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2" then click on "Files" and "Download a copy". (Any issues accessing the document should be directed to Linda Kawakami at (808) 587-0371 or Linda.Kawakami@hawaii.gov)

Please submit any comments by September 18, 2015. If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

(✓) We have no objections.
(✓) We have no comments.
( ) Comments are attached.

Signed: [signature]
Print Name: Timmy Chee
Date: 8/26/15

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
OFFICE OF CONSERVATION
AND COASTAL LANDS

2015 AUG 24 P 12: 17

DEPT. OF LAND &
NATURAL RESOURCES
STATE OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 19, 2015

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Draft Environmental Assessment for the Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2
LOCATION: Tax Map Key (1) 3-6-016:040 and (1) 3-6-019:012
APPLICANT: City and County of Honolulu Board of Water Supply, by its consultant The Limtiaco Consulting Group

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Please submit any comments by September 18, 2015. If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

( ) We have no objections.
(X) We have no comments.
( ) Comments are attached.

Not in Conservation District.

Signed: SM
Print Name: SAM LEMMO
Date:

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 19, 2015

RECEIVED
LAND DIVISION
2015 SEP -2 AM 11:08
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

MEMORANDUM

~~TO~~: From **DLNR Agencies:**

X Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

~~FROM~~: To Russell Y. Tsuji, Land Administrator
SUBJECT: Draft Environmental Assessment for the Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2
LOCATION: Tax Map Key (1) 3-6-016:040 and (1) 3-6-019:012
APPLICANT: City and County of Honolulu Board of Water Supply, by its consultant The Limtiaco Consulting Group

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Please submit any comments by September 18, 2015. If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

( ) We have no objections.
(✓) We have no comments.
(✓) Comments are attached.

Signed: [signature]
Print Name: GALEN KAWAKAMI
Date: 9/1/2015

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

KEKOA KALUHIWA
FIRST DEPUTY

JEFFREY T. PEARSON
ACTING DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 28, 2015

MEMORANDUM

TO: Russell Y. Tsuji, Land Administrator

FROM: Galen K. Kawakami, Acting Administrator

SUBJECT: Draft Environmental Assessment for the Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2.

The BWS proposes adding a second 0.5 million gallon (MG) enclosed reservoir with a 170-foot spillway elevation within its property at 855 Alamuku Street in Aina Haina. The BWS-owned parcel is identified as Tax Map Key (TMK) 3-6-016: 040. The addition of the new reservoir increases the total water storage capacity for the affected 170' system from Aina Haina to Kuliouou from 1.5 to 2.0 MG. No additional pumping capacity is proposed as part of the project. The new reservoir, which would be known as the Aina Haina 170' Potable Reservoir No. 2, will be designed to have similar capacity, spillway elevation and dimensions as the Aina Haina 170' Potable Reservoir No. 1. Project actions to install the new reservoir will require new connections to on-site drainage infrastructure. The new reservoir would add about 4,070 square feet of building area to the project site, which currently contains an enclosed reservoir and pump station building that were constructed around 1950. The proposed project may involve the acquisition of approximately 0.03 acres of unobstructed land from the adjacent Wailupe Community Park parcel. The existing BWS site is about one acre in size.

Due to the urban setting and existing pump and storage facilities, the State Division of Forestry and Wildlife (DOFAW) does not anticipate impacts to native wildlife or plant species. As such, DOFAW supports the proposal and would recommend approval. DOFAW typically recommends the use of shielded flat lens cut-off lighting to reduce the risk of the facility attracting migratory seabird species such as the Wedge-tailed shearwater, and landscaping with shade tree species to mitigate visual impacts and to accrue the many environmental and social benefits that come with mature trees.

Thank you for the opportunity to comment on this plan.

Galen K. Kawakami, Acting Administrator

9/1/2015
Date

Cc: Suzanne Case, Chairperson

DAVID Y. IGE
GOVERNOR OF HAWAII

'15 AUG 24 AM 10:54 ENGINEERING

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 19, 2015

RECEIVED
LAND DIVISION
2015 SEP 11 AM 11:16
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

MEMORANDUM

~~TO~~: FR:

DLNR Agencies:
X Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

~~FROM~~: TO: Russell Y. Tsuji, Land Administrator
SUBJECT: Draft Environmental Assessment for the Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2
LOCATION: Tax Map Key (1) 3-6-016:040 and (1) 3-6-019:012
APPLICANT: City and County of Honolulu Board of Water Supply, by its consultant The Limtiaco Consulting Group

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4. Click on the subject file "Draft Environmental Assessment for the Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2" then click on "Files" and "Download a copy". (Any issues accessing the document should be directed to Linda Kawakami at (808) 587-0371 or Linda.Kawakami@hawaii.gov)

Please submit any comments by September 18, 2015. If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: [signature]
Print Name: Carty S. Chang, Chief Engineer
Date: 9/10/15

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji
REF: DEA for Honolulu BWS Aina Haina 170' Potable Reservoir No. 2
Oahu.067

COMMENTS

(X) **We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Zone X. The National Flood Insurance Program (NFIP) does not regulate developments within Zone X.**

( ) Please take note that the project site according to the Flood Insurance Rate Map (FIRM), is located in Zone ___.

( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ___.

( ) Please note that the project must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken. If there are any questions, please contact the State NFIP Coordinator, Ms. Carol Tyau-Beam, of the Department of Land and Natural Resources, Engineering Division at (808) 587-0267.

Please be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

( ) Mr. Mario Siu Li at (808) 768-8098 of the City and County of Honolulu, Department of Planning and Permitting.

( ) Mr. Carter Romero (Acting) at (808) 961-8943 of the County of Hawaii, Department of Public Works.

( ) Mr. Carolyn Cortez at (808) 270-7253 of the County of Maui, Department of Planning.

( ) Mr. Stanford Iwamoto at (808) 241-4896 of the County of Kauai, Department of Public Works.

( ) The applicant should include project water demands and infrastructure required to meet water demands. Please note that the implementation of any State-sponsored projects requiring water service from the Honolulu Board of Water Supply system must first obtain water allocation credits from the Engineering Division before it can receive a building permit and/or water meter.

( ) The applicant should provide the water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update.

( ) Additional Comments: ______________________________

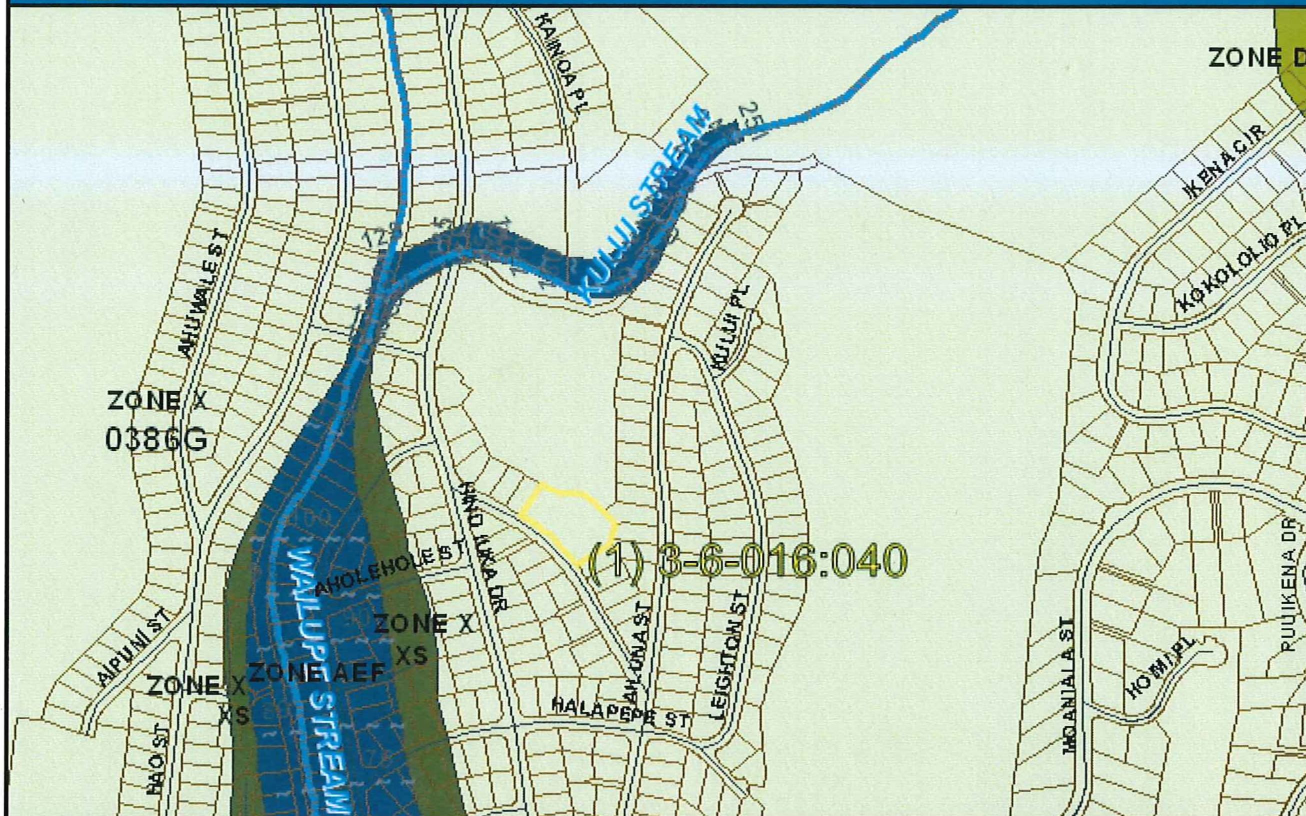
( ) Other: ______________________________

Should you have any questions, please call Mr. Dennis Imada of the Planning Branch at 587-0257.

Signed: ______________________________
CARTY S. CHANG, CHIEF ENGINEER

Date: 4/10/15

State of Hawaii
FLOOD HAZARD ASSESSMENT REPORT



NATIONAL FLOOD INSURANCE PROGRAM

FLOOD ZONE DEFINITIONS

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD – The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zone A, AE, AH, AO, V, and VE. The Base Flood Elevation (BFE) is the water-surface elevation of the 1% annual chance flood. Mandatory flood insurance purchase applies in these zones:

- **Zone A:** No BFE determined.
- **Zone AE:** BFE determined.
- **Zone AH:** Flood depths of 1 to 3 feet (usually areas of ponding); BFE determined.
- **Zone AO:** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined.
- **Zone V:** Coastal flood zone with velocity hazard (wave action); no BFE determined.
- **Zone VE:** Coastal flood zone with velocity hazard (wave action); BFE determined.
- **Zone AEF:** Floodway areas in Zone AE. The floodway is the channel of stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without increasing the BFE.

NON-SPECIAL FLOOD HAZARD AREA – An area in a low-to-moderate risk flood zone. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

- **Zone XS (X shaded):** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- **Zone X:** Areas determined to be outside the 0.2% annual chance floodplain.

OTHER FLOOD AREAS

- **Zone D:** Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

PROPERTY INFORMATION

COUNTY:	HONOLULU
TMK NO:	(1) 3-6-016-040
PARCEL ADDRESS:	855 ALAMUKU ST HONOLULU, HI 96821
FIRM INDEX DATE:	NOVEMBER 05, 2014
LETTER OF MAP CHANGE(S):	NONE
FEMA FIRM PANEL(S):	15003C0386G
PANEL EFFECTIVE DATE:	JANUARY 19, 2011

PARCEL DATA FROM:	APRIL 2014
IMAGERY DATA FROM:	MAY 2006

IMPORTANT PHONE NUMBERS

County NFIP Coordinator
City and County of Honolulu
Mario Siu-Li, CFM — (808) 768-8098

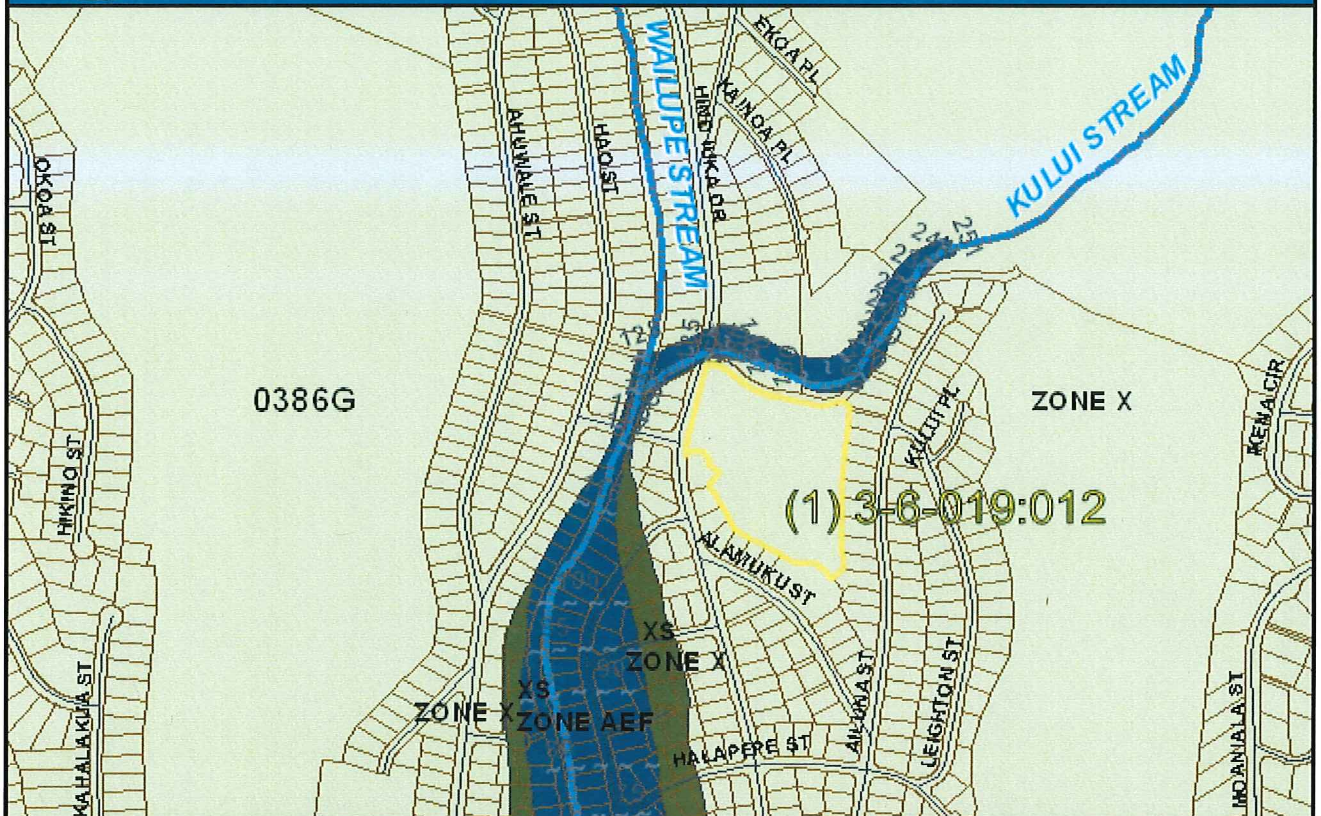
State NFIP Coordinator
Carol Tyau-Beam, P.E., CFM — (808) 587-0267

Disclaimer: The Hawaii Department of Land and Natural Resources (DLNR) assumes no responsibility arising from the use, accuracy, completeness, and timeliness of any information contained in this report. Viewers/Users are responsible for verifying the accuracy of the information and agree to indemnify the DLNR, its officers, and employees from any liability which may arise from its use of its data or information.

If this map has been identified as 'PRELIMINARY', please note that it is being provided for informational purposes and shall not be used for flood insurance rating. Contact your county floodplain manager for flood zone determinations to be used for compliance with local floodplain management regulations.

State of Hawaii

FLOOD HAZARD ASSESSMENT REPORT



NATIONAL FLOOD INSURANCE PROGRAM

FLOOD ZONE DEFINITIONS

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD – The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zone A, AE, AH, AO, V, and VE. The Base Flood Elevation (BFE) is the water-surface elevation of the 1% annual chance flood. Mandatory flood insurance purchase applies in these zones:

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- **Zone AO:** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined.
- **Zone V:** Coastal flood zone with velocity hazard (wave action); no BFE determined.
- **Zone VE:** Coastal flood zone with velocity hazard (wave action); BFE determined.
- **Zone AEF:** Floodway areas in Zone AE. The floodway is the channel of stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without increasing the BFE.

NON-SPECIAL FLOOD HAZARD AREA – An area in a low-to-moderate risk flood zone. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

- **Zone XS (X shaded):** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- **Zone X:** Areas determined to be outside the 0.2% annual chance floodplain.

OTHER FLOOD AREAS

- **Zone D:** Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

PROPERTY INFORMATION

COUNTY:	HONOLULU
TMK NO:	(1) 3-6-019-012
PARCEL ADDRESS:	941 HIND IUKA DR HONOLULU, HI 96821
FIRM INDEX DATE:	NOVEMBER 05, 2014
LETTER OF MAP CHANGE(S):	NONE
FEMA FIRM PANEL(S):	15003C0386G
PANEL EFFECTIVE DATE:	JANUARY 19, 2011

PARCEL DATA FROM:	APRIL 2014
IMAGERY DATA FROM:	MAY 2006

IMPORTANT PHONE NUMBERS

County NFIP Coordinator
City and County of Honolulu
Mario Siu-Li, CFM (808) 768-8098

State NFIP Coordinator
Carol Tyau-Beam, P.E., CFM (808) 587-0267

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BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

October 6, 2015

Mr. Russell Y. Tsuji, Land Administrator
State of Hawaii
Department of Land and Natural Resources
Land Division
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Tsuji:

Subject: Your Letter Dated September 14, 2015 Regarding the Draft Environmental Assessment for the Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2 – Tax Map Key (1) 3-6-016: 040 and (1) 3-6-019: 012, Honolulu, Oahu, Hawaii

Thank you for your letter dated September 14, 2015 regarding the Draft Environmental Assessment for the Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2.

We have the following responses to your comments:

1. We acknowledge that the Department of Land and Natural Resources (DLNR) Land Division – Oahu District has no comments.

2. We acknowledge that the DLNR Office of Conservation & Coastal Lands also has no comments.

3. We acknowledge that the proposed project should not have an impact on native wildlife or plant species and that DLNR Division of Forestry & Wildlife recommends (1) using shielded flat lens cut-off lighting to reduce the risk of the facility attracting migratory seabird species and (2) landscaping with shade tree species to mitigate visual impacts and to take advantage of the many environmental and social benefits of sustaining mature trees. Those recommendations will be considered during the design phase of the project.

4. We acknowledge that the proposed project is located in Zone "X" of the Flood Insurance Rate Map and is not regulated by the National Flood Insurance Program.

If you have any questions, please contact Scot Muraoka, Long Range Planning Branch of our Water Resources Division at (808) 748-5942.

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

cc: S. Muraoka
WR-154-15

DAVID Y. IGE
GOVERNOR OF HAWAII

JESSICA E. WOOLEY
DIRECTOR

STATE OF HAWAI'I
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
Department of Health
235 South Beretania Street, Suite 702
Honolulu, Hawai'i 96813
Telephone (808) 586-4185
Facsimile (808) 586-4186
Email: oeqchawaii@doh.hawaii.gov

September 22, 2015

Honolulu Board of Water Supply
Attn: Scot Muraoka, P.E.
630 S. Beretania Street
Honolulu, HI 96843

Dear Mr. Muraoka,

SUBJECT: Draft Environmental Assessment (EA) for the Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2 Project, Aina Haina, O'ahu.

The Office of Environmental Quality Control (OEQC) reviewed the Draft EA prepared for the subject project and offers the following comments for your consideration.

The technical aspect of the project are fairly straightforward, but some of the most important mitigation measures are mentioned only as options. The project will have less environmental impact if these options can become more concrete.

1) Nonpoint source pollution and erosion issues
While the construction of a second reservoir and access road will probably reduce the long –term potential for erosion of the top soil in that area by wind and water, it's not necessarily true that the nonpoint source pollution will be reduced. This project will have a net increase in impervious surfaces, which in turn will increase stormwater runoff and load. Therefore, this impact should receive more attention and its own mitigation measures, such as bioswales and pervious roads.

2) Floral Resources
The OEQC seconds the Department of Land and Natural Resources' Division of Forestry and Wildlife's (DFW) recommendations that a vegetated condition be maintained at the project site to help reduce sediment runoff and to reduce the heat-island effects. It would be additionally beneficial if the added landscaping was native Hawaiian plants. This would require no additional money or resources, just the conscious decision to replant the area with native plants.

3) Bioswales and Secondary Impacts
Although the secondary impacts will be very low since the project is just an additional reservoir to an already operational station, it will increase the amount of impervious surfaces. This reinforces the need for bioswales and other stormwater mitigation

measures, which are only mentioned as an option. Secondary and cumulative stormwater impacts should be expanded upon, including a more in depth description of the intended methods to reduce runoff from the site and promote groundwater recharge. A pervious access road could help offset the decrease in recharge area once the reservoir is built.

Thank you for the opportunity to comment on the Draft EA. We look forward to the response that also will be included within the project's Final EA. If you have any questions about these comments, please consult myself or Tom Eisen in our office at (808) 586-4185.

Sincerely,

Tom Eisen

for Jessica E. Wooley, Director

Cc: Jason Nakata (Consultant)

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

October 23, 2015

Ms. Jessica E. Wooley, Director
State of Hawaii
Department of Health
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Ms. Wooley:

Subject: Your Letter Dated September 22, 2015 Regarding the Draft Environmental Assessment for the Aina Haina 170' Reservoir No. 2, Tax Map Key: (1) 3-6-013: 040 and (1) 3-6-019: 012, Honolulu, Oahu, Hawaii

Thank you for your letter dated September 22, 2015 regarding the Draft Environmental Assessment (EA) for the Aina Haina 170' Reservoir No. 2 project.

We have the following responses to your comments:

1. We concur that the proposed project will result in a small net increase of impervious surface, which in turn will increase stormwater runoff and load. The Final EA will further as address mitigation measures such as the use of bioswales and pervious roads.

2. We acknowledge your comments regarding the benefits that additional landscaping, particularly with the use of native Hawaiian plants, would help to reduce sediment runoff and reduce the heat-island effect at the project site. Discussion of these mitigation measures will be added to the Final EA.

3. We concur that the increase in impervious surface will result in an increase of stormwater runoff from the project site. A discussion of the secondary impacts of increased stormwater runoff will be added to the Final EA, along with a discussion of possible mitigation measures such as bioswales or pervious pavement.

4. We understand your concern that the mitigation measures discussed above are only provided as recommendations in the EA and the project will have less environmental impact if these options could be made more concrete. The EA is prepared early in the life-cycle of the project and it is based on best available information at the time. The EA will recommend consideration of these mitigation measures as the project progresses into design. These recommendations will be considered during design of the project and topographic and geotechnical surveys will determine the feasibility of these mitigation measures.

If you have any questions, please contact Scot Muraoka, Long Range Planning Branch of our Water Resources Division, at 748-5942.

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

cc: Jason Nakata, The Limtiaco Consulting Group

COPY

DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

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

In reply, please refer to:
File:

15-592A CAB

September 4, 2015

09-10-15P01:24 RCVD

Mr. Scot Muraoka, P.E.
Project Manager
Honolulu Board of Water Supply
630 S. Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Muraoka:

SUBJECT: Draft Environmental Assessment
Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2
Honolulu, Oahu, Hawaii

If the proposed project excavates asbestos-cement pipes, the applicant should contact the Asbestos Abatement Office in the Indoor and Radiological Health Branch at 586-5800.

A significant potential for fugitive dust emissions exists during all phases of excavation and construction. The activities must comply with the provisions of Hawaii Administrative Rules, §11-60.1-33 on Fugitive Dust. We encourage the contractor to implement a dust control plan, which does not require approval by the Department of Health, to comply with the fugitive dust regulations.

Dust control measures include, but are not limited to, the following:

a) Planning the different phases of construction, focusing on minimizing the amount of dust-generating materials and activities, centralizing on-site vehicular traffic routes, and locating potential dust-generating equipment in areas of the least impact;
b) Providing an adequate water source at the site prior to start-up of construction activities;
c) Landscaping and providing rapid covering of bare areas, including slopes, starting from the initial grading phase;
d) Minimizing dust from shoulders and access roads;
e) Providing adequate dust control measures during weekends, after hours, and prior to daily start-up of construction activities; and
f) Controlling dust from debris being hauled away from the project site. Also, controlling dust from daily operations of material being processed, stockpiled, and hauled to and from the facility.

If you have any questions, please contact Mr. Barry Ching of the Clean Air Branch at 586-4200.

Sincerely,

NOLAN S. HIRAI, P.E.
Manager, Clean Air Branch

BC:rg

c: Jason S. Nakata, The Limtiaco Consulting Group, Inc.

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

October 22, 2015

Mr. Nolan Hirai, Manager
State of Hawaii
Department of Health
Clean Air Branch
P. O. Box 3378
Honolulu, Hawaii 96801-3378

Dear Mr. Hirai:

Subject: Your Letter Dated September 4, 2015 Regarding the Draft Environmental Assessment for the Aina Haina 170' Reservoir No. 2 – Tax Map Key: (1) 3-6-013: 040 and (1) 3-6-019: 012, Honolulu, Oahu, Hawaii

Thank you for your letter dated September 4, 2015 regarding the Draft Environmental Assessment for the Aina Haina 170' Reservoir No. 2 project.

The presence of asbestos-cement is not anticipated. However, if the presence of asbestos cement is discovered, the Asbestos Office in the Indoor and Radiological Health Branch will be contacted at 586-5800.

The Final Environmental Assessment will recommend implementation of a dust control plan by the contractor. The Final Environmental Assessment will acknowledge construction phasing management, minimizing the amount of dust-generating materials and activities, centralizing on-site vehicular traffic routes, locating potential dust-generating equipment in areas of least impact, providing water as dust control, landscaping, minimizing dust from shoulders and access roads, providing dust control during non-work hours, and controlling dust from construction debris as potential mitigation measures to minimize dust during construction. We acknowledge that the dust control plan does not require approval by the Department of Health.

If you have any questions, please contact Scot Muraoka, Long Range Planning Branch of our Water Resources Division at 748-5942.

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

cc: Jason Nakata, The Limtiaco Consulting Group

DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
EMD/CWB

09004PJF.15

September 1, 2015

09-03-15A07:47 RCVD

Mr. Scot Muraoka, P.E.
Project Manager
Honolulu Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Muraoka:

SUBJECT: Draft Environmental Assessment (DEA) for the Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2 Honolulu, Island of Oahu, Hawaii

The Department of Health (DOH), Clean Water Branch (CWB), acknowledges receipt of your letter, dated August 18, 2015, requesting comments on your project. The DOH-CWB has reviewed the subject document and offers these comments. Please note that our review is based solely on the information provided in the subject document and its compliance with the Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. You may be responsible for fulfilling additional requirements related to our program. We recommend that you also read our standard comments on our website at: http://health.hawaii.gov/epo/files/2013/05/Clean-Water-Branch-Std-Comments.pdf.

1. Any project and its potential impacts to State waters must meet the following criteria:

    a. Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.

    b. Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.

    c. Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).

2. You may be required to obtain National Pollutant Discharge Elimination System (NPDES) permit coverage for discharges of wastewater, including storm water runoff, into State surface waters (HAR, Chapter 11-55).

For NPDES general permit coverage, a Notice of Intent (NOI) form must be submitted at least 30 calendar days before the commencement of the discharge. An application for an NPDES individual permit must be submitted at least 180 calendar days before the commencement of the discharge. To request NPDES permit coverage, you must submit the applicable form ("CWB Individual NPDES Form" or "CWB NOI Form") through the e-Permitting Portal and the hard copy certification statement with the respective filing fee ($1,000 for an individual NPDES permit or $500 for a Notice of General Permit Coverage). Please open the e-Permitting Portal website located at: https://eha-cloud.doh.hawaii.gov/epermit/. You will be asked to do a one-time registration to obtain your login and password. After you register, click on the Application Finder tool and locate the appropriate form. Follow the instructions to complete and submit the form.

3. If your project involves work in, over, or under waters of the United States, it is highly recommended that you contact the Army Corp of Engineers, Regulatory Branch (Tel: 835-4303) regarding their permitting requirements.

   Pursuant to Federal Water Pollution Control Act [commonly known as the "Clean Water Act" (CWA)], Paragraph 401(a)(1), a Section 401 Water Quality Certification (WQC) is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may **result** in any discharge into the navigable waters..." (emphasis added). The term "discharge" is defined in CWA, Subsections 502(16), 502(12), and 502(6); Title 40 of the Code of Federal Regulations, Section 122.2; and HAR, Chapter 11-54.

4. Please note that all discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 WQC are required, must comply with the State's Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of $25,000 per day per violation.

5. It is the State's position that all projects must reduce, reuse, and recycle to protect, restore, and sustain water quality and beneficial uses of State waters. Project planning should:

   a. Treat storm water as a resource to be protected by integrating it into project planning and permitting. Storm water has long been recognized as a source of irrigation that will not deplete potable water resources. What is often overlooked is that storm water recharges ground water supplies and feeds streams and estuaries; to ensure that these water cycles are not disrupted, storm water cannot be relegated as a waste product of impervious surfaces. Any project planning must recognize storm water as an asset that sustains and protects natural ecosystems and traditional beneficial uses of State waters, like community beautification, beach going, swimming, and fishing. The approaches necessary to do so, including low impact development methods or ecological bio-engineering of drainage ways must be identified in the planning stages to allow designers opportunity to include those approaches up front, prior to seeking zoning, construction, or building permits.

b. Clearly articulate the State's position on water quality and the beneficial uses of State waters. The plan should include statements regarding the implementation of methods to conserve natural resources (e.g., minimizing potable water for irrigation, gray water re-use options, energy conservation through smart design) and improve water quality.

c. Consider storm water Best Management Practice (BMP) approaches that minimize the use of potable water for irrigation through storm water storage and reuse, percolate storm water to recharge groundwater to revitalize natural hydrology, and treat storm water which is to be discharged.

d. Consider the use of green building practices, such as pervious pavement and landscaping with native vegetation, to improve water quality by reducing excessive runoff and the need for excessive fertilization, respectively.

e. Identify opportunities for retrofitting or bio-engineering existing storm water infrastructure to restore ecological function while maintaining, or even enhancing, hydraulic capacity. Particular consideration should be given to areas prone to flooding, or where the infrastructure is aged and will need to be rehabilitated.

If you have any questions, please visit our website at: http://health.hawaii.gov/cwb/, or contact the Engineering Section, CWB, at (808) 586-4309.

Sincerely,

Alec Wong

ALEC WONG, P.E., CHIEF
Clean Water Branch

JF:bk

c: Mr. Jason S. Nakata, The Limtiaco Consulting Group

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

October 6, 2015

Mr. Alec Wong, P.E., Chief
State of Hawaii
Department of Health
Clean Water Branch
P. O. Box 3378
Honolulu, Hawaii 96801-3378

Dear Mr. Wong:

Subject: Your Letter Dated September 1, 2015 Regarding the Draft Environmental Assessment for the Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2, Honolulu, Oahu, Hawaii

Thank you for your letter dated September 1, 2015 regarding the Draft Environmental Assessment (EA) for the Honolulu Board of Water Supply (BWS) Aina Haina 170' Potable Reservoir No. 2.

We have the following responses to your comments:

1. We acknowledge that the Department of Health's (DOH) anti-degradation policy and water quality standards must be followed for any project affecting State waters. Operation of the Aina Haina 170' Potable Reservoir No. 2 will not adversely affect surface or marine waters.

2. An application for a National Pollutant Discharge Elimination System (NPDES) permit will be submitted for any discharge of wastewater, including storm water runoff, into State surface waters. The BWS acknowledges that an individual NPDES application must be submitted at least 180 days before the start of the discharge and a notice of intent must be provided at least 30 days before the start of the discharge.

3. The project does not involve work in, over, or under waters of the United States.

4. We acknowledge that any discharges from construction and other project activities must meet State water quality standards.

5. We concur with the State's position on the importance of measures to protect, restore and sustain water quality and beneficial uses of State waters.

    a. We recognize that storm water is an asset that sustains and protects natural ecosystems and beneficial uses of State waters. Opportunities to implement low impact development and bioengineering are limited since the project is simply the installation of a new potable water reservoir.

    b. Statements regarding conservation of natural resources and improvement of water quality will be incorporated into the Final EA.

    c. Storm water BMPs will be incorporated into the project as required by federal, state, and city laws, regulations, and ordinances.

    d. Opportunities to implement green building practices and bioengineering of existing drainage systems are limited since the project is simply the installation of a new potable water reservoir.

If you have any questions, please contact Scot Muraoka, Long Range Planning Branch of our Water Resources Division at (808) 748-5942.

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

cc: S. Muraoka
WR-135-15

DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:

EPO 15-210

September 3, 2015

Mr. Jason Nakata
The Limtiaco Consulting Group
1622 Kanakanui Street
Honolulu, Hawaii 96817
Email: Jason.n@ticghawaii.com

Dear Mr. Nakata:

SUBJECT: Draft Environmental Assessment (DEA) for Aina Haina 170' Potable Reservoir No. 2 TMK: (1) 3-6-016: 040 and (1) 3-6-019: 012

The Department of Health (DOH), Environmental Planning Office (EPO), acknowledges receipt of your DEA to our office via the OEQC link:
http://oeqc.doh.hawaii.gov/Shared%20Documents/EA_and_EIS_Online_Library/Oahu/2010s/2015-08-23-OA-5B-DEA-Honolulu-Board-of-Water-Supply-Aina-Haina-Reservoir-No.-2.pdf

EPO strongly recommends that you review the standard comments and available strategies to support sustainable and healthy design provided at: http://health.hawaii.gov/epo/landuse. Projects are required to adhere to all applicable standard comments.

EPO offers the following comments:

1. We suggest you review the requirements for the National Pollutant Discharge Elimination System (NPDES) permit. We recommend contacting the Clean Water Branch at (808) 586-4309 or cleanwaterbranch@doh.hawaii.gov after relevant information is reviewed at:
   a. http://health.hawaii.gov/cwb
   b. http://health.hawaii.gov/cwb/site-map/clean-water-branch-home-page/standard-npdes-permit-conditions
   c. http://health.hawaii.gov/cwb/site-map/clean-water-branch-home-page/forms

2. EPO recommends you review the need and/or requirements for a Clean Air Branch permit. The Clean Air Branch can be consulted via e-mail at: Cab.General@doh.hawaii.gov or via phone: (808) 586-4200.

3. If noise created during the construction phase of the project may exceed the maximum allowable levels as set forth in Hawaii Administrative Rules, Chapter 11-46, "Community Noise Control". A noise permit may be required and should be obtained before the commencement of work. Please call the Indoor and Radiological Health Branch at (808) 586-4700 and review relevant information online at: http://health.hawaii.gov/irhb/noise

EPO encourages you to examine and utilize the Hawaii Environmental Health Portal. The portal provides links to our e-Permitting Portal, Environmental Health Warehouse, Groundwater Contamination Viewer, Hawaii Emergency Response Exchange, Hawaii State and Local Emission Inventory System, Water Pollution Control Viewer, Water Quality Data, Warnings, Advisories and Postings. The Portal is continually updated. Please visit it regularly at: https://eha-cloud.doh.hawaii.gov

You may also wish to review the revised Water Quality Standards Maps that have been updated for all islands. The Water Quality Standards Maps can be found at:
http://health.hawaii.gov/cwb/site-map/clean-water-branch-home-page/water-quality-standards/.

We request that you utilize all of this information on your proposed project to increase sustainable, innovative, inspirational, transparent and healthy design.

Mahalo nui loa,

Laura Leialoha Phillips McIntyre, AICP
Program Manager, Environmental Planning Office

c: Scot Muraoka, P.E., Honolulu Board of Water Supply {via email only: smuraoka@hbws.org}
DOH: CAB, IRHB, CWB, SDWB {via email only)

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

October 15, 2015

Ms. Laura Leialoha Phillips McIntyre, AICP
Program Manager
State of Hawaii
Department of Health
Environmental Planning Office
P. O. Box 3378
Honolulu, Hawaii 96801-3378

Dear Ms. McIntyre:

Subject: Your Letter Dated September 3, 2015 Regarding the Draft Environmental Assessment for the Aina Haina 170' Reservoir No. 2, Tax Map Key: (1) 3-6-013: 040 and (1) 3-6-019: 012, Honolulu, Oahu, Hawaii

Thank you for your letter dated September 3, 2015 regarding the Draft Environmental Assessment (EA) for the Aina Haina 170' Reservoir No. 2 project.

Construction activities for the Aina Haina 170' Reservoir No. 2 project will adhere to Best Management Practices to protect our environment. The Final EA will include references to potential Clean Water Branch, Clean Air Branch, and Indoor and Radiological Health Branch permit requirements.

If you have any questions, please contact Scot Muraoka, Long Range Planning Branch of our Water Resources Division, at 748-5942.

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

cc: Jason Nakata, The Limtiaco Consulting Group

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT. GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P. O. BOX 1879
HONOLULU, HAWAII 96805

September 9, 2015

The Limtiaco Consulting Group
Attn: Jason S. Nakata, Staff Engineer
1622 Kanakanui Street
Honolulu, Hawaii 96817

Dear Mr. Nakata:

SUBJECT: Draft Environmental Assessment for the Honolulu Board of Water Supply Aina Haina 170'Potable Reservoir No. 2
Tax Map Key (1) 3-6-016:040 and (1) 63-6-019:012
Honolulu, Oahu, Hawaii

Thank you for the opportunity to review the Draft Environmental Assessment for the Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2.

The Department of Hawaiian Home Lands has no comment to offer at this time.

If you have any questions, please contact our Planning Office at (808) 620-9517.

Aloha,

Marvin Kaleo Manuel
Acting Planning Program Manager

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

October 13, 2015

Mr. Marvin Kaleo Manuel
Acting Planning Program Manager
State of Hawaii
Department of Hawaiian Home Lands
Planning Office
P. O. Box 1879
Honolulu, Hawaii 96805

Dear Mr. Manuel:

Subject: Your Letter Dated September 9, 2015 Regarding the Draft Environmental Assessment for the Aina Haina 170' Reservoir 2 – Tax Map Key (1) 3-6-016: 040 and (1) 3-6-019: 012, Honolulu, Oahu, Hawaii

Thank you for your letter dated September 9, 2015 regarding the Draft Environmental Assessment for the Aina Haina 170' Reservoir No. 2 project.

We acknowledge that the Department of Hawaiian Home Lands has no comment on the proposed project at this time.

If you have any questions, please contact Scot Muraoka, Long Range Planning Branch of our Water Resources Division at 748-5942.

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

cc: Jason Nakata, The Limtiaco Consulting Group

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8480 • Fax: (808) 768-4567
Web site: www.honolulu.gov

KIRK CALDWELL
MAYOR

ROBERT J. KRONING, P.E.
DIRECTOR

MARK YONAMINE, P.E.
DEPUTY DIRECTOR

09-15-15P02:00 RCVD

September 9, 2015

Honolulu Board of Water Supply
630 South Beretania Street
Honolulu, Hawaii 96843

Attn: Scot Muraoka, P.E.

Dear Mr. Muraoka:

The Department of Design and Construction does have comments on the draft environmental assessment for the Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2. Comments are noted on the enclosure.

Thank you for the opportunity to review and comment. Should there be any questions, please contact me at 768-8480.

Sincerely,

fr M. Yonamine

Robert J. Kroning, P.E.
Director

RJK: cf (621516)

Enclosure

cc: The Limtiaco Consulting Group – Jason Nakata ✓

1. SETTING AND PROJECT DESCRIPTION

1.1. Introduction and Background

The Honolulu Board of Water Supply (BWS) is a semi-autonomous agency of the City and County of Honolulu that manages the development, operation, and maintenance of Oahu's municipal water system. The agency is responsible for maintaining the water resource and distribution system throughout Oahu in order to meet the current and future water supply needs of its customers.

The BWS proposes to improve the reliability and storage capacity of the potable water supply and distribution system for the East Honolulu communities of Wailupe Peninsula, Aina Haina, Niu Valley and Kuliouou by adding a second 0.5 million gallon (MG) enclosed reservoir with a 170-foot spillway elevation within its property at 855 Alamuku Street in Aina Haina (see Figure 1). The BWS-owned parcel identified as Tax Map Key (TMK) 3-6-016: 040 will hereafter be referred to as the project site. The addition of the new reservoir increases the total water storage capacity for the affected 170' system from Aina Haina to Kuliouou from 1.5 to 2.0 MG. No additional pumping capacity is proposed as part of the project. The new reservoir, which would be known as the Aina Haina 170' Potable Reservoir No. 2, will be designed to have similar capacity, spillway elevation and dimensions as the Aina Haina 170' Potable Reservoir No. 1.

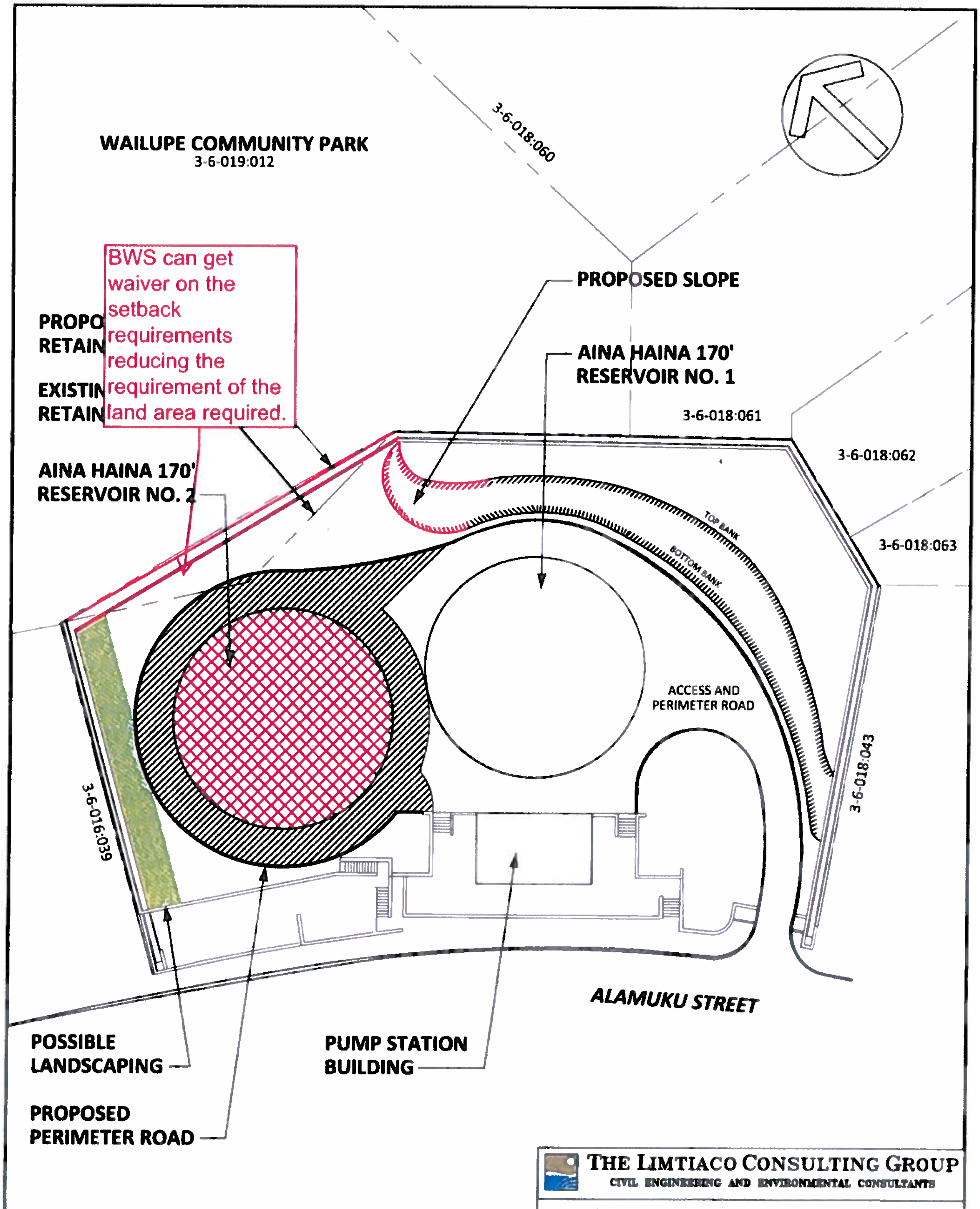
Project actions to install the new reservoir will require new connections to on-site drainage infrastructure. The new reservoir would add about 4,070 square feet (sf) of building area to the project site, which currently contains an enclosed reservoir (4,070 sf) and pump station building (960 sf) that were constructed around 1950. The existing BWS site is about one acre in size.

BWS could easily get a waiver since this if for public use and it involves two public properties.

Approximately 0.03 acres of unobstructed land from … e Community Park (formerly Wailupe Valley Element… quired from the City and County of Honolulu. The additional acr… to accommodate the extension of an access road with… t will encircle the new reservoir and for compliance with setback requirements specified in the Land Use Ordinance (Chapter 21 of the Revised Ordinances of Honolulu) for the R-7.5 Residential District. The transfer of ownership may be accomplished through the consolidation and re-subdivision of TMKs 3-6-019: 012 and 3-6-016: 040. A portion of the retaining wall and concrete gutter between the two parcels would be realigned to reflect the new property line.

BWS must check slope stability of the area and insure that the ground disturbance and additional soil loading will not affect the stability of the ground for the City property before City can agree to this.

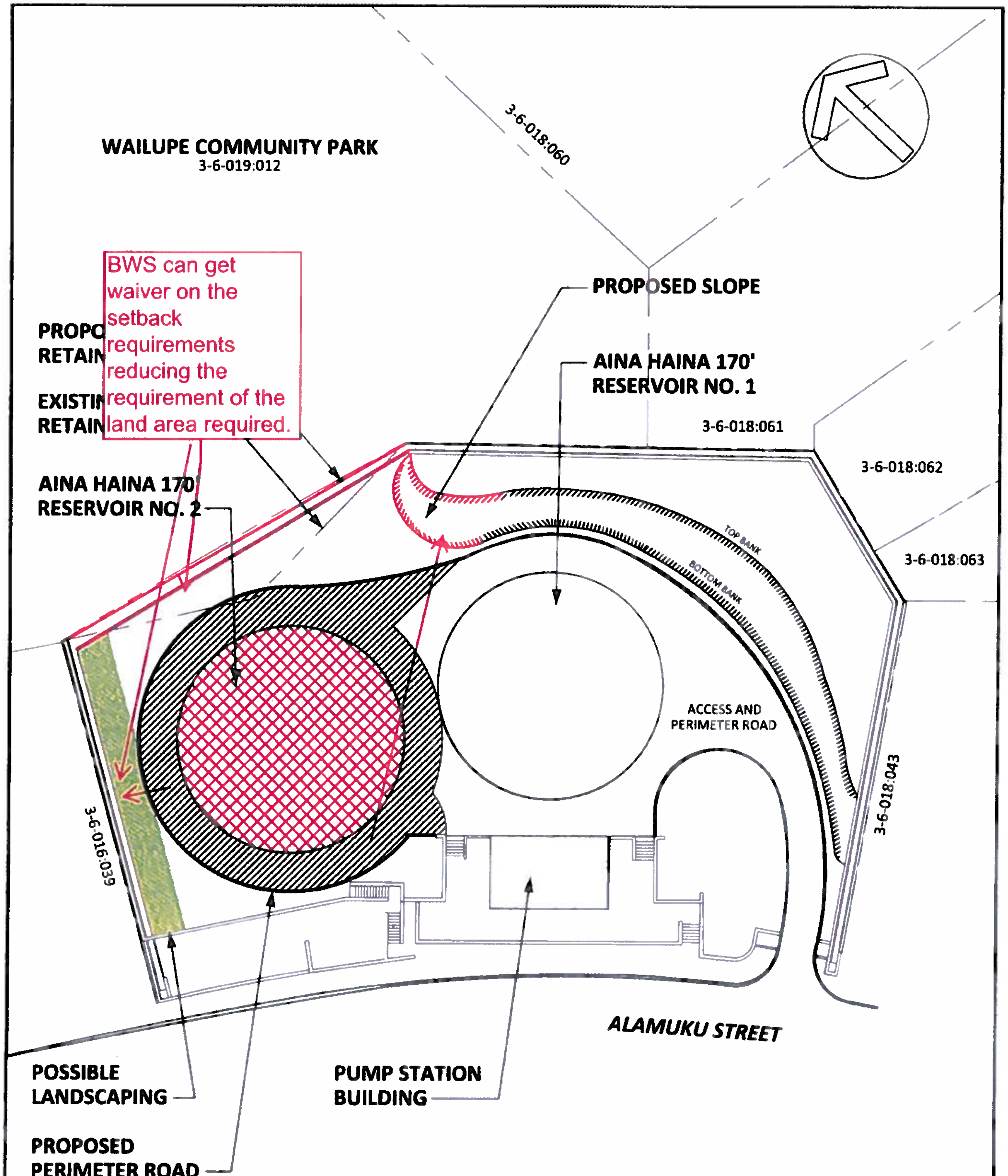
The proposed project would use County and BW… ds. Therefore, the proposed project requires preparation of an E… ment (EA) pursuant to Chapter 343, Hawaii Revised Statute… ed Title 11, Chapter 200, Hawaii Administrative Rules (HAR). … e technical, environmental, social, and economic consequenc… ncies,



THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

FIGURE 7
PROPOSED SITE PLAN

SCALE: NOT TO SCALE | DATE: AUGUST 2015



THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

FIGURE 7
PROPOSED SITE PLAN

SCALE: NOT TO SCALE | DATE: AUGUST 2015

fugitive dust and emissions. The construction contractor will be responsible for complying with HAR Title 11, Chapter 60, "Air Pollution Control." The contractor will be responsible for the implementation of erosion and dust control measures as necessary for compliance with the above-mentioned rules. Construction equipment and vehicles shall be properly maintained in order to control vehicular emissions. Said exhaust emissions are anticipated to have negligible impacts on air quality in the project vicinity since the carbon monoxide and nitrogen oxide emissions would be intermittent and readily dissipated. No significant air quality impacts are anticipated from the new reservoir, which represents a continuation of the functions and activities that currently occur at the project site.

2.2. Geology and Soils

The Island of Oahu comprises the remnants of two basaltic volcanoes that eroded to form the Waianae and Koolau Ranges, which are connected by a central plateau. The mountain range formed by the older Waianae volcano spans a distance of about 20 miles across the western third of Oahu. The younger Koolau volcano contributed to the main mountain range on Oahu that extends for 37 miles in a northwest to southeast alignment across the eastern two thirds of the island. The Koolau Range consists of thin, narrow layers of basaltic lava flows. Dissected valleys were etched into the basalt range formations through weathering and natural erosion processes. Numerous dikes and small amounts of volcanic ash are present. The valley floors contain alluvium (e.g., clay, silt, sand, gravel, or similar material) and unconsolidated non-calcareous sediments transported from valley slopes by stream flows.

Soils underlying Wailupe Valley belong to the Lualualei-Fill land-Ewa association and are deep, nearly level to moderately sloping, well-drained, fine textured and moderately fine textured soils (U.S. Department of Agriculture, Soil Conservation Service, 1972). Lualualei soils have a high shrink-swell potential that may cause unstable soil conditions and these soils "account for about 75 percent of the acreage which has been involved in mass movements (landslides, creep) on the island of Oahu" (GK and Associates, 1991). Basaltic bedrock, weathered basalt, alluvium and colluvium (e.g., rock detritus and soil accumulated at the foot of a slope) are found in the project area.

According to the *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* (U.S. Department of Agriculture, Soil Conservation Service, 1972) and *Web Soil Survey* (U.S. Department of Agriculture, Natural Resources Conservation Service, n.d.), the predominant soil type in the vicinity of the project site is classified as Lualualei extremely stony clay, 3 to 35 percent slopes (LPE). The LPE soil type has limited topsoil mixed with a substantial amount of stones and is characterized by medium to rapid runoff with a moderate to severe erosion hazard. The soil classifications are shown in Figure 8.

What added precautions will be taken to reduce this hazard for the City property which is down hill from the site?

The Aina Haina area is known to have unstable soils. "In the 1990s, the city paid $6.7 million to buy out a group of homes on Ailuna and Leighton streets when a leaky sewer pipe caused them to slip down the hill" (Fassler, 2008). There are no indications of settlement or poor soil conditions at the project site. In September 2011, exploratory test borings taken from the flat, vacant area of the project site confirmed shallow cut-and-fill conditions with relatively shallow depths to basalt. It is anticipated that a conventional foundation on the underlying basalt stratum can support the proposed concrete reservoir.

Impacts and Mitigation Measures

The new reservoir will be properly designed with respect to subsurface conditions within the footprint of new construction. The replaced portion of the retaining wall and concrete gutter will also be properly designed and constructed with respect to geotechnical concerns. Project actions would therefore have no adverse impacts on the underlying geology and soils at the project site such that no mitigation measures are necessary.

Will retaining wall also be placed on basalt stratum? Because of the shallow depth to rock any vibrations caused by hard excavation techniques need to be addressed so as not to cause any damages to adjoing properties.

Earth disturbing activities may create exposed areas at the project site that are susceptible to erosion from wind and rain. The construction contractor is expected to implement dust barriers/fences and other dust control measures that effectively minimize or prevent nuisance concerns from fugitive dust and the effects of wind erosion. Mitigation that addresses sediment-laden runoff is discussed in Section 2.4, Water Resources. Areas affected by project actions will be stabilized and either paved or landscaped, which reduces the long-term potential for erosion by water and wind. No graded areas will remain uncovered.

Topography

Most of the project site is located between approximately 145 to 165 feet above mean sea level (refer to Figure 8). The general topography of the surrounding area suggests that the project site originally sloped from northeast to southwest. Undeveloped land along the northeastern to southeastern boundaries of the project site may reflect the original topography of the area, whereas developed portions of the project site are mostly level. Retaining walls define the site boundaries and were constructed when the project site was developed for use as a BWS facility.

Project actions may include the acquisition of approximately 0.03 acres of land from the adjacent Wailupe Community Park site at TMK 3-6-019: 012 in order to comply with the setback requirements associated with the extension of the access road around the new reservoir. The relatively flat, unobstructed area that abuts the retaining wall and concrete gutter is between approximately 150 to 160 feet above mean sea level.

Why is a waiver on the set backs not discussed. It seems like this project could easily get one in the upper watershed elevations of Wailupe Valley. Wailupe Stream is approximately 8.1 miles in length; however, about 2 miles of its lower reach have been altered. The project site is approximately 0.17 miles (or approximately 900 linear feet) east of Wailupe Stream, which drains to Maunalua Bay. The project site is approximately one mile north of Maunalua Bay, which has a marine water quality classification of Class A. Nonpoint source pollution including sediment-laden runoff from urban activities is considered to be a threat to coastal ecosystems.

Impacts and Mitigation Measures

Project actions would not significantly impact the underlying aquifer and groundwater resource in the Waialae-East ASYA, especially since the BWS facility does not involve the development of a new potable water source and no additional pumping capacity is proposed as part of the project. The long-term use of the project site represents a continuation of the current site usage and would not affect groundwater recharge. No significant impacts to surface water quality are anticipated since the project site is devoid of such resources including wetlands, perennial streams, or other sensitive riparian habitats. Construction of the new reservoir and access road ultimately reduces nonpoint source pollution concerns and the long-term potential for erosion by water and wind.

A short-term and temporary impact of the project may occur from the generation of sediment-laden surface runoff during earth-disturbing activities, especially if heavy rains coincide with the activity. A National Pollutant Discharge Elimination System (NPDES) Permit for discharges of pollutants, including storm water runoff (e.g., construction dewatering effluent) is required for the disturbance of one acre or more of total land area pursuant to HAR Title 11, Chapter 55, "Water Pollution Control" effective December 6, 2013. The project site is an area of less than one acre that is not part of a larger common plan of development or sale. DOH will be consulted if it is determined that the NPDES Permit is necessary. DLNR's Division of Forestry and Wildlife (DFW) in its letter dated July 15, 2014 recommended maintaining vegetated areas and diverting water from paved areas to vegetated bioswales to help reduce sediment runoff. The construction contractor will be responsible for implementing a storm water management plan that incorporates runoff and erosion control measures intended to prevent a concentration of runoff from flowing down the paved road and into residential areas. No adverse impact from the project is anticipated after the completion of construction.

Because of the susceptibility of the site to erosion due to the geology discussed in 2.3 what special precautions will be done during construction?

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

October 26, 2015

TO: ROBERT J. KRONING, P.E., DIRECTOR
DEPARTMENT OF DESIGN AND CONSTRUCTION

FROM: ERNEST Y. W. LAU, P.E., MANAGER AND CHIEF ENGINEER

SUBJECT: YOUR LETTER DATED SEPTEMBER 9, 2015 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE BOARD OF WATER SUPPLY AINA HAINA 170' POTABLE RESERVOIR NO. 2 – TAX MAP KEY: (1) 3-6-016: 040 AND (1) 3-6-019: 012, HONOLULU, OAHU, HAWAII

Thank you for your letter dated September 9, 2015 regarding the Draft Environmental Assessment for the Aina Haina 170' Reservoir No. 2 project.

We acknowledge that the proposed reservoir could apply for a waiver from setback requirements outlined in Chapter 21, Revised Ordinances of Honolulu (Land Use Ordinance) in order to reduce the amount of land that the Board of Water Supply must acquire from the Wailupe Community Park. The Final Environmental Assessment will recommend that the project designer explore the possibility of obtaining a waiver from setback requirements in order to minimize the amount of land that must be acquired from Wailupe Community Park.

Your letter commented that slope stability must be checked to ensure that ground disturbance during realignment of the retaining wall will not affect ground stability at the Wailupe Community Park. Your letter also commented that, because of the shallow depth to rock, any vibrations caused by hard excavation techniques needs to be addressed so that no damage is caused to adjoining properties. The Final Environmental Assessment will indicate an additional geotechnical survey be done during design of the proposed project and will mention that the geotechnical and structural engineers must ensure soil stability at the Wailupe Community Park before the City and County of Honolulu can agree to the proposed project. The Final Environmental Assessment will also state that the contractor should be responsible for ensuring that excavation techniques do not cause excess vibrations, which could result in damage to adjoining properties.

If you have any questions, please contact Scot Muraoka, Long Range Planning Branch of our Water Resources Division at 748-5942.

cc: / Jason Nakata, The Limtiaco Consulting Group

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 768-8000 • FAX: (808) 768-6041
DEPT. WEB SITE: www.honoluludpp.org • CITY WEB SITE: www.honolulu.gov

KIRK CALDWELL
MAYOR

GEORGE I. ATTA, FAICP
DIRECTOR

ARTHUR D. CHALLACOMBE
DEPUTY DIRECTOR

2015/ELOG-1734 (tb)

September 11, 2015

MEMORANDUM

TO: Ernest Y. W. Lau, P.E., Manager and Chief Engineer
Board of Water Supply

ATTN: Scot Muraoka, P.E., Project Manager
Board of Water Supply

FROM: George I. Atta, FAICP, Director
Department of Planning and Permitting

SUBJECT: Draft Environmental Assessment for the Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2, Honolulu, Hawaii
Tax Map Keys: (1) 3-6-016: 040 and (1) 3-6-019: 012

Thank you for your letter dated August 18, 2015, regarding a request for comments on the Draft Environmental Assessment (EA) for the Board of Water Supply Aina Haina 170' Potable Reservoir No. 2 project. We have the following comments:

1. Section 2.6, Natural Hazards, should disclose that the proposed project is below the Ailuna Leighton slide area. According to Figure 7, it appears the proposed project will include grading to create a sloped condition uphill of the reservoirs.

   Discuss the impacts, if any, that the grading work would have to the overall stability of the slide area. A slope hazard evaluation may be required at a later date.

2. The project will require an indirect drain connection license. Please amend Section 5, Permits and Approvals accordingly.

3. A subdivision application shall be submitted to adjust the property line. Please amend Section 5, Permits and Approvals accordingly.

Should you have any questions, please contact Thomas Blair of our staff at 768-8030.

GIA:bkg
1279885

cc: Jason S. Nakata, The Limtiaco Consulting Group

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

October 23, 2015

10-29-15P02:03 RCVD

TO: GEORGE I. ATTA, FAICP, DIRECTOR
DEPARTMENT OF PLANNING AND PERMITTING

FROM: ERNEST Y. W. LAU, MANAGER AND CHIEF ENGINEER

SUBJECT: YOUR LETTER DATED SEPTEMBER 11, 2015 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE AINA HAINA 170' POTABLE RESERVOIR NO. 2, TAX MAP KEY: (1) 3-6-016: 040 AND (1) 3-6-019: 012, HONOLULU, OAHU, HAWAII

Thank you for your letter dated September 11, 2015 regarding the Draft Environmental Assessment (EA) for the Aina Haina 170' Reservoir No. 2 project.

We have the following responses to your comments:

1. Section 2.6 of the Final EA will mention that the proposed project is located downhill of the Ailuna-Leighton slide area, and will indicate that an additional geotechnical study be done during design of the project.

2. An indirect drain connection license will be added to Section 5.

3. A subdivision application will be added to Section 5.

If you have any questions, please contact Scot Muraoka, Long-Range Planning Branch of our Water Resources Division, at 748-5942.

cc: Jason Nakata, The Limtiaco Consulting Group

DEPARTMENT OF PARKS & RECREATION

CITY AND COUNTY OF HONOLULU

1000 Uluohia Street, Suite 309, Kapolei, Hawaii 96707
Phone: (808) 768-3003 • Fax: (808) 768-3053
Website: www.honolulu.gov

KIRK CALDWELL
MAYOR

MICHELE K. NEKOTA
DIRECTOR

JEANNE C. ISHIKAWA
DEPUTY DIRECTOR

10 13 26A13-379CEDL

September 24, 2015

Mr. Jason Nakata, Staff Engineer
The Limtiaco Consulting Group
1622 Kanakanui Street
Honolulu, Hawaii 96817

Dear Mr. Nakata:

SUBJECT: Draft Environmental Assessment for the Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2
Tax Map Key (1) 3-6-016:040 and (1) 36-6-019:12
Honolulu, Oahu, Hawaii

Thank you for the opportunity to review and comment on the Draft Environmental Assessment for the Honolulu Board of Water Supply (BWS) Aina Haina 170' Potable Reservoir No. 2.

The Department of Parks and Recreation (DPR) understands that the project may require acquisition of .03 acres of Wailupe Community Park to accommodate the extension of an access road within the project site that will encircle the new reservoir and for compliance with the setback requirements of the Land Use Ordinance.

The DPR does not currently object to the Board of Water Supply (BWS) acquiring the proposed .03 acres as its acquisition will have no impact on any of our programs or facilities and or proposed park improvements.

As stated in our July 17, 2014 comments at the Pre-Consultation Stage of the environmental assessment, the DPR does have concerns that there are existing park improvements including children's play apparatus that may represent challenges to BWS's contractor being able to utilize park property for vehicles and equipment required to construct portions of the reservoir improvements from the park side.

Please continue to dialogue with Todd Hiranaga, District I Manager, at 373-8013 regarding these concerns.

Should you have any questions, please contact Mr. John Reid, Planner at 768-3017.

Sincerely,

Michele K. Nekota
Director

MKN:jr
(621614)

cc: Scott Muraoka, P.E., Board of Water Supply
Todd Hiranaga, Parks Recreation District Manager II
Wynn Hamano, Budget and Fiscal Services

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

October 15, 2015

10-22-15P01:03 RCVD

TO: MICHELE K. NEKOTA, DIRECTOR
DEPARTMENT OF PARKS AND RECREATION

FROM: ERNEST Y. W. LAU, P.E., MANAGER AND CHIEF ENGINEER

SUBJECT: YOUR LETTER DATED SEPTEMBER 24, 2015 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE BOARD OF WATER SUPPLY AINA HAINA 170' POTABLE RESERVOIR NO. 2 – TAX MAP KEY: (1) 3-6-016: 040 AND (1) 3-6-019: 012, HONOLULU, OAHU, HAWAII

Thank you for your letter dated September 24, 2015 regarding the Draft Environmental Assessment (EA) for the Aina Haina 170' Reservoir No. 2 project.

We acknowledge that the Department of Parks and Recreation (DPR) does not currently object to the proposed project, as the acquisition of approximately 0.03 acres from the Wailupe Community Park will have no impact to any programs, facilities, or park improvements.

We acknowledge DPR concerns that existing children's play apparatus may represent challenges to the Board of Water Supply (BWS) contractor for vehicles and equipment required to construct portions of the reservoir improvements from the Wailupe Community Park property. The Final EA will include a discussion of the existing equipment. We expect construction activities to take place from within the BWS property. We will continue dialogue with Todd Hiranaga, District 1 Manager, throughout the project process.

If you have any questions, please contact Scot Muraoka, Long-Range Planning Branch of our Water Resources Division, at 748-5942.

cc: Jason Nakata, The Limtiaco Consulting Group

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, THIRD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 768-4730 • Internet: www.honolulu.gov

KIRK CALDWELL
MAYOR

MICHAEL D. FORMBY
DIRECTOR

MARK N. GARRITY, AICP
DEPUTY DIRECTOR

TP8/15-621689R

September 16, 2015

09-17-15P02:29 RCVD

Mr. Jason S. Nakata
Staff Engineer
The Limtiaco Consulting Group
1622 Kanakanui Street
Honolulu, Hawaii 96817

Dear Mr. Nakata:

SUBJECT: Draft Environmental Assessment for Board of Water Supply Aina Haina 170' Potable Reservoir No. 2, Honolulu, Oahu, Hawaii

In response to your letter dated August 18, 2015, we have the following comments:

1. Ensure that the access driveway to the project site is safe for pedestrians and bicyclists to cross.

2. Any damage to the roadway and sidewalk area caused by any contractor's vehicles entering the project site should be repaired and the area should be restored to its original condition or better.

Thank you for the opportunity to review this matter. Should you have any questions, please contact Renee Yamasaki of my staff at 768-8383.

Very truly yours,

Michael D. Formby
Director

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

October 15, 2015

TO: MICHAEL D. FORMBY, DIRECTOR
DEPARTMENT OF TRANSPORTATION SERVICES

FROM: ERNEST Y. W. LAU, P.E., MANAGER AND CHIEF ENGINEER

SUBJECT: YOUR LETTER DATED SEPTEMBER 16, 2015 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE BOARD OF WATER SUPPLY AINA HAINA 170' POTABLE RESERVOIR NO. 2 – TAX MAP KEY: (1) 3-6-016: 040 AND (1) 3-6-019: 012, HONOLULU, OAHU, HAWAII

Thank you for your letter dated September 16, 2015 regarding the Draft Environmental Assessment (EA) for the Aina Haina 170' Reservoir No. 2 project.

We concur that the access driveway to the project site should be safe for pedestrians and bicyclists to cross. We acknowledge that any damage to the roadway and sidewalk area caused by construction vehicles entering the project site must be repaired and restored. These requirements will be added to the Final EA.

If you have any questions, please contact Scot Muraoka, Long-Range Planning Branch of our Water Resources Division, at 748-5942.

cc: Jason Nakata, The Limtiaco Consulting Group

HONOLULU FIRE DEPARTMENT
CITY AND COUNTY OF HONOLULU
636 South Street
Honolulu, Hawaii 96813-5007
Phone: 808-723-7139 Fax: 808-723-7111 Internet: www.honolulu.gov/hfd

September 17, 2015

TO: ERNEST LAU, P.E., MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

ATTN: SCOT MURAOKA, P.E.
PROJECT MANAGER

FROM: SOCRATES D. BRATAKOS, ASSISTANT CHIEF

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT
BOARD OF WATER SUPPLY'S AINA HAINA 170' POTABLE RESERVOIR NO. 2
TAX MAP KEYS: 3-6-016: 040
3-6-019: 012

In response to a letter received from Mr. Jason Nakata of The Limtiaco Consulting Group dated August 18, 2015, regarding the above-mentioned subject, the Honolulu Fire Department determined that there will be no significant impact to fire department services.

Should you have questions, please contact Battalion Chief Terry Seelig of our Fire Prevention Bureau at 723-7151 or tseelig@honolulu.gov.

SOCRATES D. BRATAKOS
Assistant Chief

SDB/SY:bh

cc: Mr. Jason Nakata
The Limtiaco Consulting Group

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

October 7, 2015

TO: SOCRATES D. BRATAKOS, ASSISTANT CHIEF
HONOLULU FIRE DEPARTMENT

FROM: ERNEST Y. W. LAU, P.E., MANAGER AND CHIEF ENGINEER

SUBJECT: YOUR LETTER DATED SEPTEMBER 17, 2015 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED HONOLULU BOARD OF WATER SUPPLY AINA HAINA 170' POTABLE RESERVOIR NO. 2

Thank you for your letter dated September 17, 2015 regarding the Draft Environmental Assessment for the proposed Aina Haina 170' Potable Reservoir No. 2.

We acknowledge that the proposed project will have no significant impact on the Honolulu Fire Department.

If you have any questions, please contact Scot Muraoka, Long Range Planning Branch of our Water Resources Division at 748-5942.

cc: S. Muraoka
15-1505

POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU
801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulupd.org

KIRK CALDWELL
MAYOR

LOUIS M. KEALOHA
CHIEF

DAVE M. KAJIHIRO
MARIE A. McCAULEY
DEPUTY CHIEFS

OUR REFERENCE MT-DK

August 27, 2015

09-02-15P03:12 RCVD

MEMORANDUM

TO: Ernest Y. W. Lau, P.E., Manager
Board of Water Supply

ATTENTION: Scott Muraoka, P.E., Project Manager

FROM: Louis M. Kealoha, Chief of Police

SUBJECT: Draft Environmental Assessment - Proposed Honolulu Board of Water Supply Aina Haina 170' Potable Reservoir No. 2

This is in response to The Limtiaco Consulting Group's letter of August 18, 2015, concerning the subject above.

Based on the information provided, this project should have no significant impact on the service or operations of the Honolulu Police Department at this time.

If there are any questions, please call Major Lester Hite of District 7 (East Honolulu) at 723-3369.

Thank you for the opportunity to review this project.

Louis M. Kealoha
Chief of Police

By Mark Tsuyemura
Mark Tsuyemura
Management Analyst VI
Office of the Chief

cc: ✓Mr. Jason Nakata, Staff Engineer,
The Limtiaco Consulting Group

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

October 2, 2015

10-07-15-91901-ARNV

TO: LOUIS M. KEALOHA, CHIEF
HONOLULU POLICE DEPARTMENT

FROM: ERNEST Y. W. LAU, P.E. MANAGER AND CHIEF ENGINEER

SUBJECT: YOUR LETTER DATED AUGUST 27, 2015 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED HONOLULU BOARD OF WATER SUPPLY AINA HAINA 170' POTABLE RESERVOIR NO. 2

Thank you for your letter dated August 27, 2015 regarding the Draft Environmental Assessment for the proposed Aina Haina 170' Potable Reservoir No. 2.

We acknowledge that the proposed project should have no significant impact on the Honolulu Police Department.

If you have any questions, please contact Scot Muraoka, Long Range Planning Branch of our Water Resources Division at 748-5942.

cc: Jason Nakata, The Limtiaco Consulting Group

November 30, 2015

Mr. Ernest Y. W. Lau, P. E.
Manager and Chief Engineer
Board of Water Supply
630 South Beretania Street
Honolulu, HI. 96843

Thank you for your letter dated October 22, 2015 acknowledging my concerns regarding the proposed project slated for the Reservoir no. 2 on Alamuku Street.

The potential damage that may be caused by the construction is of great concern. I have a swimming pool that is partially under ground, as our home which is in close vicinity to the proposed project. The Aina Haina area has been known for slow-moving landslides. It would be prudent to reassure the surrounding community of the potential damage that may occur.

The statement in your letter that the contractor should be responsible for ensuring that excavation techniques do not cause excess vibration, which could result in damage to adjoining properties, does not give me peace of mind.

A statement is one thing, a written commitment that the city and county will absorb any damage done to our property is peace of mind.

Regards,

Curtis and Dale Fujimura
830 Alamuku Street
Honolulu, HI. 96821

808-387-1968

cc: Jason Nakata, Limtiaco Consulting Group, Inc.

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

October 22, 2015

Ms. Dale Fujimura
830 Alamuku Street
Honolulu, Hawaii 96821

Dear Ms. Fujimura:

Subject: Your Phone Call of August 20, 2015 Regarding the Draft Environmental Assessment for the Aina Haina 170' Reservoir No. 2, Tax Map Key: (1) 3-6-013: 040 and (1) 3-6-019: 012, Honolulu, Oahu, Hawaii

Thank you for your phone call on August 20, 2015 to our consultant, Mr. Jason Nakata at The Limtiaco Consulting Group with your comments regarding the proposed project. We understand you have concerns that the proposed project may potentially result in damage to your property due to settlement or vibrations during construction.

The Final Environmental Assessment will indicate an additional geotechnical survey be done during design of the proposed project and will mention that the geotechnical and structural engineers must ensure that the proposed project will not result in any adverse impacts to slope stability. The Final Environmental Assessment will also state that the contractor should be responsible for ensuring that excavation techniques do not cause excess vibration, which could result in damage to adjoining properties.

If you have any questions, please contact Scot Muraoka, Long Range Planning Branch of our Water Resources Division at 748-5942.

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

cc: Jason Nakata, The Limtiaco Consulting Group

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

April 5, 2016

Ms. Dale Fujimura
830 Alamuku Street
Honolulu, Hawaii 96821

Dear Ms. Fujimura:

Subject: Your Letter of November 30, 2015 Regarding the Proposed Aina Haina Reservoir No. 2 on Alamuku Street - Tax Map Key (1) 3-6-13: 40 and (1) 3-6-19: 12, Honolulu, Oahu, Hawaii

Thank you for your letter regarding the proposed Aina Haina Reservoir No. 2 on Alamuku Street. We understand that your home is in close proximity to the proposed project and recognize your concerns about potential damage to your property.

The Board of Water Supply (BWS) ensures measures will be taken to ensure that the project does not result in damage to surrounding properties. Any construction related damage would be investigated and addressed by BWS. We understand your concerns regarding responsibility for damages that may occur due to construction. In addition, your letter will be provided to the engineering design consultant that will be leading this project so that they are also aware of your concerns.

We apologize for the delay in our response and appreciate your understanding.

If you have any questions, please contact Scot Muraoka, Long Range Planning Branch of our Water Resources Division at 748-5942 or via email at smuraoka@hbws.org.

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

cc: Jason Nakata, The Limtiaco Consulting Group

09/14/2015

Scot Muraoka, P.E., Project Manager
Honolulu, Board of Water Supply
630 S. Beretania Street
Honolulu, HI 96843

Jason Nakata, Staff Engineer
The Limtiaco Consulting Group
1622 Kanakanui Street
Honolulu, HI 96817

Aloha Scot,

Re: DEA Aina Haina 170' Potable Reservoir No. 2

I only received the DEA letter yesterday. I would like to use this letter to establish my concerns before the deadline of 09/22/2015.

I have concerns about leakage. This project is directly across the street from my address. What is the Board of Water Supply's assurances of leakage prevention and liabilities. In the event that the leakage damages my property, who will be responsible to pay for all my property damages. I'm sure the assessment was done with soil and bedrock sampling, but with landside concerns in the valley above the old and the new reservoir location, can there be assurances towards the future impact to my property of land disturbances that will affect my property?.

Please forward this letter to Jason Nakata.

Sincerely,

Adleen and Terry Ichinose
866 Alamuku Street
Honolulu, HI 96821
tichinose7689@gmail.com

P.S. Please provide an Email address for future correspondences, communications will be faster and cheaper.

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

October 23, 2015

Terry and Adleen Ichinose
866 Alamuku Street
Honolulu, Hawaii 96821

Dear Mr. and Mrs. Ichinose:

Subject: Your Letter Dated September 14, 2015 Regarding the Draft Environmental Assessment for the Aina Haina 170' Reservoir No. 2, Tax Map Key: (1) 3-6-013: 040 and (1) 3-6-019: 012, Honolulu, Oahu, Hawaii

Thank you for your letter dated September 14, 2015 regarding the Draft Environmental Assessment for the Aina Haina 170' Reservoir No. 2 project.

The Board of Water Supply (BWS) ensures measures will be taken to ensure that the project does not result in leakage or damage to surrounding properties. Any construction related damage would be investigated and addressed by the BWS. We understand your concerns regarding responsibility for damages that may occur due to construction.

Mention of the Ailuna-Leighton slide area will be included in the Final Environmental Assessment. The Final Environmental Assessment will indicate an additional geotechnical survey be done during design of the proposed project and that geotechnical and structural engineers must ensure soil stability.

If you have any questions, please contact Scot Muraoka, Long Range Planning Branch of our Water Resources Division at 748-5942 or via email at smuraoka@hbws.org.

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

cc: Jason Nakata, The Limtiaco Consulting Group