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IN REPLY REFER TO:
WEC.CSE 22-012

April 4, 2022

Ms. Mary Alice Evans, Director
Environmental Review Program
Office of Planning and Sustainable Development
Department of Business, Economic Development and Tourism
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

SUBJECT: Draft Environmental Assessment and Anticipated Finding of No Significant Impact for the Ahuimanu Wastewater Pre-Treatment Facility Improvements and Equalization Facility
Koolaupoko District, Island of Oahu, Hawaii
Tax Map Key: (1) 4-7-004:006 (por.)

Dear Ms. Evans:

With this letter, the City and County of Honolulu, Department of Environmental Services (ENV), Division of Wastewater Engineering and Construction hereby transmits the Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI) for the proposed Ahuimanu Wastewater Pre-Treatment Facility Improvements and Equalization Facility project on the Island of Oahu for publication in the next available edition of The Environmental Notice. Persons interested in commenting must submit comments to the ENV within thirty days from the initial date that the notice was published in The Environmental Notice.

Simultaneous with this letter, we are providing your office with the required information and files concerning the DEA, along with a PDF-formatted electronic copy of the DEA-FONSI, via the Environmental Review Program's online submission platform.

If there are any questions, please contact Ms. Jaime Nishikawa of R.M. Towill Corporation at (808) 842-1133 or by email at jaimen@rmtowill.com, or Ms. Ashlee Saito of ENV at (808) 768-8760 or by email at ashlee.saito@honolulu.gov.

Sincerely,

Roger Babcock, Jr.

Roger Babcock, Jr., Ph.D., P.E.
Director

From: webmaster@hawaii.gov
To: DBEDT OPSD Environmental Review Program
Subject: New online submission for The Environmental Notice
Date: Friday, April 15, 2022 11:27:52 AM

Action Name

‘Āhuimanu Wastewater Pre-Treatment Facility Improvements and Equalization Facility

Type of Document/Determination

Draft environmental assessment and anticipated finding of no significant impact (DEA-AFNSI)

HRS §343-5(a) Trigger(s)

- (1) Propose the use of state or county lands or the use of state or county funds

Judicial district

O‘ahu - multiple districts

Tax Map Key(s) (TMK(s))

(1) 4-7-004:006 por.;
(1) 4-7-037:030 – Not an active part of ENV’s ‘Āhuimanu WWPTF and is occupied by the Department of Facility Maintenance’s (DFM) ‘Āhuimanu Dewatering Facility.
However, Conditional Use Permit No. 1999/CUP1-15, issued April 6, 1999, authorized the joint development of both parcels.

Action type

Agency

Other required permits and approvals

For information on the required permits and approvals, see Section 5 of the Draft Environmental Assessment.

Proposing/determining agency

City and County of Honolulu, Department of Environmental Services, Division of Wastewater Engineering and Construction

Agency contact name

Ashlee Saito

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Map It

Was this submittal prepared by a consultant?

Yes

Consultant

R. M. Towill Corporation

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(808) 842-1133

Consultant address

2024 North King Street, Suite 200
Honolulu, Hawaii 96819
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Map It

Action summary

The ENV plans to:
1. Rehabilitate the onsite wastewater storage system to prevent wastewater spills during storage events (force main or pump station failure or maintenance/conditional assessment shutdown) or projected peak wet weather flow conditions.
2. Renovate the Headworks to accommodate new screening and grit removal equipment and replace the non-functional odor control system.
3. Renovate the Influent Pump Station Building to accommodate an office/bathroom and rehabilitate interior equipment and utilities.
4. Replace deteriorating equipment located within the existing Effluent Pump Station and Auxiliary Generator and Blower Buildings, upgrade SCADA and security systems, demolish non-operational Sludge Dewatering Building and other general landscape/drainage improvements.

Reasons supporting determination

For the rationale in support of the determination, please refer to Section 7 of the Draft Environmental Assessment.

Attached documents (signed agency letter & EA/EIS)

- 220330_Ahuimanu-WWPTF-DRAFT-EA_COMPLETE.pdf
- WEC.CSE-22-012.pdf

Action location map

- AHUIMANUWWPTF-SHP.zip

Authorized individual

Jaime Nishikawa

Authorization

- The above named authorized individual hereby certifies that he/she has the authority to make this submission.

DRAFT ENVIRONMENTAL ASSESSMENT

Prepared and submitted in accordance with Hawaiʻi Revised Statutes, Chapters 205A and 343

ʻĀhuimanu Wastewater Pre-Treatment Facility Improvements and Equalization Facility

APPLICANT

Department of Environmental Services
City and County of Honolulu
1000 Uluohia Street, Suite 308
Kapolei, Hawaiʻi 96707

April 2022

DRAFT ENVIRONMENTAL ASSESSMENT

Prepared and submitted in accordance with Hawaiʻi Revised Statutes, Chapters 205A and 343

ʻĀhuimanu Wastewater Pre-Treatment Facility Improvements and Equalization Facility

APPLICANT

Department of Environmental Services

City and County of Honolulu

1000 Uluohia Street, Suite 308

Kapolei, Hawaiʻi 96707

PREPARED BY

R.M. Towill Corporation

2024 North King Street, Suite 200

Honolulu, HI 96819

April 2022

Project Summary

Project:	ʻĀhuimanu Wastewater Pre-Treatment Facility (WWPTF) Improvements and Equalization Facility
Applicant:	Department of Environmental Services (ENV) City and County of Honolulu (CCH)
Accepting Agency:	ENV, CCH
Agent:	R. M. Towill Corporation 2024 North King Street, Suite 200 Honolulu, Hawaiʻi 96819 (808) 842-1133
Location:	ʻĀhuimanu, Island of Oʻahu
Tax Map Key:	(1) 4-7-004:006 por. (1) 4-7-037:030 – Not an active part of ENV's ʻĀhuimanu WWPTF and is occupied by the Department of Facility Maintenance's (DFM) ʻĀhuimanu Dewatering Facility. However, Conditional Use Permit No. 1999/CUP1-15, issued April 6, 1999, authorized the joint development of both parcels.
Proposed Action:	The ENV plans to: 1. Rehabilitate the onsite wastewater storage system to prevent wastewater spills during storage events (FM or pump station failure or maintenance/conditional assessment shutdown) or projected peak wet weather flow conditions. 2. Renovate the Headworks to accommodate new screening and grit removal equipment and replace the non-functional OCS. 3. Renovate the IPS Building to accommodate an office/bathroom and rehabilitate interior equipment and utilities. 4. Replace deteriorating equipment located within the existing Effluent Pump Station (EPS) and Auxiliary Generator and Blower Buildings, upgrade SCADA and security systems, demolish non-operational Sludge Dewatering Building and other general landscape/drainage improvements.
Land Area:	Approximately 3.2 acres (project area on TMK [1] 4-7-004: 006 por.)
Present Use:	The ʻĀhuimanu WWPTF currently operates as a pretreatment, storage and pumping facility. The main WWPTF facilities include the Headworks, two (2) Equalization Basins, Effluent Pump Station, Influent Pump Station, and

	Blower and Generator Building.
State Land Use District:	Urban
Ko'olau Poko Sustainable Communities Plan Land Use Designation:	Institutional per Map A-2: Land Use Urban per Map A-3: Public Facilities
County Zoning District:	C - Country
Special Management Area:	No
FEMA/FIRM Designation:	X (areas of 0.2 percent annual chance floodplain) X (outside the 0.2 percent annual chance floodplain)
Permits Required:	Clearances and permits needed from the various State and City and County of Honolulu agencies include but are not limited to the following: **City and County of Honolulu** **ENV** • Finding of No Significant Impact **Department of Planning and Permitting (DPP)** • Construction plan review and approval • Building Permit • Grading and Stockpiling Permit • Trenching Permit • Permit to Discharge into the CCH Storm Drainage System **Department of Environmental Services** • Construction Plan Review and Approval • Industrial Wastewater Discharge Permit for Temporary Discharge **State of Hawai'i** **Department of Health** • Construction plan review and approval • National Pollutant Discharge Elimination System Permit for Authorizing Discharges Associated with Construction Storm Water, Hydrotesting and Construction Dewatering • Community Noise Variance (if nighttime construction is required) • Air Pollution Control Permit • Disability and Communication Access Board Plan Review **Department of Land and Natural Resources** • State Historic Preservation Department Approvals

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ABBREVIATIONS AND ACRONYMS

ACM	Asbestos Containing Material
AST	Above-Ground Storage Tank
AQI	Air Quality Index
BMP	Best Management Practices
BWS	Board of Water Supply
CCH	City and County of Honolulu
CDP	Census Designated Place
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CMC	Castle Medical Center
CSM	Collection Systems Maintenance
CWB	Clean Water Branch, DOH
DAR	Design Alternatives Report
dBA	Decibel Level A
DEA	Draft Environmental Assessment
DEM	Department of Emergency Management
DI	Ductile Iron
DLNR	Department of Land and Natural Resources
DOH	State of Hawaii Department of Health
DOT	Department of Transportation
DPP	Department of Planning and Permitting, CCH
DPR	Department of Parks and Recreation
DSP	Department of State Parks
EA	Environmental Assessment
EAL	Environmental Action Level, DOH
EIS	Environmental Impact Statement
ENV	Department of Environmental Services, CCH
EPA	Environmental Protection Agency
EPS	Effluent Pump Station
EQ Basins	Equalization Basins
ESA	Environmental Site Assessment
FACD	First Amended Consent Decree
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FM	Force Main

FONSI	Finding of No Significant Impact
FRP	Fiberglass Reinforced Plastic
FSCP	Final Spill Contingency Plan
HAR	Hawaii Administrative Rules
HECo	Hawaiian Electric Company
HFD	Honolulu Fire Department
HP	Horsepower
HPD	Honolulu Police Department
HRS	Hawaii Revised Statutes
HT	Hawaiian Telecom
IBC	International Building Code
IPS	Influent Pump Station
KK Tunnel	Kāne‘‘ohe – Kailua Sewer Tunnel
kWH	Kilowatt-Hour
KvA	Kilovolt Amps
LBP	Lead-Based Paint
LCP	Lead-Containing Paint
lf	Linear Feet
LOMR	Letter of Map Revision
LUO	Land Use Ordinance
MCC	Motor Control Centers
msl	Mean Sea Level
mg	Million Gallons
mgd	Million Gallons Per Day
NFIP	National Flood Insurance Program
NHC	National Hurricane Center
NWI	National Wetland Inventory
NO_3+NO_2	Nitrate +Nitrite
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
OCS	Odor Control System
PAH	Polynuclear Aromatic Hydrocarbon
PC	Primary Clarifier
PCB	Polychlorinated Biphenyl and Metals
ppm	Parts Per Million
PS	Pump Station

PTWC	Pacific Tsunami Warning Center
RCRA	Resource and Conservation Recovery Act
ROH	Revised Ordinances of Honolulu
ROW	Right-of-Way
SCADA	Supervisory Control and Data Acquisition
SCP	Sustainable Communities Plan
SDC	Seismic Design Categories
Sf	square feet
SHPD	State Historic Preservation Division, DLNR
SMA	Special Management Area
SP	Sampling Point
SWPPP	Storm Water Pollution Prevention Plan
USDA	U.S. Department of Agriculture
TDH	total dynamic head
TMK	tax map key
TN	Total Nitrogen
TP	Total Phosphate
TPH-DRO	Total Petroleum Hydrocarbon-Diesel Range Organic
TPH-RRO	Total Petroleum Hydrocarbon-Residual Range Organic
WWPTF	Wastewater Pre-Treatment Facility
WWTP	Wastewater Treatment Plant
VFD	Variable Frequency Drive

SECTION 1
Introduction

1.1 PROJECT OVERVIEW

The City and County of Honolulu (CCH), Department of Environmental Services (ENV) proposes to rehabilitate the onsite wastewater storage system and associated pumps and piping located at the ʻĀhuimanu Wastewater Pre-Treatment Facility (WWPTF) to ensure operations continue to provide approximately 800,000 gallons of storage during storage events or wet weather flow conditions. The structural conditions of the wastewater storage system, which utilize two (2) Equalization (EQ) Basins, Primary Clarifier (PC), Aerobic Digester and Rapid Block Tank, have significantly deteriorated and require rehabilitation or replacement of existing tanks, equipment and piping. The proposed project will rehabilitate structural walls of the storage tanks, improve the flow distribution system, replace aging piping/valves, demolish non-operational equipment and other necessary maintenance activities in order to ensure continued reliability of the existing wastewater storage system and minimize the potential for wastewater sewage spills during storage events (force main [FM] or pump station failure or maintenance/conditional assessment shutdown) or projected peak wet weather flow conditions. The proposed improvements will extend the design service life of the existing wastewater storage system by approximately 15 years.

The ENV also proposes to renovate the Headworks including the replacement of non-functional grit conveyers and an inefficient screening system that have impacted downstream equipment and the ʻĀhuimanu FM. The new grit and screening system will have a higher removal efficiency and mitigate grit settling in the EQ Basins and ʻĀhuimanu FM. It will also minimize noise levels. The non-functional odor control system (OCS) will be replaced with a new OCS with the capacity to pull 5,100 cubic feet per minute (cfm) from the existing Headworks, EQ Basins and wet well. The Influent Pump Station (IPS) Building will be renovated to meet current operational needs for an office/bathroom and rehabilitate interior equipment and utilities. Other proposed improvements include the replacement of deteriorated equipment located within the existing Effluent Pump Station (EPS) and Auxiliary Generator and Blower Buildings, upgrade the Supervisory Control and Data Acquisition (SCADA) and security systems, demolition the non-operational Sludge Dewatering Building, and other general landscaping/drainage improvements to ensure optimal operations of the ʻĀhuimanu WWPTF. See **Section 2** for a detailed project description.

1.2 PROJECT PURPOSE AND NEED

The purpose of the project includes:

1. Rehabilitate onsite wastewater storage system to prevent wastewater spills during storage events (FM or pump station failure or maintenance/conditional assessment shutdown) or projected peak wet weather flow conditions.

2. Renovate the Headworks to accommodate new screening and grit removal equipment and replace the non-functional OCS.
3. Renovate the IPS Building to accommodate an office/bathroom and rehabilitate interior equipment and utilities.
4. Replace deteriorating equipment located within the existing Effluent Pump Station (EPS) and Auxiliary Generator and Blower Buildings, upgrade SCADA and the security systems, demolish the non-operational Sludge Dewatering Building, and other general landscape/drainage improvements.

1.3 BASIS FOR THE ENVIRONMENTAL ASSESSMENT

In accordance with Hawaiʻi Revised Statutes (HRS), Chapter 343, Section 5, this project involves the following action that requires the preparation of an environmental assessment (EA):

> *(1) Propose the use of state or county lands or the use of state or county funds;*

Pursuant to the requirements of HRS, Chapter 343, and Hawaiʻi Administrative Rules (HAR), Chapter 11-200, the proposing agency, ENV, has determined that the project is not expected to have significant environmental effects. Based on analysis and review of environmental conditions, project effects, and proposed mitigation measures, it is anticipated that a Finding of No Significant Impact (FONSI) will be issued for this project.

1.4 PROPOSING AGENCY AND ACCEPTING AUTHORITY

The project is being undertaken with funds from the CCH ENV. In accordance with Chapter 343, Section 5, HRS, and Sections 11-200-4 and 11-200-9, HAR, the proposing agency and determination agency for this Draft EA is the CCH ENV.

FIGURE 1-1
Project Location

'Āhuimanu WWPTF Improvements and Equalization Facility DEA

DEPT. OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU

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SECTION 2
Project Description

2.1 PROJECT LOCATION

The project site is located at 47-305 Kahekili Highway in ʻĀhuimanu in Oʻahu's Koʻolau Poko district. It is located approximately 2.5 miles north of Kāneʻohe and approximately 1.5 miles south of Kahaluʻu. The project site is bordered to the west by Kahekili Highway (Route 83) and to the north, south and east by the channelized ʻĀhuimanu Stream. The project limits are shown in **Figure 1-1: Project Location**.

2.1.1 OWNER INFORMATION

The CCH is the recorded fee owner of the property, identified by tax map key (TMK) (1) 4-7-004:006. The ENV owns all of the ʻĀhuimanu WWPTF facilities and infrastructure. A Conditional Use Permit No. 1999/CUP1-15 was issued on April 6, 1999, which authorized the joint development of TMKs (1) 4-7-004:006 and (1) 4-7-037:030. However, the ʻĀhuimanu WWPTF facilities and infrastructure are located entirely on TMK (1)4-7-004:006. TMK (1)4-7-037:030 is not an active part of the ENV's ʻĀhuimanu WWPTF and is occupied by the CCH Department of Facility Maintenance's ʻĀhuimanu Dewatering Facility.

2.1.2 ʻĀHUIMANU WWPTF OPERATIONS

In 1964, the ʻĀhuimanu WWPTF was initially constructed as a secondary wastewater treatment plant (WWTP). In 1972, it was upgraded to provide tertiary wastewater treatment. However, nutrient removal capabilities were determined to be insufficient for discharging effluent into the adjacent channelized ʻĀhuimanu Stream, so in 1986 the WWTP was converted into a WWPTF with effluent being diverted to the Kāneʻohe WWTP (now the Kāneʻohe WWPTF) by way of a 16-inch FM for further treatment.

Currently, the ʻĀhuimanu WWPTF is a pretreatment, storage and pumping facility. Sewage flows into the facility via three (3) gravity sewers (ranging from 10 inches to 15 inches) which combine into a single 24-inch gravity sewer from the ʻĀhuimanu area and two (2) 12-inch FMs from the Kahaluʻu Housing Pump Station (PS) and Kahaluʻu PS. Effluent from the ʻĀhuimanu WWPTF is sent through a 16-inch FM to the Kāneʻohe WWPTF approximately five miles downstream. The primary processes utilize the Headworks (screenings and grit removal), two (2) EQ Basins (A and B) and EPS. Support processes include an OCS, emergency generator and blower facilities. The old Sludge Dewatering Building remains on-site, although it has not been in use since the conversion to the WWPTF in 1986. See **Figures 2-1, ʻĀhuimanu WWPTF General Site Plan – Existing**.

The ʻĀhuimanu WWPTF was required to comply with two requirements outlined in the 2010 Consent Decree, now referred to as the First Amended Consent Decree (FACD), between the CCH, State of Hawaiʻi Department of Health and Environmental Protection Agency (EPA). The first was to provide a minimum of 600,000 gallons of wastewater storage until the Kāneʻohe-Kailua Sewer Tunnel (KK Tunnel) completed an initial 2-year operational period. The first requirement was fulfilled when the KK Tunnel completed its initial 2-year operational period on June 29, 2020. The second requirement was the implementation of a force main spill contingency plan. The second requirement was fulfilled by the Final Spill Contingency Plan for Ahuimanu Force Main (2012, Fukunaga and Associates, Inc.) (2012 FSCP). The 2012 FSCP identifies a total of 800,000 gallons of existing onsite storage and 25.3 hours of retention time currently available at the ʻĀhuimanu WWPTF. The retention time was based on a dry weather average flow of 0.76 million gallons per day (mgd) if the FM or EPS needs to be shut down for repair.

Liquid Waste Stream Processes

Wastewater is conveyed to the ʻĀhuimanu WWPTF and is screened and de-gritted at the Headworks before discharging into one compartment of the EQ Basin (Basin A). Screenings and grit are collected in hoppers for eventual landfill disposal. After passing through the EQ Basin compartments (Basin A or Basin B), wastewater enters the EPS wet well. The EPS conveys wastewater to the Kāneʻohe WWPTF via a 16-inch FM to the 24-inch Haiku Bypass Sewer and then to the 27-inch Kamehameha-Heʻeia Interceptor Sewer. The liquid waste stream process flow diagram of ʻĀhuimanu WWPTF is shown in **Figure 2-2, ʻĀhuimanu WWPTF Process Flow Diagram - Existing**.

During a storage event, such as a storm, wastewater is diverted from the EQ Basin to the existing onsite storage tanks by surcharging the sewer line leading to the IPS. The IPS was originally used to pump incoming raw wastewater to the different process facilities when ʻĀhuimanu was operating as a WWTP. Currently, the IPS is used to pump wastewater to the Rapid Block Tank for storage only. When the Rapid Block Tank is full, wastewater is pumped via submersible pumps (old "Ammonia Pumps") to the PC. After the PC is full, the flow is then pumped from the PC to the Aerobic Digester. Once these three (3) tanks are full, any overflow is sent by gravity to the EQ Basin B compartment. After the storage event is completed, wastewater in the Aerobic Digester and PC are drained to the IPS and pumped to the Rapid Block Tank. Wastewater in the Rapid Block Tank is drained by gravity to the EQ Basin B compartment and eventually pumped through the ʻĀhuimanu FM to the Kāneʻohe WWPTF.

The following is a description of the major liquid waste stream units:

<u>Headworks</u>

The purpose of the Headworks is to remove screenings and grit. The Headworks configuration consists of in-channel grinders followed by screening augers and a conveyor system. The in-channel grinders are JWC Channel Monsters powered by a 5-horsepower (HP) motor with an 8-foot extended motor shaft. The screenings augers are JWC Auger Monsters powered by 2 HP motors. The inclined perforated screen section is about 7 feet long and is within the hydraulic flow area of the channel. Solids are removed by inclined shaftless screw conveyors each approximately 30 feet long. Screenings from the augers are deposited into a horizontal conveyor which discharges to the screenings bin. There are two parallel grit chambers, each with an aeration system followed by Parkson inclined grit conveyors. The grit chambers are separated by a continuous wall except for a crossover slide gate near the upstream end. The grit conveyors collect grit from the bottom of the chambers and dispose the grit into external hoppers.

Equalization (EQ) Basins

The purpose of the EQ Basins is to reduce the maximum pumping rate to the downstream Kāneʻohe WWTP (now Kāneʻohe WWPTF) and minimize the total dynamic head (TDH) requirements. The EQ Basins can provide storage for up to 240,000 gallons of wastewater. Wastewater enters the EQ Basins via an influent box on the upstream end of the basins. Slide gates then direct the flow into Basin A or Basin B. Basin A and Basin B are separated by a 24-inch concrete dividing wall. Basin A is used for normal dry weather flow and Basin B is used for wet weather flows and wastewater storage. EQ Basin A is in continuous use and essentially serves as an extended wet well for the EPS. Air diffusers have been installed at the bottom of the EQ Basins in order to aerate the incoming wastewater.

Effluent Pump Station (EPS)

The purpose of the EPS is to convey wastewater to the Kāneʻohe WWPTF. The EPS is a 4-level structure with the top floor at grade and the 3 lower levels below grade. Wastewater enters the EPS wet well via a slide gate on the downstream side of the EQ Basins. There is about a 3-foot drop from the EQ Basins to the EPS wet well. Wastewater from the EPS is pumped to the Kāneʻohe WWPTF through a 5-mile long FM. Flow enters the EPS wet well through a slide gate in the EQ Basin wall. There are four (4) constant speed pumps located in the EPS. All four (4) pumps have a motor mounted on the top floor with a drive shaft extending to the pump located on the pump room floor approximately 30 feet below. Under normal flows, only one (1) pump is in operation. During peak flows, no more than two (2) pumps are placed into operation due to downstream hydraulic restrictions in the existing FM. The lead pump alternates depending on which pump has most recently been rebuilt and is therefore running the most efficiently. The pump operation is controlled by a float-level controller which is the originally installed equipment.

Force Main

The 16-inch polyethylene lined ductile iron (DI) FM was completed in 1984. The FM is divided into two (2) sections. The first segment is 12,400 lineal feet (lf), which operates as a typical pressurized FM. The latter segment is 12,300 lf and operates as a gravity sewer line except at the inverted siphons where the hydraulic grade line is above the sewer line.

Influent Pump Station (IPS)

The original purpose of the IPS was to pump incoming wastewater to the rest of the plant. The IPS has since been converted to pump wastewater to the onsite storage tanks during a peak wet weather flow or storage event. The IPS is a two-story structure with the top level at grade and the lower level approximately 15 feet below grade. There are four (4) constant-speed pumps located in the IPS. The pumps are controlled by a single float level controller. There are no remote controls for the IPS. The IPS is in operation only when onsite storage is required. Wastewater is diverted to the IPS via a diversion manhole located upstream of the EQ Basins. The IPS then pumps wastewater to the Rapid Block Tank.

Figure 2-1, ‘Āhuimanu WWPTF General Site Plan - Existing

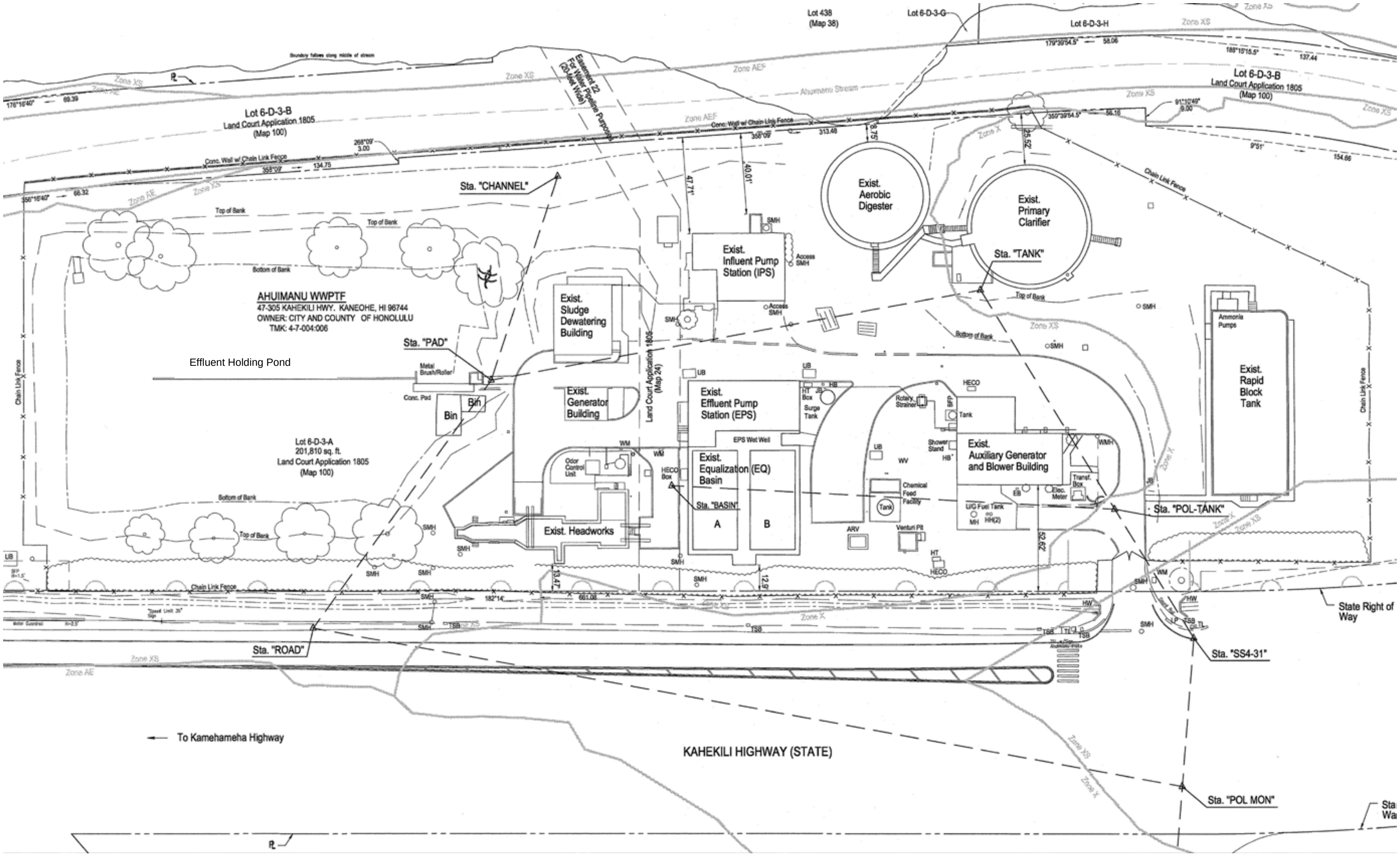
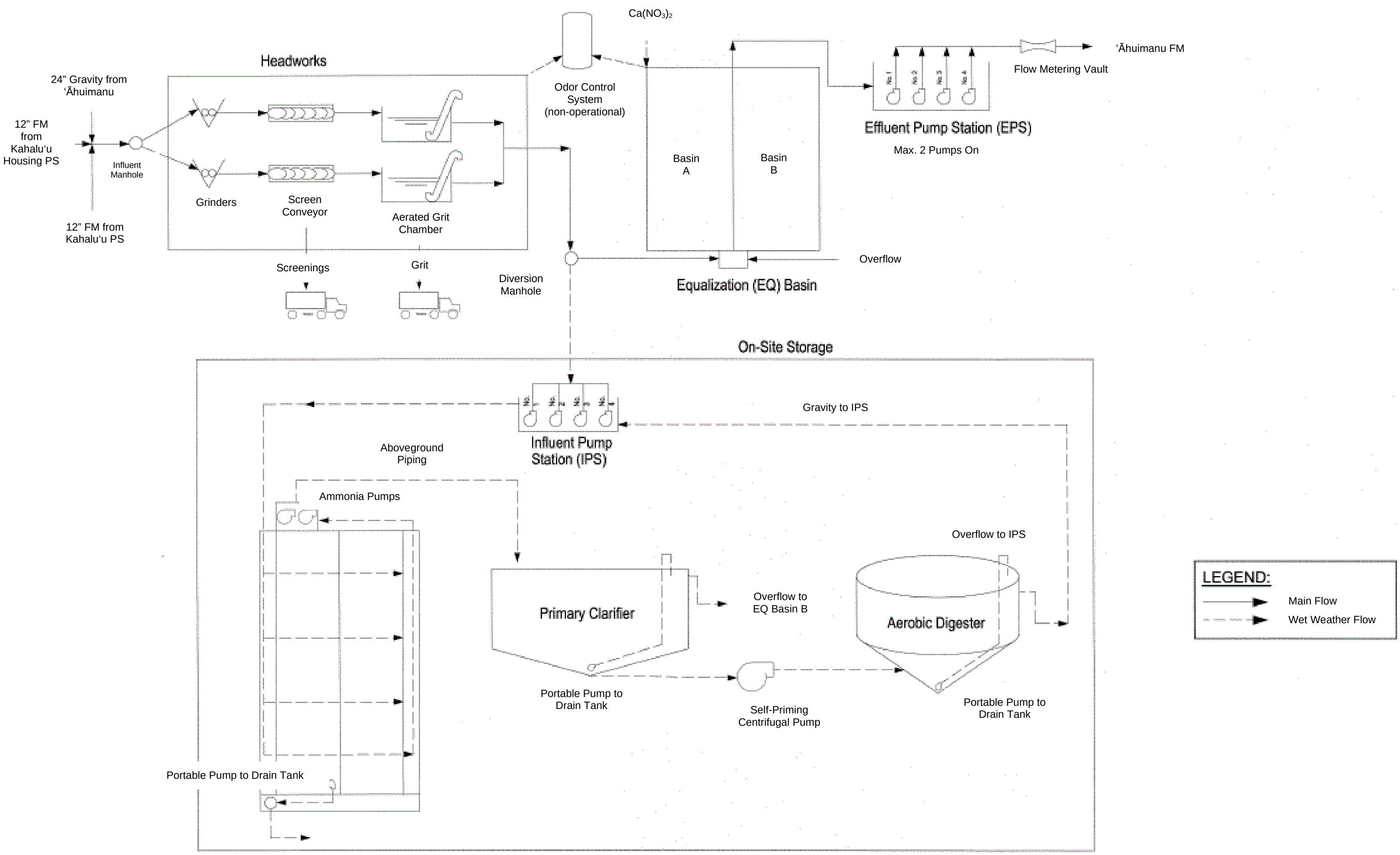


Figure 2-2, ‘Āhuimanu WWPTF Process Flow Diagram - Existing



Wastewater Storage System

The onsite storage system consists of the EQ Basins, the Rapid Block Tank, the PC and the Aerobic Digester, which provide approximately 800,000 gallons of storage. See **Table 2-1, Storage Tank Volumes**. The majority of the mechanical equipment associated with the storage facilities has been completely abandoned and is not operable. The exceptions to this are the old Ammonia Pumps in the Rapid Block Tank and the piping manifold adjacent to the PC.

During a storage-mode event, the flow is pumped to the Rapid Block Tank via the IPS. When the Rapid Block Tank is full, wastewater is pumped to the PC. Aboveground PVC piping between the Rapid Block Tank and the PC is laid on the surface between the two (2) tanks. Flow from the PC to the Aerobic Digester is pumped by a single self-priming centrifugal pump installed in the piping manifold. When the Rapid Block Tank and PC are full, any overflow is sent by gravity to EQ Basin B. Overflow from the Aerobic Digester is sent by gravity to the IPS, which again pumps wastewater to the Rapid Block Tank. When all four (4) storage tanks are filled, the flow runs backwards through the Headworks and surcharges the influent manhole, which overflows to the unlined holding pond at the north end of the facility. It is rare for a storm event to cause any of the storage tanks to overflow; in fact, it has only happened twice in the past 15 years.

Once the storage event is over, wastewater in the PC is pumped to the Aerobic Digester. Wastewater in the Aerobic Digester is pumped to an effluent line which flows by gravity to the IPS. The IPS then pumps the wastewater to the Rapid Block Tank. All wastewater in the Rapid Block Tank is pumped via a portable pump to an effluent channel which drains by gravity to EQ Basin B. If the storage event is a planned event due to FM or pump station maintenance, the flow will be diverted directly to EQ Basin B first rather than engaging all available storage tanks. This significantly reduces the required maintenance during and after the event.

Table 2-1: Storage Tank Volumes

Tank Name	Volume (million gallons, mg)
EQ Basins (A and B)	0.24
Rapid Block Tank	0.20
Primary Clarifier	0.17
Aerobic Digester	0.19
TOTAL	0.80

Support Systems

The following is a description of the major support systems:

<u>Blowers/Aeration</u>

There are three (3) blowers in the Auxiliary Generator and Blower Building. One (1) blower (Blower 3) was installed as part of the 1972 WWTP expansion, while the other two (2) (Blowers 4 and 5) were installed as part of the 1986 WWPTF construction. The blowers were originally designed to provide aeration to the existing Rapid Block Tank, the existing EQ Basins and the existing aerated grit chamber. Under normal operations, one blower is in service with the other two (2) are on standby.

Odor Control System

The original OCS included two (2) carbon scrubbers; one (1) 12-foot diameter duty scrubber and one (1) 5-foot diameter standby scrubber. The duty unit was designed to treat 6,000 cubic feet per minute (cfm) of foul air and the standby unit could treat 1,000 cfm of foul air. The OCS was intended to treat foul air from the Headworks and EQ Basins. The OCS is currently non-operational. The 12-foot carbon vessel has been removed leaving only the standby vessel in place.

A chlorine gas injection system was originally designed to inject chlorine into the EPS effluent to prevent generation of odors in the FM downstream. The chlorine injection facility has been abandoned and a new calcium nitrate feed system has been installed recently, although it has not yet been turned over to the CCH. Operations staff instead inject calcium nitrate into EQ Basin A directly from portable totes.

Non-Operational Facilities

The following is a description of the non-operational facilities:

Sludge Dewatering Building

The Sludge Dewatering Building houses old sludge filter presses, which have not been in use since the construction of the WWPTF. There is an additional room where the previous emergency generator was staged, but it has since been removed. This building is planned to be demolished.

Effluent Holding Pond

Under the original WWTP operations, treated wastewater effluent entered the holding pond through a pipe running down the center of the basin. A discharge pipe, with a control valve, located in the northeast corner of the basin was used to discharge treated effluent into the adjacent ‘Āhuimanu Stream. After the ‘Āhuimanu WWTP was converted into a WWPTF in 1986, the effluent holding pond was abandoned in place. In 2010, the discharge pipe was plugged and capped.

2.2 PROJECT DESCRIPTION

The ENV proposes to rehabilitate structural deterioration in the existing wastewater storage system identified in a structural condition assessment completed for the ‘Āhuimanu WWPTF in 2014 and again in 2020 as part of the Ahuimanu Wastewater Pre-Treatment Facility Improvements and Equalization Facility, Design Alternatives Report (2020, R.M. Towill Corporation) (2020 DAR). The 2020 DAR determined the wastewater storage system, which consists of the EQ Basins, Aerobic Digester, PC and Rapid Block Tank, has significant deterioration of storage tanks, equipment and piping.

To address structural and system deficits identified in the 2020 DAR, the Aerobic Digester, PC and Rapid Block Tank will be upgraded to improve their functionality as storage tanks. A new flow distribution system will allow each storage tank to directly receive flows from the IPS during storage events or peak wet weather flows. Each storage tank will be drained via a new gravity drain system that will be connected to the existing EQ Basin. During wet weather flows, the proposed renovations will allow the WWPTF to divert flows to the existing IPS wet well. From there flows will be pumped to the Aerobic Digester, PC and/or Rapid Block Tank for storage. The flows to each storage tank will be controlled by new motorized gate valves. Water levels will be monitored by new level transmitters. Once the flow conditions entering the WWPTF return to normal, each of the existing storage tanks may be drained via the new gravity drainage system, sending wastewater to existing EQ Basin B and then pumped from the EPS to the Kāneʻohe WWPTF. Portable submersible pumps will remove any residual wastewater that remain in the tanks and will be conveyed by gravity to the tank drainage system. The proposed improvements will extend the design service life of the existing wastewater storage system by approximately 15 years. See **Figure 2-3, ʻĀhuimanu WWPTF General Site Plan – Proposed** and **Figure 2-4, ʻĀhuimanu WWPTF Solid Waste Process Schematic - Proposed**. The existing issues and proposed renovations include the following:

EQ Basins

Key structural issues include the deterioration of T-Lock lining and elastomeric coating in tank structure, corrosion of concrete and rebar, and water infiltration between the floor slab and walls. Key operational issues include odor emissions due to non-operational OCS and/or lack of standby blower for the aeration system. Other general issues include the corrosion of handrails and deterioration of the existing fiberglass reinforced plastic (FRP) covers and sluice gates. The ENV plans to address key structural and operational issues to extend the EQ Basins' service life by approximately 20-30 years. Proposed renovations to the EQ Basins include the following:

- Rehabilitate the existing EQ Basin (A and B) and provide a new epoxy liner.
- Provide a new dry weather compartment.
- Reroute the existing piping.
- Replace the existing diffusers and aeration piping.
- Replace the existing FRP covers.
- Replace the existing gates.

Aerobic Digester / PC / Rapid Block Tank

A key operational issue relating to the storage system is it is labor-intensive to operate. Three (3) days are required to empty/clean the tanks if all three (3) are utilized. Additionally, there are no remote SCADA controls, so an operator must be onsite during peak flow storm events. Another operational issue is the Rapid Block Tank's hoppers are not typically completely dewatered, which reduces available storage capacity for the next storage event. Key structural issues include numerous unsafe components (i.e., cracks in walls, corroded rebar, eroded protective coating, rusted catwalk/access stairs/grating/railings). Proposed renovations to the wastewater storage system include the following:

- Rehabilitate the existing storage tanks.

- Rehabilitate the existing catwalks, railings and stairs as needed.
- Replace the existing piping and valves to provide more automation.

Based on other issues identified in the 2020 DAR, the ENV proposes to renovate the Headworks and IPS Building, replace deteriorated equipment located within the existing EPS and Auxiliary Generator and Blower Buildings, upgrade the SCADA system and demolish the non-operational Sludge Dewatering Building. See **Figure 2-3, ʻĀhuimanu WWPTF General Site Plan – Proposed** and **Figure 2-4, ʻĀhuimanu WWPTF Process Flow Diagram - Proposed**. The existing issues and proposed renovations include the following:

<u>Headworks and OCS</u>
Key structural issues include the deterioration of interior T-Lock lining, corrosion of concrete and rebar, and water infiltration though walls. Key operational issues include non-functional grit conveyers, inefficient screenings system and high noise levels. The existing grit conveyers and screening system have a lower removal efficiency, which have resulted in issues with grit settling in the EQ Basins, ʻĀhuimanu FM, and other downstream equipment.

Odor issues at the WWPTF are generally not an issue for the surrounding community; however, significant foul odors are noticeable around the Headworks, EQ Basins and EPS as the existing OCS is non-operational.

Proposed renovations to the Headworks and OCS will increase the footprint by approximately 2,880 square feet (sf). The expansion will occur on the footprint of the demolished Sludge Dewatering Building, which has not been utilized since 1986. See **Table 2-1: Proposed Changes to Building Footprints**. Proposed renovations to the Headworks include the following:

- Replace the existing Screenings Facility. Install new screens in existing channel.
- Replace the existing Grit Removal. Install new vortex grit removal system and grit washer.
- Rehabilitate the existing channels and provide new liner.
- Modify existing channel for the new mechanical equipment.
- Replace FRP covers with aluminum covers.
- Replace corroded railings.
- Replace existing gates.
- Provide new OCS with the capacity to pull 5,100 cfm of foul air from the existing Headworks, EQ Basins and wet well.

<u>IPS / Office</u>
Key structural issues include termite infestation in the wood structure and a leaking roof. Key operational issues include the insufficient ventilation system, lack of remote SCADA system, and unreliability due to exceeded service life. Other issues include the non-operational blowers and non-occupied laboratory room.

The IPS Building was previously expanded by 216 sf; however, the exact date is unknown. Proposed renovations to the IPS will not increase the existing building area and will repurpose the existing building area to meet current operational needs for an office and bathroom. Proposed renovations to the IPS include the following:

- Replace the existing pumps with new variable frequency drive (VFD) pumps.
- Rehabilitate the existing wet well.
- Replace the existing electrical equipment.
- Replace the existing piping and valves as needed.
- Provide ventilation.
- Demolish the existing laboratory extension.
- Replace existing office/bathroom that will be demolished in the EPS and Generator Building with new one.

<u>EPS</u>
Key operational issues include the long detention time of wastewater in the wet well due to the limitation of the EPS, insufficient ventilation system and high noise levels.

There have been community complaints specifically regarding odors emanating from several sections of the gravity segment of the ʻĀhuimanu FM. Odors are the result of extreme differential pressure swings associated with constant speed pumps located in the EPS, which are unable to modulate the pump to match wastewater flow rates and prevent air pressure spikes.

Proposed renovations to the EPS include the following:

- Replace existing constant speed pumps with three new VFD dry pit submersible pumps.
- Install a 4th smaller pump.
- Replace existing piping and valves as needed.
- Relocate the existing oil water separator.
- Replace the electrical equipment.
- Remove the bathroom as needed.
- Provide ventilation.
- Update the surge protection system.

<u>Auxiliary Generator and Blower Building</u>
A key issue is that only one (1) of the three (3) blowers is operational. Proposed renovations to the Auxiliary Generator and Blower Building include the following:

- Replace the existing generator.
- Replace the underground storage tank with new aboveground.
- Replace the existing above-ground storage tank (AST)
- Replace the existing blowers.
- Replace the existing aeration piping.
- Remove the existing office as needed.
- Enclose the existing chlorine storage area.

Electrical / SCADA

The ENV plans to modernize the existing SCADA system to meet the CCH's current standards. Proposed renovations to the electrical / SCADA system include the following:

- Replace Hawaiian Electric Company (HECo) transformer
- Replace existing service entrance conductors
- Replace existing switchboard, motor control centers (MCC) and electrical distribution equipment.
- Replace the second electrical system.
- Replace the existing exterior lighting.
- Upgrade the existing SCADA system to meet CCH standards.
- Provide security cameras and automatic gate at the entrance driveway.
- Provide ASCAM security system and card readers on all doors to the facilities.
- Provide video cameras inside the existing buildings.

Sludge Dewatering Building and Old Generator Room

The Sludge Dewatering Building has been abandoned since the WWTP was converted to a WWPTF in 1986. The Old Generator room is an additional room where the previous emergency generator was staged, but the generator has since been relocated. The ENV plans to demolish the building.

Table 2-2: Proposed Changes to Building Footprints

Description	**Type**	**Existing Building Area (sf)**	**Proposed Building Area (sf)**[1]
Headworks and OCS	Renovate	1,900	4,780
IPS – Ground Floor [2]	Renovate	1,120	1,120
Sludge Dewatering and Old Generator Room	Demolish	1,805	0
Total		4,825	5,900
Total Net Change in Building Area (sf)		1,075	

[1] Building area are based on preliminary designs and are subject to slightly change pending final design.
[2] The IPS Building was previously expanded by 216 sf; however the exact date is unknown.

Figure 2-3, 'Āhuimanu WWPTF General Site Plan - Proposed

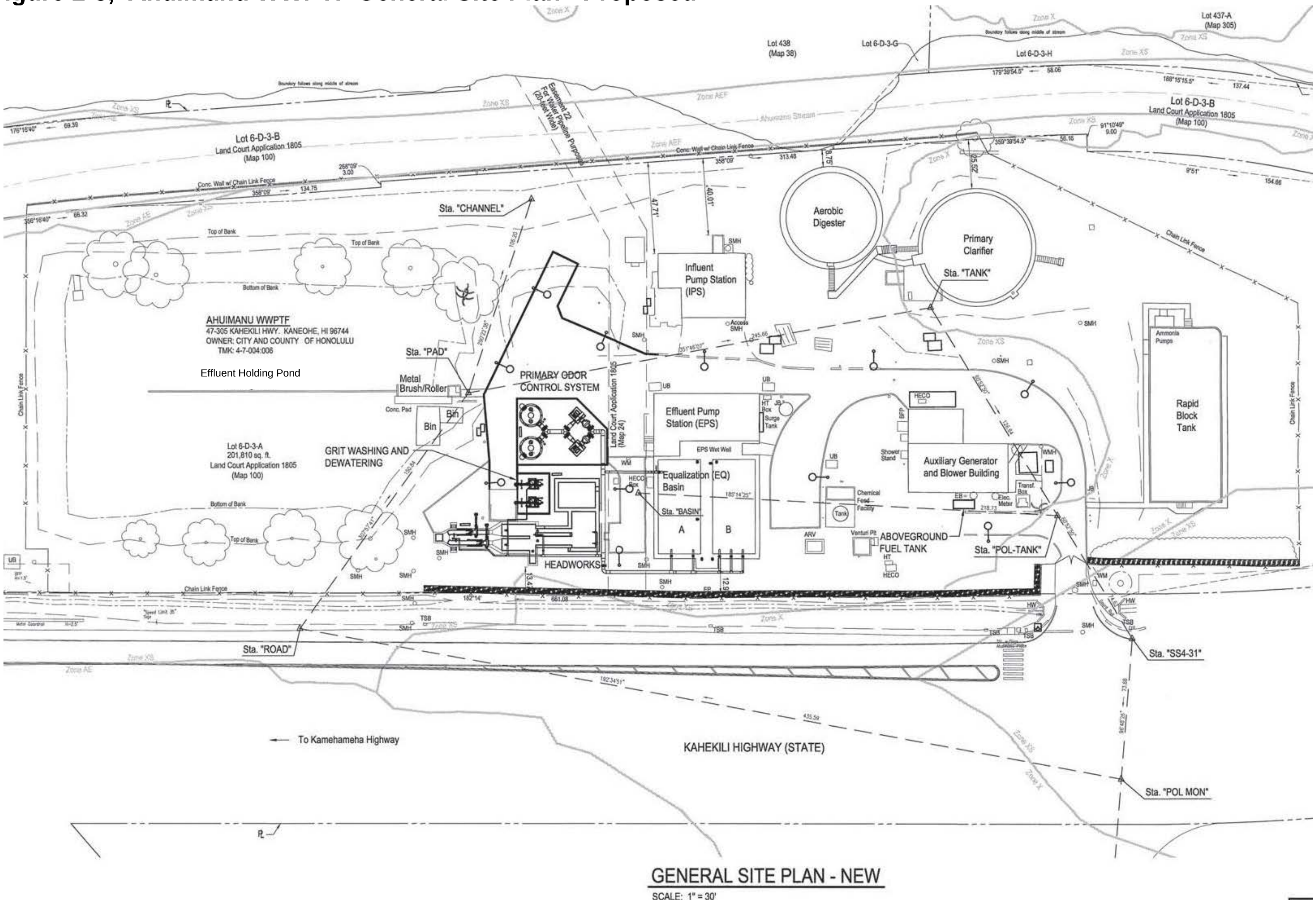
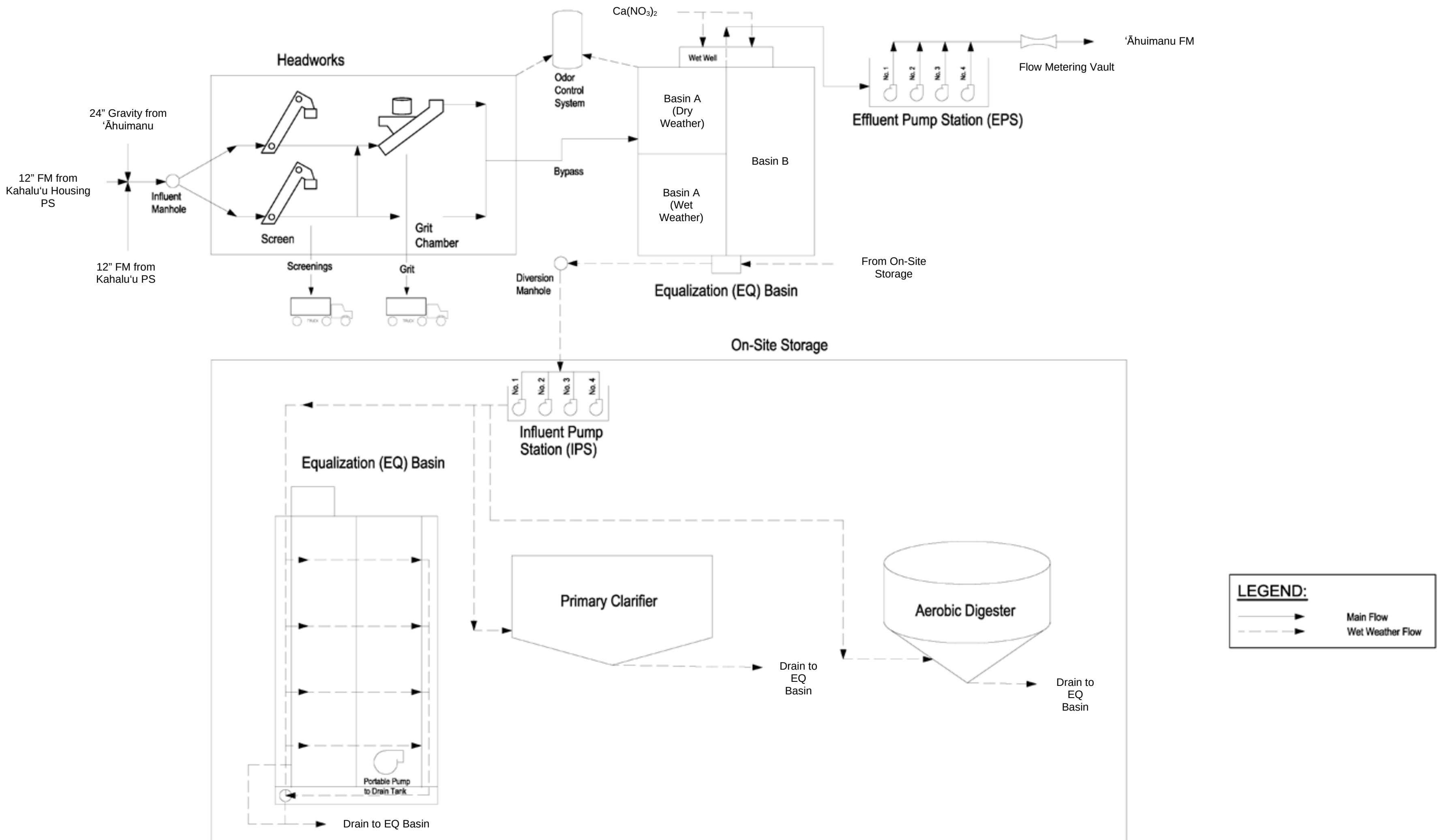


Figure 2-4, ‘Āhuimanu WWPTF Process Flow Diagram - Proposed



Additional proposed site work includes a truck turnaround and general improvements to the landscape and drainage. The T-shaped truck turnaround will be developed on the footprint of the demolished Sludge Dewatering Building. It will allow for improved vehicular access to the Headworks and OCS facilities as well as improved safety for trucks to turnaround and exit the WWPTF. For the Truck Turnaround Plan, see **Appendix A, Construction Drawings: Preliminary Site Plans**. General landscape improvements will remove the existing high-maintenance and overgrown trees located along Kahekili Highway, which deposit leaves/debris and create an operational hazard by clogging the ʻĀhuimanu WWPTF tanks and EQ basins. The existing overgrown trees will be replaced with low-maintenance shrubs and continue to provide a visual screening of the facility. General drainage improvements include site grading to direct runoff to the existing effluent holding pond and a new berm along the fence line adjacent to Kahekili Highway. The new berm will prevent stormwater runoff from Kahekili Highway flowing on to the ʻĀhuimanu WWPTF property. For more information on drainage, see **Section 3.3.2 Drainage System**.

The proposed project will occur on the already developed, existing ʻĀhuimanu WWPTF property. A majority of the proposed work items will not expand the footprint of the WWPTF including the rehabilitation of existing facilities, replacement of deteriorated equipment located inside existing buildings, and upgrade of technology/utilities. The proposed work items that will increase the WWPTF footprint include the expansion of the Headworks to accommodate new screening and grit removal equipment and replacement of the non-functional OCS; however, these two facilities will be expanded onto the area that is currently developed with the Sludge Dewatering Building. The Sludge Dewatering Building will be demolished since it has not been utilized since 1986. Additionally, the IPS Building will not increase the existing building area and will repurpose the building footprint to meet current operational needs for an office and bathroom. However, the IPS Building was previously expanded by 216 sf at an unknown date and the expansion was not permitted.

The proposed project will improve the reliability of the ʻĀhuimanu WWPTF to provide pretreatment processes and onsite wastewater storage during storage events or peak wet weather flows, thereby addressing existing Kailua – Kāneʻohe – Kahaluʻu wastewater service area issues of wastewater overloads and spills. The proposed improvements will also create a more efficient and safe work environment for operations staff by addressing existing issues with structural deterioration in equipment/facilities, labor-intensive processes, and lack of remote SCADA controls that meet current CCH standards. Additional benefits include the reduction of noise and odor emissions and the overall optimization of municipal wastewater service for the community and region. The proposed action includes all the recommended improvements identified for the ʻĀhuimanu WWPTF in the Koʻolau Poko Sustainable Communities Plan (SCP), Section 4.3.1 Kailua – Kāneʻohe – Kahaluʻu Wastewater Service Area (DPP, 2017). See **Section 4.5, Koʻolau Poko Sustainable Communities Plan**.

The preliminary project plans are provided in **Appendix A**.

2.3 PROJECT SCHEDULE AND COST

2.3.1 SCHEDULE

Completion of Permitting and Entitlements	August 2022
Award of Construction Contract	February 2024
Start of Construction	May 2024
Completion of Construction	May 2027

2.3.2 COST

The estimated construction cost for the proposed project is $46 million dollars.

2.4 ALTERNATIVES ANALYSIS

Several design and construction alternatives for the onsite wastewater storage system were evaluated during the planning phase of this project. The criteria used to compare alternatives include total wet weather storage capacity, constructability, cost, ease of operation, feasibility of adding septage receiving manhole/driveway, and available space for the Division of Wastewater Treatment and Disposal's Collection Systems Maintenance (CSM) drying bins. The Preferred Alternative is to reuse/rehabilitate the existing storage tanks. Alternative 2 is to construct a new storage tank and demolish the existing EQ Basins. Alternative 3 is to construct a new EQ Basin in addition to the existing EQ Basins. Additional alternatives proposed were to delay or halt the project.

2.4.1 PREFERRED ALTERNATIVE

The preferred alternative is to rehabilitate the existing storage tanks. This action would increase the reliability and safety of WWPTF operations to accommodate wastewater storage during storage events or peak wet weather flow conditions. See **Section 2.2** for a detailed project description. The benefits of the preferred alternative include ease of constructability, low construction costs, and available space for CSM drying bins. The preferred alternative would meet the purpose and need by completing the project in a timely manner to ensure continued reliability of the ʻĀhuimanu WWPTF for the surrounding community. See **Section 3, Description of Affected Environment** for a detailed description of impacts and mitigation measures. The preferred alternative would also support the objectives and policies outlined in state, county, and community plans. See **Section 4, Relationship to Land Use Plans and Policies** for a detailed description of how the proposed project relates to state, county and community plans.

2.4.2 ʻĀHUIMANU WWPTF ALTERNATIVES

The other alternatives evaluated during the planning phase of this project include the following:

- <u>Alternative 2 - New Storage Tank</u>
  Alternative 2 involves demolishing the existing EQ Basins and constructing a single new 1.0 MG EQ Basin. The estimated cost for Alternative 2 is approximately $57 million. To construct the new EQ Basin, the existing EQ Basin would be removed and all incoming flows would be routed directly to the EPS wet well. The IPS would remain and continue to pump flows to the new EQ Basin. The existing wastewater storage system would be demolished. Two

proposed sites for the new EQ Basins were evaluated: the site of the existing storage tanks and effluent holding pond.

However, Alternative 2 has the most complex construction phasing and high construction costs. Another construction issue includes the extended bypass period required while the EQ Basins are demolished and the influent piping to the EPS is reconfigured. Operational issues are related to the required use of the IPS for wet weather storage and the lack of dry weather compartments to reduce retention times. For these reasons, Alternative 2 was rejected from further consideration.

- <u>Alternative 3 – Existing EQ Basins with New EQ Basin</u>
  Alternative 3 involves maintaining the existing EQ Basins and constructing an additional new 0.84 MG EQ Basin. The estimated cost for Alternative 3 is approximately $53 - 58 million. The existing EQ Basin would be reconfigured to include a dry weather compartment, while maintaining a volume of 160,000 gallons for wet weather events. The new and existing EQ Basins would provide a total storage volume of 1 MG at the WWPTF. Two flow systems were considered: the existing IPS and a new gravity drain system. Two proposed sites for the new EQ Basin were evaluated: the site of the existing storage tanks and the effluent holding pond.

  However, Alternative 3 has a complex construction phasing and high construction costs. Another construction issue is any unknown underground obstruction could make the option infeasible. Operational issues are related to the required use of the IPS for wet weather storage and the existing EQ Basins needs to be aerated. For these reasons, Alternative 3 was rejected from further consideration.

2.4.3 NO ACTION

State legislation requires that a “no-action” alternative be considered to serve as a baseline against which potential actions can be measured. The no-action alternative would involve no effort to rehabilitate the onsite wastewater storage system, renovate the Headworks and IPS Building, replace deteriorated equipment located in the EPS and Auxiliary Generator and Blower Buildings, upgrade SCADA and other site improvements at the ʻĀhuimanu WWPTF. Under this alternative, project costs and environmental impacts resulting from work activities would be avoided, but the existing ʻĀhuimanu WWPTF would continue to operate as-is with no improvements. The “no-action” alternative would further perpetuate risks to public health, safety and sanitation by neglecting required maintenance and renovations to ensure optimal operations of the WWPTF to provide pretreatment processes and onsite wastewater storage during storage events or peak wet weather flows. Without the proposed project, the WWPTF would continue to contribute to existing issues of wastewater overloads and spills in the Kailua – Kāneʻohe – Kahaluʻu wastewater service area. Existing efficiency and safety issues regarding structural deterioration of equipment/facilities, labor-intensive operations, and lack of remote SCADA controls would continue to affect operations staff. Additionally, concerns regarding odors from the ʻĀhuimanu FM would continue to be an issue for the community. This alternative would therefore not meet the project purpose and need of providing reliable wastewater pretreatment and storage at ʻĀhuimanu WWPTF, and for this reason was rejected from further consideration.

2.4.4 DELAYED ACTION

The delayed action alternative would postpone improvements to the ʻĀhuimanu WWPTF to an unspecified future date. Under this alternative, environmental impacts resulting from work activities would be delayed, but are anticipated to be generally the same as with the preferred alternative for the project. It is also reasonable to expect that labor and material costs required for construction will increase over time, resulting in ultimately higher project costs if the action is delayed. The delayed action alternative would also fail to address inefficient equipment/facilities to fulfill pretreatment processes including grit removal as well as the structural deterioration of critical wastewater storage infrastructure. These conditions pose an unnecessary risk to public health and safety. For these reasons, the Delayed Action alternative is eliminated from further consideration.

SECTION 3
Description of Affected Environment

3.1 PHYSICAL ENVIRONMENT

3.1.1 CLIMATE

The project site is located on the windward side of Oʻahu. The windward region has a mild subtropical climate which is characterized by abundant sunshine, persistent northeast trade winds, relatively constant temperatures and moderate humidity. The area has constant trade wind exposure with average wind velocity in the area varying from 10 to 15 mph. Mean annual temperatures on the windward side range from high 80° F in the summer months to low 70° F in the winter months. Mean annual rainfall can range from about 3 inches during the summer months to as high as 9 inches during the winter months. Mean annual relative humidity ranges from 70% during the summer months to 73% during the winter months (UH, 2014).

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in any significant short or long-term impacts on the existing climatic conditions of the site or the surrounding region. No mitigation measures are necessary or recommended.

3.1.2 TOPOGRAPHY, GEOLOGY, AND SOILS

There are no unusual or unique topographic features within or surrounding the project site. The project site has a relatively flat topography where there is approximately 0% topographic gradient running east-west and a 1% topographic gradient running north-south within the project area. The existing ground elevations at the ʻĀhuimanu WWPTF range from 45 to 55 feet. Soils underlying the project site, as classified by the U.S. Department of Agriculture Soil Conservation Service (USDA, 1972), are described below and illustrated on **Figure 3-1: Soil Type**. For a description of soil contamination encountered on the project site, see **Section 3.1.8 Hazardous Waste**.

Soils within the project site:

- Hanalei Silty Clay (HnA) – Runoff is very slow; erosion hazard is no more than slight; 0 to 2 percent slopes.

Soils that occur in the vicinity of the project site include:

- Alaeloa (AeE) – Runoff is medium; erosion hazard is moderate; 15 to 35 percent slopes.
- Alaeloa Silty Clay (ALF) – Runoff is rapid to very rapid; erosion hazard is severe; 40 to 70 percent slopes.
- Loleka`a Silty Clay (LoB) – Runoff is slow; erosion hazard is slight; 3 to 8 percent slopes.
- Loleka`a Silty Clay (LoD) – Runoff is medium; erosion hazard is moderate; 15 to 25 percent slopes.
- Lolekaʻa Silty Clay (LoE) – Runoff is medium to rapid; erosion hazard is moderate to severe; 25 to 40 percent slopes.

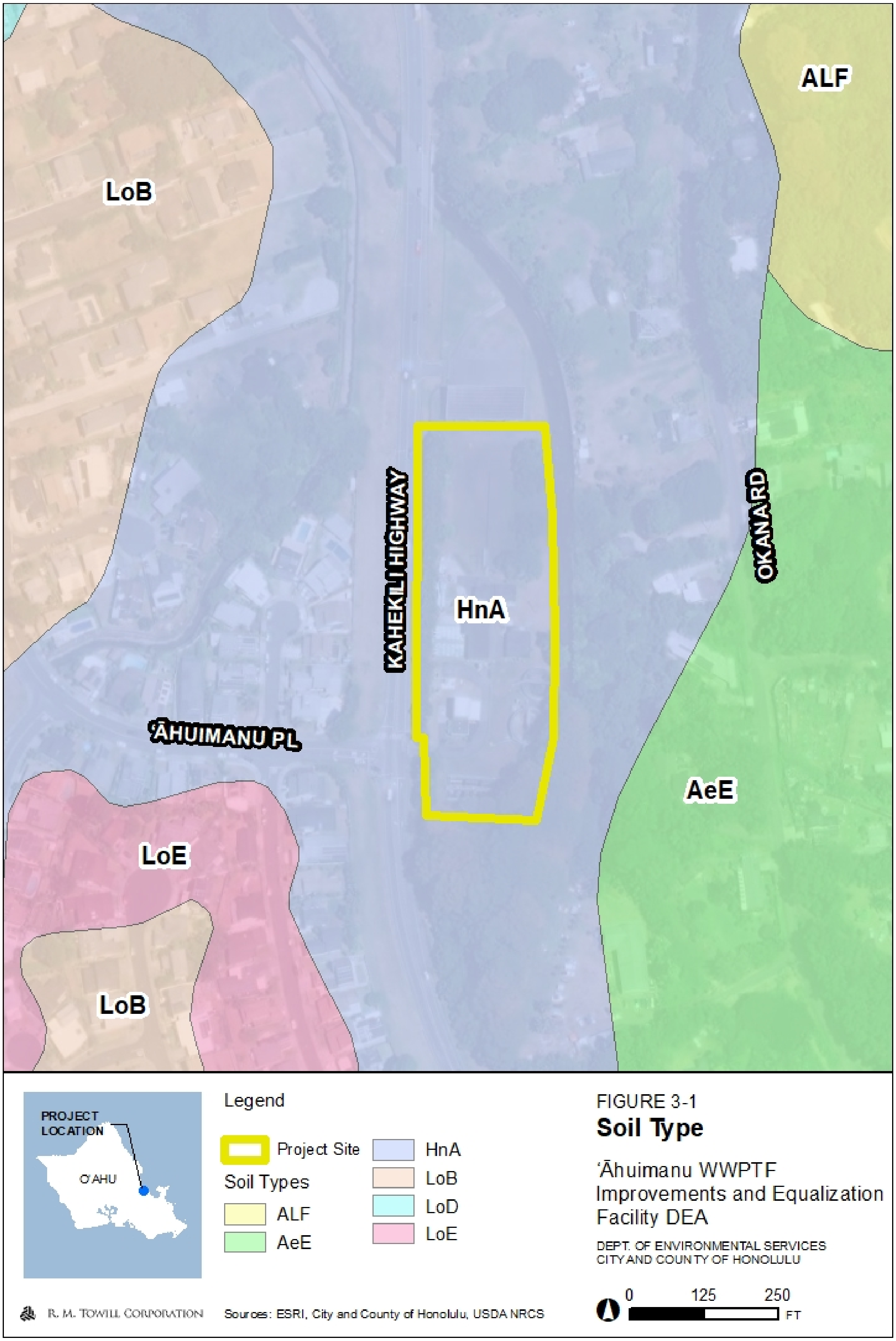


FIGURE 3-1
Soil Type
ʻĀhuimanu WWPTF Improvements and Equalization Facility DEA
DEPT. OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in any significant short or long-term impacts on the topography, geology or soil conditions of the site or the surrounding region.

During construction, best management practices (BMPs) such as such as perimeter controls (silt fences, filter socks, and catch basin inlet protection) and ground stabilization measures (covering exposed soils when work is inactive, minimizing exposure times, and repaving in a timely fashion) will be employed to minimize soil erosion and runoff that may impact the area. All construction activities will be completed in compliance with applicable State and CCH regulatory requirements and engineering design standards. No additional mitigation measures are necessary or recommended.

3.1.3 GROUND WATER, SURFACE WATERS AND HYDROLOGY

In July 2016, *Yogi Kwong Engineers* technicians conducted a geotechnical field exploration of the project site and established three (3) exploratory borings. The borings measured elevated groundwater levels ranging between approximately 34 feet above msl and 40 feet above msl. Technicians installed a groundwater monitoring well that provides continuous groundwater monitoring. Based on the project site's proximity to ʻĀhuimanu Stream and the subsurface conditions encountered, it is likely that the groundwater will fluctuate with stream flows and rainfall events. Perched subsurface seepage or higher groundwater are also anticipated, particularly during or after rainy periods in the upland areas and/or high flood levels in the nearby stream.

The project site is located in the Kahaluʻu Ahupuaʻa. There is an unnamed channelized tributary of the ʻĀhuimanu Stream on the east side of the project site, which joins with the main branch of the ʻĀhuimanu Stream downstream from the project site and then converges with Kahuluʻu Stream prior to discharging into the Kahuluʻu Flood Control Lagoon and ultimately the Kāneʻohe Bay.

According to the U.S. Fish and Wildlife Services National Wetland Inventory (NWI), there are no wetlands on the project site. On July 9, 2015, *AECOS* scientists conducted a wetland delineation survey and determined there are no wetlands located within the project site. One (1) sampling point (SP) was established at the low point of the effluent holding pond, which was selected as it is the lowest point on the property and thereby most likely to exhibit all three (3) wetland characteristics. The U.S. Army Corps of Engineers (USACE) manual requires three (3) indicators to be present in the identification of a wetland - hydrophytic vegetation, hydric soils, and wetland hydrology. The survey determined that the SP exhibited two of three required wetland indicators - hydrophytic vegetation and hydric soils, but no wetland hydrology, and therefore is not a wetland. On January 15, 2016, the USACE confirmed that the proposed project does not occur within the jurisdictional limits of a Navigable Water of the U.S. as defined by Section 10 of the Rivers and Harbors Act of 1899 or within the limits of a Waters of the U.S. as defined by Section 404 of the Clean Water Act and therefore does not require a Department of Army permit.

A description of surface waters near the project site is listed below and illustrated in **Figure 3-2: Surface Waters.**

- ʻĀhuimanu Stream: A perennial stream abutting the makai side of the project site. Designated by the State of Hawaiʻi, Department of Health, Clean Water Branch (DOH-CWB) as a ʻClass 2 Inland Waterbodyʼ and listed in the DOH-CWBʼs 2014 State of Hawai`i Water Quality Monitoring and Assessment Report as a §303(d) impaired water body; ʻĀhuimanu Stream does not meet state water quality standards for turbidity during the dry and wet season.
- Kahuluʻu Stream: A perennial stream approximately 1.5 miles from the project site. Designated by the DOH-CWB as a ʻClass 2 Inland Waterbodyʼ and listed as a ʻDOH-CWB 2014 §303(d) impaired waterʼ; Kahuluʻu Stream does not meet state water quality standards for nitrate + nitrite (NO_3+NO_2) during the dry season and turbidity during the dry and wet season.
- Kāneʻohe Bay: A marine body located approximately 0.8 miles from the project site. Designated as a ʻClass AA Marine Bodyʼ by DOH-CWB and listed as a ʻDOH-CWB 2014 §303(d) list impaired waterʼ; Kāneʻohe Bay does not meet the state water quality standards for enterococci, total nitrogen (TN), NO_3+NO_2, ammonium, total phosphate (TP), turbidity, and chlorophyll a during the wet season.

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in any significant short or long-term impacts to ground water, surface waters or hydrology conditions of the site or the surrounding region. While the project site is located adjacent to the ʻĀhuimanu Stream, the proposed project will improve the reliability and safety of the WWPTF to accommodate wastewater storage during storage events and wet weather flow conditions, thereby minimizing the potential for wastewater sewage overflows.

Construction activities will be conducted in compliance with HAR, § 11-54, *Water Quality Standards*; HAR, § 11-55, *Water Pollution Control*, and CCH grading and erosion control standards. A National Pollutant Discharge Elimination Systems (NPDES) Notice of Intent (NOI) Form C permit for stormwater discharges associated with construction activity will be obtained from the DOH-CWB. If construction dewatering is required, dewatering effluent will either be discharged into the existing sewer system or will be treated and discharged to state waters through the CCHʼs storm drain system under a NPDES NOI Form G permit obtained from the DOH-CWB. As part of the NPDES permit application, the Contractor is required to develop a Storm Water Pollution Prevention Plan (SWPPP) that identifies potential sources of stormwater pollution at the construction site and describes stormwater control measures to reduce or eliminate pollutants in stormwater discharges from the construction site.

The Contractor will implement BMPs in accordance with the SWPPP and NPDES permit approval conditions to prevent soil loss and discharges of sediment and pollutants in stormwater runoff from project work sites. BMPs will include structural (e.g., silt fences, berms, barriers, filter fabric), vegetative (e.g., grass, mulch, ground cover, soil stabilization), and management measures (e.g., project scheduling and phasing, material

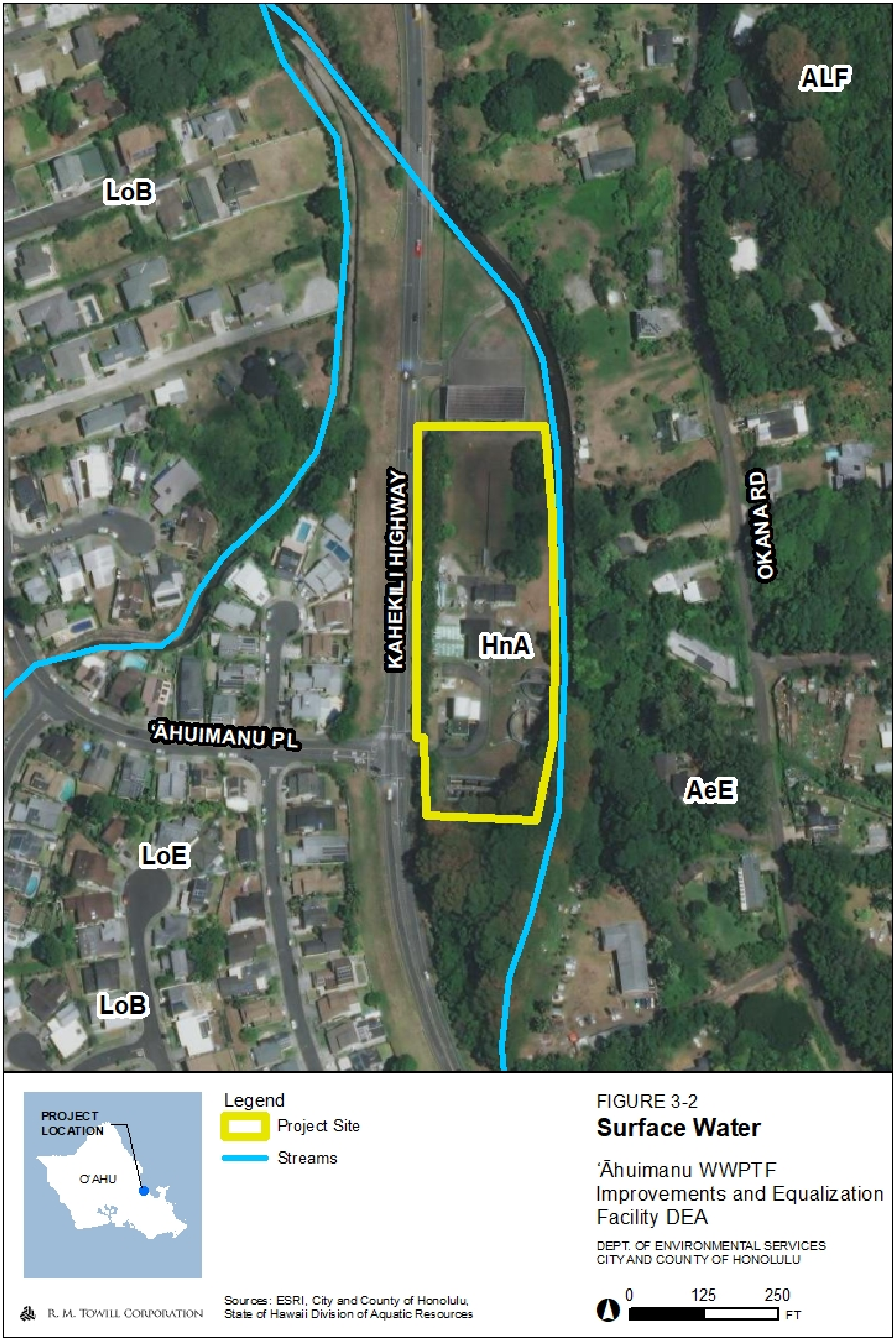


FIGURE 3-2
Surface Water
ʻĀhuimanu WWPTF Improvements and Equalization Facility DEA
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storage and equipment maintenance procedures, BMP monitoring), as necessary. No additional mitigation measures are necessary or recommended.

3.1.4 AIR QUALITY

Air pollutant levels are monitored by the DOH at a network of sampling stations statewide, although there are no sampling stations on windward Oʻahu. The state air quality monitoring stations consistently show Air Quality Index (AQI) levels as in compliance with state and federal air quality standards (DOH, 2021).

The present ambient air quality in the project area is considered good due to the prevailing northeasterly trade winds and the absence of major industrial activities. Air quality in the project vicinity can be affected by human and natural sources of air pollutants. Human sources of air pollution include vehicular emissions from motorists traveling on residential streets, emissions from equipment using internal combustion engines, BBQs, refuse burning and other intermittent sources. Natural sources of air pollution include wind-blown dust, wild fires, and the occasional distant volcanic emissions from the island of Hawaiʻi.

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in any significant short or long-term impacts on air quality conditions of the site or the surrounding region.

Regarding odors, the proposed project will install a new OCS to pull 5,100 cfm of foul air from the existing Headworks, EQ Basins and wet well. Ventilation of the dry weather and wet weather compartments of the EQ Basins will be engineered to reduce the average hydrogen sulfide gas concentrations to below 15 parts per million (ppm). Continued use of the chemical injection system will prevent the regeneration of dissolved sulfides in the ʻĀhuimanu FM. The new EPS pumps with VFD will prevent odor releases from the gravity segment of the ʻĀhuimanu FM by modulating the pump to match the wastewater flow rates thereby maintaining a predictable and manageable airflow and preventing air pressure spikes.

During construction, dust and exhaust emissions will be generated from construction vehicles and equipment including backhoes, trucks, pile driving equipment, generators, fuel tanks, etc., during construction. Mitigation of fugitive dust generated during construction will be handled through the use of periodic site watering and applicable on-site BMPs. Additional measures as provided in HAR Chapter 11-60.1 - Air Pollution Control will also be followed and will include, but not be limited to, the following:

- The planning of project construction operations will focus on minimizing the amount of dust-generating materials and activities, centralizing material transfer points and onsite vehicular traffic routes, and locating potentially dusty equipment in areas of least impact.
- An adequate water source at the site will be provided prior to start-up of construction activities for dust control wet-down application.
- Disturbed soils will be stabilized as soon as possible by means of grassing, hydromulch, geo-fabric, or other methods of cover.

- Dust will be controlled by stabilizing ground conditions at project entrances to prevent dirt tracking onto adjacent access roads, and by covering or wetting down construction vehicles carrying dust-generating materials.
- Adequate dust control measures will be provided on weekends, after hours, and prior to daily start-up of construction activities.

Vehicle and construction equipment exhausts are a source of air pollution. Mitigation of potential adverse effects associated with use of construction equipment, fuel tanks, and vehicle exhausts will be handled through adherence to applicable Federal, State and County regulations. As required, all machinery and vehicles will be required to be in proper working order with appropriate use of mufflers. No additional mitigation measures are necessary or recommended.

3.1.5 NOISE

The project site is located in the Class C zoning district under HAR Chapter 11-46. Under Class C zoning, the maximum permissible sound level is 70 A-weighted decibel (dBA) during the daytime and nighttime. However, the typical background noise levels in the project area are between 40 to 50 dBA, which means noise emissions near 70 dBA would likely cause noise complaints from adjacent residences. Therefore the acoustical design goal for the proposed project is set at 45 to 50 dBA at the closest residences, 70 dBA from the emergency generator at the west property line and not to exceed existing generator noise levels at the east property line.

The present noise level in the project area is fairly low, as ‘Āhuimanu is a rural, low-density, residential area. Existing noise levels are attributable to both human activity and the natural environment. Human sources of noise generation typically includes airplanes, emergency sirens, motor vehicles, power tools, stereo equipment, yard maintenance tools and/or house pets. Natural sources of noise generation include weather, wind and/or bird calls.

Potential Impacts and Mitigation Measures

The proposed project will result in a reduction of noise emissions from the project site. While current ‘Āhuimanu WWPTF operations are within permissible noise levels, the acoustic design goal of the proposed project is to maintain noise levels between 40-50 dBA. Mitigative measures to address noise generated by the ‘Āhuimanu WWPTF include the following:

- Emergency Generator – The existing emergency generator will be replaced with a smaller unit. Other acoustical treatments to the Generator Room and Booster Pump/Switchgear Rooms may include the installation of 4-inch thick acoustical walls/ceiling panels and sound rated doors, replacement of the existing exhaust silencer and the replacement of the existing louvers with duct silencers located at the existing ventilation openings.
- EPS – The existing motors/pumps will be replaced. Another acoustical treatment that may be done is the installation of acoustical ceiling tiles.
- Headworks – The existing Screenings and Grit Removal facilities will be replaced.

Construction activities will result in short-term noise impacts, primarily generated during mobilization and the operation of heavy equipment and power tools. Construction equipment typically generates noise levels in the range of 55 to 90 dBA, dependent on the construction methods and tools used. The Contractor will monitor noise levels, respond to any complaints and ensure that project activities are in compliance with HAR, Chapter 11-46. Ambient sound levels will return to normal, pre-construction conditions once construction activities are completed. Mitigation measures for short-term construction-related impacts include the following:

- Work will be limited to weekdays during daylight hours between 8:30 am and 3:30 pm. No work will be scheduled on Sundays and federal or state holidays.
- If the project generates excessive noise levels or requires work during nighttime hours, a noise variance permit will be obtained by the DOH, Noise, Radiation and Indoor Air Quality Branch.
- All internal-combustion powered machinery and equipment will be equipped with mufflers and related noise attenuation technologies and will remain in good working order.

No additional mitigation measures are necessary or recommended.

3.1.6 NATURAL HAZARDS

Tsunami

A tsunami involves the generation of a series of destructive ocean waves that can affect all shorelines. Tsunamis that affect Hawaiʻi typically originate from distant, seismically active areas around the Pacific, or from local, shallow undersea earthquakes, primarily near the seismically active island of Hawaiʻi. Tsunami waves can occur at any time with limited or no warning. The Pacific Tsunami Warning Center (PTWC) in Hawaiʻi issues warnings when a potential tsunami is imminent (PTWC, 2009). According to the Department of Emergency Management's (DEM) Tsunami Evacuation Zone Map, Panel 21 Inset 2 (updated April 2015), the project site is located in the 'Safe Zone', approximately 0.23 miles from the Extreme/Tsunami Evacuation Zone boundary (DEM, 2015). Therefore, the project site is within an area considered to be safe from tsunami wave action and that would not likely be subject to inundation. See **Figure 3-3, Tsunami Evacuation Zone.**

Seismic Hazard

The Hawaiian Islands experience thousands of earthquakes each year, but most are so small that they can only be detected by instruments. Some are strong enough to be felt and a few cause minor to moderate damage. Most of Hawaiʻi's earthquakes are directly related to volcanic activity and are caused by magma moving beneath the earth's surface. According to FEMA's seismic design categories (SDC), the project areas is located in SDC 'D_0', which indicates that the project site could experience very strong shaking and damage of structures depending on the design and of the structure.

Flood

As shown on Federal Emergency Management Agency, Flood Insurance Rate Map (FEMA-FIRM) panel 15003C0260F, revised to reflect letter of map revision (LOMR) effective September 8, 2017, the project site is located within Zone X. See **Figure 3-4, FEMA-FIRM Zone**.

- Zone X (blue): Areas of 0.2% annual chance flood and areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile.
- Zone X (dark orange): Areas determined to be outside the 0.2% annual chance floodplain.

Hurricane and Wind

The Hawaiian Islands are seasonally affected by Pacific hurricanes from the late summer to early winter months. The State has been affected twice since 1982 by significant hurricanes, ʻIwa in 1982 and ʻIniki in 1992. During hurricanes and storm conditions, high winds can cause strong uplift forces on structures, particularly on roofs. Wind-driven materials and debris can attain high velocity and cause devastating property damage and harm to life and limb. It is difficult to predict these natural occurrences, but it is reasonable to assume that future events will occur.

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in any significant short or long-term increase in risk to human safety or property damage due to natural hazards.

The project site is outside of the tsunami evacuation zone and the project is not anticipated to exacerbate or increase ʻĀhuimanu's long-term vulnerability to tsunami events. In the event of a tsunami, the PTWC will issue a tsunami warning and civil defense agencies, including the Honolulu police and fire departments will oversee the evacuation of areas at risk for tsunami inundation.

The project is no more or less vulnerable to seismic activity than the rest of the island, and the project is not anticipated to exacerbate or increase ʻĀhuimanu's long-term vulnerability to seismic activity conditions. The CCH has adopted International Building Code (IBC) standards, CCH Land Use Ordinance (LUO), Chapter 16, Article 1, *Adoption of the International Building Code (IBC)*. The project will be designed and constructed in accordance with the IBC and recommendations of a geotechnical engineer.

The proposed project is within Zone X (shaded) and Zone X (unshaded). The project is not anticipated to exacerbate flood conditions or increase ʻĀhuimanu's long-term vulnerability to coastal or inland flooding. The proposed project will comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Code of Federal Regulations (CFR) Title 44, as well as applicable ordinances in ROH, Section 21-9.10-6, *Flood Fringe District*.

The project is no more or less vulnerable than the rest of the island to destructive wind and rain associated with hurricanes. The National Hurricane Center (NHC) typically issues a "Hurricane Watch" within 48 hours of a potential hurricane event, and issues a "Hurricane Warning" when sustained winds of at least 74 mph are expected within 36 hours of a potential hurricane event. Upon notification of an impending hurricane event or "Hurricane Watch", operations would cease, and equipment, machinery, and construction materials susceptible to loss or damage would be secured and/or removed. No additional mitigation measures are necessary or recommended.

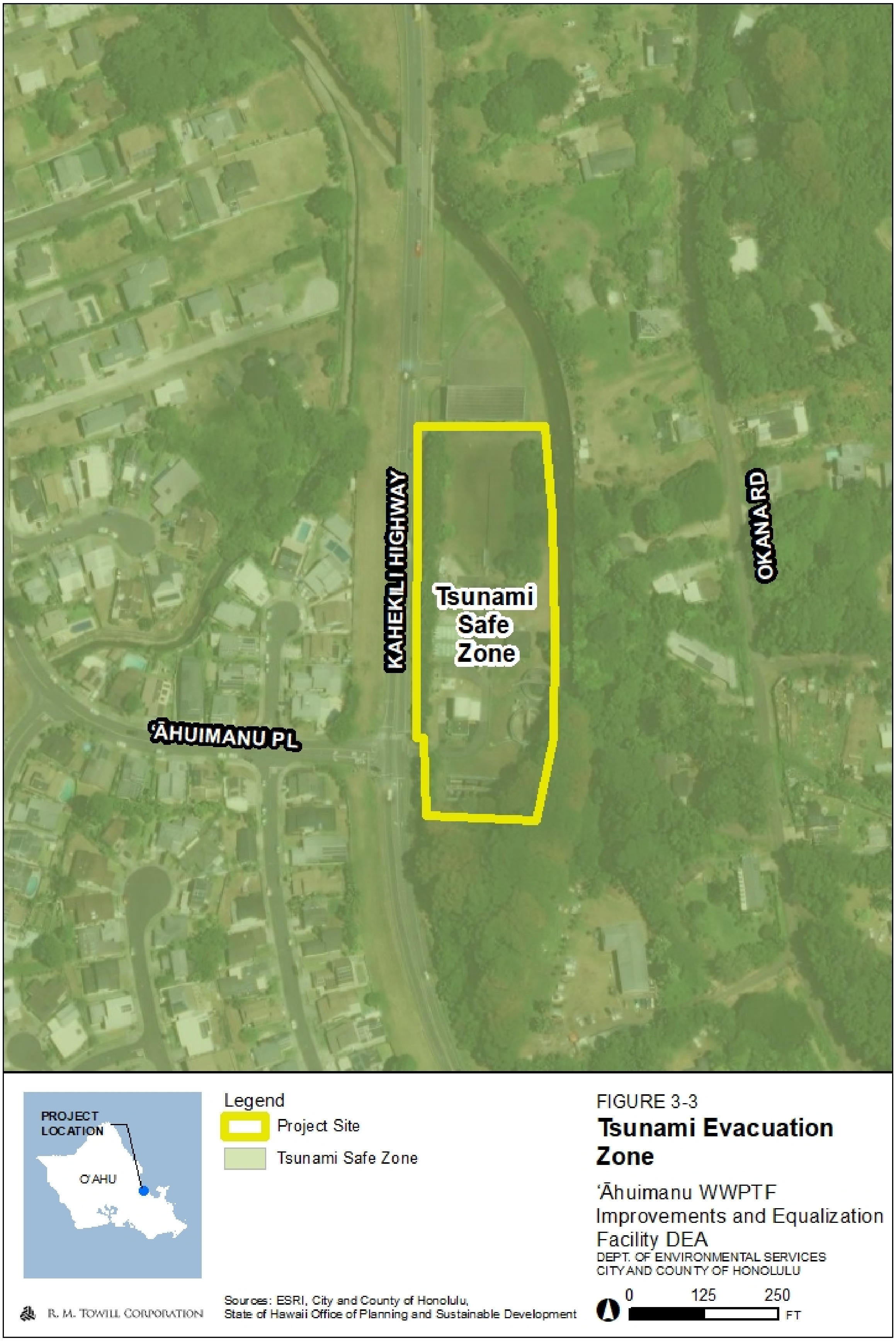

FIGURE 3-3
Tsunami Evacuation Zone
ʻĀhuimanu WWPTF Improvements and Equalization Facility DEA
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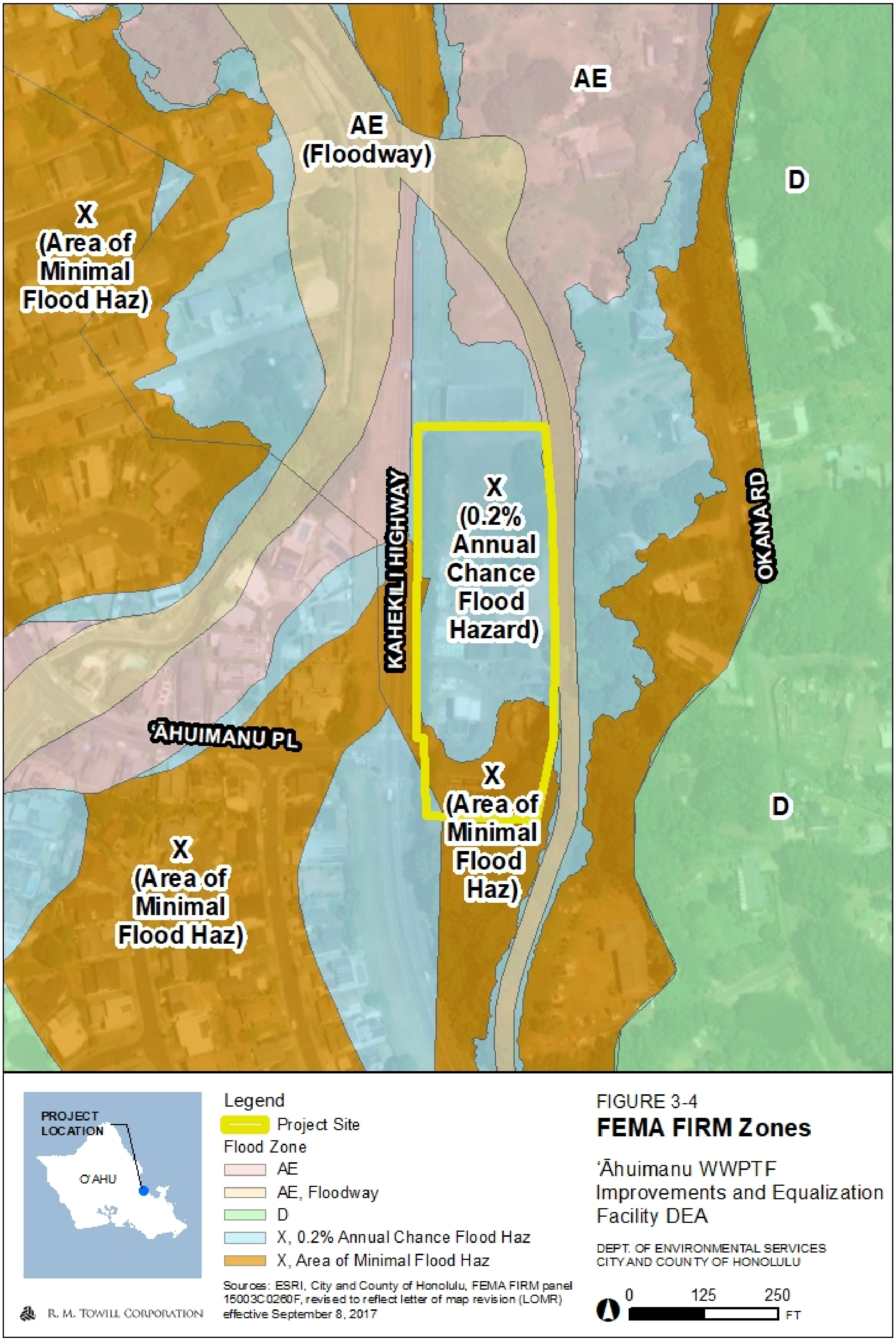

FIGURE 3-4
FEMA FIRM Zones

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3.1.7 FLORA AND FAUNA

Flora and fauna in the project vicinity are typical of urbanized areas and consist of common introduced species. There are no known threatened or endangered species or their habitat within or around the project site.

Flora consists of ornamental species commonly found in the urban landscape including, but not limited to Song of India (*Dracaena reflexa*), Mango (*Mangifera indica*), Plumeria (*Plumeria obtusa*), Papaya (*Carica papaya*), Tī Leaf (*Cordiyline fruticosa*), Musk Fern (*Phymatosarus grossus*), Croton (*Croton spp*.), Monstera (*Monstera deliciosa*), Rainbow Shower Tree (*Cassia fistula x javanica*), White Ginger (*Hedychium coronarium*), Alexandra Palm (*Archontophoenix alexandrae*), Lilikoi (*Passiflora edulis f flavicarpa),* Banana (*Musa acuminata*), Bougainvillea (*Bougainvillea spp*.), Naupaka (*scaevola taccada*), and Coconut (*Cocos nucifera*). Fauna that may likely be seen near the project site and reside in an urban setting include domesticated pets, feral cats (*Felis catus*), rats (*Rattus* sp), house mouse (*Mus musculus*), and the small Indian Mongoose (*Herpestes javanicus*). Avifauna that may likely be seen near the project site are the Common Mynah (*Acridotheres tristis*), Red-Crested Cardinal (*Paroaria coronata*), House Finch (*Carpodacus mexicanus*), Java Sparrow (*Padda oryzivora*), Cattle Egret (*Bubulcus ibis*), Rock Pigeon (*Columba livia*), Spotted Dove (*Streptopelia chenensis*), Zebra Dove (*Geopelia striata*), Red-Vented Bulbul (*Pycnonotus cafer*), and Japanese White-Eye (*Zosterops japonicas*), and the migratory Pacific Golden Plover (*Pluvialis fulva*).

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in any significant short or long-term impacts to fauna, avifauna, or flora.

The existing high-maintenance trees located along Kahekili Highway will be replaced with low-maintenance shrubs and continue to provide a visual screening of the facility.

Construction activities may temporarily disrupt routine behavior of common faunal species in the immediate project area, but will not result in permanent displacement, or adversely affect regional distribution of affected fauna. Once project activities are complete, faunal activity in the vicinity of the work site is expected to return to pre-existing conditions. While there is no evidence of migratory seabird species using the project site for breeding or habitation, if nighttime construction is necessary, mitigation measures to prevent adverse impacts to avifauna will include shielding and angling nighttime lighting downward to reduce glare and disruption of bird flight. Additional mitigation measures were provided during early consultation with the Department of Land and Natural Resources, Division of Forestry and Wildlife's (DLNR, DOFAW) in a letter, dated February 16, 2022, which recommends consulting the Hawaiʻi Pacific Weed Risk Assessment website to determine the potential invasiveness of plants proposed in the project and minimizing the movement of plant or soil material between worksites to avoid transfer of pathogens or pests that could harm native species and ecosystems. In addition, DOFAW provided the following mitigation measures to be implemented before or during construction to minimize impacts to sensitive species:

- Any required site clearing should be timed to avoid disturbance to the State listed Hawaiian Hoary Bat or *ʻŌpeʻapeʻa (Lasiurus cinereus semotus)* during their birthing and pup rearing season (June 1 through September 15). During this period, woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmer. Barbed wire should also be avoided for any construction because bats can become ensnared and killed by such fencing during flight.

- For nighttime work that might be required, DOFAW recommends that all lights used to be fully shielded to minimize the attraction of seabirds. Nighttime work that requires outdoor lighting should be avoided during the seabird fledging season from September 15 through December 15. This is the period when young seabirds take their maiden voyage to the open sea.
- State listed waterbirds such as the Hawaiian Duck (*Anas wyvilliana*), Hawaiian Stilt (*Himantopus mexicanus knudseni*), Hawaiian Coot (*Fulica alai*), and Hawaiian Common Gallinule (*Gallinula chloropus sandvicensis*) could potentially occur in the vicinity of the proposed project site. It is against State law to harm or harass these species. If any of these species are present during construction activities, then all activities within 100 feet (30 meters) should cease, and the bird should not be approached. Work may continue after the bird leaves the area of its own accord.

No additional mitigation measures are necessary or recommended.

3.1.8 HAZARDOUS MATERIALS

Lead and Asbestos

Asbestos containing material (ACM), lead-based paint (LBP), and lead-containing paint (LCP) were encountered during an Environmental Site Assessment (ESA) in August 2014. The ESA was prepared to assess the extent of hazardous waste that may need to be removed prior to demolition or renovation. LBP is defined as paint containing at least 0.5% by weight of lead. LCP is defined as paint containing any detectable amount of lead up to 0.5% by weight. ACM was identified in the Chemical Feed, Auxiliary Generator and Blower Building, IPS, and EPS. LBP in poor condition was identified in the Aerobic Digester, PC, Sludge Dewatering Building, and IPS. LBP in good condition was identified in the Chemical Feed, Auxiliary Generator and Blower Building, and IPS. No LBP was found in the Rapid Block Tank, Headworks, Old Generator Room, or EPS; however, LCP was found in all structures sampled.

Soil Contamination

Low levels of soil contamination were encountered while drilling a geotechnical borehole approximately four feet away from the Headworks in April 2021. None of the detected concentrations exceed the DOH's Tier 1 Environmental Action Levels (EAL) for unrestricted use. The soil cuttings were recovered from 0.5 to 11.5 feet and registered photo ionization detector readings ranging from 6.5 to 54 ppm. The highest readings were measured in soils recovered from 0.5 to 2.0 feet. Three (3) soil samples were analyzed for the following parameters: total petroleum hydrocarbon-diesel range organic / total petroleum hydrocarbon-residual range organic (TPH-DRO/TPH-RRO), polynuclear aromatic hydrocarbon (PAHs), 8 Resource and Conservation Recovery Act (RCRA) metals and polychlorinated biphenyl (PCBs). The sample IDs were Sample 1C (depth 0.5-2.0 feet), Sample 3C (depth 5.0-6.5 feet) and Sample 5C (depth 10.0-11.5 feet).

Table 3-1: Soil Sample Results

Sample ID	Tier 1 EAL[1]	Sample 1C	Sample 3C	Sample 5C	Units
DRO (C9-C25)	220	22	55	74	mg/kg
RRO (C24-C40)	500	15	41	19	mg/kg
Arsenic	24	< 2.5	< 3.1	< 2.4	mg/kg
Barium	1000	6	122	7	mg/kg
Cadmium	14	1.4	1.47	0.49	mg/kg
Chromium	1000	103	204	39	mg/kg
Mercury	4.7	< 0.015	0.282	< 0.015	mg/kg
Lead	200	< 1	< 1.3	< 1	mg/kg
Selenium	78	< 2	< 2.6	< 2	mg/kg
Silver	78	< 0.24	< 0.31	< 0.24	mg/kg
[1] State of Hawaiʻi, Department of Health, Environmental Action Levels (Fall 2017)					

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in any significant short or long-term impacts to onsite hazardous materials.

The proposed project will improve the health and safety of the site by removing onsite hazardous waste during the demolition of the Sludge Dewatering Building and Old Generator Room and renovation of the IPS, Headworks, EQ Basins, EPS, Aerobic Digester, PC, Rapid Block Tank, and Auxiliary Generator and Blower Buildings. During demolition and renovation, the Contractor will be responsible for proper handling and disposal of hazardous materials in compliance with applicable CCH, State, and federal regulatory requirements. Potential risks to workers will be mitigated by proper planning and use of personal protective equipment. No additional mitigation measures are necessary or recommended.

3.2 SOCIO-ECONOMIC ENVIRONMENT

3.2.1 LAND USE

The project site is located within the C (Country) zoning district. The land use surrounding the project area is primarily residential and with a few commercial uses. The surrounding zoning districts include R-5 (Residential) and R-10 (Residential. See **Figure 3-5: CCH Zoning District.**

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in any significant short or long-term impacts on land uses in the surrounding area. The proposed project will benefit the community by improving the reliability and safety of the ʻĀhuimanu WWPTF to provide pretreatment processes and accommodate wastewater storage during storage events and wet weather flow conditions. No mitigation measures are necessary or recommended.

3.2.2 ARCHAEOLOGICAL AND CULTURAL RESOURCES

The project site is already developed with the existing ʻĀhuimanu WWPTF. The soils have already been subject to ground disturbance during initial construction in 1964, subsequent renovations, and current operations. There are no known archaeological or cultural sites on or adjacent to the project site based on a review of the State of Hawaiʻi, State Historic Preservation Division's (SHPD) Register of Historic Sites.

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in any significant short or long-term impacts on archaeological and cultural resources of the site or the surrounding region. All proposed work will occur on previously disturbed area and thereby is not expected to encounter any archaeological and/or cultural resources.

In the unlikely event that unknown or unexpected historic or cultural features, deposits, or burials are discovered during project activities, all work will be suspended immediately and SHPD will be immediately notified to determine the appropriate course of action. Work will only resume upon authorization of SHPD following the appropriate treatment of the findings.

3.2.3 SCENIC AND VISUAL RESOURCES

Views from both land and air are iconic and highlight the beauty of the island of Oʻahu. The Koʻolau Poko SCP identifies views of the Koʻolau Mountains and coastal headlands of Oʻahu's windward side as important components of the Koʻolau Poko regional identity, offering both residents and visitors a unique perspective of the Hawaiian Islands scenery (DPP, 2017). Within the project area along Kahekili Highway there are mauka views of the Koʻolau Mountains ridgeline. There are no coastal views from any part of the project site.

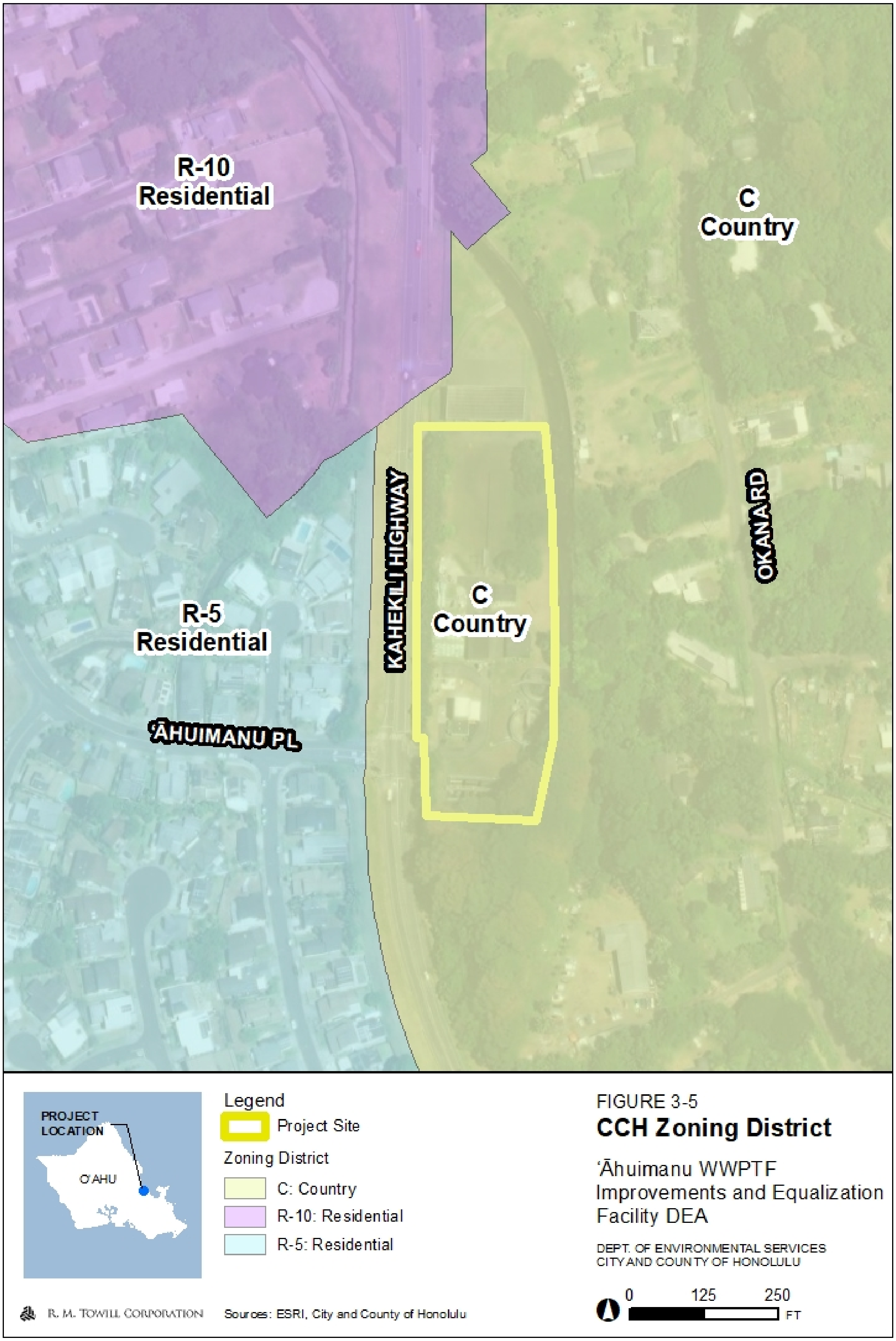

FIGURE 3-5
CCH Zoning District
ʻĀhuimanu WWPTF Improvements and Equalization Facility DEA
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Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in any significant short or long-term impacts on the scenic views identified in the SCP.

During construction, views of the construction activities and/or equipment will be apparent in various locations; however, they will not completely block scenic views at any given time. No mitigation measures are necessary or recommended.

3.2.4 RECREATIONAL FACILITIES

County park facilities are maintained by the Department of Parks and Recreation (DPR) and state park facilities are maintained by the Department of Land and Natural Resources, Division of State Parks (DLNR, DSP). Recreational facilities in the vicinity of the project site include the following County and State parks:

- ʻĀhuimanu Community Park is a 4.1-acre park located approximately 0.8 miles from the project site.
- Heʻeia State Park is an 18.5-acre park located approximately 0.16 miles from the project site.
- Laenani Neighborhood Park is a 1.4-acre park located approximately 1.5 miles from the project site.

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in any signification short or long-term impacts on the recreational facilities of the surrounding region. No mitigation measures are necessary or recommended.

3.2.5 FIRE, POLICE AND MEDICAL SERVICES

The Honolulu Fire Department (HFD) provides firefighting services for Oʻahu. The HFD responds to emergencies including, but not limited to fires, emergency medical calls, hazardous materials incidents, motor vehicle accidents, natural disasters and technical rescues. The island of Oʻahu is divided into five battalions containing 45 fire stations. Kahaluʻu Fire Station is located approximately 1.5 miles and Kāneʻohe Fire Station is located approximately 3.5 miles from the project site.

Police protection services on Oʻahu are provided by the Honolulu Police Department (HPD). The HPD is comprised of 29 divisions. The proposed project is within Patrol District 4, which covers the "Kāneʻohe/Kailua/Kahuku" area. The Kāneʻohe Police Station is located approximately 3.5 miles from the project site.

The major medical service provider nearest the project site is the Castle Medical Center (CMC), located approximately 8.5 miles from the project site. CMC and contains physician offices, laboratory services, a pharmacy, and other home and community care services.

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in any significant short or long-term impacts on fire, police, or medical services.

Emergency vehicle access to and through the project site will be maintained for the duration of the project. No mitigation measures are necessary or recommended.

3.2.6 SOCIO-ECONOMIC CONDITIONS

The following table shows various summary data on the overall demographics of the ‘Āhuimanu Census Designated Place (CDP) compared to Honolulu County. **Table 3-1** shows a breakdown of data on population, ethnic groups, household information, and income estimated by the U.S. Census Bureau for 2019 comparing ‘Āhuimanu CDP to Honolulu County.

Table 3-2: Estimated Demographics Data for 2019

	‘Āhuimanu CDP[1]	**Honolulu County**[1]
Population	8,023	984,821
Race		
White	23.1%	20.9%
African American	0.2%	2.4%
Asian	33.3%	42.7%
American Indian/Alaskan Native	0.8%	0.2%
Native Hawaiian/Pacific Islander	9.4%	9.5%
Two or More Races	32.4%	23.2%
Some Other Race	0.8%	1.0%
Gender		
Male	49.8%	50.4%
Female	50.2%	49.6%
Age		
Under 14	15.9%	18.0%
15-24	12.9%	12.7%
25-34	10.5%	15.3%
35-44	7.9%	12.7%
45-60	24.0%	18.2%
60 and Over	28.7%	23.1%
Median Income by Household	$112,875	$85,857
Persons in Poverty	3.7%	8.3%
Median Home Value	$708,300	$678,200
Median Household Size	2.95	2.97
[1] United States Census Bureau, 2019 American Community Survey 5-Year Estimates		

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in any significant short or long-term impacts on the socioeconomic conditions. The proposed project will improve the reliability and safety of the WWPTF, but will not increase capacity, which could be an impetus for population growth.

In the short term, construction activities will result in temporary economic benefits in the form of construction jobs and material procurement. Surrounding businesses may see a temporary increase in revenue from expenditures by construction personnel. These economic impacts will be temporary and will cease upon project completion. No additional mitigation measures are necessary or recommended.

3.3 INFRASTRUCTURE AND UTILITIES

3.3.1 TRAFFIC AND TRANSPORTATION SYSTEMS

The project site is accessed via the intersection of Kahekili Highway, Route 83, and ʻĀhuimanu Place. Kahekili Highway, Route 83, is a segment of the Kamehameha Highway that serves as the primary north-south traffic corridor between Haleʻiwa to Kāneʻohe. In the project vicinity, Kahekili Highway is developed as a 2-lane highway that serves as a regional bypass highway with a limited number of fully signalized intersections. ʻĀhuimanu Place is a 2-lane roadway that provides access to the adjacent residential neighborhood. The Bus provides access to the site via bus routes 65, 88, and PH4. Along Kahekili Highway there are wide shoulders that may be used as a bicycle route; however, there are no dedicated bicycle facilities.

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in any significant short or long-term impacts on the traffic and transportation systems.

In the short-term, construction activities may be temporarily noticeable from Kahekili Highway. Construction-related traffic will not significantly alter the total volume of traffic on Kahekili Highway. The Contractor will be required to keep all construction vehicles in proper operating condition and ensure that material loads are properly secured to prevent dust, debris, leakage, or other adverse conditions from affecting public roadways. No other mitigation measures are necessary or recommended.

3.3.2 DRAINAGE SYSTEM

The existing ʻĀhuimanu WWPTF is approximately 3.2 acres consisting of 0.75 acres of impervious surface (buildings and pavement) and 2.45 acres of pervious surface (grass and trees). A majority of the onsite runoff flows into the existing effluent holding pond based on the site's topography and the remaining runoff flows into the adjacent ʻĀhuimanu Stream.

Runoff from Kahekili Highway flows into an adjacent roadway swale that flows to the north along the WWPTF boundary. The swale discharges runoff to a culvert that runs along the northern border of the WWPTF and outfalls to the ʻĀhuimanu Stream. The Kahekili Highway swale does not have adequate capacity, which results in highway runoff overflowing onto the ʻĀhuimanu WWPTF property.

Potential Impacts and Mitigation Measures

The proposed project will lead to an increase in impervious surfaces and thus a slight increase in runoff volumes, however, the existing effluent holding pond has adequate capacity to contain the increase in runoff generated onsite from a 50-year, 1-hour storm event to comply with the CCH's stormwater quality standards.

The ENV will collaborate the State of Hawaiʻi Department of Transportation (DOT) to excavate the Kahekili Highway drainage swale to ensure that it has adequate capacity and does not overflow onto the ʻĀhuimanu WWPTF property.

Construction activities could result in discharges of pollutants into the CCH drainage system in stormwater runoff. BMPs will be employed in accordance with a NPDES NOI

Form C permit as described in Section 3.1.3 Surface Water and Hydrology, to minimize the potential for pollutant discharges in stormwater.

The project might require discharges of water into the CCH storm drain system from construction dewatering during trench excavation, and hydrotesting water during testing of the installed sewer main. If required, these discharges will be conducted in compliance with a NPDES NOI Form F permit for hydrotesting, and a NPDES NOI Form G permit for construction dewatering, obtained from the State DOH prior to construction. These discharge activities will not require any modifications to the storm drain system. BMPs will be employed and the dewatering and hydrotesting effluent will be treated as necessary before discharging to the storm drain system to ensure compliance with NPDES permit conditions and with HAR 11-54, Water Quality Standards and HAR 11-55 Water Pollution Control.

3.3.3 WATER SYSTEM

Potable water is provided to the ‘Āhuimanu WWPTF by the Honolulu Board of Water Supply (BWS). Existing domestic and fire protection water service to the project site is provided through a 2-inch diameter water lateral connected to the 30-inch diameter BWS water main located within the Kahekili Highway ROW. There is a BWS water meter at the point of connection.

Potential Impacts and Mitigation Measures

The proposed project will not result in any significant short or long-term impacts on the water system.

A 4-inch diameter water lateral and 3-inch compound meter will replace the existing 2-inch diameter water lateral and meter. The existing water lateral and meter will be abandoned in place. A new fire hydrant will be located within the Kahekili Highway ROW by the entrance of the WWPTF. Water service to the fire hydrant will be provided through a 6-inch diameter water lateral connection to the 30-inch diameter BWS water main located within Kahekili Highway. The existing water system is adequate to accommodate the WWPTF operations.

Construction activities will require use of water for dust control, vehicle wash down, concrete mixing, general housekeeping activities, and for pipe pressure testing. These uses will be intermittent and of short duration and will cease upon project completion. Quantities of water required for these uses are relatively minor. The existing water system has sufficient capacity to accommodate the temporary demands from construction activities. No mitigation measures are necessary or recommended.

3.3.4 WASTEWATER SYSTEM

The proposed project is a WWPTF that accommodates flows through three (3) gravity sewers, ranging from 10 inches to 15 inches in diameter. The gravity sewers converge into one (1) 24-inch gravity sewer main from the ‘Āhuimanu area and two (2) 12-inch FMs from the Kahaluʻu Houing PS and Kahaluʻu PS. Effluent from the ‘Āhuimanu WWPTF is sent to the Kāneʻohe WWPTF through a 16-inch FM to the 24-inch Haiku Bypass Sewer and then to the 27-inch

Kamehameha-He‘eia Interceptor Sewer. Effluent is then conveyed to the Kailua WWTP for secondary treatment before being discharged to the ocean through the Mōkapu Outfall.

Potential Impacts and Mitigation Measures

The proposed project will result in significant improvements to the ‘Āhuimanu WWPTF’s infrastructure and operations. The rehabilitation of the onsite wastewater storage system will improve the reliability and safety of WWPTF operations to accommodate wastewater storage during storage events and wet weather flow condition, thereby minimizing potential for wastewater sewage overflows. Renovation of the Headworks will minimize grit settling in the ‘Āhuimanu FM and other downstream equipment, which will alleviate existing issues of wastewater overloads and spills in the Kailua – Kāne‘ohe – Kahalu‘u wastewater service area. Additional renovations will improve pretreatment processes, reduce noise and odor levels, and ensure overall optimal operations for the community and region. No mitigation measures are necessary or recommended.

3.3.5 ELECTRICAL/COMMUNICATIONS SYSTEMS

Electrical System

Electrical service to the ‘Āhuimanu WWPTF is provided by a HECo primary overhead distribution system that runs along the northern side of the Sludge Dewatering Building, continues south along Kahekili Highway, and dead-ends at a rise pole adjacent to the WWPTF driveway. Primary service conductors are extended to a HECo pad-mounted transformer via an underground concrete-encased ductline. The HECo transformer is located along the facility entrance driveway, adjacent to the Blower Building. This HECo transformer is identified as HECo Vault 5532 and rated 300 kilovolt amps (kVA).

The pad-mounted transformer provides the WWPTF with secondary electrical service at 480/277 volts, 3-phase, 4-wire, 60 hertz. An underground secondary electrical ductline consisting of four (4) 3-inch PVC, concrete-encased conduits extend from the pad mounted transformer to the EPS. The record drawings indicate that the feeder from the HECo transformer to the WWPTF consists of four (4) sets of three (3) 350 kcmil conductors per phase. The secondary feeder terminates at the service entrance switchboard for the facility which is located at the Blower Building.

HECo kilowatt-hour (kWH) Meter 532560 is located at the exterior of the Blower Building. HECo metering instrument transformers are located within the service entrance switchboard. Based on historical demand data obtained from HECo, the peak demand reading since 2014 for Meter 53560 was 212.2 kilowatts (235.8 kVA at 0.9 power factor) in June 2015. HECo is responsible for the primary cables and ductlines, pad-mounted transformer and kWH meter.

Communication System

Hawaiian Telcom (HT) currently provides underground telecommunications service to the ʻĀhuimanu WWPTF. HT utilizes a 2-inch underground ductline to provide telecommunications service from its cable facilities along Kahekili Highway to the WWPTF. The existing Hawaiian Telcom service is utilized telephone (voice) service only. Hawaiian Telcom is responsible for the existing telecommunications service cable to the WWPTF.

Spectrum is responsible for the existing fiber link to the WWPTF.

Potential Impacts and Mitigation Measures

The proposed project will not result in any significant short or long-term impacts on the provision of electrical or communication services.

Improvements to the off-site electrical distribution system include the replacement of the existing 300 kVA HECo transformer with a 1,000 kVA HECo transformer and the installation of new service entrance conductors.

The existing HECo system has adequate capacity to meet the power requirements during construction activities. No mitigation measures are necessary or recommended.

3.3.6 SOLID WASTE DISPOSAL

Solid waste collection, transport and disposal operations are the responsibility of the CCH ENV Refuse Division. Solid waste is collected from the surrounding residential, institutional and commercial uses and disposed of at either the Waimānalo Gulch Landfill in the ʻEwa district or the H-Power facility at Campbell Industrial Park. PVT Land Company operates a privately owned and operated, licensed solid waste facility for recovery of recyclable materials and disposal of construction and demolition materials. The PVT Landfill accepts waste on a pre-arranged basis from the Contractor. Waste loads are screened to remove recyclable materials and the remaining wastes are landfilled.

Potential Impacts and Mitigation Measures

The proposed project will not result in any significant short or long-term impacts on the solid waste disposal services.

Construction activities will result in the generation of small amounts of construction and demolition debris. Construction and demolition debris will be disposed of at the PVT Landfill in accordance with CCH and DOH regulations and provisions of the PVT facility license. Non-construction solid waste generated by project activities may be collected and disposed at the Waimānalo Gulch Landfill or H-Power. No additional mitigation measures are necessary or recommended.

SECTION 4
Relationship to Land Use Plans and Policies

4.1 THE HAWAIʻI STATE PLAN

The Hawaiʻi State Plan, adopted in 1978, and promulgated in HRS, Chapter 226, consists of three major parts:

- Part I, describes the overall theme including Hawaiʻi's desired future and quality of life as expressed in goals, objectives, and policies.
- Part II, Planning Coordination and Implementation, describing a statewide planning system designed to coordinate and guide all major state and county activities and to implement the goals, objectives, policies, and priority guidelines of the Hawaiʻi State Plan.
- Part III, Priority Guidelines, which express the pursuit of desirable courses of action in major areas of statewide concern.

The proposed project is consistent with the objectives and policies of the Hawaiʻi State Plan. Specifically, the rehabilitation of the onsite wastewater storage system, renovation of facilities/buildings, and replacement of deteriorating equipment at the ʻĀhuimanu WWPTF will ensure reliable wastewater storage during storage events or peak wet weather flows, improve the pretreatment processes, reduce noise and odors, and ensure overall optimal operations and service to the community. Described below are sections of the Hawaiʻi State Plan's goals, objectives, and policies that are relevant to the proposed action.

> *§226-14 Objectives and policies for facility systems—in general. (a) Planning for the State's facility systems in general shall be directed towards the achievement of water, transportation, waste disposal, and energy and telecommunications 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. [L 1978, c 100, pt of §2; am L 1986, c 276, §13]*
>
> *§226-15 Objectives and policies for facility systems--solid and liquid wastes. (a) Planning for the State's facility systems with regard to solid and liquid wastes shall be directed towards the achievement of the following objectives:*
> *(1) Maintenance of basic public health and sanitation standards relating to treatment and disposal of solid and liquid wastes. [L 1978, c 100, pt of §2; am L 1986, c 276, §14]*

The proposed project supports the State Plan objectives and policies related to the adequate development of sewerage facilities. The project will provide infrastructure improvements to the ʻĀhuimanu WWPTF to maintain and ensure continued reliable of wastewater storage during storage events and pretreatment processes for the present and future needs of Hawaiʻi's people in consonance with state and county plans.

4.2 STATE LAND USE LAW

The State Land Use Commission classifies all lands in the State of Hawaiʻi into one of four land use designations: Urban, Rural, Agricultural and Conservation. The project site is completely located in the State Land Use Urban District. Wastewater treatment facilities and appurtenances are an approved public use within this District. Land uses within the Urban District are regulated through the CCH Land Use Ordinance, Chapter 21, Revised Ordinances of Honolulu (ROH). No action from the State Land Use Commission is required to implement the proposed project. See **Figure 4-1, State Land Use District**.

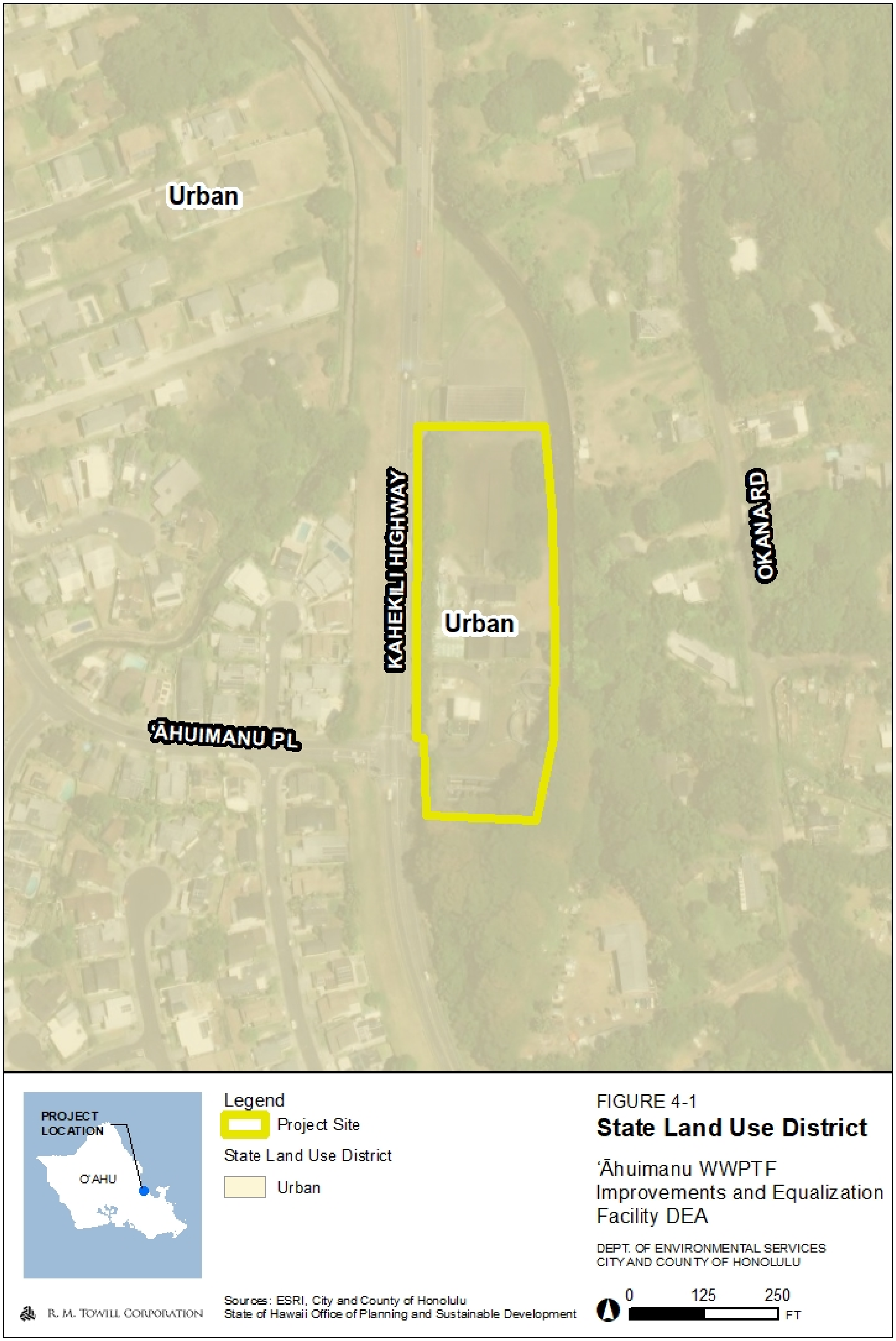
4.3 CITY AND COUNTY OF HONOLULU GENERAL PLAN

The General Plan, approved in 2002, is a statement of the long-range social, economic, environmental, and design objectives and a statement of broad policies which facilitate the attainment of the objectives of the plan.

Wastewater facilities and appurtenances are considered utilities. Therefore, the most relevant section of the General Plan is Section V, entitled "Transportation and Utilities".

> **Section V, Transportation and Utilities**
>
> **Objective B**: To meet the needs of the people of Oʻahu for an adequate supply of water and for <u>environmentally sound systems of waste disposal</u>.
>
> > Policy 5 - <u>Provide safe, efficient, and environmentally sensitive waste-collection and waste-disposal services</u>.
>
> **Objective C**: To maintain a high level of service for all utilities.
>
> > Policy 1 - <u>Maintain existing utility systems in order to avoid major breakdowns</u>.
> >
> > Policy 2 - <u>Provide improvements to utilities in existing neighborhoods</u> to reduce substandard conditions.
>
> **Objective D**: To maintain transportation and utility systems which will help Oʻahu continue to be a desirable place to live and visit.
>
> > Policy 1 - Give primary emphasis in the capital-improvement program to the <u>maintenance and improvement of existing</u> roads and <u>utilities</u>.

The proposed project is consistent with Section V, Objective B, concerning environmentally-sound utility systems. Implementation of the project will promote safe, efficient, and environmentally sensitive wastewater storage during storage events or peak wet weather flows and pretreatment processes. Objective C is aimed at maintaining a high level of service for all utilities under the jurisdiction of CCH, including wastewater collection. The project will ensure the CCH maintains a high level of infrastructure utility service. With regard to Objective D, the planned improvements are for the purpose of maintaining and improving the existing municipal wastewater system.


Urban
KAHEKILI HIGHWAY
Urban
OKANA RD
'ĀHUIMANU PL
PROJECT LOCATION
O'AHU
Legend
Project Site
State Land Use District
Urban
FIGURE 4-1
State Land Use District
'Āhuimanu WWPTF Improvements and Equalization Facility DEA
DEPT. OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
R. M. TOWILL CORPORATION
Sources: ESRI, City and County of Honolulu
State of Hawaii Office of Planning and Sustainable Development
0
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4.4 CCH ZONING AND LAND USE ORDINANCE

The project site is located in CCH C Country zoning district as defined in Chapter 21, ROH, the “Land Use Ordinance” (LUO):

> *“Sec. 21-3.60 Country district--Purpose and intent.*
>
> *(a) The purpose of the country district is to recognize and provide for areas with limited potential for agricultural activities but for which the open space or rural quality of agricultural lands is desired. The district is intended to provide for some agricultural uses, low density residential development and some supporting services and uses.”*

According to LUO Table 21-3, Master Use Table, the ‘Āhuimanu WWPTF is defined as “public uses and structures” and is permitted in the C zoning district. The project is thus consistent with the CCH LUO. See **Figure 3-5, CCH Zoning District**.

4.5 KO‘OLAU POKO SUSTAINABLE COMMUNITIES PLAN

The Ko‘olau Poko Sustainable Communities Plan (SCP), updated in 2017, is prescribed by the City Charter to implement the broad objectives and policies contained in the CCH General Plan. The SCP serves as a policy guide for public actions in support of regional community goals and visions. Objectives, policies and guidelines from the SCP that pertain to the proposed project include the following:

> *4.3.1 Kailua – Kāne‘ohe – Kahalu‘u Wastewater Service Area*
> *The Kailua-Kāne‘ohe-Kahalu‘u area is served by the Kailua Regional WWTP. As part of a regional plan, the Kailua WWTP receives wastewater flows from the Kāne‘ohe and ‘Āhuimanu areas. The Kailua WWTP serves as a secondary treatment facility and has an average design capacity of 18.0 mgd and a 1995 average flow of approximately 12.3 mgd. The former treatment plants at Kāne‘ohe and ‘Āhuimanu were converted to preliminary treatment facilities (screening and grit removal only) in late 1994. Wastewater flows from the entire region are now conveyed to the Kailua WWTP for treatment and are then discharged through the Mōkapu Outfall. The system has experienced major problems which resulted in overloads and spills. To remedy the situation, a new gravity sewer tunnel is currently being constructed to replace the existing force main that connects the Kāne‘ohe WWPTF with the Kailua Regional WWTP. Other improvements at the Kāne‘ohe WWPTF are also under construction.*
>
> *Unsewered areas in the service area are primarily in the Kahalu‘u area. For much of these areas, Sewer Improvement Districts have been identified and are being implemented, but no plans are in place for areas north of Waihe‘e Road. There are also some small pockets of unsewered areas in Kāne‘ohe and Kailua.*
>
> *Population projections for the Kailua-Kāne‘ohe-Kahalu‘u area indicate a declining population between 2010 and 2035. However, in order to address the problems mentioned above and to accommodate projected five-year peak storm flows, substantial expansions and modifications of the Kailua WWTP, the Kāne‘ohe and*

ʻĀhuimanu WWPTF, and the collection system were and are continuing to be made.

Major proposed improvements include:

ʻĀhuimanu WWPTF:
New screening and grit removal facility, and new odor control and flow equalization tank improvements.

4.3.3 Policies

- *Direct all wastewater produced within the Community Growth Boundary to municipal or military sewer service systems.*
- *Mitigate visual, noise, and odor impacts associated with wastewater collection and treatment systems, especially when they are located adjacent to residential designated areas.*

4.3.4 Guidelines

- *Complete planned improvements to the Kailua Regional WWTP service area facilities.*
- *Provide adequate horizontal separations and landscape elements (e.g. berms and windrows) between wastewater facilities and adjacent residential designated areas.*

The proposed project is consistent with the policies, guidelines and proposed improvements included in Koʻolau Poko SCP, Section 4.3, Wastewater Management. The project includes all major improvements identified for the ʻĀhuimanu WWPTF in Section 4.3.1, Kailua – Kāneʻohe – Kahaluʻu Wastewater Service Area and will install new screening and grit removal equipment and OCS as well as rehabilitate the onsite wastewater storage tanks. Renovations to the Headworks will reduce grit settling in the ʻĀhuimanu FM and other downstream equipment. The new OCS will efficiently reduce odors emanating from the Headworks, EQ Basins, and EPS. Rehabilitation of the onsite storage tanks will alleviate potential wastewater spills during storage events or peak wet weather flow conditions. The proposed project would also improve the efficiency of pretreatment processes, reduce noise and odor emissions, and optimize overall WWPTF operations for the community and region. The project site is located within land area designated for "Institutional" use on the SCP Map A-2: Land Use and "Urban" use on SCP Map A-3: Public Facilities.

4.6 SPECIAL MANAGEMENT AREA (SMA) RULES AND REGULATIONS

The CCH has designated the shoreline and certain inland areas of Oʻahu as being within the Special Management Area (SMA). SMA areas are designated sensitive environments that should be protected in accordance with the State's Coastal Zone Management policies, as set forth in Revised Ordinances of Honolulu (ROH), Section 25, Shoreline Management, and HRS, Section 205A, Coastal Zone Management.

The project site is located outside of the SMA boundary, and therefore does not require review under SMA rules and regulations.

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SECTION 5
Necessary Permits and Approvals

5.1 CITY AND COUNTY OF HONOLULU

Department of Environmental Services

- Finding of No Significant Impact, per HRS 343

Department of Planning and Permitting

- Construction Plan Review and Approval
- Building Permit
- Grading and Stockpiling Permits
- Trenching Permit
- Permit to Discharge into the CCH Storm Drainage System

Department of Environmental Services

- Construction Plan Review and Approval
- Industrial Wastewater Discharge Permit for Temporary Discharge

5.2 STATE OF HAWAI‘I

Department of Health

- Construction Plan Review and Approval
- National Pollutant Discharge Elimination System (NPDES) Notice of Intent (NOI) Permits Authorizing Discharges of Storm Water Associated with Construction Activities (NOI Form C), Hydrotesting (NOI Form F), and Construction Dewatering (NOI Form G)
- Community Noise Variance (if nighttime construction is required)
- Air Pollution Control Permit
- Disability and Communication Access Board Plan Review

Department of Land and Natural Resources

- State Historic Preservation Division Approvals

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SECTION 6
Organizations and Agencies Consulted during the Preparation of the DEA

Table 6.1: Pre-Assessment Consultation Letter Recipients

Distribution	Pre-Assessment Consultation Recipient	Pre-Assessment Comments Received
Federal Agencies		
U.S. Environmental Protection Agency, Pacific Islands Office, Region 9	X	
State of Hawaiʻi Agencies		
State of Hawaiʻi, Department of Accounting and General Services	X	
State of Hawaiʻi, Department of Business, Economic Development & Tourism, Office of Planning	X	
State of Hawaiʻi, Department of Education	X	X
State of Hawaiʻi, Department of Hawaiian Home Lands	X	
State of Hawaiʻi, Department of Health, Disability and Communication Access Board	X	X
State of Hawaiʻi, Department of Health, Environmental Health Administration	X	
State of Hawaiʻi, Department of Health, Indoor and Radiological Health Branch	X	X
State of Hawaiʻi, Department of Health, Wastewater Branch	X	X
State of Hawaiʻi, Department of Health, Solid and Hazardous Waste Branch	X	
State of Hawaiʻi, Department of Health, Clean Air Branch	X	
State of Hawaiʻi, Department of Land and Natural Resources	X	
State of Hawaiʻi, Department of Land and Natural Resources, Land Division	X	X

State of Hawaiʻi, Department of Land and Natural Resources, Commission on Water Resource Management	X	X
State of Hawaiʻi, Department of Land and Natural Resources, Division of Aquatic Resources	X	X
State of Hawaiʻi, Department of Land and Natural Resources, Division of Boating and Ocean Recreation	X	
State of Hawaiʻi, Department of Land and Natural Resources, Division of Forestry and Wildlife	X	X
State of Hawaiʻi, Department of Land and Natural Resources, Division of State Parks	X	
State of Hawaiʻi, Department of Land and Natural Resources, Engineering Division	X	X
State of Hawaiʻi, Department of Land and Natural Resources, Office of Conservation and Coastal Lands	X	X
State of Hawaiʻi, Department of Land and Natural Resources, State Historic Preservation Division	X	
State of Hawaiʻi, Department of Transportation	X	X
Hawaiʻi Documents Center	X	
Ahuimanu Elementary School	X	
Kāneʻohe Public Library	X	
Legislative Reference Bureau	X	
City and County of Honolulu Agencies		
City and County of Honolulu, Department of Design and Construction	X	X
City and County of Honolulu, Department of Facility Maintenance	X	X
City and County of Honolulu,	X	

Department of Parks and Recreation		
City and County of Honolulu, Department of Planning and Permitting	X	X
City and County of Honolulu, Department of Transportation Services	X	X
Board of Water Supply	X	X
City and County of Honolulu, Honolulu Fire Department	X	X
City and County of Honolulu, Honolulu Police Department	X	X
Elected Officials, Neighborhood Board and Community Organizations		
Senator Jarrett Keohokalole, Senate District 24	X	
Speaker Lisa Kitagawa, House District 48	X	
Councilmember Esther Kiaaina, District 3	X	
Chair Kannoi Walk, Kahaluʻu Neighborhood Board No. 29	X	
Hawaiian Electric Company	X	X
Kāneʻohe Business Group	X	
Hawaiian Telcom	X	X
Adjacent Neighbors/Residents		
Resident, 47-351 Hui Koloa Pl., Kāneʻohe	X	
Resident, 47-418A Ahuimanu Pl., Kāneʻohe	X	
Resident, 47-130A Okana Rd., Kāneʻohe	X	
Resident, 47-332 Hui Koloa Pl., Kāneʻohe	X	
Resident, 47-146 Okana Rd., Kāneʻohe	X	
Resident, 47-382 Hui Koloa Pl., Kāneʻohe	X	
Resident, 47-418B Ahuimanu Pl., Kāneʻohe	X	
Resident, 47-70 Okana Rd., Kāneʻohe	X	
Resident, 47-414 Ahuimanu Pl., Kāneʻohe	X	
Resident, 47-375 Hui Koloa Pl., Kāneʻohe	X	

Resident, 47-337 Hui Koloa Pl., Kāneʻohe	X	
Resident, 47-361 Hui Koloa Pl., Kāneʻohe	X	
Resident, 47-416 Ahuimanu Pl., Kāneʻohe	X	
Resident, 47-331 Hui Koloa Pl., Kāneʻohe	X	
Resident, 47-412 Ahuimanu Pl., Kāneʻohe	X	
Resident, 47-377 Hui Koloa Pl., Kāneʻohe	X	
Resident, 47-345 Hui Koloa Pl., Kāneʻohe	X	
Resident, 47-60 Okana Rd., Kāneʻohe	X	
Resident, 47-50B Okana Rd., Kāneʻohe	X	
Resident, 47-54 Okana Rd., Kāneʻohe	X	
Resident, 47-373 Hui Koloa Pl., Kāneʻohe	X	
Resident, 47-305 Kahekili Hwy, Kāneʻohe	X	
Resident, 47-341 Hui Koloa Pl., Kāneʻohe	X	
Resident, 47-353 Hui Koloa Pl., Kāneʻohe	X	
Resident, 47-359 Hui Koloa Pl., Kāneʻohe	X	
Resident, 47-339 Hui Koloa Pl., Kāneʻohe	X	
Resident, 47-130 Okana Rd., Kāneʻohe	X	
Resident, 47-381 Hui Koloa Pl., Kāneʻohe	X	
Resident, 47-50D Okana Rd., Kāneʻohe	X	
Resident, 47-335 Hui Koloa Pl., Kāneʻohe	X	X
Resident, 47-347 Hui Koloa Pl., Kāneʻohe	X	
Resident, 47-333 Hui Koloa Pl., Kāneʻohe	X	
Resident, 47-371 Hui Koloa Pl., Kāneʻohe	X	
Resident, 47-355 Hui Koloa	X	

Pl., Kāneʻohe		
Resident, 47-50 Okana Rd., Kāneʻohe	X	
Resident, 47-120 Okana Rd., Kāneʻohe	X	
Resident, 47-414 Ahuimanu Pl., Kāneʻohe	X	
Resident, 47-106 Okana Rd., Kāneʻohe	X	
Resident, 47-106A Okana Rd., Kāneʻohe	X	
Resident, 47-414 Ahuimanu Pl., Kāneʻohe	X	
Resident, 47-412 Ahuimanu Pl., Kāneʻohe	X	

6.1 Summary of Pre-Assessment Consultation Comments Received

The table below provides a summary of the comments received during the pre-assessment consultation period, along with the associated responses and referenced sections in the Draft EA. A copy of the comment letters received are provided in **Appendix C**.

Table 6.2: Summary of Pre-Assessment Consultation Comments Received

No.	Commentor	Date of Letter	Comments	Response	Draft EA Reference Sections
1	State of Hawaiʻi, Department of Health, Indoor and Radiological Health Branch / Thomas G. Lileikis	1/18/2022	Project shall comply with the following Administrative Rules of the Department of Health: Chapter 11-39 Air Conditioning & Ventilation, Chapter 11-41 Lead-based Paint Activities, Chapter 11-45 Radiation Control, Chapter 11-46 Community Noise Control, Chapter 11-501 Asbestos Requirements, Chapter 11-504 Asbestos Abatement Certification Program	The ENV acknowledges and will comply with HAR regulations concerning Chapters 11-39, Air Conditioning & Ventilation; 11-41, Lead-based Paint Activities; 11-45, Radiation Control; 11-46, Community Noise Control; 11-501, Asbestos Requirements; and 11-504, Asbestos Abatement Certification Program.	3.1.5; 3.1.8
2	John Kaneshiro, Resident of 47-335 Hui Kōloa Pl., Kāneʻohe	1/18/2022	1. I have received the notice regarding the aforementioned project. I am a resident residing across from the Facility on Hui Koloa Place.In general, I am in support of the project being proposed provided it meets all the necessary requirements of the federal, state, and county ordinances. I am aware of the age of these facilities being a long-time resident in Kaneohe. 2. According to the notice, it appears many of the equipment and machinery	1. The ENV acknowledges this comment. The Project will be in compliance with all applicable federal, state, and county regulations. 2. The ENV acknowledges the comment and confirms the Project will account for existing and future wastewater flows in the community. 3. The ENV acknowledges this comment and confirms that any traffic issues that may arise will be temporary and will cease once the Project	3.3.1; 3.3.2; 3.3.4

			doesn't appear to function as it should requiring its replacement(s). However, there wasn't any information provided to indicate if the proposed replacements have taken into account changes in the community such as population growth, traffic, and developments. I am assuming they have been and the capacities of the facilities have been adjusted. 3. I know the property have been cleared recently of the trees. A temporary access was created to transport the cuttings that at times tied up traffic rather than utilizing the existing access probably due to on-site logistics. I assume this access will continue until the project is completed but not beyond that as it is not at the traffic light. 4. I am sure the EIS will address any potential run-off from the parcel now that the tree are no longer there and will not cause flooding or blockage of Kahaluu Stream or Kahekili Highway. I do not expect a direct response from your firm; just wanted to sure that my comments were already or will be considered.	construction is completed. 4. The ENV acknowledges the comment and confirms that all of the stormwater runoff will be retained and treated on-site through planned improvements to the Ahuimanu WWPTF's drainage system. There will be no net increase in drainage leaving the Project site, thus no impacts to neighboring properties' drainage systems are anticipated.	
3	State of Hawai'i, Disability and Communication Access Board / Kirby Shaw, Executive Director	1/27/2022	1. Because this project is being constructed on City and County land, it is covered by 103-50, Hawai'i Revised Statutes (HRS). Construction of the Ahuimanu Wastewater Pre-Treatment Facility Improvements and Equalization Facility Project is required to comply with the Department of Justice's (DOJ) 2010 ADA Standards for Accessible Design (2010 Standards) http://www.ada.gov/2010ADAstandards_index.htm. To be consistent with the DOJ's standard, DCAB adopted the 2004 Americans with Disabilities Ace Accessibility Guidelines (ADAAG) as of January 1, 2011 and passed	1. The ENV confirms that the Project will comply with the DOJ's 2010 ADA Standards for Accessible Design. 2. The Project will not receive federal funds. 3. The Project's construction documents will be submitted to DCAB for formal review. 4. The ENV confirms that the Project will comply with the ADA Title II provisions.	

			interpretive opinions consistent with the 2010 ADA Standards. All new Interpretive Opinions can be viewed or downloaded at http://health.hawaii.gov.dcab/facility-access/interpretive-opinions/. 2. If this project is receiving federal funds, it will also have to comply with the requirements under Section 504 of the Rehabilitation Act, but this is not included in the DCAB review process. 3. Projects with construction documents that are covered by 103-50, HRS, are required tobe submitted to DCAB for a formal document review. DCAB's review for this proposed project will include employee and public spaces. 4. Beyond DCAB's review process, program access obligations must be met under the ADA Title II provisions. This obligation may require additional means to provide access, especially where full compliance with the 2010 Standards cannot be achieved.		
4	City and County of Honolulu, Department of Design and Construction / Alex Kozlov, P.E., Director	1/28/2022	No Comments	On behalf of the City and County of Honolulu, Department of Environmental Services, we thank you for your letter dated January 28, 2022. We acknowledge that the City and County of Honolulu, Department of Design and Construction has no comments at this time.	
5	City and County of Honolulu, Honolulu Fire Department / Craig Uchimura, Acting Assistant Chief	1/28/2022	No Comments as it was determined that there will be no significant impact to fire department services.	On behalf of the City and County of Honolulu, Department of Environmental Services, we thank you for your letter dated January 28, 2022. We acknowledge that the City and County of Honolulu, Honolulu Fire Department has no comments at this time and has determined that there will be no significant impact to fire department services.	
6	State of Hawaiʻi, Department of Land and Natural Resources, Commission on Water Resource		1. We recommend that water efficient fixtures be installed and water efficient practices implemented throughout the development to reduce the increased demand on the area's freshwater resources. Reducing the	1. The ENV acknowledges this comment and confirms that water efficient fixtures will be installed wherever practicable. 2. The ENV confirms that all of the stormwater runoff will be retained and	3.3.2

	Management / M. Kaleo Manuel, Deputy Director	1/31/2022	water usage of a home or building may earn credit towards Leadership in Energy and Environmental Design (LEED) certification. More information on LEED certification is available at http://www.usgbc.org/leed. A listing of fixtures certified by the EAP as having high water efficiency can be found at http://www.epa.gov/watersense. 2. We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at http://planning.hawaii.gov/czm/initiatives/low-impact-development/; 3. We recommend the use of alternative water sources, wherever practicable. 4. We recommend adopting landscape irrigation conservation best management practices endorsed by the Landscape Industry Council of Hawaii. These practices can be found online at http://www.hawaiiscape.com/wp-content/uploads/2013/04/LICH_Irrigation_Conservation_BMPs.pdf. 5. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality. 6. The Hawaii Water Plan is directed toward the achievement of the utilization of reclaimed water for uses other than	treated on-site through planned improvements to the Ahuimanu WWPTF's drainage system. There will be no net increase in drainage leaving the Project site, thus no impacts to neighboring properties' drainage systems are anticipated. 3. The ENV acknowledges this comments. 4. The ENV acknowledges this comment and confirms that alternative water sources will be used wherever practicable. 5. The ENV acknowledges this comment and will comply with all applicable county, state and federal regulations regarding potential for ground or surface water degradation/contamination. 6. The ENV acknowledges this comment; however, R-1 water is not available onsite.	

			drinking and for potable water needs in one hundred per cent of State and County facilities by December 31, 2045 (§174C-31(g)(6), Hawaii Revised Statutes). We strongly recommend that this project consider using reclaimed water for its non-potable water needs, such as irrigation. Reclaimed water may include, but is not limited to, recycled wastewater, gray water, and captured rainwater/stormwater. Please contact the Hawaiʻi Department of Health, Wastewater Branch, for more information on their reuse guidelines and the availability of reclaimed water in the project area.		
7	Hawaiʻi Electric Company / Rouen Liu, Permit Engineer	2/4/2022	Hawaiian Electric Company has no objection to the project. Should Hawaiian Electric have existing easements and facilities on the subject property, we will need continued access for maintenance of our facilities.	On behalf of the City and County of Honolulu, Department of Environmental Services, we thank you for your email dated February 4, 2022. We acknowledge that the Hawaiian Electric Company has no comments at this time.	
8	State of Hawaiʻi, Department of Transportation, Highways Division / Jade T. Butay, Director of Transportation	2/7/2022	Our Highways Division, Oahu District Office has reviewed the proposed work and we do not anticipate any affect on our drainage system in the area nor any impact to our right-of-way. Therefore, we do not have comments.	On behalf of the City and County of Honolulu, Department of Environmental Services, we thank you for your letter dated February 7, 2022. We acknowledge that the Department of Transportation, Highways Division has no comments at this time.	
9	State of Hawaiʻi, Department of Health, Wastewater Branch / Sina Pruder, P.E., Chief	2/7/2022	1. The subject project shall comply with applicable provisions of Chapter 11-62, Hawaii Administrative Rules, "Wastewater Systems." 2. In addition, please be informed that the proposed wastewater system may have to include design considerations to address any effects associated with the construction of and/or discharges from the wastewater systems to any public trust, Native Hawaiian resources or the exercise of traditional cultural practices.	1. The ENV confirms the Project will comply with HAR regulations concerning Chapter 11-62. 2. The ENV acknowledges the comment and confirms that the Project will rehabilitate/replace deteriorated equipment in order to minimize potential for wastewater discharges/spills during storage events or projected peak wet weather flow that could have any effects to any public trust, Native Hawaiian resources or the exercise of traditional cultural practices.	2.2; 3.3.4
10	Hawaiʻi Telcom / James Migia	2/9/2022	Will there be any exterior structural changes at the plant? I didn't see any changes between the existing and the	The ENV acknowledges this comment. There will be exterior structural changes to the	2.2

			proposed drawings. Also after reviewing our cable maps we are servicing the facility with aerial cables/terminals. Do you have any plans/drawings of the interior renovations that may shift the location of how our service drops enter the bldg.?	Administration/Influent Pump Station Building and Generator Building. Once design drawings move towards Pre-Final Drawing Submittal, the ENV can provide plans/drawings of the proposed changes to exterior structures.	
11	State of Hawaiʻi, Department of Education	2/10/2022	Based on the information provided, the proposed Project will not impact Department facilities.	On behalf of the City and County of Honolulu, Department of Environmental Services, we thank you for your letter dated February 10, 2022. We acknowledge that the Department of Education has no comments at this time.	
12	City and County of Honolulu, Department of Planning and Permitting / Dean Uchida, Director	2/11/2022	1. The Draft EA should demonstrate how the proposed Project will conform to the objectives, policies, and guidelines of the Oʻahu General Plan and the Koolaupoko Sustainable Communities Plan, especially the policies found in Section 4.3.3 and the guidelines found in Section 4.3.4. 2. According to our records, Conditional Use Permit No. 1999/CUP1-15 was issued on April 6, 1999, which authorized the joint development of TMKs 4-7-004: 006 and 4-7-37:030. Pursuant to LUO Section 21-5.380, all lots included in a Joint Development Agreement are treated as one zoning lot. Therefore, the Draft EA should include TMK 4-7-37:030 as part of the Project. 3. Public uses and structures qualify for Zoning Waiver Permits under LUO Section 21-2.130. The Draft EA should state whether the project is likely to require a Zoning Waiver Permit.	1. The ENV acknowledges the comment and confirms the Project will conform to the objectives, policies, and guidelines of the Oʻahu General Plan and the Koʻolau Poko Sustainable Communities Plan. 2. The ENV acknowledges the comment and confirms the TMK 4-7-37:030 will be included as part of the Project. 3. The ENV acknowledges the comment and confirms that it is not anticipated that the Project will require a Zoning Waiver Permit.	4.4; 4.5
13	City and County of Honolulu, Police Department / Darren Chun, Assistant Chief of Police	2/15/2022	The Honolulu Police Department (HPD) has reviewed the plans and has some concerns. The HPD recommends that adequate notification be made to the public and businesses in the area in the event of road closures. Any impacts to vehicular traffic, particularly off of Kahekili Highway (a main thoroughfare in the area), may lead to complaints.	The ENV acknowledges the comment and confirms that a Traffic Control Plan will be prepared and submitted to the Department of Transportation for review and approval prior to the commencement of construction activities.	
14	City and County of Honolulu, Board of Water Supply / Ernest Lau,	2/15/2022	1. The existing water system is adequate to accommodate the proposed development. However, please be advised that this information is	1. The ENV acknowledges the comment. 2. The ENV acknowledges the comment and confirms that water conservation measures	

	Manager and Chief Engineer		based upon current data, and therefore, the Board of Water Supply (BWS) reserves the right to change any position or information stated herein up until the final approval of the building permit application. The final decision on the availability of water will be confirmed when the building permit application is submitted for approval. 2. Water conservation measures are required for all proposed developments. These measures include utilization of non-potable water for irrigation using rain catchment, drought tolerant plants, xeriscape landscaping, efficient irrigation systems, such as a drip system and moisture sensors, and the use of Water Sense labeled ultra-low flow water fixtures and toilets. 3. The proposed project is subject to BWS Cross-Connection Control and Backflow Prevention requirements prior to issuance of the Building Permit Applications. 4. The BWS has a 30-inch water main traversing through the parcel. This water main shall be located within paved roadways and be made accessible for repairs and maintenance. Any structures should be adequately set back from the water main easement for safety and to prevent damage to the structures during breaks, repair, and maintenance events. The construction drawings should be submitted for our review, and the construction schedule should be coordinated to minimize impact to the water system. 5. The on-site fire protection requirements should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.	will be implemented. 3. The ENV acknowledges the comment and confirms that it will comply with BWS Cross-Connection Control and Backflow Prevention requirements. 4. The ENV acknowledges the comment and confirms that the water main shall be located within paved roadways and be made accessible for repairs and maintenance. All structures will be adequately set back from the water main easement. 5. The ENV acknowledges the comment and confirms construction drawings shall be submitted to BWS for review. The ENV acknowledges the comment and confirms that on-site fire protection requirements will be coordinated with the Fire Protection Bureau of the Honolulu Fire Department.	
15	City and County of Honolulu, Department of Facility	2/15/2022	The Department of Facilities Maintenance (DFM) has an existing Ahuimanu Dewatering Facility (TMK: 4-7-37:030) which is adjacent and north of the Ahuimanu Wastewater	The ENV acknowledges the comment. There are no anticipated impacts to either DFM's ʻĀhuimanu Dewatering Facility or ʻĀhuimanu Stream. All proposed activities will	2.2; 3.1.3

	Maintenance / Dawn Szewczyk, Director and Chief Engineer		Pre-Treatment Facility. DFM also maintains Ahuimanu Stream that runs adjacent to the proposed Pre-Treatment Facility. What anticipated impacts will your proposed Pre-Treatment Facility have on our Dewatering Facility and Ahuimanu Stream?	occur within the ʻĀhuimanu WWPTF property. Construction activities will be conducted in compliance with HAR, § 11-54, Water Quality Standards; HAR, § 11-55, Water Pollution Control, and CCH grading and erosion control standards to minimize any potential impacts to the adjacent ʻĀhuimanu Stream.	
16	Department of Land and Natural Resources, Land Division, Division of Aquatic Resources, Engineering Division, Office of Conservation and Coastal Resources / Russell Tsuji, Land Administrator	2/16/2022	1. The Division of Aquatic Resources (DAR) would like to request that Best Management Practices (BMPs) be included in the Draft Environmental Assessment. This is to ensure that the contractor(s) implement the BMPs to minimize runoff/sedimentation and land-based sources of pollution (LBSP) at the project area where there is the opportunity (e.g. any site where there will be excavation, grading, or sediment/pollutant producing activities) for discharge into nearby Ahuimanu Stream. These BMPs may include (but not limited to) any type of barrier (e.g. sediment fences, silt screens/curtains, bags, environmental socks, petroleum absorption diapers) that limits the amount of runoff, sediment, or LBSP (e.g. petroleum products, chemicals, debris, etc.) to the maximum extent possible. This is important given the immediate proximity of Ahuimanu Stream. Periods of heavy rains increases runoff and there is a higher risk of sediment or LBSP ending up in Ahuimanu Stream.; 2. The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high-risk areas). Be advised that 44CFR, Chapter 1, Subchapter B, Part 60 reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may	1. The ENV acknowledges the comment and confirms that BMPs will be included in the Draft EA. 2. The ENV acknowledges the comment. The Project is not located in a Special Flood Hazard Area. 3. The ENV acknowledges the comment. The Project is located within Zone XS per FEMA-FIRM panel 15003C0260, revised to reflect letter of map revision (LOMR) effective September 8, 2017. 4. The ENV acknowledges the comment and the mitigation measure is included in Section 3.1.7 of the Draft EA. 5. The ENV acknowledges the comment and confirms that for nighttime work, all lights will be fully shielded and angled downward to reduce glare and disruption to bird flight patterns. The mitigation measure has been included in Section 3.1.7 of the Draft EA. 6. The ENV acknowledges the comment and confirms that permanent lighting will be minimized and installed only where necessary for the safety and security of the WWPTF and staff. Permanent exterior lighting will comply with the city and state regulations regarding exterior lighting. 7. The ENV acknowledges the comment and confirms that all construction activities will comply with state regulations regarding state listed waterbirds. The mitigation measure has been included in Section 3.1.7 of the Draft	3.1.3; 3.1.6; 3.1.7

			stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards. 3. The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood zones subject to NFIP requirements are identified on FEMA.s Flood Insurance Rate Maps (FIRM). The official FIRMs can be accessed through FEMAs Map Service Center (msc.fema.gov). Our Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT) could also be used to research flood hazard information. 4. The State listed Hawaiian Hoary Bat or ʻŌpeʻapeʻa (Lasiurus cinereus semotus) could potentially occur in the vicinity of the project and may roost in nearby trees. Any required site clearing should be timed to avoid disturbance to bats during their birthing and pup rearing season (June 1 through September 15). During this period woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed. Barbed wire should also be avoided for any construction because bats can become ensnared and killed by such fencing during flight. 5. Artificial lighting can adversely impact seabirds that may pass through the area at night by causing disorientation. This disorientation can result in a collision with manmade structures or the grounding of birds. For nighttime work that might be required, DOFAW recommends that all lights used to be fully shielded to minimize the attraction of seabirds. Nighttime work that requires outdoor lighting should be avoided during the seabird fledging season from September 15	EA. 8. The ENV acknowledges the comment. If a the Hawaiian Short-eared Owl or Pueo (Asio flammeus sandwichensis) is identified on-site, a buffer zone will be established and DOFAW staff will be notified. 9. The ENV acknowledges the comment and will minimize the movement of plant or soil material between worksites. The mitigation measure has been included in Section 3.1.7 of the Draft EA. 10. The ENV acknowledges the comment and confirms that the Hawaiʻi Pacific Weed Risk Assessment website will be consulted to determine the potential invasiveness of plants proposed for use in the project. The landscaping plant selected for the project site is Acalypha wilkesiana, which is not an invasive plant species. The mitigation measure has been included in Section 3.1.7 of the Draft EA.	

			through December 15. This is the period when young seabirds take their maiden voyage to the open sea. 6. Permanent lighting also poses a risk of seabird attraction, and as such should be minimized or eliminated to protect seabird flyways and preserve the night sky. For illustrations and guidance related to seabird-friendly light styles that also protect seabirds and the dark starry skies of Hawaiʻi please visit https://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf. 7. State listed waterbirds such as the Hawaiian Duck (Anas wyvilliana), Hawaiian Stilt (Himantopus mexicanus knudseni), Hawaiian Coot (Fulica alai), and Hawaiian Common Gallinule (Gallinula chloropus sandvicensis) could potentially occur in the vicinity of the proposed project site. It is against State law to harm or harass these species. If any of these species are present during construction activities, then all activities within 100 feet (30 meters) should cease, and the bird should not be approached. Work may continue after the bird leaves the area of its own accord. If a nest is discovered at any point, please contact the Oʻahu Branch DOFAW Office at (808) 973- 9778. 8. The State endangered Hawaiian Short-eared Owl or Pueo (Asio flammeus sandwichensis) could also potentially occur in the project site vicinity. The Pueo is a crepuscular species, most active during dawn and dusk twilights. DOFAW recommends twilight pre-construction surveys by a qualified biologist prior to clearing vegetation. If Pueo nests are present, a buffer zone should be established in which no clearing occurs until nesting ceases, and DOFAW staff should be notified.		

			9. DOFAW recommends minimizing the movement of plant or soil material between worksites. Soil and plant material may contain pathogens, pests such as Little Fire ants and/or Coconut Rhinoceros beetles, or invasive plant parts that could harm our native species and ecosystems. We recommend consulting the Oʻahu Invasive Species Committee (OISC) at (808) 266-7994 to plan, design, and construct the project to learn of any high-risk invasive species in the area ways to mitigate their spread. All equipment, materials, and personnel should be cleaned of excess soil and debris to minimize the risk of spreading invasive species. 10. DOFAW recommends using native plant species for landscaping that are appropriate for the area (i.e., climate conditions are suitable for the plants to thrive, historically occurred there, etc.). Please do not plant invasive species. DOFAW recommends consulting the Hawaiʻi-Pacific Weed Risk Assessment website to determine the potential invasiveness of plants proposed for use in the project (https://sites.google.com/site/weedriskassessment/home). We recommend that you refer to www.plantpono.org for guidance on the selection and evaluation of landscaping plants.		
17	City and County of Honolulu, Department of Transportation Services / J. Roger Morton, Director	2/16/2022	1. Neighborhood Impacts. The area representatives, neighborhood board, as well as the area residents, businesses, emergency personnel (fire, ambulance, and police), Oʻahu Transit Services, Inc. (TheBus and TheHandi-Van), etc., should be kept apprised of the details and status throughout the project and the impacts that the project may have on the adjoining local street area network.	1. The ENV acknowledges the comment and confirms that area representatives, neighborhood board, adjacent residents, businesses, and emergency personnel have been notified of the proposed project in the pre-consultation assessment letter, dated January 13, 2022. 2. The ENV acknowledges the comment and will	

			2. Bus Stops. The project site is in the immediate vicinity of bus stops. Please coordinate roadway improvements with DTS – Transportation Mobility Division (TMD). Contact DTS-TMD at TheBusStop@honolulu.gov. 3. Disability and Communication Access Board (DCAB). Project plans (vehicular and pedestrian circulation, sidewalks, parking and pedestrian pathways, vehicular ingress/egress, etc.) should be reviewed and approved by DCAB to ensure full compliance with Americans with Disabilities Act requirements.	coordinate with DTS Transportation Mobility Division regarding the proposed project. 3. The ENV acknowledges the comment and confirms that construction documents will be submitted to DCAB for formal review.	

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SECTION 7
Determination

In accordance with the content requirements of Chapter 343, Hawaiʻi Revised Statutes, and the significance criteria in HAR, Chapter 11-200.1-13, this assessment has determined that the proposed project will have no significant adverse impact to water quality, air quality, existing utilities, noise levels, social welfare, archaeological sites, or wildlife habitat. All anticipated impacts will be temporary and will not adversely impact the environmental quality of the project site or region.

According to the significance criteria:

1. *Irrevocably commit a natural, cultural, or historic resource.*

The proposed project will not irrevocably commit any natural, cultural, or historic resources. The proposed project involves the rehabilitation of existing facilities, renovation of facilities onto already developed area, replacement of equipment located internally within existing buildings, and upgrade of various utilities/technology within the existing, developed ʻĀhuimanu WWPTF. As a result of the proposed action, the improvements identified for the ʻĀhuimanu WWPTF in the Koʻolau Poko SCP, Section 4.3.1 Kailua – Kāneʻohe – Kahaluʻu Wastewater Service Area will be implemented (DPP, 2017). Should archaeological or cultural features be discovered during the demolition or grading phase of construction, SHPD will be notified immediately and work in the vicinity of the discovered features will be halted until the site has been evaluated for significance.

2. *Curtail the range of beneficial uses of the environment.*

The proposed project will not curtail the range of beneficial uses of the environment. The proposed project is a WWPTF, which provides sanitary, environmental, and public health benefits to the community in ensuring wastewater is properly conveyed, stored, treated, and disposed of. Upon project completion, the ʻĀhuimanu WWPTF will improve the reliability of pretreatment processes and onsite wastewater storage during storage events or peak wet weather flows, reduce noise and odor emissions, and optimize overall operations and service for the community.

3. *Conflict with the State's environmental policies or long-term environmental goals established by law.*

The proposed project is consistent with the State's environmental policies and long-term environmental goals established by law as discussed in **Section 4, Relationship to Land Use Plans and Policies**. The proposed project is also consistent with the CCH Koʻolau Poko SCP relating to wastewater management. Potential sources of adverse impacts have been identified and appropriate BMPs and other mitigation measures have been developed to either mitigate or minimize potential impacts to negligible levels.

4. Have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community or State.

The proposed project will not have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community or State. The proposed action is expected to enhance the future long-term stability of the CCH and State through the improvements of basic public works infrastructure necessary to the health and welfare of the community and region. The proposed project is not anticipated to adversely affect the economic or social welfare for the surrounding area. The rehabilitated onsite wastewater storage system, renovated Headworks, new OCS, new equipment for pretreatment processes, and other upgrades to utilities/technology will improve service reliability, but will not increase capacity which could be an impetus for population growth. In the short-term, construction activities will result in temporary economic benefits in the form of construction jobs and material procurement. Surrounding businesses may see a temporary increase in revenue from expenditures by construction personnel. These economic effects will be temporary and will cease upon project completion.

5. Have a substantial adverse effect on public health.

The proposed project will not have a substantial adverse effect on public health. The proposed action will improve the reliability of the ʻĀhuimanu WWPTF to provide pretreatment processes and rehabilitate the existing onsite wastewater storage system to prevent potential wastewater overloads and/or spills during storage events or peak wet weather flows, thereby continuing to protect public health by responsibly treating, storing, and disposing of wastewater for the community and region. The proposed project will be constructed in accordance with all applicable rules and regulations governing public health and safety. Concerns involving air, water, noise, and waste impacts have been addressed in this EA document by use of appropriate mitigation measures as described in **Section 3, Description of Affected Environment**.

6. Involve adverse secondary impacts, such as population changes or effects on public facilities.

The proposed project will not involve adverse secondary impacts, such as population changes or effects on public facilities. The proposed action will improve an existing public facility to ensure the continued reliability of pretreatment processes and onsite wastewater storage; however, it will not increase the capacity of the ʻĀhuimanu WWPTF, which could be an impetus for population growth.

7. Involves a substantial degradation of environmental quality.

The proposed project will not involve a substantial degradation of environmental quality. The proposed action will be developed in accordance with the environmental polices of Chapter 343, HRS, and the National Environmental Policy Act. The project will ensure the continued reliability of operations and maintenance of the ʻĀhuimanu WWPTF. It is anticipated that energy, material, and human resources will be expended during future construction. Mitigation measures will be employed to minimize potential effects from construction activities, such as dust and stormwater controls.

8. *Be individually limited but cumulatively have substantial adverse effect upon the environment or involves a commitment for larger actions.*

The proposed project will not be individually limited but cumulatively have substantial adverse effect upon the environment or involve a commitment for larger actions. The proposed project will provide necessary rehabilitation and renovation of existing facilities, replacement of deteriorated equipment, and modernization of utilities/technology of the existing ʻĀhuimanu WWPTF to ensure continued reliability of the CCH wastewater system for the community and region. The proposed actions will not expand the municipal wastewater system service area or capacity, which could be an impetus for population growth.

9. *Have a substantial adverse effect on a rare, threatened, or endangered species, or its habitat.*

The proposed project will not have a substantial adverse effect on a rare, threatened, or endangered species, or its habitat as the project site has been previously disturbed and developed with the existing ʻĀhuimanu WWPTF. There are no known rare, threatened, or endangered species or their habitat within the project site.

10. *Have a substantial adverse effect on air or water quality or ambient noise levels.*

The proposed project will not have a substantial adverse effect on air or water quality or ambient noise levels. The proposed action will improve the Kailua – Kāneʻohe – Kahaluʻu wastewater service area by improving the ʻĀhuimanu WWPTF's ability to provide pretreatment processes and onsite wastewater storage during storage events or peak wet weather flows, thereby addressing existing wastewater service area issues of wastewater overloads and spills. The proposed improvements will minimize noise and odor emissions from the WWPTF. Any short-term potential impacts to air, water quality, or noise levels will be mitigated through BMPs and the implementation of appropriate mitigation measures described in **Section 3, Description of Affected Environment**.

11. *Have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.*

The proposed project will not have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area. The proposed action will reduce existing wastewater service area issues of wastewater overloads and spills, thereby minimizing potential impacts to environmentally sensitive areas. The project site is not located in an environmentally sensitive area as described in **Section 3, Description of Affected Environment**.

12. *Have a substantial adverse effect on scenic vistas and view planes, during day or night, identified in county or state plans or studies.*

The proposed project will not have a substantial adverse effect on scenic vistas and view planes as described in **Section 3, Description of Affected Environment**. Since the project site is already developed with the existing ʻĀhuimanu WWPTF, future site improvements would not substantially alter existing views. During construction, views of the construction activities and/or equipment will be apparent in various locations; however, they will not completely block scenic views at any given time.

13. *Require substantial energy consumption or emit substantial greenhouse gases.*

The proposed project will not require substantial energy consumption or emit substantial greenhouse gases. There will be a slight increase in energy consumption during construction activities, however, energy consumption rates will return to normal once construction is completed.

Based on analysis and review of the information contained in this Environmental Assessment, it is anticipated that an Environmental Impact Statement (EIS) will not be required and that a recommended FONSI will be issued for this project.

SECTION 8
References

(DEM, 2015). Department of Emergency Management. (2015). *Tsunami Evacuation Zone Map*, *Map 21, Inset 2*. Retrieved from: https://www.honolulu.gov/rep/site/dem/dem_docs/tsunami_evac/etez_final/Kaneohe_Bay_to_Koolau_Bay_map21_inset2.pdf

(DOH, 2014). State of Hawaiʻi, Department of Health. (2014). *Water Quality Standards Map of the Island of Oʻahu.* Retrieved from: http://health.hawaii.gov/cwb/files/2013/05/WQS_20140708_Oahu_Reduced.pdf

(DOH, 2021). State of Hawaiʻi, Department of Health. (2021). *Island of Oʻahu, Daily Air Quality Data*. Retrieved from: https://air.doh.hawaii.gov/home/map.

(DPP, 2017). Department of Planning and Permitting, City and County of Honolulu. (2017). *Koʻolau Poko Sustainable Communities Plan*. Retrieved from:

http://honoluludpp.org/Portals/0/pdfs/planning/Koolaupoko/2017-08.KPSCP.pdf

(DPP, 2021). Department of Planning and Permitting, City and County of Honolulu. (2021). *City and County of Honolulu's Maps of Oʻahu.* Retrieved from: http://honolulugis.org/

(FEMA, 2014). Federal Emergency Management Agency. (2014). *Federal Insurance Rate Map (FIRM). Map No. 15003C0260F, revised to reflect letter of map revision (LOMR) effective 09/08/2017.* Retrieved from: https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd&extent=-157.84394497894323,21.43423427848666,-157.81793828033412,21.454206520156898

(PTWC, 2009). Pacific Tsunami Warning Center. (2009). *Tsunami Safety & Preparedness in Hawaiʻi.* Retrieved from: http://ptwc.weather.gov/ptwc/hawaii.php

(RMTC, 2020). R. M. Towill Corporation. (2020). *ʻĀhuimanu Wastewater Pre-Treatment Facility Improvements and Equalization Facility, Design Alternatives Report*.

(UH, 2014). University of Hawaiʻi, Department of Geography. (2014) *Atlas of Hawaiʻi.* Honolulu: University of Hawaiʻi Press.

(USDA, 1972). United States Department of Agriculture (USDA), Soil Conservation Service, in Cooperation with the University of Hawaiʻi Agricultural Experiment Station. (1972). *Soil Survey of Islands of Kauaʻi, Oʻahu, Maui, Molokaʻi and Lānaʻi, State of Hawaiʻi*.

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Appendix A

Construction Drawings: Preliminary Site Plans

JOB NO. XX-XX

AHUIMANU WASTEWATER PRETREATMENT FACILITY IMPROVEMENTS AND EQUALIZATION FACILITY

AHUIMANU, KANEOHE, OAHU, HAWAII
TMK: 4-7-004: 006

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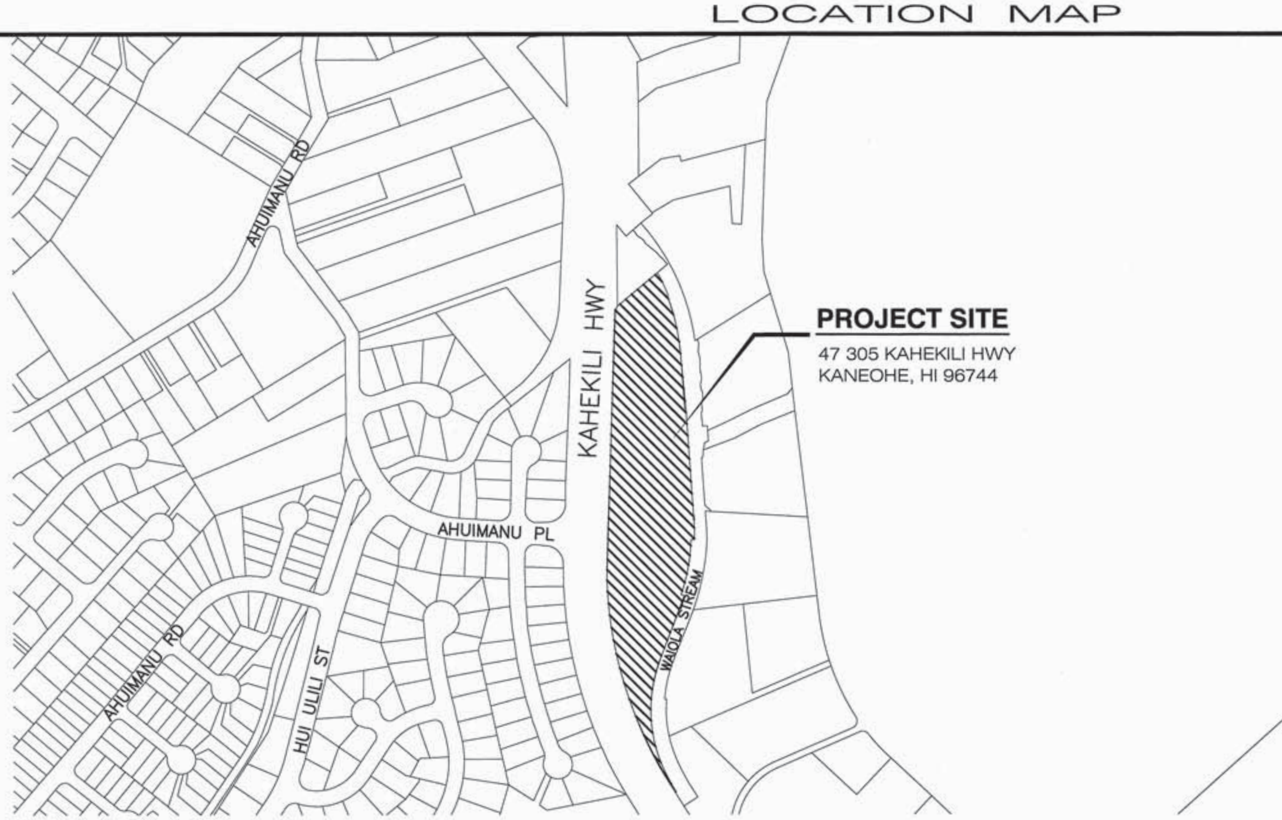
DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY & COUNTY OF HONOLULU

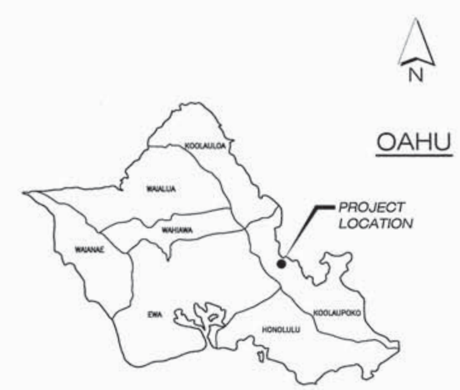
PREPARED BY:

R. M. TOWILL CORPORATION
SINCE 1930
Planning • Engineering • Environmental Services • Photogrammetry • Surveying • Construction Management

LOCATION MAP



LOCATION MAP
NOT TO SCALE



TMK: 4-7-004: 006

APPROVED

DIRECTOR
DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
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DIRECTOR
DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
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CHIEF
ENVIRONMENTAL MANAGEMENT DIVISION
STATE DEPARTMENT OF HEALTH
DATE

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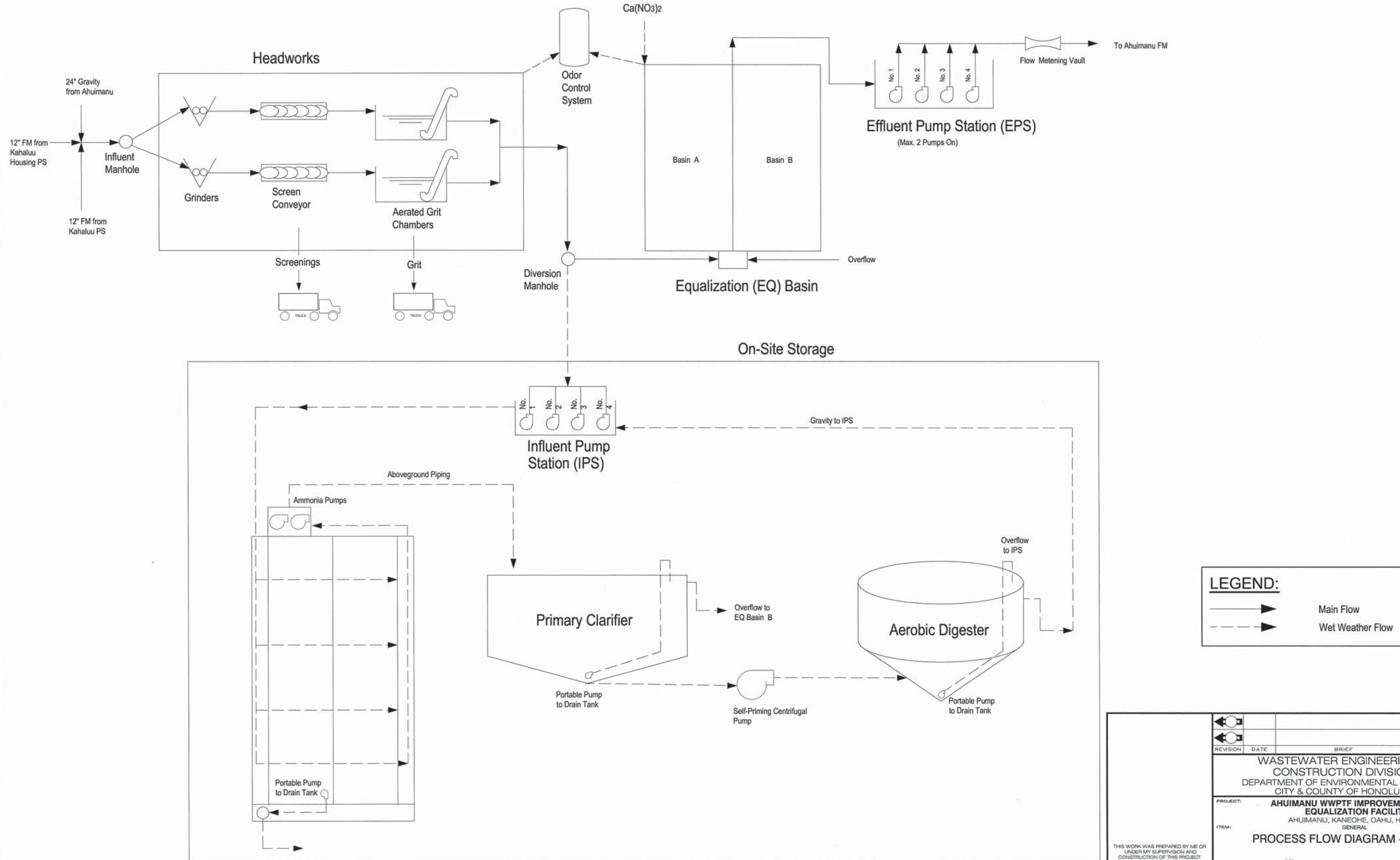
JOB NO. XX-XX

ANU WWPTF IMPROVEMENTS AND EQUALIZATION FACILITY-60% SUBMITTAL



PROCESS FLOW DIAGRAM - EXISTING

Wed, 07 Jul 2021 - 8:31am K:\ww\22366 Ahuimanu WWPTF\Drawings\Construction Dwgs\General\G04_Ahui-Process Flow Diagram_Liquid Ex.dwg

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DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY & COUNTY OF HONOLULU

PROJECT: **AHUIMANU WWPTF IMPROVEMENTS AND EQUALIZATION FACILITY**
AHUIMANU, KANEOHE, OAHU, HAWAII

ITEM: GENERAL

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BRANCH HEAD
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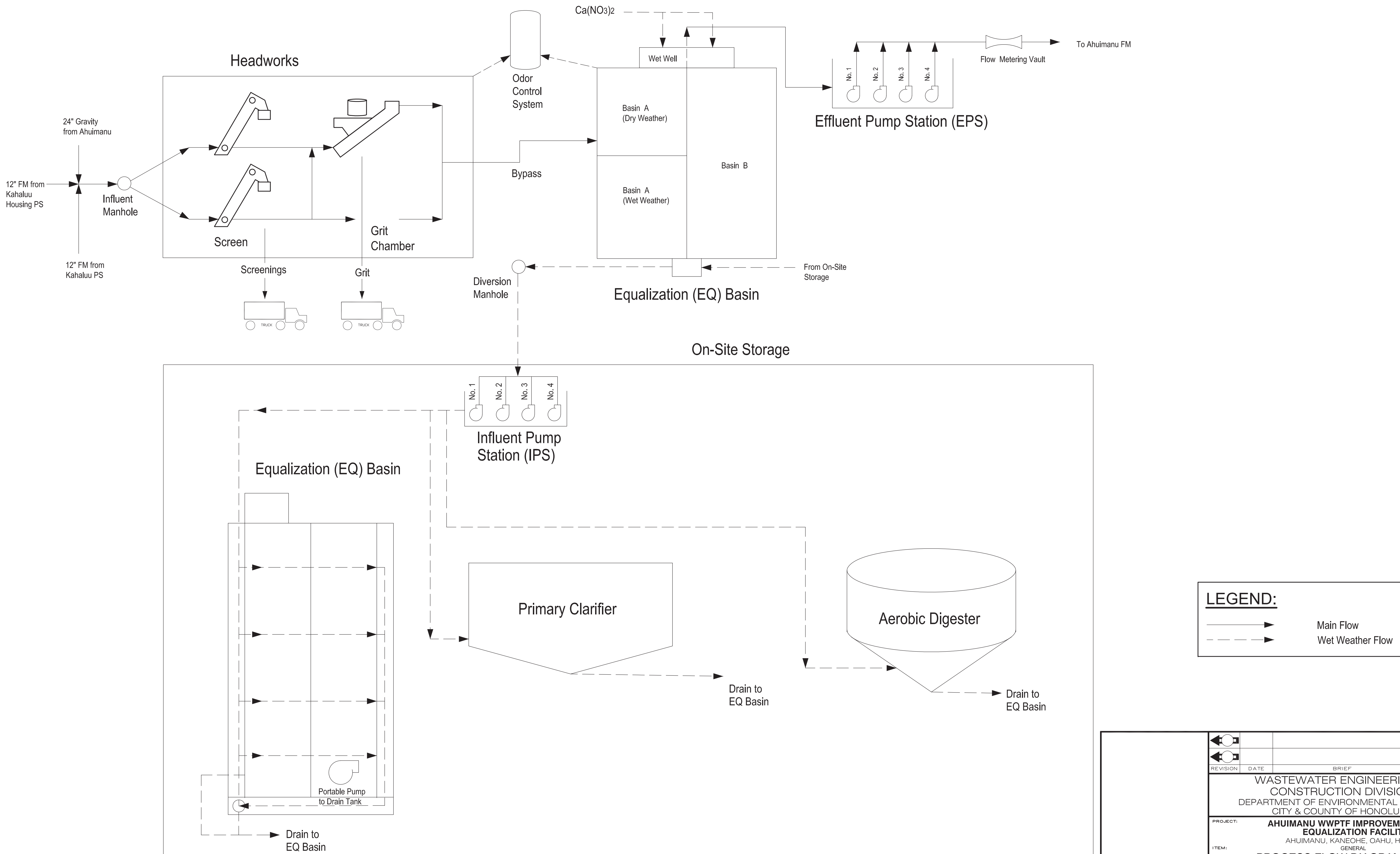

PROCESS FLOW DIAGRAM - (NEW)

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DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY & COUNTY OF HONOLULU

PROJECT: **AHUIMANU WWPTF IMPROVEMENTS AND EQUALIZATION FACILITY**
AHUIMANU, KANEOHE, OAHU, HAWAII

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PROCESS FLOW DIAGRAM - (NEW)

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PIPE AND FITTING DESIGNATION

DOUBLE LINE | SINGLE LINE

- STRAIGHT PIPE
- BELL & SPIGOT JOINT
- RESTRAINED BELL & SPIGOT JOINT
- FLANGED JOINT
- GROOVED END COUPLING
- GROOVED END COUPLING
- FLANGE/GROOVED END FLANGED ADAPTER
- MECHANICAL JOINT
- FLEX-COUPLING SINGLE SPHERE
- FLEX-COUPLING RIBBED
- BLIND FLANGE
- STRAINER
- SCREWED JOINT
- WELDED JOINT
- SOLVENT WELD JOINT
- ELBOW DOWN (TEE SIMILAR)
- ELBOW UP (TEE SIMILAR)
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER
- UNION
- CUT PIPE

VALVE DESIGNATION

- BALL
- BUTTERFLY
- DOUBLE DISK CHECK
- SWING CHECK
- GLOBE
- GATE
- NEEDLE
- PLUG
- ANGLE
- FLUSHING CONNECTION
- PRESSURE REDUCING
- BACK PRESSURE REDUCING
- RELIEF
- MANUAL AIR RELIEF
- SAMP — MANUAL AIR RELIEF/ SAMPLING PORT

VALVE ACTUATORS

- (BLANK) — MANUALLY OPERATED
- M — MOTOR OPERATED
- S — SOLENOID OPERATED
- H — HYDRAULICALLY OPERATED
- SLUICE/SLIDE GATE OPERATOR

FLOW ELEMENTS

- PARSHALL FLUME
- CUTTHROAT FLUME
- ULTRASONIC FLOW ELEMENT
- M — MAGNETIC FLOW ELEMENT
- PROPELLER METER

MISCELLANEOUS

- ROTAMETER
- DIAPHRAGM CHEMICAL SEAL
- FLEXIBLE HOSE
- SLUICE GATE
- GATE
- SLIDE GATE
- GAUGE
- DRIP TRAP
- WATER LEVEL
- INJECTOR
- TUBULAR CHEMICAL SEAL
- FIRE HYDRANT
- CLEANOUT
- HOSE BIBB, FLOOR DRAIN WHERE NOTED
- FLOAT SWITCH
- RF — CAPACITANCE LEVEL ELEMENT
- GAUGE ISOLATION RING
- RADAR LEVEL ELEMENT
- HYDROSTATIC LEVEL ELEMENT

CIVIL LEGEND

EXISTING

ST. MON.	STREET MONUMENT
SMH	SEWER MANHOLE
DMH	DRAIN MANHOLE
WMH	WATER MANHOLE
WM	WATER METER
50	CONTOUR LINE
WV	WATER VALVE
FH	FIRE HYDRANT
	ELECTRICAL POLE
	ELEC. POLE W/LIGHT
	STREET LIGHT
R/W OR R.O.W.	RIGHT-OF-WAY
	SIGN
℞	PROPERTY LINE
	TREES
	BENCH MARK
+44.30	SPOT ELEVATION
	CRM WALL
	FENCE
	EASEMENT LINE
18"S — S18	SEWER LINE
18"D — D18	DRAIN LINE
18"W — W18	WATER LINE
OH	ELECTRICAL/TELEPHONE OVERHEAD LINE

PROPOSED

ST. MON.	STREET MONUMENT
SMH	SEWER MANHOLE
DMH	DRAIN MANHOLE
WMH	WATER MANHOLE
WM	WATER METER
WV	WATER VALVE
FH	FIRE HYDRANT
ARV	AIR RELIEF VALVE
R/W OR R.O.W.	RIGHT-OF-WAY
	SIGN
℞	PROPERTY LINE
F.G.	FINISH GRADE
44.5	FINISH GRADE ELEVATION
	BASELINE
	BORING LOCATION
	FLOW
	DEMOLISH AND REMOVE
D18	DRAIN LINE
W18	WATER LINE
S18	SEWER LINE
	FENCE
	TOP OF SLOPE
	BOTTOM OF SLOPE

CROSS REFERENCING SYSTEM

SECTION IDENTIFICATION LETTER

A — M101 | M102

NUMBER OF SHEET ON WHICH SECTION IS TAKEN

NUMBER OF SHEET ON WHICH SECTION IS DRAWN

SYMBOL WHERE SECTION IS TAKEN

SECTION — SCALE: 3/32" = 1'-0" — A — M101 | M102

SUBTITLE FOR SECTION DRAWING

7 — M102 | M3

IDENTIFICATION NUMBER OF DETAIL

NUMBER OF SHEET ON WHICH CONDITION IS SHOWN

NUMBER OF SHEET ON WHICH DETAIL OF THE CONDITION IS DRAWN

SYMBOL FOR LOCATING CONDITION FOR WHICH THERE IS A DETAIL

DETAIL — SCALE: 3/8" = 1'-0" — 7 — M102 | M3

SUBTITLE FOR DETAIL DRAWING

DISCIPLINE DESIGNATION

G	GENERAL
C	CIVIL
GT	GEOTECHNICAL
L	LANDSCAPE
A	ARCHITECTURAL
S	STRUCTURAL
N	PROCESS & INSTRUMENTATION
M	MECHANICAL
MM	AIR CONDITIONING & VENTILATION
P	PLUMBING
E	ELECTRICAL

PIPE DESIGNATION

- 24" PE — EXISTING PIPE
- 24" PE — FUTURE PIPE
- 24" PE — NEW PIPE
- SERVICE DESIGNATION
- PIPE SIZE

LINE SYMBOLS

- EXISTING PIPE
- FUTURE PIPE
- NEW PIPE

REVISION | DATE | BRIEF | BY | APPROVED

WASTEWATER ENGINEERING & CONSTRUCTION DIVISION
DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY & COUNTY OF HONOLULU

PROJECT: AHUIMANU WWPTF IMPROVEMENTS AND EQUALIZATION FACILITY
AHUIMANU, KANEOHE, OAHU, HAWAII

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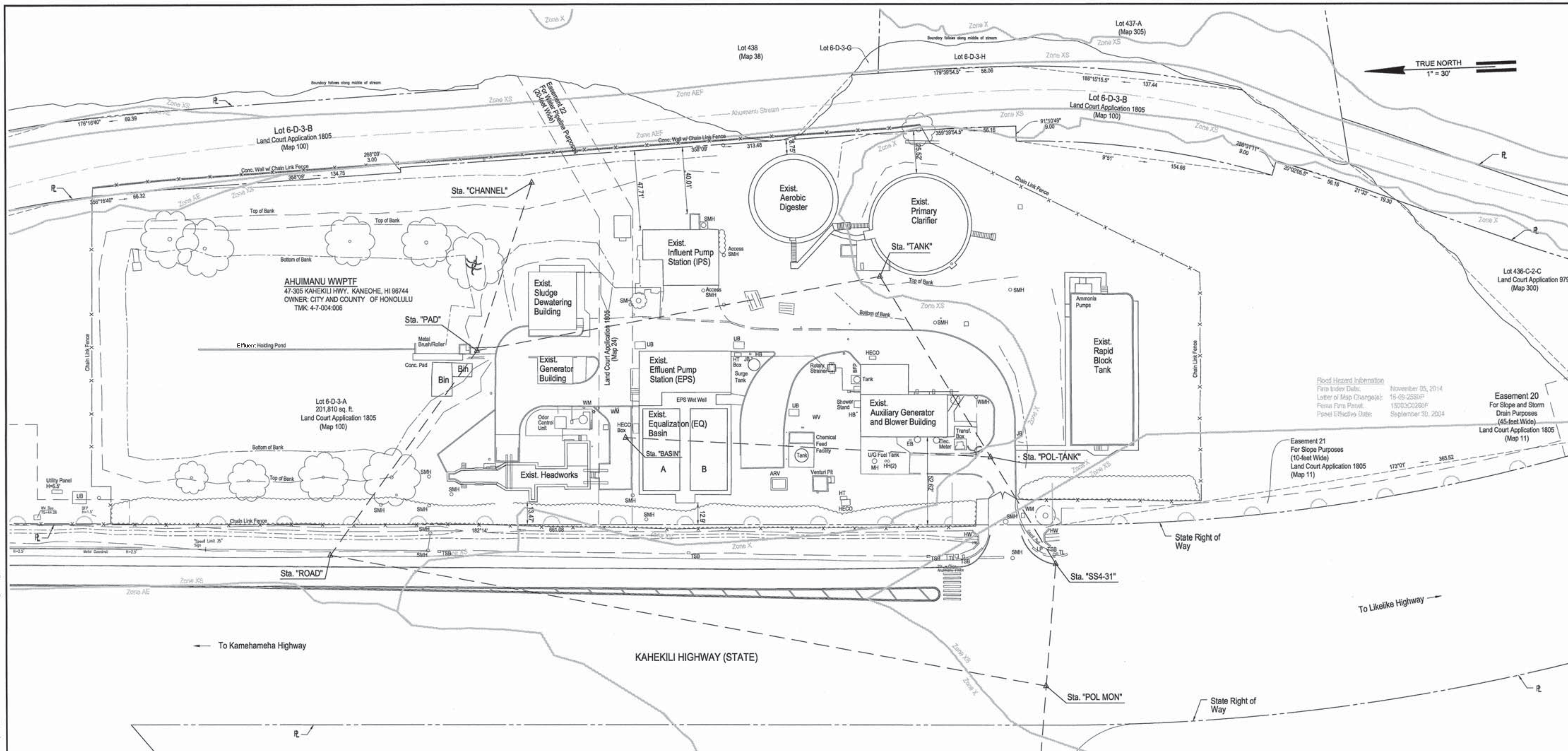

GENERAL SITE PLAN - EXISTING

SCALE: 1" = 30'

GRAPHIC SCALE:

1" = 30' 30' 15' 0 30' 60'

REVISION	DATE	BRIEF	BY	APPROVED

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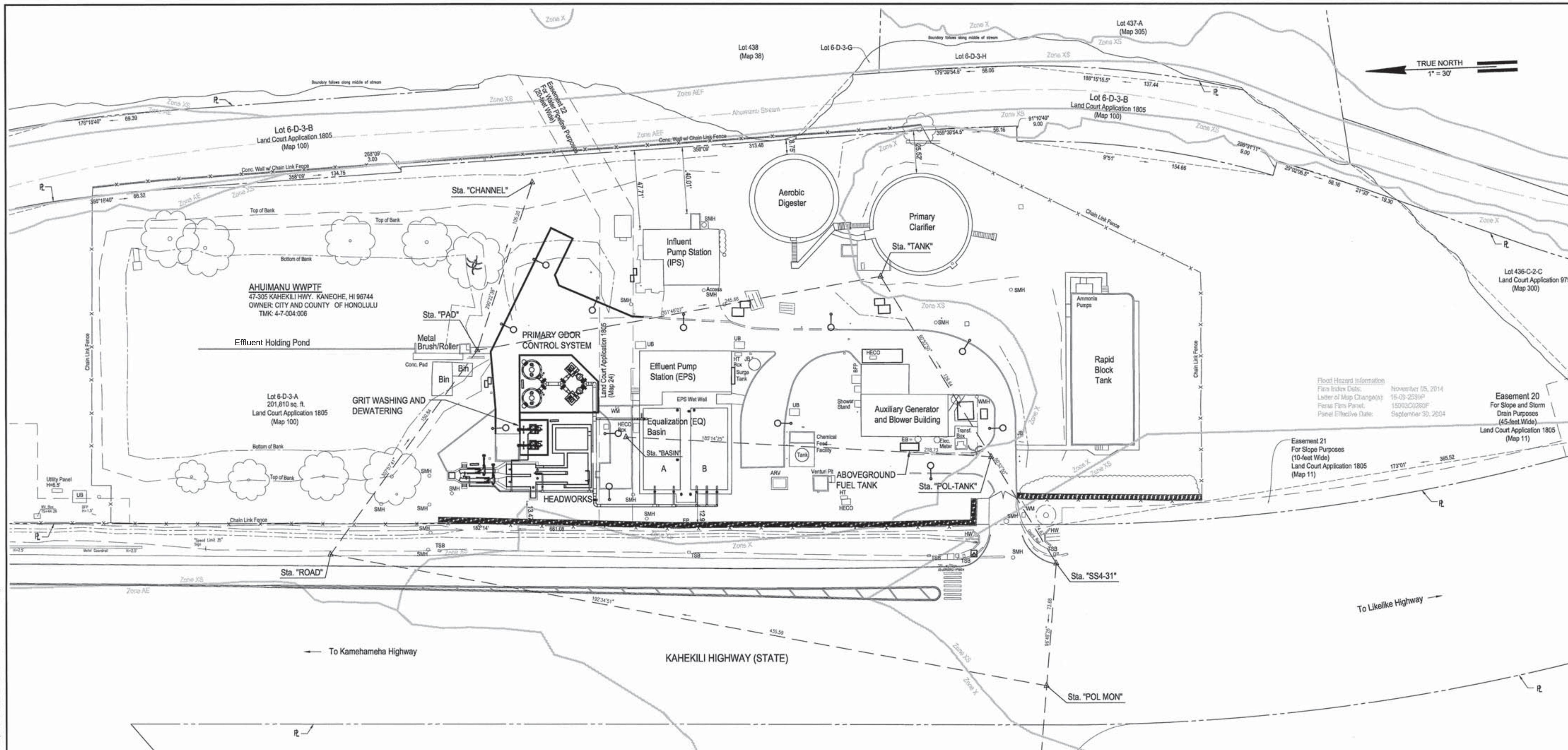

GENERAL SITE PLAN - NEW

SCALE: 1" = 30'

GRAPHIC SCALE:

1" = 30' 30' 15' 0 30' 60'

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PROJECT: **AHUIMANU WWPTF IMPROVEMENTS AND EQUALIZATION FACILITY**
AHUIMANU, KANEOHE, OAHU, HAWAII

ITEM: CIVIL
GENERAL SITE PLAN - NEW

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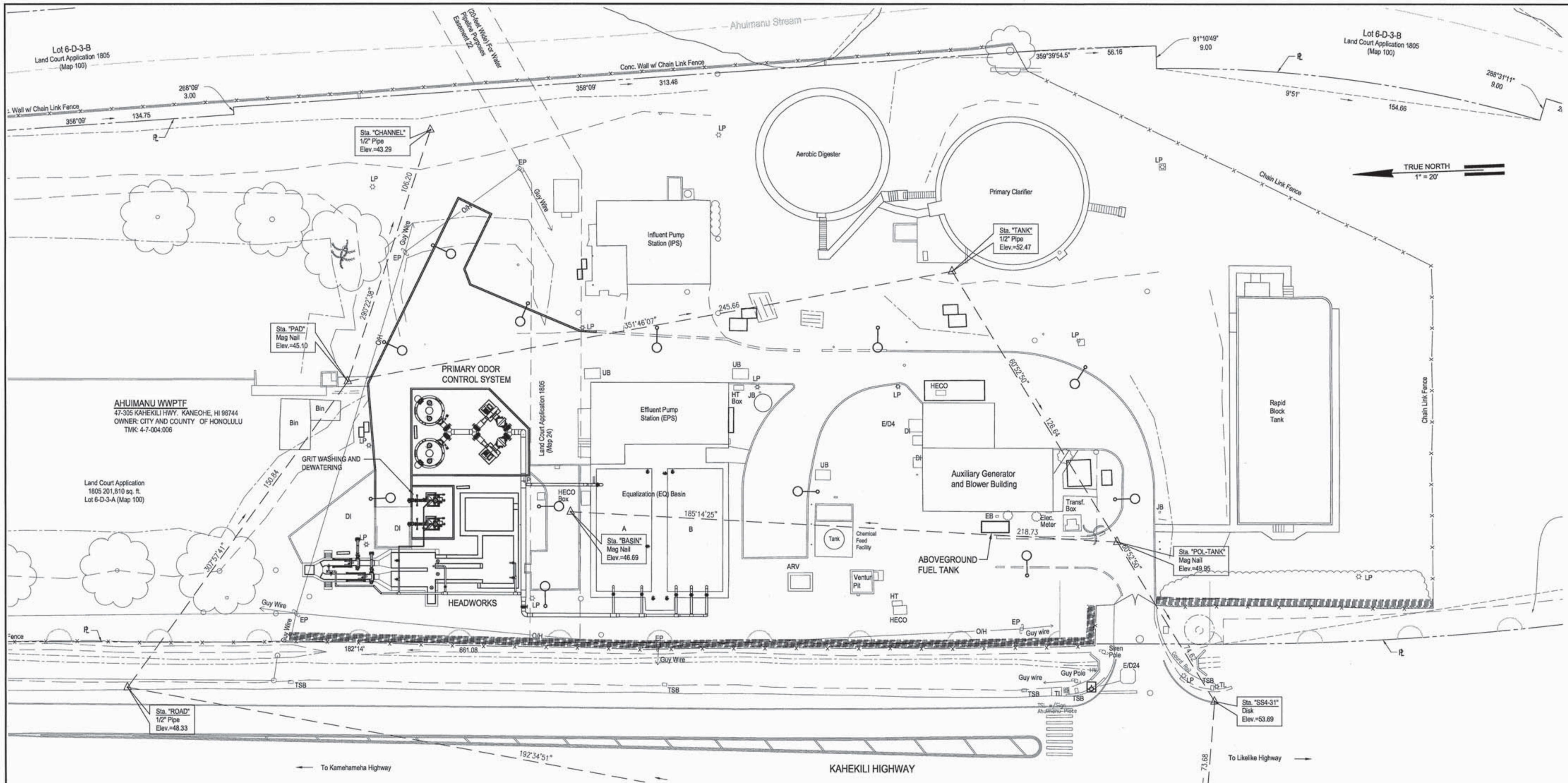

SITE PLAN

SCALE: 1" = 20'

GRAPHIC SCALE:

1" = 20' 20' 10' 0 20' 40'

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CITY & COUNTY OF HONOLULU

PROJECT: AHUIMANU WWPTF IMPROVEMENTS AND EQUALIZATION FACILITY
AHUIMANU, KANEOHE, OAHU, HAWAII

ITEM: CIVIL
SITE PLAN

DESIGNED BY: SW/GR/JMN CHECKED BY: GR/JMN
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APPROVED: BRANCH HEAD
CHIEF DATE

JOB NO. W

FILE CABINET DRAWER FILE POCKET FOLDER NO.

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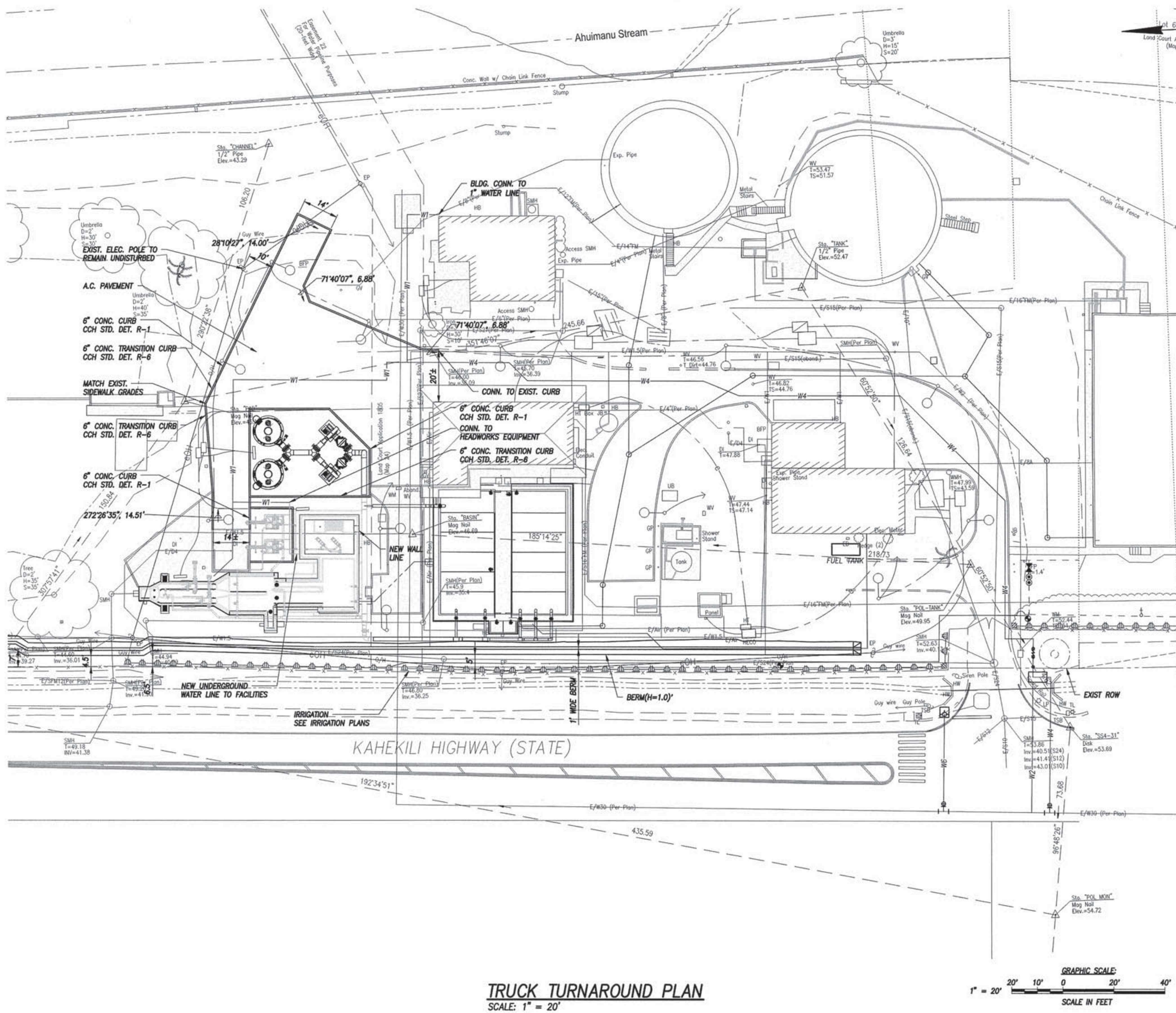

TRUCK TURNAROUND PLAN

SCALE: 1" = 20'

REVISION	DATE	BRIEF	BY	APPROVED

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CITY & COUNTY OF HONOLULU

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AHUIMANU, KANEOHE, OAHU, HAWAII

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TRUCK TURNAROUND PLAN

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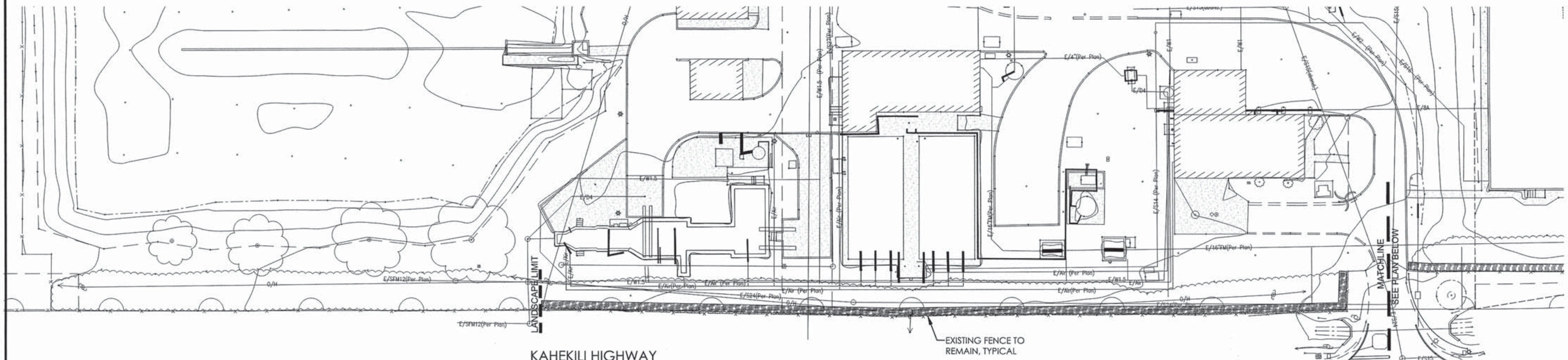
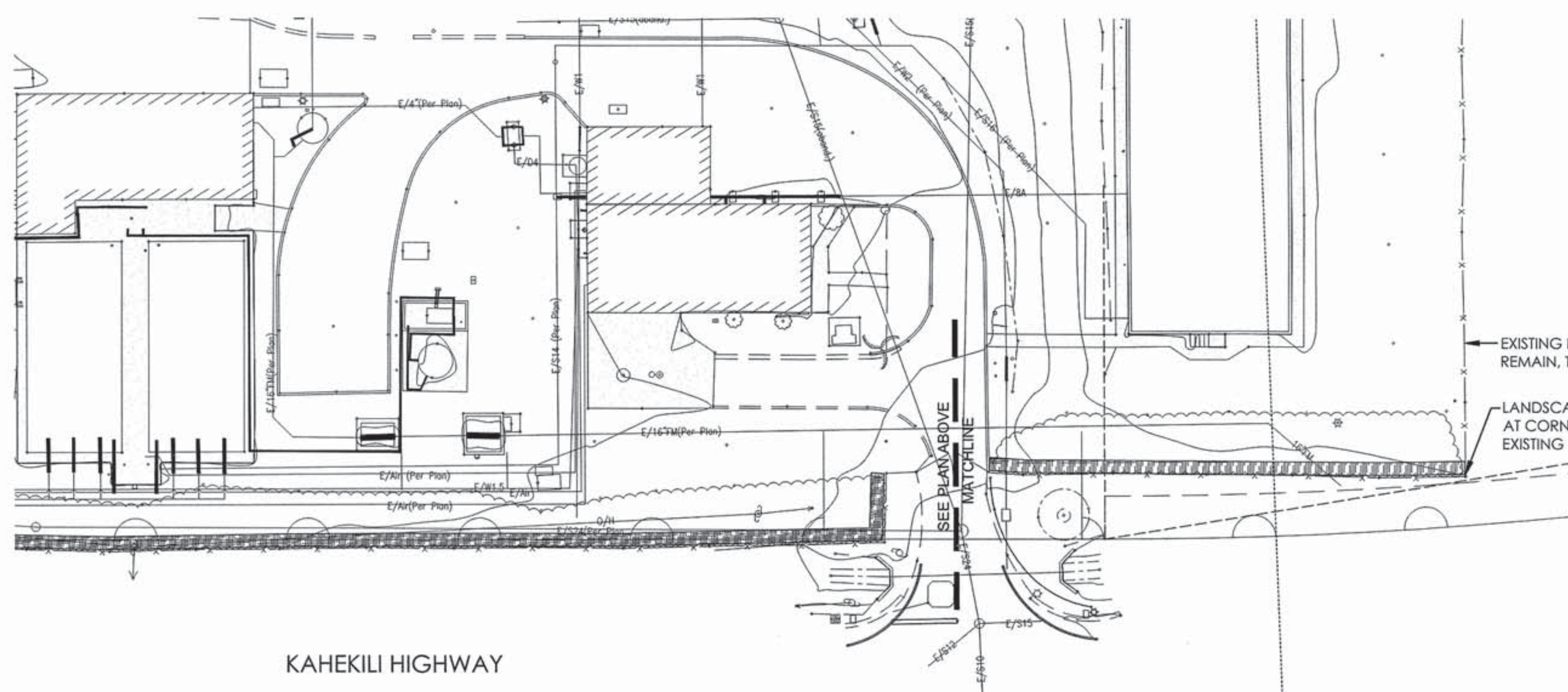


LANDSCAPE PLAN - 1
SCALE: 1" = 20'-0"

0 10 20 40 60
SCALE: 1" = 20'-0"

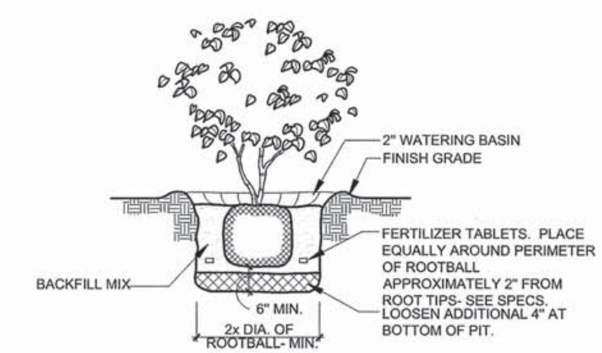
PLANT LEGEND

	300 EA. COPPERLEAF / ACALYPHA WILKESIANA MACAFEANA 1 GAL. CAN, 18" HT., 1'-6" O.C. PLANT 2'-0" FROM EXISTING FENCE MAINTAIN AT 10'-0" HT. MIN.



LANDSCAPE PLAN - 2
SCALE: 1" = 20'-0"

0 10 20 40 60
SCALE: 1" = 20'-0"



SHRUB PLANTING
NOT TO SCALE

LP-001a
12/31/98

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RICHARD C. BROWNLIE
LICENSED PROFESSIONAL LANDSCAPE ARCHITECT
No. 4613
HAWAII, U.S.A.

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PROJECT: AHUIMANU WWPTF IMPROVEMENTS AND EQUALIZATION FACILITY
AHUIMANU, KANEOHE, OAHU, HAWAII

ITEM:
LANDSCAPE PLAN

DESIGNED BY: RB
DRAWN BY: JB
APPROVED:
CHIEF

CHECKED BY:
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BRANCH HEAD
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Appendix B

‘Āhuimanu WWPTF Improvements and Equalization Facilities
Design Alternatives Report

R.M. Towill Corporation ▪ 2024 N. King Street Suite 200 ▪ Honolulu, HI 96819-3470 ▪ 808-842-1133 ▪ email: rmtowill@rmtowill.com

Ahuimanu Wastewater Pre-Treatment Facility Improvements and Equalization Facility, Design Alternatives Report

Final - August 20

Prepared by:

R. M. Towill Corporation

Prepared for:

RMTC Ref: 1-22366-00

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Abbreviations & Acronyms

AC/h	air changes per hour
ACM	asbestos-containing material
AST	above-ground storage tank
bgs	below ground surface
CCH	City and County of Honolulu
cfm	cubic feet per minute
CSM	Collection Systems Maintenance (City and County of Honolulu Department of Environmental Services)
DAR	Design Alternatives Report
DI	ductile iron
DS	Dissolve sulfide
E2	Element Environmental, LLC
EPS	Effluent Pump Station
EQ	Equalization
ESA	Environmental Site Assessment
FACD	First Amended Consent Decree
FM	force main
FRP	fiberglass reinforced plastic
ft	foot
gpm	gallons per minute
H_2S	hydrogen sulfide
HAR	Hawaii Administrative Rules
HDOT	State of Hawaii Department of Transportation
HECo	Hawaiian Electric Company
HP	horsepower
HT	Hawaiian Telcom
Hwy	highway
IPS	influent pump station
kg	kilogram
KK Tunnel	Kaneohe-Kailua Tunnel
kVA	kilovolt amps
kW	kilowatts
kWh	kilowatt hours
LBP	lead-based paint
lbs	pounds
LCP	lead-containing paint
LF	lineal feet
LID	Low Impact Development
MCC	motor control center
MG	million gallons
mgd	million gallons per day
NFPA	National Fire Protection Agency
OCS	odor control system

OTWC	Oceanic Time Warner Cable
PC	Primary Clarifier
PLC	programmable logic controller
PS	pump station
PWWF	peak wet weather flow
RMTC	R.M. Towill Corporation
SCADA	Supervisory Control and Data Acquisition System
SES	Sand Equivalent Size
SMH	Sewer Manhole
SP	sampling point
TDH	total dynamic head
UPS	uninterruptible power supplies
UST	underground storage tank
VFD	variable frequency drive
VIS	vertically integrated sampler
WQV	water quality volume
WWPTF	wastewater pre-treatment facility
WWTP	wastewater treatment plant

Preface

The original version of this “Ahuimanu Wastewater Pre-Treatment Facility Improvements and Equalization Facility, Design Alternatives Report (FINAL)” was prepared in August 2020, for the Department of Environmental Services (ENV), Wastewater Engineering and Construction Division (WEC), City and County of Honolulu by R.M. Towill Corporation.

This report has been updated to reflect changes to the Ahuimanu WWPTF Improvements and Equalization Facility Design Alternatives Report after the Final Workshop was completed.

This current version is an update of the original version and was prepared by R.M Towill Corporation.

Executive Summary

Background

The Ahuimanu Wastewater Pre-Treatment Facility (WWPTF) is a pretreatment, storage and pumping facility located at 47-305 Kahekili Highway in the Ahuimanu area of Kaneohe.

The purpose of this report is to explore potential options that would provide the following:

- Increased storage to prevent spills in the event of station failure and/or maintenance.
- Increased storage for projected peak wet weather flow.
- Provide and maintain a minimum of 600,000 gallons of storage required in the First Amended Consent Decree (FACD) until the conclusion of the operational period of the Kaneohe-Kailua Sewer Tunnel (KK Tunnel). **Completed.**

Recommendations on a proposed storage system that satisfies the above requirements and other facility improvements needed at the Ahuimanu WWPTF are mentioned in the sections below.

Storage System Alternatives

The following three (3) storage system alternatives were evaluated based on total wet weather storage capacity, constructability, construction costs, ease of operation, and available land for a Septage Receiving Facility and CSM drying bins.

- *Option 1 – Re-Use Existing Storage Tanks*
- *Option 2 – New Storage Tanks*
- *Option 3A – Existing EQ Basins with New EQ Basin (Pumped)*
- *Option 3B – Existing EQ Basins with New EQ Basin (Gravity)*

A summary of the major features of each of the storage system alternatives and their rankings are shown in **Table ES-1**.

Table ES-1.
Summary of Storage System Alternatives and Ranking

	Option 1	Option 2	Option 2	Option 3A (Pumped)	Option 3A (Pumped)	Option 3B (Gravity)	Option 3B (Gravity)
New Tank Location	-	Ex. Storage Tank Site	Effluent Holding Pond	Ex. Storage Tank Site	Effluent Holding Pond	Ex. Storage Tank Site	Effluent Holding Pond
Existing EQ Basin to remain?	Yes	No	No	Yes	Yes	Yes	Yes
Total wet weather storage volume (MG)	0.80	1.0	1.0	1.0	1.0	1.0	1.0
Constructability ranking[1]	1	4	4	2	2	3	3
Ease of operation ranking[1]	4	2	2	2	2	1	1
	Option 1	Option 2	Option 2	Option 3A (Pumped)	Option 3A (Pumped)	Option 3B (Gravity)	Option 3B (Gravity)
Construction of a septage receiving manhole and driveway possible?	No	Yes	Yes	Yes	Yes	Yes	Yes
Space available for drying bins?	No	Yes[2,3]	Yes[2,3]	Yes[2,3]	Yes[2,3]	Yes[3] (largest)	Yes[3] (largest)
Influent Pump Station to be used?	Yes	Yes	Yes	Yes	Yes	No	No
Potential risk[4]	No	No	No	No	No	Yes	Yes
Construction cost[5]	$12.4M	$33.5M	$32.8M	$30.0M	$29.1M	$34.3M	$33.5M

Footnote:
1. Rankings: 1 is the best and 4 is the worst.
2. Same footprint for Option 2 and Option 3A.
3. The available land is in the flood zone.
4. Any unknown underground obstruction will make the option infeasible.
5. Cost includes new EQ and associated work related to EQ option only (see **Section 6**). Cost includes 35% contingency.

The recommended storage option for Ahuimanu WWPTF is Option 1 – Re-Use Existing Storage Tanks. Option 1 is preferred since the CITY is planning to construct a new backup force main in the future to alleviate the need for a new Equalization Basin for spill contingency. This option utilizes both the existing storage tanks (Aerobic Digester, Primary Clarifier, Rapid Block Unit) and the existing EQ Basin to store up to 0.8 million gallons (MG) of wastewater during peak wet weather conditions. Under dry weather conditions, wastewater flows from the Headworks structure directly into a new dry weather compartment partitioned in EQ Basin A. New influent piping will be installed and connected to the dry weather compartment where wastewater will discharge through a drop pipe submerged below the basin operating water level.

Incoming flows that exceed 5.83 mgd, will initially overflow to the remaining wet weather compartments in the existing EQ Basin. As the water level continues to rise, wastewater will surcharge from the existing diversion manhole to the IPS. The IPS will be used to pump wastewater to the existing storage tanks. After the storage event is over, wastewater stored in the existing storage tanks will be drained by gravity back to the existing EQ Basin B and pumped out via the EPS.

As discussed in **Section 4**, this storage alternative (Option 1) has the lowest construction cost and constructability difficulty. It would however, be the most difficult option to operate, require the most maintenance, and provide the least amount of wet weather storage. It also would not be able to be completely drained without additional portable submersible pumps.

Facility Improvements

Additional facility improvements at the Ahuimanu WWPTF were evaluated in accordance with the Project Charter and are discussed below. Recommended facility improvements are also based on CITY preferences and on implementing and supporting Storage Option 1.

Headworks

Replacement of the existing Headworks is recommended to address screenings and grit issues that have impacted the downstream equipment and the Ahuimanu Force Main over the years. The proposed screenings system will be installed within the existing Headworks structure and be able treat 2030 peak wet weather flows. The proposed grit removal system will have a higher removal efficiency and mitigate grit settling in the existing Equalization Basin and Ahuimanu Force Main. Rehabilitation of the existing concrete structure and liner will also be required.

Effluent Pump Station (EPS)

New variable speed pumps and other system improvements were recommended for the EPS. These new dry pit submersible pumps would be able to handle the projected peak wet weather flows of 5.84 mgd. An additional jockey pump with no standby will be installed to manage low flow conditions at night. The main pumps should be run periodically to flush the existing force main and prevent grit accumulation after periods of low flow as the jockey pumps will be pumping at low velocities. The proposed EPS pump design is summarized in **Table ES-2**.

Table ES-2.
Constant Speed Pump Design Information

Type	Dry-Pit Submersible
No. of Pumps	2+1 Standby
Main Pumps	2,030 gpm @ 294 ft TDH
Main Pumps – Reduced Speed	1,390 gpm @ 211 ft TDH
Jockey Pump	600 gpm @ 150 ft TDH
Jockey Pump – Reduced Speed	200 gpm @ 145 ft TDH

Influent Pump Station (IPS)

Option 1 requires the IPS to have a design capacity of 2.27 mgd in order to handle peak wet weather flows that exceed the maximum design pumping rate of 5.84 mgd at the EPS. The IPS pump design summary is shown in **Table ES-3**.

Table ES-3.
IPS Pump Design Summary

Pump type	Submersible dry pit
Pump size	• 525 gpm
No. of Pumps	3+1 standby

The system improvements would also include structural rehabilitation, and replacement of the existing piping, ventilation, level control, and gas monitoring system.

Blowers

The aeration system piping shall be re-configured to provide continuous air to the EQ Basin A and B compartments. Aerating the dry weather compartment will allow the solids to remain in suspension and strip out dissolved sulfides present in the wastewater. Aeration of the wet weather compartments will be intermittent and only when the existing EQ Basin is in use. New smaller and energy efficient blowers are recommended to replace the existing blowers.

Odor Control System

A new odor control system shall be installed to pull 5,100 scfm of foul air from the existing Headworks, EQ Basin and wet well. Ventilation of the dry weather and wet weather compartments will be engineered to reduce the average H2S gas concentrations to below 15 ppm. Carbon scrubbers are the recommended type of odor control system to be used because of their ease of operation and require less maintenance. Continued use of the chemical injection system is also recommended to prevent the regeneration of dissolved sulfides in the existing force main.

Emergency Power

Because the existing generator is over 30 years old and near the end of its useful service life, it is recommended that a new 1,000 KW generator and 12,000 gallon aboveground storage tank be installed, to handle the facility improvements previously indicated. The automatic transfer switch, switchboards, MCCs and electrical distribution equipment located within the existing generator building should also be replaced. The SCADA and control system are also recommended to be upgraded to current City and County of Honolulu technology and design standards for improved reliability, and allow remote monitoring/remote access.

Septage Receiving Facility

With Storage Option 1, space is not available for a new Septage Receiving Facility within the current fenceline of the WWPTF. Once the new backup force main is completed, the existing storage tanks may be demolished, and a new Septage Receiving Facility may be constructed in its place. The new Septage Receiving Facility would greatly reduce haul time and travel distance for City and private haulers coming from the Windward side.

Preliminary Cost Estimate

The total cost of the recommended storage Option 1 and facility improvements were estimated to be $41.9 million. A summary of the construction costs for each of the facility improvements and for Storage Option 1 are shown in **Table ES-4**.

Table ES-4.
Cost Estimate Breakdown for Recommended Option and Improvements

Storage System Alternative		Headworks	Effluent Pump Station Upgrades	Generator/ Blower Room Upgrades	Total
1	$20.0M	$7.8M	$8.7M	$5.4M	$41.9M

Section 1 – Introduction

1.1 Project Overview and Purpose

The Ahuimanu Wastewater Pre-Treatment Facility (WWPTF) is a pretreatment, storage and pumping facility located at 47-305 Kahekili Highway in the Ahuimanu area of Kaneohe. A location map is shown in **Figure 1.1-1**. Sewage flows into the facility via three (3) gravity sewers (ranging from 10 inches to 15 inches) which combine into a single 24-inch gravity sewer from the Ahuimanu area and two (2) 12-inch force mains from the Kahaluu Housing Pump Station (PS) and Kahaluu PS. Effluent from the Ahuimanu WWPTF is sent through a 16-inch force main to the Kaneohe WWPTF approximately five (5) miles downstream.

As required in the First Amended Consent Decree (FACD), a minimum of 600,000 gallons of wastewater storage shall be maintained at the Ahuimanu WWPTF until the Kaneohe-Kailua Sewer Tunnel (KK Tunnel) completes an initial 2-year operational period. Moreover, the FACD requires implementation of force main spill contingency plans. The *Final Spill Contingency Plan for Ahuimanu Force Main,* Fukunaga and Associates, Inc., December 2012 (2012 SCP) identifies a total of 800,000 gallons of storage currently available at the Ahuimanu WWPTF. As identified in the 2012 SCP, the existing onsite storage can provide 25.3-hours retention time. The retention time was based on a dry weather average flow of 0.76 million gallons per day (mgd) if the Effluent Pump Station or force main needs to be shut down for repair.

Based on the above requirements, the primary goals of this project are the following:

1. Provide additional storage to prevent spills in the event of an Ahuimanu force main and/or pump station failure or maintenance/condition assessment shut down.
2. Provide storage during peak wet weather flow (PWWF) flow events so as not to create a design conflict with the design criteria used for the KK Tunnel.
3. Provide a minimum of 600,000 gallons of storage until the KK Tunnel completes the initial 2-year operational period. The KK Tunnel is expected to begin operation on July 1, 2018.

Additional improvements to be considered in this project include:

- Upgrade and replace old equipment.
- Demolish abandoned facilities.
- Improve facility safety and system reliability.
- Install a septage receiving manhole and/or package system for private and City haulers in the future.
- Include space for a separate fenced area, if available, for future Collection System Maintenance (CSM) debris drying operations in the future.

This design alternatives report (DAR) presents the major design features of the proposed storage facilities as well as other improvements to the Ahuimanu WWPTF.

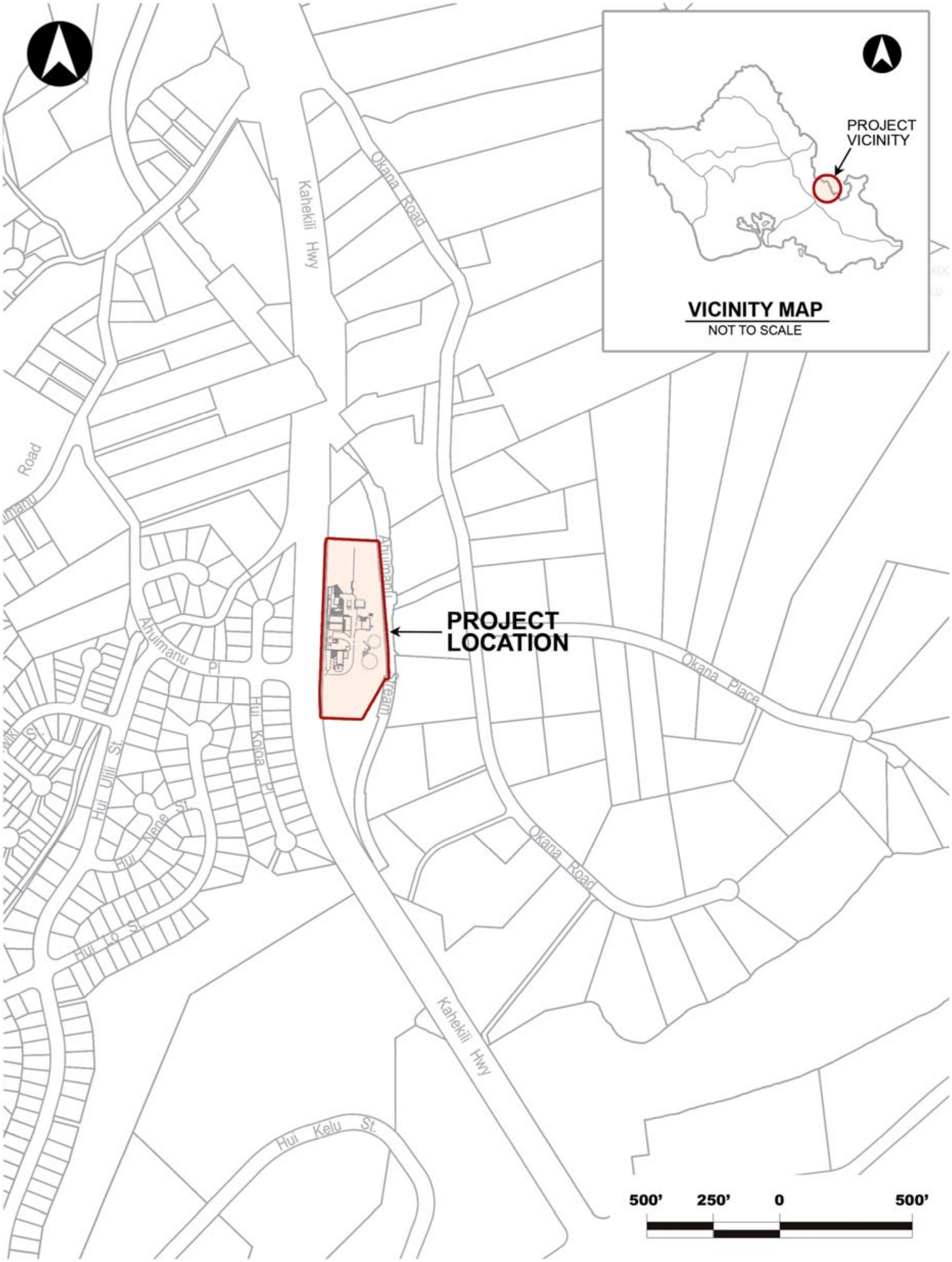

Figure 1.1-1. Ahuimanu WWPTF Location Map

1.2 Scope of Work

The major scope of work items are as follows:

- Consider and compare a minimum of three (3) equalization (EQ) tank-configuration alternatives to provide between 800,000 to 1,000,000 gallons of wastewater storage capacity. The suggested tank configuration alternatives are:
    - Rehabilitate and reuse the existing process tanks and interconnecting piping.
    - Construct a new tank of between 800,000 to 1,000,000 gallons and demolish all existing storage tanks (including existing EQ Basins) with all related piping, pumping and controls.
    - Convert a portion of the existing EQ Basins to a dry weather flow tank and construct a new supplemental tank of between 600,000 to 800,000 gallons. Upgrade all related piping, pumping and controls.
- Headworks – Evaluate the current screening and grit removal systems; determine if screening is necessary for future operations. Provide a way to isolate each channel or to bypass the Headworks completely; and perform a noise assessment on the current screening system.
- EQ Basin – Perform a structural assessment of the existing EQ Basin. Evaluate the configuration of the EQ Basin and piping to reduce the sewage detention times and turbulence. As an alternative, partition an appropriately sized section of the EQ Basin to accommodate dry weather flows and provide bypass piping so that flows can be routed directly to this section.
- Effluent Pump Station (EPS) – Evaluate the overall operation of the EPS including pumps, ventilation system and electrical/control systems. Provide recommendations for replacement of pumps, including an evaluation of pumps with variable frequency drives (VFD). Provide recommendations for replacement of electrical and control systems. Perform a structural assessment of the wet well and a noise assessment of existing pumps.
- Facility – Evaluate whether the WWPTF could be converted to a pump station facility only.
- Influent Pump Station (IPS) – Evaluate the overall operation of the IPS including pumps, ventilation system and electrical/control systems. Perform a structural assessment of the IPS wet well. If the IPS is to be retained as part of the recommended storage alternative, provide upgrades for the aging pumps, electrical and control systems.
- Other Storage Structures (Rapid Block Tank, Primary Clarifier, Digester) – Perform a structural assessment of all facilities and recommend tank upgrades that would provide an additional 15 years of design service life. If selected as the recommended alternative, replace interconnection piping, valves, stairways and walkways. Provide a wash down system for cleaning tanks after a storage/storm event.
- Blowers/Aeration System – Evaluate the aeration requirements for the proposed new facilities. Provide a preliminary blower layout and equipment recommendation.

- Emergency Generator – Evaluate the capacity of the existing generator to meet proposed upgrades and recommended storage alternative. If needed, provide recommendations for a replacement generator and associated electrical equipment. Perform a noise assessment and recommend noise mitigation measures. Evaluate replacement of the existing underground storage tank (UST) with an above-ground storage tank (AST).
- Odor Control System (OCS) – Perform odor sampling under the current facility configuration and recommend future odor mitigation measures. Assume the existing odor control chemical feed system will remain on a permanent basis.
- SCADA – Upgrade the supervisory control and data acquisition system (SCADA) to the latest City standards. Upgrade instrumentation and controls to allow remote control.
- Demolish and remove abandoned facilities.
- Evaluate two (2) locations for a new septage receiving manhole and a package system to service both private and City haulers.
- Provide other site improvements, including landscaping, drainage, fencing, and driveway modifications.
- Provide a budgetary cost estimate for the recommended storage alternatives and all other facility upgrades.

Section 2 - Existing Wastewater Facility

2.1 Facility History

The Ahuimanu WWPTF was initially constructed in 1964 as a secondary wastewater treatment plant (WWTP). The treatment process consisted of screening and de-gritting, an aero-accelerator for treatment and clarification, chlorination, and final polishing in an aerobic lagoon. The effluent was discharged to the adjacent Ahuimanu Stream, which flows into Kaneohe Bay. Solids from the primary clarifier and aero-accelerator were treated in an aerobic digester and then dried in sludge drying beds. The original WWTP was designed for an average daily flow of 0.29 mgd, a maximum daily flow of 0.44 mgd, and a peak flow of 1.15 mgd.

The Ahuimanu WWTP was expanded in 1972 to include a primary clarifier, a “rapid block” system for further secondary treatment and a new mechanical sludge dewatering facility. The original grit removal facility as well as the original chlorine contact tank were expanded to accommodate increased flows. A blower facility was built to provide aeration to the Rapid Block Tank. The WWTP was upgraded to a tertiary plant designed for an average flow of 1.4 mgd, maximum daily flow of 2.1 mgd and a peak flow of 4.6 mgd.

In 1986, the Ahuimanu WWTP was converted into a pre-treatment facility. Although the expanded WWTP was designed for tertiary treatment, the nutrient removal capabilities were determined to be less than required for discharging into Ahuimanu Stream. The WWPTF effluent was instead diverted to Kaneohe WWTP (now the Kaneohe WWPTF) by way of a new 16-inch force main for further treatment.

The pre-treatment facility consisted of screenings and grit removal in a new Headworks, flow equalization in two (2) new EQ basins and effluent pumping. A new emergency generator, OCS and chlorination injection system were also built. Two (2) additional blowers were installed in the existing blower building to accommodate the added aeration demand for the aerated grit chamber and EQ basins. The original Headworks, aero-accelerator, and chlorine contact tank were demolished, and the original emergency generator was removed. The Ahuimanu WWPTF was designed for an average flow of 1.2 mgd, a peak daily flow of 3.2 mgd and a peak hourly flow of 5.1 mgd.

The Ahuimanu WWPTF has not changed much since construction in 1986. Minor upgrades have included replacement of the original Headworks equipment in the early 2000s. In 2013 a new chemical injection system was installed to provide odor control for the force main downstream. One of the existing EPS pumps was replaced by new dry-pit submersible pumps in 2018 and a second one was replaced in 2020.

2.2 Existing Process Description

2.2.1 Process Overview

Wastewater is conveyed to the Ahuimanu WWPTF through three (3) gravity sewers, ranging from 10 inches to 15 inches in diameter. They converge into one (1) 24-inch gravity sewer main from Ahuimanu area, and two (2) 12-inch force mains from the Kahaluu PS and Kahaluu Housing PS. Wastewater is screened and de-gritted at the Headworks before discharging into one compartment of the EQ Basin (Basin A). Screenings and grit are collected in hoppers for eventual landfill disposal. After passing through the EQ Basin compartments (Basin A or Basin B), wastewater enters the EPS wet well. The EPS conveys wastewater to the Kaneohe WWPTF via a 16-inch force main (FM) to the 24-inch Haiku Bypass Sewer and then to the 27-inch Kamehameha-Heeia Interceptor Sewer. .

During a storage event, such as a storm, wastewater is diverted from the EQ Basin to the existing on-site storage tanks by surcharging the sewer line leading to the IPS. The IPS was originally used to pump incoming raw wastewater to the different process facilities when Ahuimanu was operating as a WWTP. Currently, the IPS is used to pump wastewater to the Rapid Block Tank for storage only. When the Rapid Block Tank is full, wastewater is pumped via submersible pumps (old “Ammonia Pumps”) to the Primary Clarifier (PC). After the PC is full, the flow is then pumped from the PC to the Aerobic Digester. Once these three (3) tanks are full, any overflow is sent by gravity to the EQ Basin B compartment. After the storage event is completed, wastewater in the Aerobic Digester and PC are drained to the IPS and pumped to the Rapid Block Tank. Wastewater in the Rapid Block Tank is drained by gravity to the EQ Basin B compartment and eventually pumped through the Ahuimanu FM to the Kaneohe WWPTF.

Support processes include an OCS, emergency generator and blower facilities. The old Sludge Dewatering Building remains on-site, although it has not been in use since the conversion to the WWPTF in 1986.

The existing site plan is shown in **Figure 2.2-1** and a process flow schematic is shown in **Figure 2.2-2**. This flow schematic presents both dry weather and wet weather/storage flow schemes.

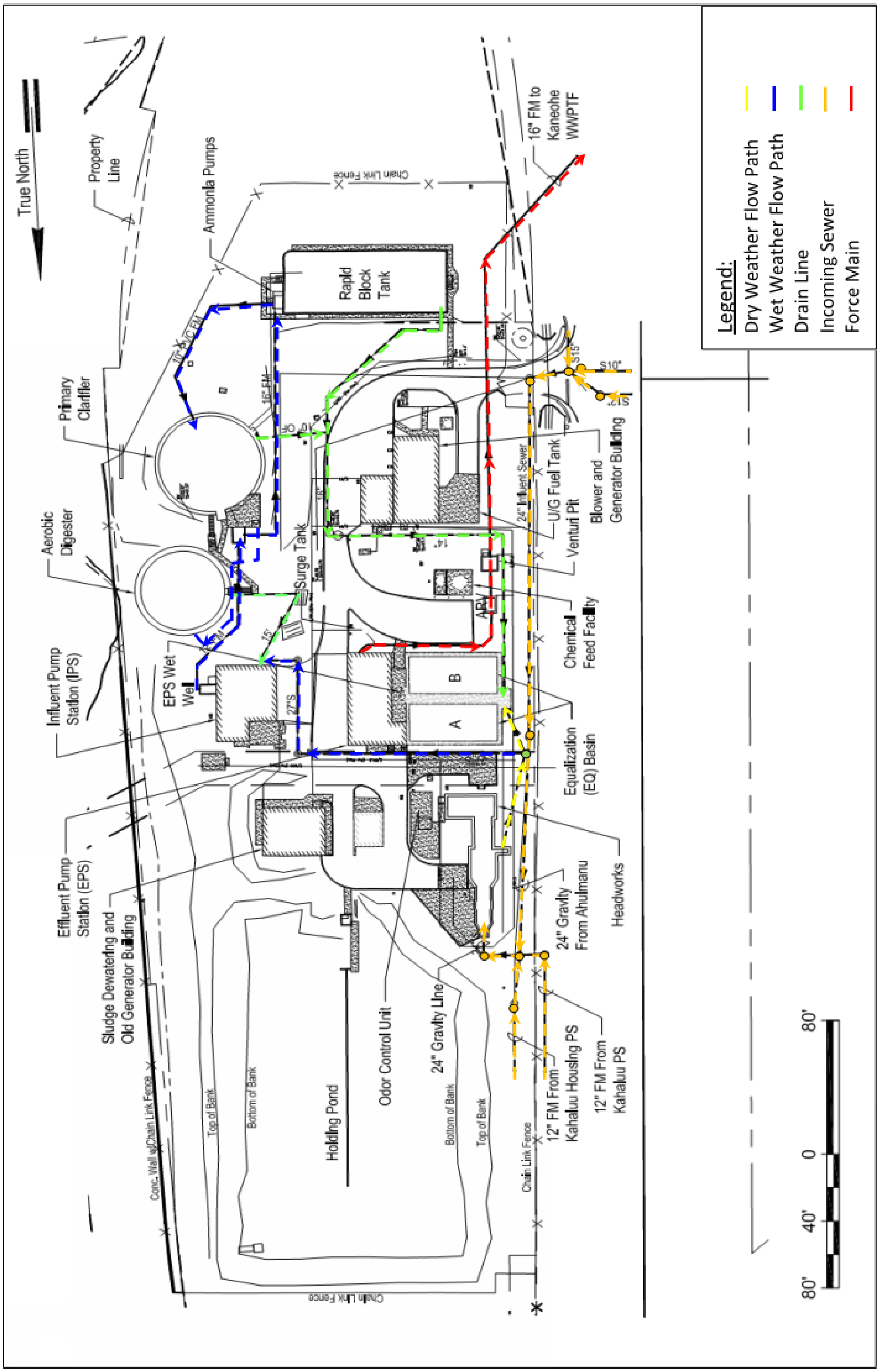

Figure 2.2-1. Existing Site Plan

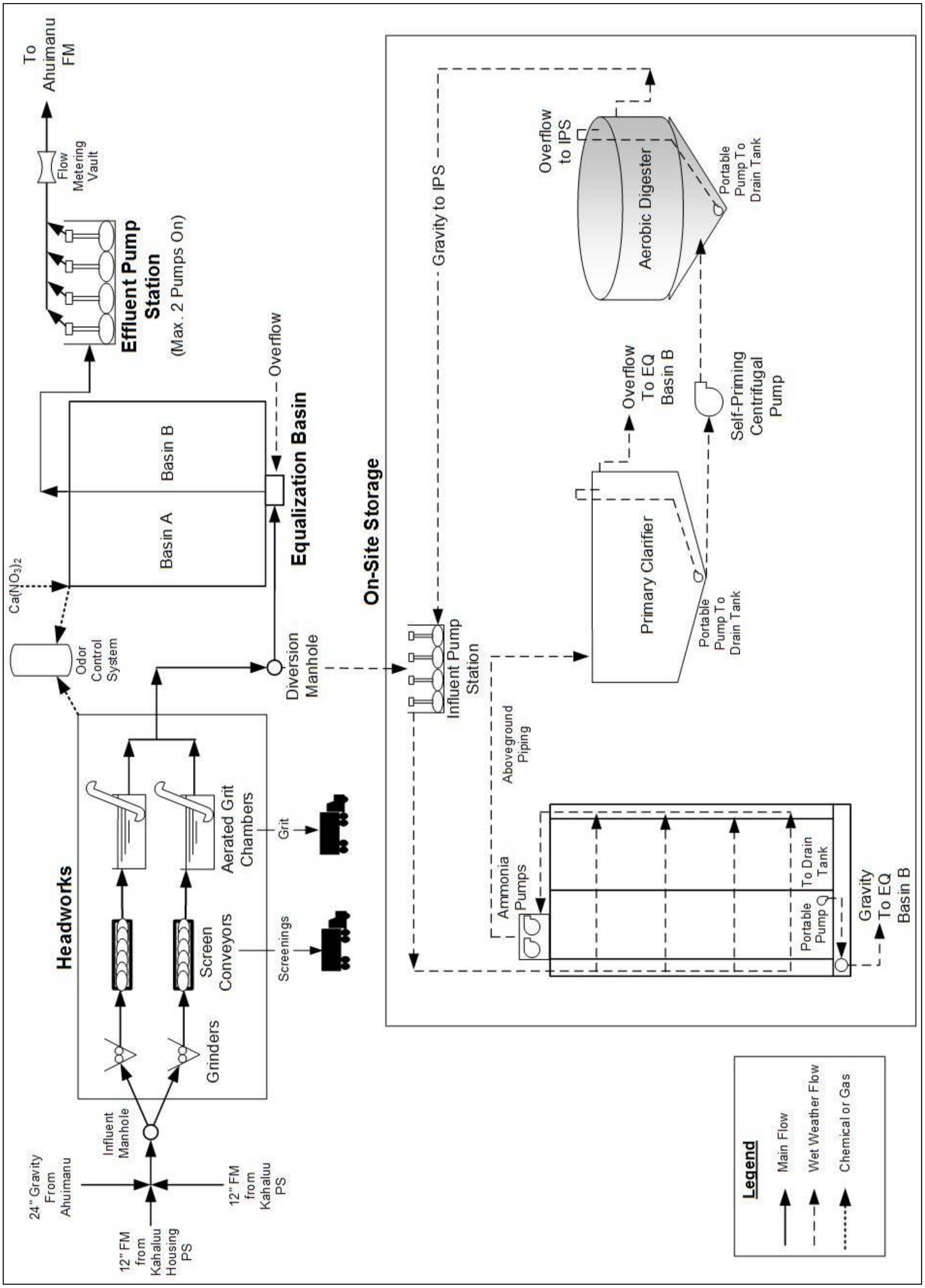

Figure 2.2-2. Existing Flow Schematic

2.2.2 Headworks

The original 1986 Headworks for the Ahuimanu WWPTF included two (2) process trains consisting of mechanically cleaned ½-inch bar screens followed by aerated grit chambers. Screenings and grit were removed by belt conveyors which discharged to a screening and grit hopper.

The modified Headworks configuration consists of in-channel grinders followed by screening augers and a conveyor system. The original aerated grit chamber remains, but the grit conveyors have been replaced (see **Figure 2.2-3**). Plan and section views of the existing Headworks are shown in **Figure 2.2-4**.

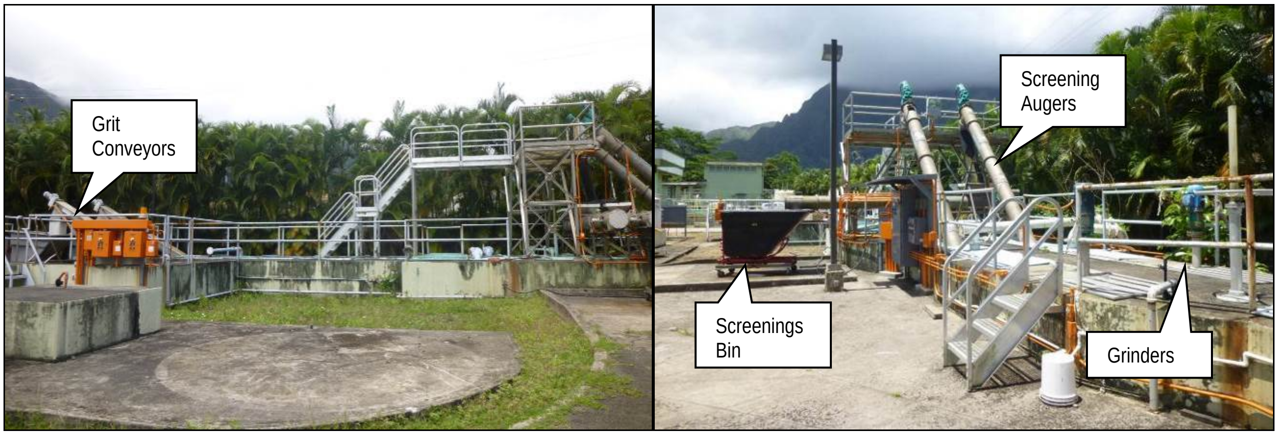

Figure 2.2-3. Ahuimanu WWPTF Headworks

Screening System

The in-channel grinders are JWC Channel Monsters powered by a 5 horsepower (HP) motor with an 8-foot extended motor shaft. Rags and debris were observed to have accumulated in the framing and support elements above each grinder, which may indicate that peak flows exceed the capacity of the grinders.

The screenings augers are JWC Auger Monsters powered by 2 HP motors. The inclined perforated screen section is about 7 feet long and is within the hydraulic flow area of the channel. Solids are removed by inclined shaftless screw conveyors each approximately 30 feet long. Similar to the grinders, rags have collected above the screens indicating peak flows exceed the screen's capacity.

Screenings from the augers are deposited into a horizontal conveyor which discharges to the screenings bin.

Grit Removal System

There are two parallel grit chambers, each with an aeration system followed by Parkson inclined grit conveyors. The grit chambers are separated by a continuous wall except for a crossover slide gate near the upstream end. The grit conveyors collect grit from the bottom of the chambers and dispose the grit into external hoppers.

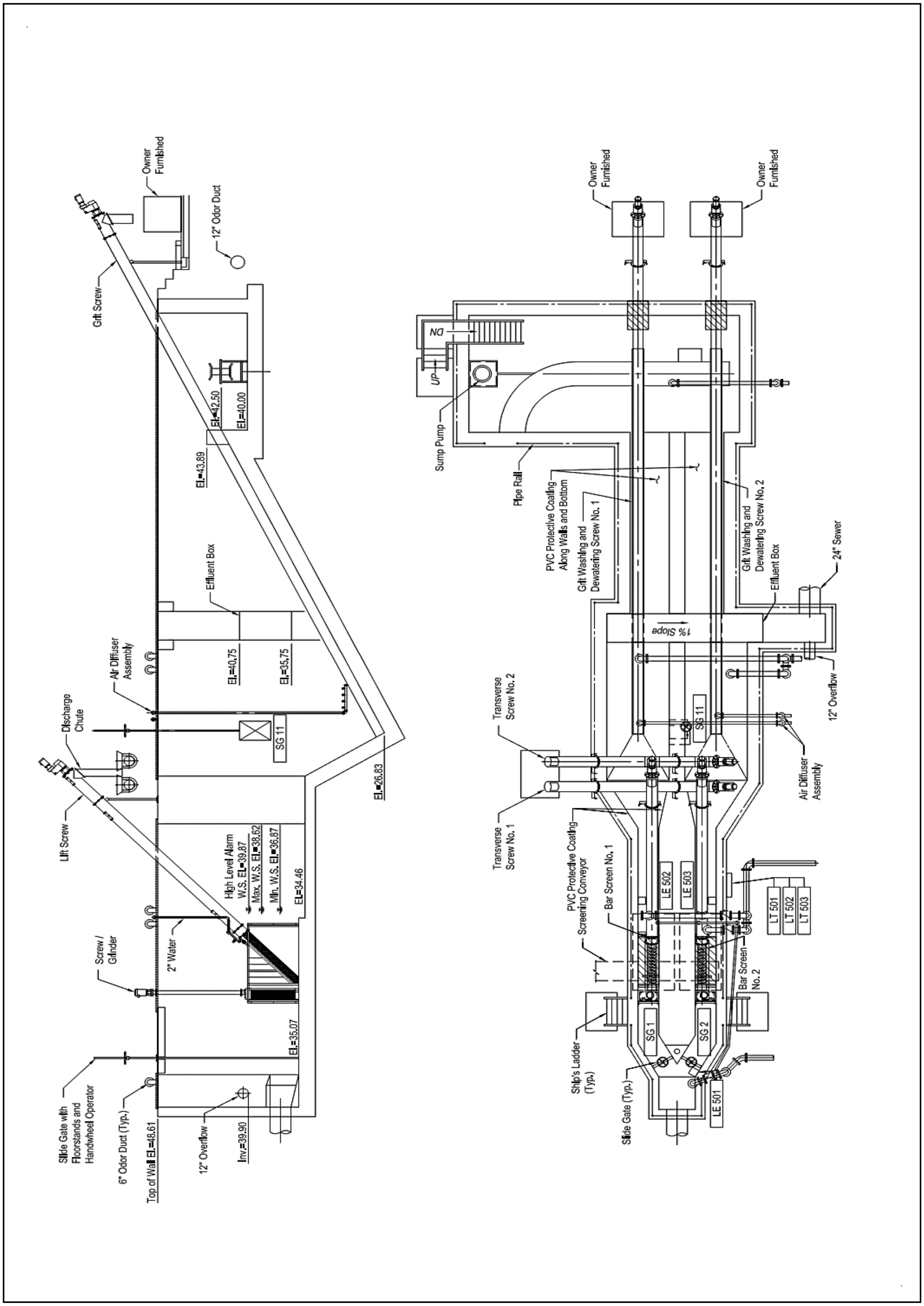

Figure 2.2-4. Plan and Section View of the Existing Headworks

Normal Operations

The design intent for the current Headworks is to use one (1) process train at a time. However, multiple equipment malfunctions have led to the inlet slide gates of both process trains to remain open all the time. Currently the aerated grit chambers are operational, but the grit conveyors are not in service. The screenings conveyors are manually operated while the operators are on-site. Only Grinder #1, Auger #1 and Conveyor #1 (closest to the Kahekili Highway) are functional at this time.

The following are additional issues with the Headworks equipment:

- The screenings system efficiency has declined since installation. This could be due to corrosion of the screen section below the water line.
- The screening conveyor system creates excessive noise when in operation (metal-to-metal grinding).
- Operators state that they do not have a way to isolate the two aerated grit chambers because of the configuration of the retrofitted grit removal equipment.
- Operators have indicated that when the aerated grit chamber and grit conveyors were operational, significant grit accumulation was observed in the headworks.
- When the Aeration system is not operational, odors are generated.

Noise Assessment

The existing horizontal screw conveyor is the dominant noise source at the Headworks, creating a noise level of approximately 55 dBA at the Makai property line. The noise levels were found to increase over time (5 dBA in 10 minutes). Both the grinder and inclined screw conveyor were quiet and not found to be a noise concern. The complete noise assessment is attached in **Appendix A**.

Structural Assessment

A structural condition assessment was not performed on the Headworks as part of this study. Observations from a field assessment include:

- Interior T-Lock protective vinyl sheets were delaminated and damaged. Random concrete surfaces were exposed and deteriorated with rebars rusted.
- Several watermarks were noted to exhibit possible water infiltration through the walls.
- Top cover panels were damaged and deteriorated.

2.2.3 Equalization Basins

The EQ Basins were installed when the Ahuimanu WWTP was converted to a WWPTF. The intent of the EQ Basins was to reduce the maximum pumping rate to the downstream Kaneohe WWTP (now Kaneohe WWPTF) and minimize the total dynamic head (TDH) requirements. The EQ Basins can provide storage for up to 240,000 gallons of wastewater. Plan and section views of the existing EQ Basins are shown in **Figures 2.2-5** and **2.2-6**.

Normal Operations

Wastewater enters the EQ Basins via an influent box on the upstream end of the basins. Slide gates then direct the flow into Basin A or Basin B. Basin A and Basin B are separated by a 24-inch concrete dividing wall. Basin A is used for normal dry weather flow and Basin B is used for wet weather flows and wastewater storage. EQ Basin A is in continuous use and essentially serves as an extended wet well for the EPS.

Air diffusers have been installed at the bottom of the EQ Basins to aerate incoming wastewater. The above-ground air piping is in poor condition and leaking air while only one of the blowers is currently operational.

Additional issues with the EQ Basins include:

- The aeration system for the EQ Basins has periodically been offline for maintenance repairs. There is no standby blower available.
- Wastewater enters the EQ Basin compartments approximately 14 feet above the tank floor. The large drop generates turbulence and strips odors from the wastewater. Existing odor control system for the EQ Basin is not operational.
- The long detention time in the EQ Basins generates odors within the tank when the aeration system is not available. A fraction of the total EQ Basin volume is required for dry weather flows.
- Sluice gates do not seal tightly between EQ Basins A and B and between the EQ Basin and EPS wet well.
- Existing fiberglass reinforced plastic (FRP) covers are not structurally sound and unsafe to walk on, giving operators limited access to the basins.
- The handrails are severely corroded and unsafe.

Structural Assessment

A structural condition assessment of EQ Basin B was conducted as part of this study. EQ Basin A could not be accessed due to operational complexities of draining and bypassing the chamber. It is assumed that EQ Basin A is in similar condition as EQ Basin B. Observations from the structural field assessment include:

- The tank structure is in fairly good condition since it is lined with T-Lock. Concrete appeared sound with some minor damages.
- The T-Lock had bubbles, blistering and delaminations. In one location, water was detected between the T-Lock and the concrete surface.
- The elastomeric coating below the T-Lock was damaged and peeled off. Blistering was noted on the coating surface.
- Locations where the concrete was exposed had significant deterioration.
- Corroded concrete and reinforcing bars were observed at gate opening.
- Water infiltration was seen at a few locations on the floor slab and wall surfaces.

It is estimated that the EQ Basins can provide another 20-30 years of service life if the above conditions are addressed. The entire structural evaluation report is provided in **Appendix B**.

2.2.4 Effluent Pump Station (EPS)

The EPS is a 4-level structure with the top floor at grade and the 3 lower levels below grade. Wastewater enters the EPS wet well via a slide gate on the downstream side of the EQ Basins. There is about a 3-foot drop from the EQ Basins to the EPS wet well. Wastewater from the EPS is pumped to the Kaneohe WWPTF through a 16-inch force main and gravity sewer system. Plan and section views of the EPS are presented in **Figures 2.2-5** and **2.2-6**, and a photo of the EPS and adjacent EQ Basins is shown in **Figure 2.2-7**.

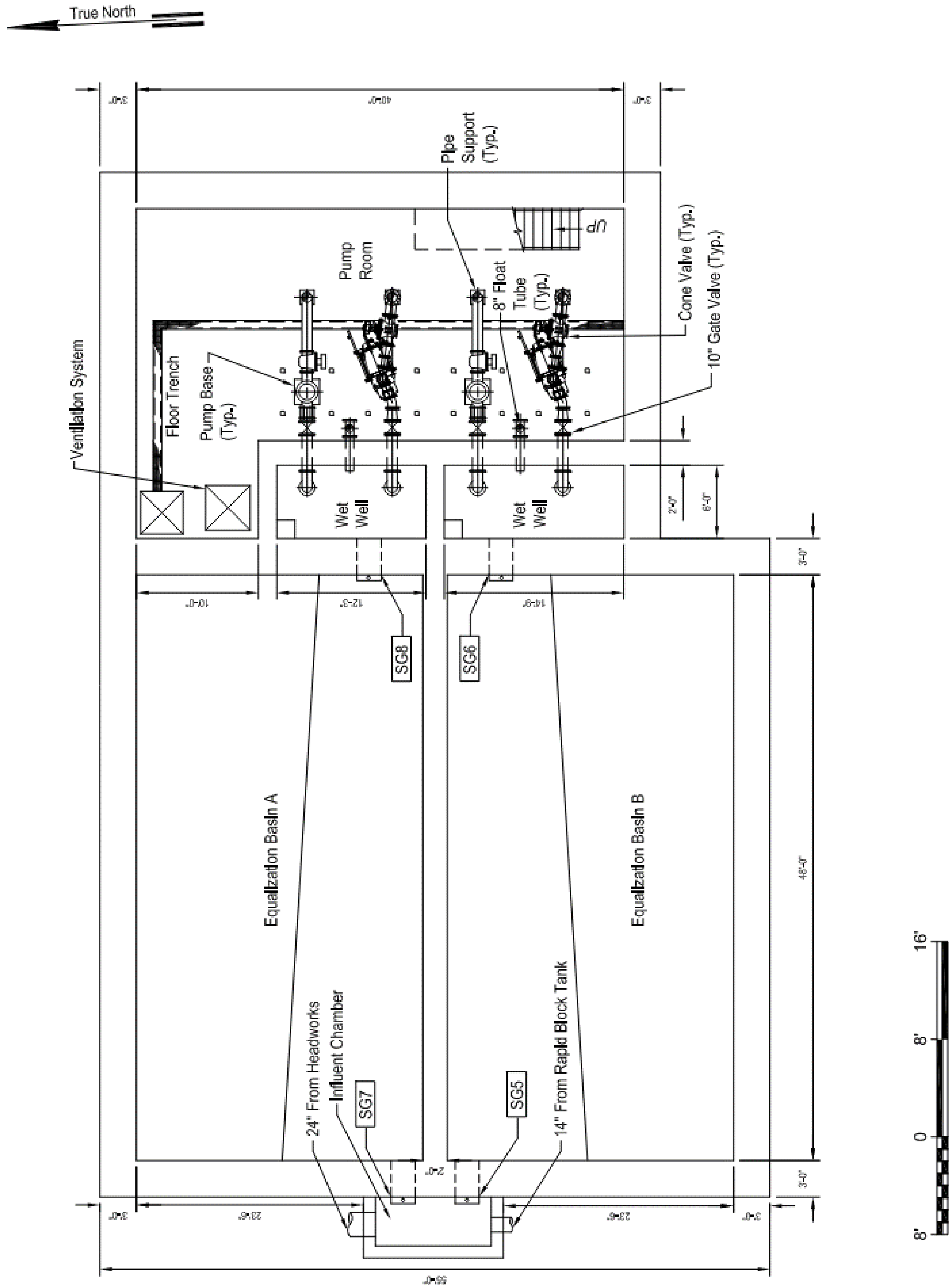

Figure 2.2-5. Plan View of the Existing EQ Basins and EPS

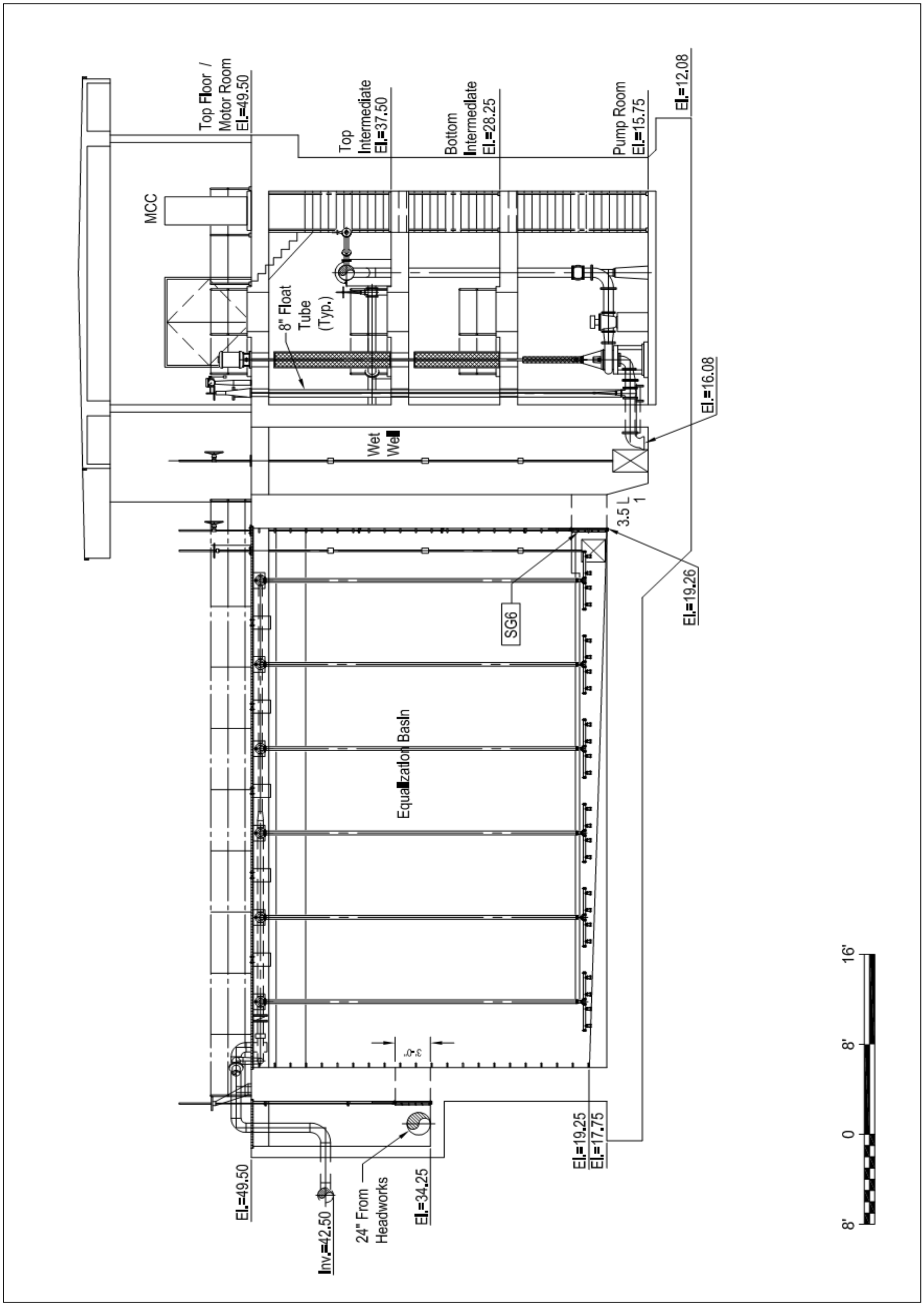

Figure 2.2-6. Section View of the Existing EQ Basins and EPS

Figure 2.2-7. EPS and EQ Basin

Pumps and Normal Operations

Flow enters the EPS wet well through a slide gate in the EQ Basin wall. There are four (4) constant-speed pumps located in the EPS. Two (2) pumps, Pump No. 1 and 3, have a motor mounted on the top floor with a drive shaft extending to the pump located on the pump room floor approximately 30 feet below. The remaining two (2) pumps, Pump No. 2 and 4 were recently replaced with horizontal dry-pit submersible pumps. Nameplate data for each pump is listed in **Table 2.2-1**.

Table 2.2-1.
EPS Pumps Nameplate Data

Pump #	Flow (gal/min, gpm)	TDH (feet, ft)
1	1150	203
2	1740	180
3	1000	168
4	1740	180

Under normal flows, only one (1) pump is in operation. During peak flows, no more than two (2) pumps are placed into operation due to downstream hydraulic restrictions in the existing force main.

The WWPTF supervisor stated that one (1) pump is almost always out of service and in the process of being rebuilt. The lead pump alternates depending on which pump has most recently been rebuilt and is therefore running the most efficiently.

The pump operation is controlled by radar sensor level transmitters. The Healy Ruff float-level controllers were removed from each wet well .

Additional issues with the EPS include:

- Pumps operate for only nine (9) hours per day, on average, causing very long detention times in the wet well. Operations staff prefers variable speed pumps that are sized to handle the low overnight flows as well as peak daily flows.
- The wet well is very deep and hard to access.
- Pumps experience high vibration levels due to the long motor drive shafts. Operators would prefer submersible dry-pit type pumps.
- Pump mechanical seals are leaking.
- No combustible gas monitoring and alarms for the wet wells per National Fire Protection Agency (NFPA) 820.
- The pump room ventilation system is not sufficient.

Structural Assessment

A structural condition assessment of the EPS wet well and EPS building structure was conducted as part of the2014 study. Wet well access was difficult due to the deep and narrow configuration of the tank. Only one chamber of the wet well could be inspected for this study, and it is assumed the other chamber is in similar condition.

Observations of the EPS wet well include:

- The concrete was lined with T-Lock and in fairly good condition.
- Locations where the concrete was exposed showed significant deterioration
- Corroded concrete and reinforcing bars were observed at the gate opening between the wet well chambers

Observations of the EPS building structure include:

- The entire building appeared to be in very good condition.
- Several hairline cracks and concrete spalls were observed on the walls and floors. The cracks appeared to be caused by thermal volume changes or shrinkage of the concrete and do not pose any structural concern.
- No sign of significant foundation settlement.
- Concrete cracking due to pump vibration is a minor concern.

Ventilation

The EPS is ventilated by a centrifugal fan which is in poor condition. The fan is located on the pump room floor and ducted up to the top floor with a 44/24 duct, which then discharges though the side of the wall on the top floor. The existing fan is rated for 8,500 cubic foot per minute (cfm) at 0.5 inches of static pressure with a 3 HP motor. Make-up air is provided by the louvered wall openings on the top floor. Make-up air is drawn down to the lower floors through grated service openings. The existing exhaust fan is capable of satisfying current NFPA 820 ventilation requirements of at least twelve (12) air changes per hour (AC/h) for the three (3) lower levels only and will need to be upsized to provide sufficient ventilation for all four (4) floors.

Noise Assessment

The current pumps were found to create an average noise level of 101 dBA with Pumps 1 and 2 in operation. It is recommended that any replaced/upgraded pumps be specified not to exceed 85 dBA at 3 feet.

Force Main Assessment

The 16-inch polyethylene lined ductile iron (DI) FM was completed in 1984. The FM is divided into two (2) sections. The first segment is 12,400 LF, which operates as a typical pressurized FM. The latter segment is 12,300 LF and operates as a gravity sewer line except at the inverted siphons where the hydraulic grade line is above the sewer line as shown in **Figures 2.2-9 and 2.2-10**.

Previously, the force main was known to have issues of manhole surcharging near Kamehameha Highway (Hwy) when the high capacity pumps were in operation. Based on the "Ahuimanu Force Main Capacity and Odor Control Study," October 1997 by Earth Tech, Inc., the capacity and odor issues in the FM were identified along a 2,925-foot long stretch of consistent pipeline surcharging along Anoi, Paleka, and Waikalua roads near the Kamehameha Hwy inverted siphon. Air binding was determined to be the major cause of the loss in hydraulic capacity in this section of the force main. Corrective measures were made to the existing force main which included retrofitting two (2) manholes along Paleka Road with exhaust vents which expel air from the pipeline through an odor control canister containing activated carbon, reducing the effects of air binding. CSM operators have indicated that they also routinely flush the siphon at least once per year because of grit build-up.

The EPS operational procedures have also been modified to alleviate the existing air binding problem in the force main. Operation of the pump station has been limited to 2,100 gpm or maximum of two (2) pumps on during wet weather events. Additionally, only one (1) pump was allowed to start/stop within a 20-minute time frame to prevent surcharging through several manholes on Paleka Road and Waikalua Road. This allows time for the trapped air within the force main to be expelled from the vented manholes along Paleka Road.

To meet the EPA Consent Decree, a condition assessment was performed on the force main with the results detailed in the "Ahuimanu WWPTF Condition Assessment Report Force Main Condition Assessment", dated December 2010, by R. M. Towill Corporation. Recommended repairs, rehabilitation and improvements of the force main are listed below:

- Manhole Rehabilitation – Rehabilitation of manholes completed in April 2011.
- Pipe Corrosion Repair – CIPP rehabilitation of corroded pipe sections between Sewer Manhole (SMH) 4046226 and SMH 4046225. Rehabilitation was completed in December 2015.
- Pipe Liner Repair – Repair the polyethylene liner in sections of pipe that have been delaminated from the pipe wall at the manhole to pipe transition and/or throughout the segment. A permanent bypass sewer along Haiku Road was completed in 2018 to replace the gravity segment of the existing Ahuimanu Force Main. The Haiku Bypass Sewer in **Figure 2.2-11** diverts the flow away from the inverted siphon on Kamehameha Highway and removes any previous operational pumping restrictions at the EPS.

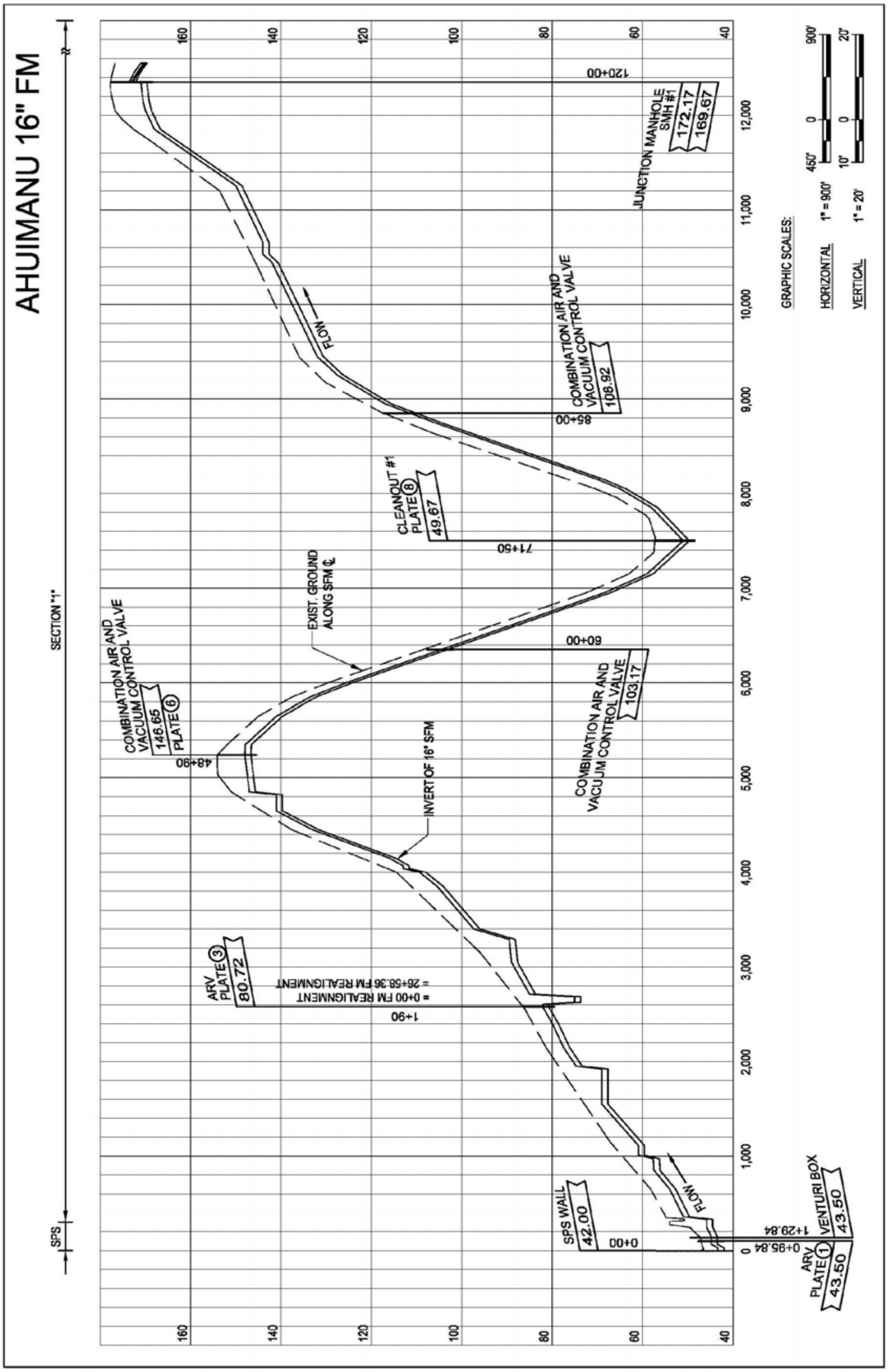

Figure 2.2-9 Existing Ahuimanu Force Main – Pressurized Segment

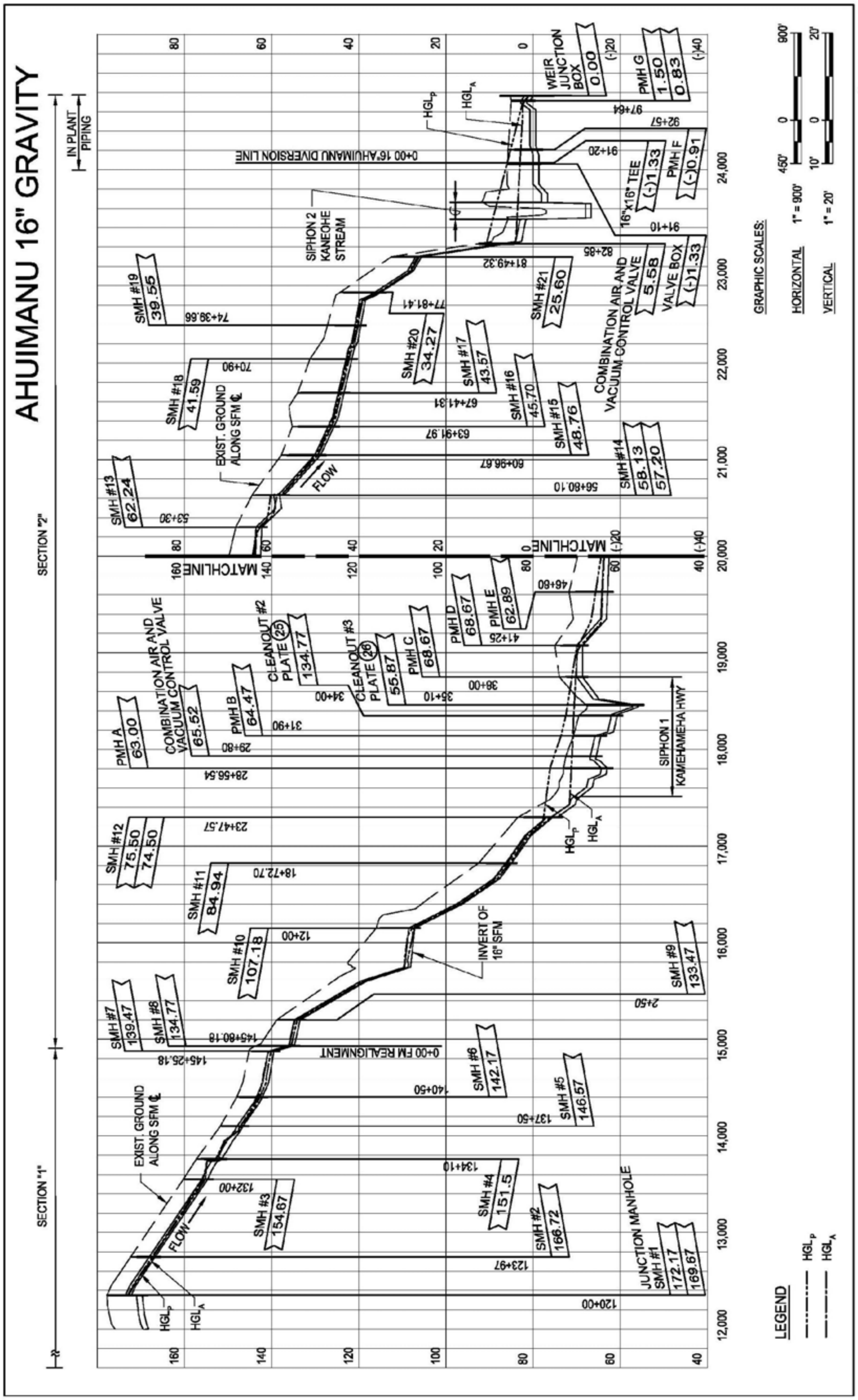

Figure 2.2-10 Existing Ahuimanu Force Main – Gravity Segment

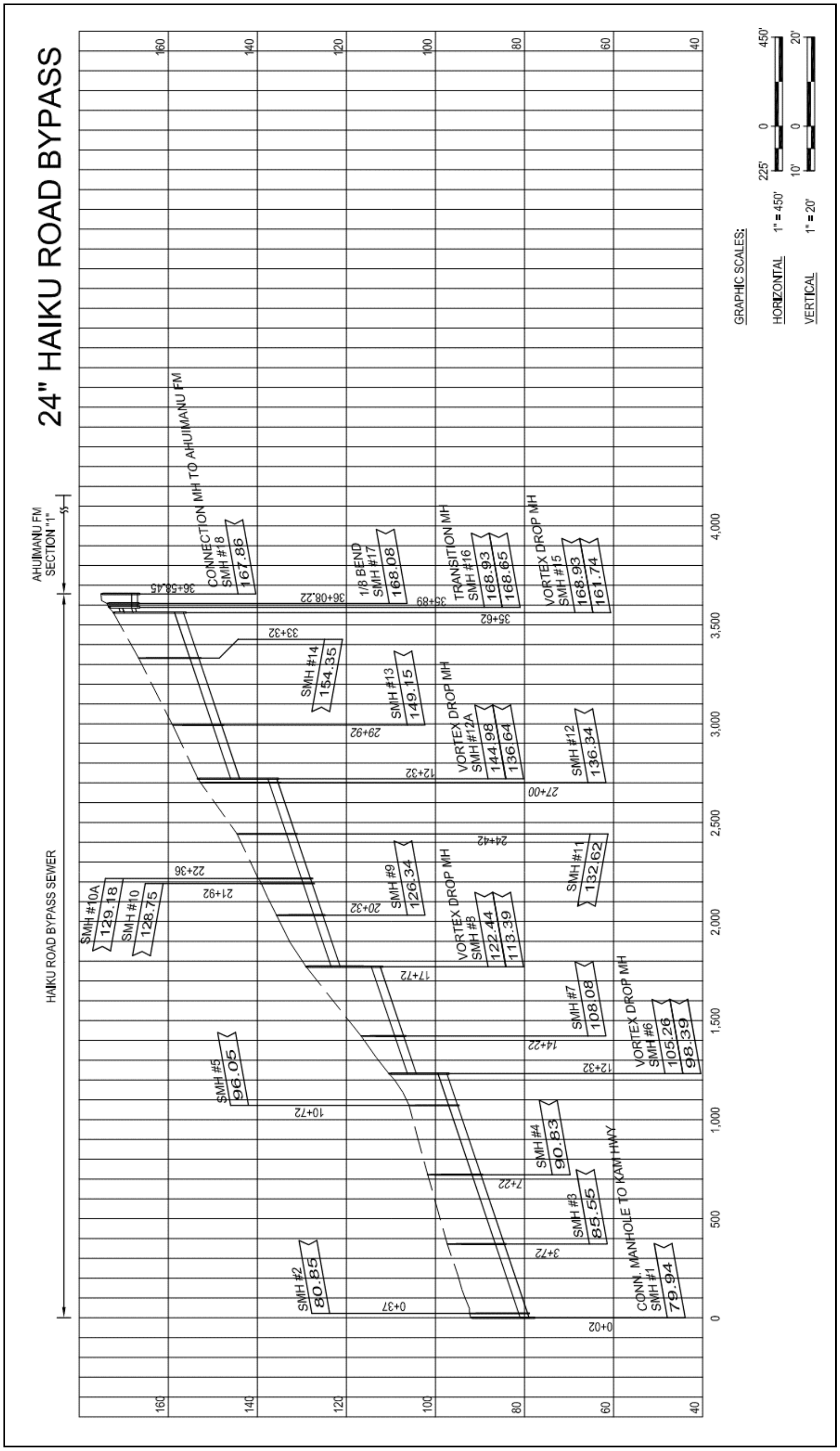

Figure 2.2-11 Existing Haiku Road Bypass Sewer

2.2.5 Influent Pump Station (IPS)

The IPS was part of the original Ahuimanu WWTP and pumped incoming wastewater to the rest of the plant. The IPS was retained as part of the converted WWPTF and is now used to pump wastewater to the on-site storage tanks during a peak wet weather flow or storage event. The IPS is a two-story structure with the top level at grade and the lower level approximately 15 feet below grade. The IPS building is shown in **Figure 2.2-12**.

Figure 2.2-12. IPS Building

Pumps

There are four (4) constant-speed pumps located in the IPS. Nameplate data for each pump is listed in **Table 2.2-2**.

Table 2.2-2.
IPS Pumps Nameplate Data

Pump #	Flow (gpm)	TDH (ft)
1	400 / 700	28 / 17
2	400 / 700	28 / 17
3	1200	40
4	750	28

All four (4) pumps are the originally installed equipment. The pumps are controlled by a single radar sensor level controller. There are no remote controls for the IPS.

Normal Operations

The IPS is in operation only when onsite storage is required. Wastewater is diverted to the IPS via a diversion manhole located upstream of the EQ Basins. The IPS then pumps wastewater to the Rapid Block Tank.

The following are known issues with the IPS:

- The pump room ventilation system is inoperable. The ventilation system needs to meet NFPA requirements. Confined space entry precautions are required to enter the pump room.

- The IPS is not connected to any SCADA system, so operators must be onsite during peak flow (i.e. storm) events.
- There are no combustible gas monitoring or alarm for the wet wells, per NFPA 820.
- Abandoned blowers as well as an old kitchen and lab room are located on the top floor of the building. These items are not used and should be demolished.
- Portion of the existing roof is leaking.
- Major termite infestation in the wood structure.
- Although functional, the IPS pumps have exceeded their service life and should be replaced with new pumps for better reliability.
- IPS is planned for future demolition once a backup force main is constructed.

Wet Well Structural Assessment

A structural condition assessment was completed for the IPS wet well in 2014. The main chamber of the wet well is located underneath the IPS building and was not accessible, therefore only the entrance chambers could be inspected. It is assumed the condition of the main chamber is similar to the entrance chambers. A structural assessment of the IPS building structure was not included in this study.

Observations of the IPS entrance chamber include:

- The concrete was in fairly good conditions. Wall surfaces appeared sound and smooth.
- The elastomeric coating remained mostly intact.

Ventilation

The ventilation fan for the IPS is currently inoperable. The existing fan is a centrifugal fan located on the top floor and ducted down (16/8 duct) to the pump room floor. The fan discharges through a 16/16 louver on the side of the exterior wall on the top floor. The existing fan is rated for 1,210 cfm at 0.375” static pressure with a ¾ HP motor. Make-up air is provided by the louvered wall openings on the top floor and drawn down through the grated service openings. If the ventilation fan were operable, it would be capable of providing the minimum 12 AC/h for the pump room floor only (19 AC/h). If the total building volume were evaluated, the fan would only be capable of providing 6.7 AC/h.

2.2.6 Wastewater Storage System

The onsite storage system consists of the EQ Basins (discussed in **Section 2.3.3**), the Rapid Block Tank, the Primary Clarifier (PC) and the Aerobic Digester. The storage volume of each tank is listed in **Table 2.2-3**.

Table 2.2-3.
Storage Tank Volumes

Tank Name	Volume (million gallons, MG)
EQ Basin (A and B)	0.24
Rapid Block Tank	0.20
Primary Clarifier	0.17
Aerobic Digester	0.19
TOTAL	0.80

Normal Operations

The majority of the mechanical equipment associated with the storage facilities has been completely abandoned and is not operable. The exceptions to this are the old Ammonia Pumps in the Rapid Block Tank and the piping manifold adjacent to the PC (see **Figure 2.2-13**).

Figure 2.2-13. Old Ammonia Pumps (left), PC Pump (right)

During a storage-mode event, the flow is pumped to the Rapid Block Tank via the IPS. When the Rapid Block Tank is full, wastewater is pumped to the PC. Aboveground PVC piping between the Rapid Block Tank and the PC is laid on the surface between the two (2) tanks. Flow from the PC to the Aerobic Digester is pumped by a single self-priming centrifugal pump installed in the piping manifold. When the Rapid Block Tank and PC are full, any overflow is sent by gravity to EQ Basin B. Overflow from the Aerobic Digester is sent by gravity to the IPS, which again pumps wastewater to the Rapid Block Tank. When all four (4) storage tanks are filled, the flow runs backwards through the Headworks and surcharges the influent manhole, which overflows to the unlined holding pond at the north end of the facility. It is rare for a storm event to cause any of the storage tanks to overflow; in fact, it has only happened twice in the past 15 years.

Once the storage event is over, wastewater in the PC is pumped to the Aerobic Digester. Wastewater in the Aerobic Digester is pumped to an effluent line which flows by gravity to the IPS. The IPS then pumps the wastewater to the Rapid Block Tank. All wastewater in the Rapid Block Tank is pumped via a portable pump to an effluent channel which drains by gravity to EQ Basin B.

If the storage event is a planned event due to force main or pump station maintenance, the flow will be diverted directly to EQ Basin B first rather than engaging all available storage tanks. This significantly reduces the required maintenance during and after the event.

The following are known issues with the wastewater storage tanks:

- The storage system is labor-intensive to operate. If all tanks are filled, three (3) days are required to empty and clean the tanks. No remote SCADA controls are available, so operators must be on-site during a peak flow (storm) event.
- There are unsafe components such as rusted access stairs and grating.
- The temporary aboveground piping is not meant to be used permanently.
- The equipment was not originally designed for use as storage tanks.
- The hoppers in the Rapid Block Tank are typically not completely dewatered. Therefore, the volume that is filled with water is not available during the next storage event.

Structural Assessment

A structural condition assessment of the PC, Aerobic Digester and Rapid Block Tank was completed in 2014 and then again in 2020 as part of this study. Photos displaying the condition of each structure are included in the Structural Evaluation Report in **Appendix B**.

Observations of the Rapid Block Tank include:

- The entire tank is in fairly good condition. The concrete appeared to be sound with only several hairline cracks and spalls.
- Most of the interior wall coating had peeled off.
- Exterior wall surfaces showed random vertical cracks ranging from 1/16" to 1/8" wide.
- Inner channel slab was noted to have random hollow spots underneath the concrete.
- Steel stairs and grating were corroded.
- Metal railing appeared severely rusted.

Observations of the PC include:

- The entire tank shows moderate to severe deterioration.
- Vertical cracks between 1/32" to 1/16" wide were observed on the exterior wall surfaces due to thermal expansion and contraction. One large vertical wall crack of ½" wide at South/East corner of Settling Tank No. 1 was observed. .
- Horizontal cracks were observed on the soffit surfaces of the launder overhang slab.
- Most of the interior protective coating was gone, as well as the topping on the bottom slab.
- Random 1/16" vertical and horizontal cracks were found throughout the interior walls.
- Hollow sounds were detected on large areas of the base slab which indicates delamination or separation of base slab concrete from the supporting soil and that the foundation has weakened.

- Along the base line of the west side exterior walls ground settlement of up to 5” was noted. It could not be determined if this was due to soil settlement or erosion of the ground.
- Steel stairs on both the South and North sides of the tanks appeared in working condition with minor rusts.
- Catwalk appeared severely rusted.
- It is suspected that additional concrete defects would be found once the surface concrete is removed. Some reinforcing bars are likely corroded.

Observations of the Aerobic Digester include:

- The entire tank appeared moderately deteriorated. The deterioration appeared worse than the last observation in 2014.
- Vertical cracks of 1/32” to 1/16” wide were observed on the exterior wall surfaces due to thermal expansion and contraction.
- Horizontal cracks up to 1/16” wider were observed on the soffit surfaces of the launder overhang slab.
- The interior protective coating on the base slab and interior wall surface was gone. There was no grout topping over the bottom slab.
- Continuous horizontal cracks with widths ranging from 1/32” to 1/8” were observed throughout the interior walls. There were several cracks on top of the wall between 3/16” and 1/4” wide.
- Horizontal cracks were observed on the bottom slab, particularly near the wall base.
- Hollow sounds were detected on large areas of the base slab which indicates delamination or separation of base slab concrete from the supporting soil and that the foundation has weakened.
- Steel stairs on west side of the tank appeared in working conditions with minor rusts.
- Catwalk was severely corroded.
- Rusting was noted on the surfaces of all metal railings.
- It is suspected that additional concrete defects would be found once the surface concrete is removed. Some reinforcing bars may be corroded.

2.3 Support Systems

2.3.1 Blowers/Aeration

There are three (3) blowers in the Blower and Generator Building. One (1) blower (Blower 3) was installed as part of the 1972 WWTP expansion, while the other two (2) (Blowers 4 and 5) were installed as part of the 1986 WWPTF construction. The blowers were originally designed to provide aeration to the existing Rapid Block Tank, the existing EQ Basins and the existing aerated grit chamber. Design data for the blowers is listed in **Table 2.3-1**.

Table 2.3-1.
Blowers Design Data

Blower #	Type	Capacity	Motor (HP)
3	Centrifugal	1,400 cfm at 10 PSI	60
4	Centrifugal	1,250 cfm at 9 PSI	100
5	Centrifugal	1,250 cfm at 9 PSI	100

Under normal operations, one blower is in service with the other two (2) are on standby. However, only two (2) of the three (3) blowers are in place and only one (1) blower was recently repaired to operable condition. A project to repair the above-ground aeration piping was completed in September 2014, and the repaired #5 blower has been in operation since October 2014. The blower is currently only used to aerate the EQ Basins because the grit conveyors are not in operation and the Rapid Block Tank is no longer used as a process unit. A photo of the blower room is shown in **Figure 2.3-1**.

Figure 2.3-1. Aeration Blowers

2.3.2 Odor Control System

The original OCS included two (2) carbon scrubbers; one (1) 12-foot diameter duty scrubber and one (1) 5-foot diameter standby scrubber. The duty unit was designed to treat 6,000 cfm of foul air and the standby unit could treat 1,000 cfm of foul air. The OCS was intended to treat foul air from the Headworks and EQ Basins. The OCS is currently non-operational. The 12-foot carbon vessel has been removed leaving only the standby vessel in place; see **Figure 2.3-2**. The carbon in the standby unit needs replacement prior to putting it back in operation.

Figure 2.3-2. Existing OCS at Ahuimanu WWPTF

Hydrogen sulfide (H_2S) data was collected from the EQ Basins and Headworks for evaluation of a new vapor-phase OCS to be installed at the Ahuimanu WWPTF. The results of this data collection are discussed in **Section 5** and attached in **Appendix C**. Although odor complaints from the surrounding neighbors are generally not a problem for the WWPTF, significant foul odors can be noticed around the Headworks, EQ Basins and EPS.

In regard to the force main however, there have been complaints from the public about foul odors along several sections of the gravity segment of the force main which initiated an odor investigation by V&A in 2014. Results of the odor analysis revealed high H_2S concentrations and extreme differential pressure swings associated with operation of the EPS. Although the high H_2S concentrations are a major concern for both odor and corrosion, the primary concern are the differential pressures. The pressure spikes of >2 in. w.c. is more than enough to cause odor complaints and could even force odors through house plumbing vents. The vacuum of <-2 in. w.c., created each time the pumps turn off is not a problem in terms of odor complaints, but makes controlling the odors and corrosion more difficult.

A chlorine gas injection system was originally designed to inject chlorine into the EPS effluent to prevent generation of odors in the force main downstream. The chlorine injection facility has been abandoned and a new calcium nitrate feed system has been installed. Operations staff instead inject calcium nitrate into EQ Basin A directly from portable totes. Since the calcium nitrate feed system was recently installed, no assessment of this facility was completed.

2.4 Unused Facilities

2.4.1 Sludge Dewatering Building

The Sludge Dewatering Building houses old sludge filter presses which have not been in use since the construction of the WWPTF. There is an additional room where the previous emergency generator was staged but it has since been removed. This building is planned to be demolished. The Sludge Dewatering Building is shown in **Figure 2.4-1**.

Figure 2.4-1. Sludge Dewatering Building

2.4.2 Effluent Holding Pond

Under the original WWTP operations, treated wastewater effluent entered the holding pond through a pipe running down the center of the basin. A discharge pipe, with a control valve, located in the northeast corner of the basin was used to discharge treated effluent into the adjacent Ahuimanu Stream.

In 1986, the Ahuimanu WWTP was converted into a WWPTF. The effluent holding pond was abandoned in place. The influent pipe and discharge pipe remained in place, but unused. In 2010, the discharge pipe was plugged and capped.

The holding pond is currently grassed with narrow-leaved carpet grass (*Axonopus fissifolius*) and Hilo grass (*Paspalum conjugatum*). Various trees, shrubs and palms grow along the tops and outer sides of the eastern and western berms. The grass and vegetation are routinely mowed and trimmed. The holding pond is currently used as a drainage basin during major storm events.

A concrete-channelized unnamed tributary to Ahuimanu Stream borders the eastern side of the property. The confluence of this tributary with the main branch of Ahuimanu Stream is located approximately 750 feet downstream from the property, on the opposite side of Kahekili Highway. A distance of approximately 40 feet separates the top of the holding pond's eastern berm from the nearest edge of Ahuimanu Stream.

2.5 Power and Instrumentation

For the electrical analysis of the Ahuimanu WWPTF, the assessment was limited to visual observations of the electrical power, lighting and telecommunication systems. All available as-builts as well as the *Island-Wide Assessment of Wastewater Pump Stations, Ahuimanu Pre-Treatment Facility Final Report,* URS, July 2011 (2011 URS Report) and *Draft Ahuimanu Wastewater Pre-Treatment Facility Electrical I&C Condition Assessment Summary,* Brown & Caldwell, July 2012 (2012 B&C Electrical Assessment) were consulted. An in-depth investigation and testing of the electrical systems are beyond the scope of this study.

2.5.1 Off-Site Electrical Distribution System

Electrical service to the Ahuimanu WWPTF is provided by a Hawaiian Electric Company (HECo) primary overhead distribution system along Okana Road. The HECo overhead distribution system crosses Ahuimanu Stream and then runs along the northern side of the Sludge Dewatering Building and Headworks. The poleline then continues in the southerly direction, along Kahekili Highway and dead-ends at a riser pole adjacent to the driveway to the WWPTF. Primary service conductors are extended to a HECo pad-mounted transformer via an underground concrete-encased ductline. The HECo transformer is located along the facility entrance driveway, adjacent to the Blower Building. This HECo transformer is identified as HECo Vault 5532 and rated 300 kilovolt amps (kVA). An existing electrical site plan of the facility is shown in **Figure 2.5-1**.

The pad-mounted transformer provides the WWPTF with secondary electrical service at 480/277 volts, 3-phase, 4-wire, 60 hertz. An underground secondary electrical ductline consisting of four (4) 3-inch PVC, concrete-encased conduits extend from the pad mounted transformer to the EPS. The record drawings indicate that the feeder from the HECo transformer to the WWPTF consists of four (4) sets of three (3) 350 kcmil conductors per phase. The secondary feeder terminates at the service entrance switchboard for the facility which is located at the Blower Building.

HECo kilowatt-hour (kWH) Meter 532560 is located at the exterior of the Blower Building. HECo metering instrument transformers are located within the service entrance switchboard. Based on historical demand data obtained from HECo, the peak demand reading since 2014 for Meter 53560 was 212.2 kilowatts (235.8 kVA at 0.9 power factor) in June 2015.

HECo is responsible for the primary cables and ductlines, pad-mounted transformer and kWH meter. The City only becomes involved if there are changes to the service capacity or any modification or relocation of these items.

Telephone System

Hawaiian Telcom (HT) currently provides underground telecommunications service to the Ahuimanu WWPTF. HT utilizes a 2-inch underground ductline to provide telecommunications service from its cable facilities along Kahekili Highway to the WWPTF. The existing Hawaiian Telcom service is utilized telephone (voice) service only.

Hawaiian Telcom is responsible for the existing telecommunications service cable to the WWPTF. The City only becomes involved if changes are made to the type of service required at the WWPTF.

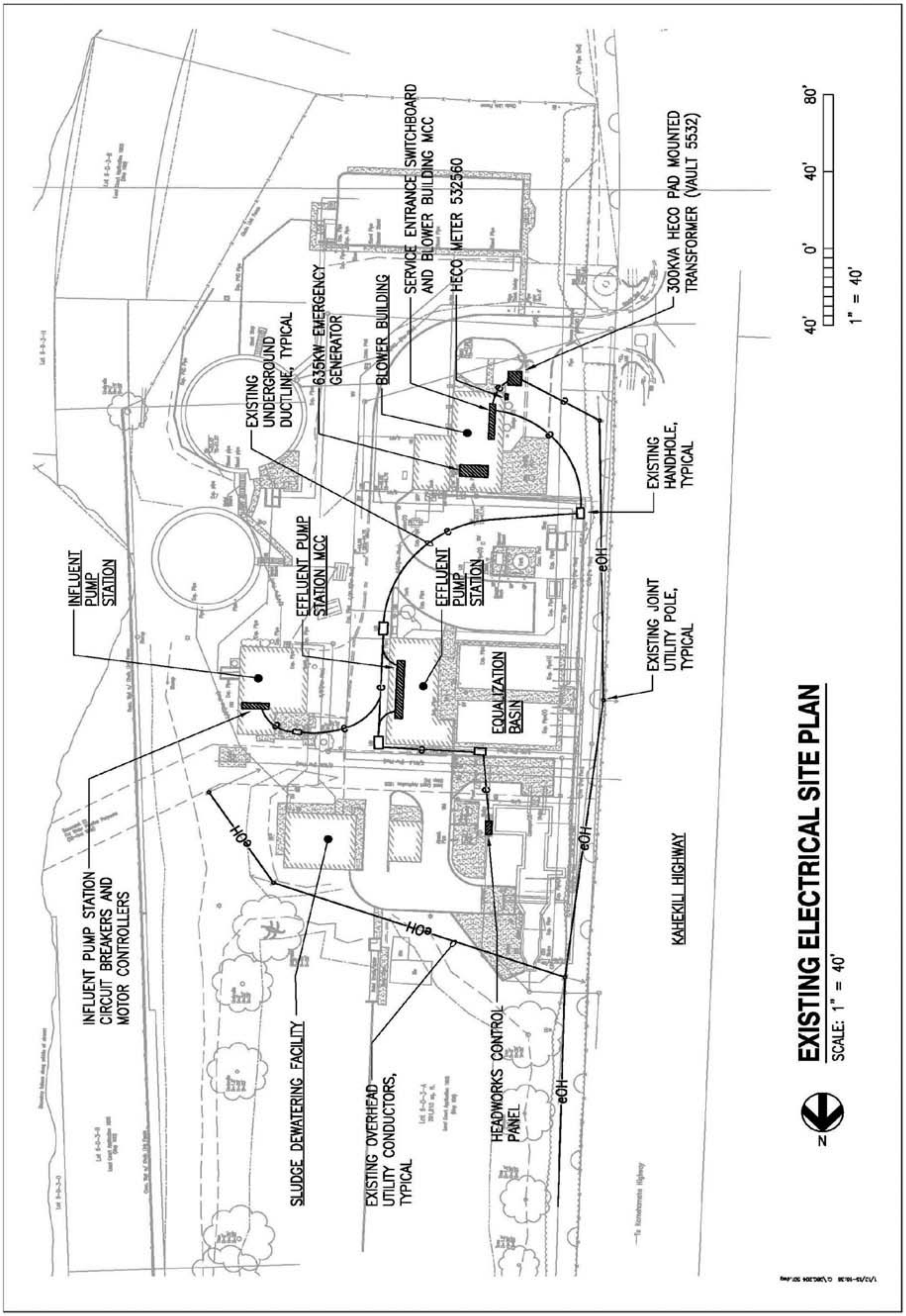

Figure 2.5-1. Ahuimanu WWPTF Existing Electrical Site Plan

2.5.2 On-Site Electrical Distribution System

The current electrical service equipment for the WWPTF is located in the Blower Building and is a Cutler Hammer *MP200* series unit, rated for 2,000 amperes, 480/277 volts, 3-phase, 4-wire. The switchboard contains the main (service) breaker rated at 900 amperes, generator automatic transfer switch and feeder circuit breakers serving the various loads/buildings at the WWPTF. The generator automatic transfer switch is manufactured by Russelectric. The switchboard was installed in the early 1980s as part of the EPS construction project. Signs of corrosion and degradation were observed on the switchboard.

The Motor Control Center (MCC) for the Blower Building is a Cutler Hammer *Unitrol* series unit rated for 600 amperes, 480 volts, 3-phase, 3-wire. The Blower Building MCC contains circuit breakers and controllers for the aeration system blowers, chlorine booster pumps, instrument air compressors and other miscellaneous process equipment. The majority of the equipment serviced by the Blower Building MCC has been demolished, de-energized or abandoned. The Blower Building MCC is coupled to the service entrance switchboard and was also installed in the early 1980s.

A second MCC located in the EPS contains circuit breakers and controllers for the EPS wastewater pumps, sump pumps, seal water pumps, exhaust fans, odor control fans, and Headworks facility, a panel for 120-volt power, and the SCADA monitoring panel for the EPS. The MCC is a Cutler Hammer *Unitrol* series unit rated for 1,000 amperes, 480 volts, 3-phase, 3-wire. The EPS MCC is the original MCC installed when the EPS was constructed. The 2012 B&C Electrical Assessment indicated that small signs of overheating and evidence of a short circuit incident at one of the EPS pump starter sections was observed on the MCC.

The IPS process equipment is served by a wireway with numerous feeder taps to support separately enclosed circuit breakers and motor controllers for the IPS wastewater pumps, ventilation equipment, panelboards and other miscellaneous process equipment. Although the IPS electrical distribution system was installed in the early 1960s, few signs of corrosion or deterioration of the equipment enclosures were observed.

It is unknown if the circuit breakers in the existing switchboard, MCCs and IPS have ever been tested or recalibrated or if routine maintenance has been performed on the distribution equipment or its components. Hence, it is uncertain whether all the protective devices and controls will operate properly when called upon to do so.

2.5.3 Secondary Electrical System

All large, electrically operated equipment, including the wastewater pumps, sump pumps, and ventilation equipment, are operated from their 480 volt respective MCC power systems at the Blower Building and EPS and wireway feeder taps at the IPS. Insulated conductors in conduits distribute the 480-volt power to the various electrically-operated equipment.

Step down dry-type transformers provide 240/120 volt, single phase, 3-wire power for smaller loads including lighting, duplex receptacles, controls, etc. Insulated conductors in conduits distribute the circuits from branch circuit panelboards to the various loads.

The City has not reported any significant problems with the secondary electrical distribution system, including duplex receptacles, light switches and other devices.

2.5.4 Lighting Systems

The exterior night lighting system consists of a combination of wall-mounted luminaires utilizing either high-pressure sodium or incandescent lamps. The luminaires appear to be the original luminaires installed when the buildings were first constructed. These exterior luminaires illuminate the exterior perimeter of the various buildings at the WWPTF. Pole-mounted luminaires utilizing high pressure sodium lamps were also observed along the access driveways throughout the WWPTF.

The interior lighting systems at the Blower Building, EPS and IPS are a combination of surface- and pendant- mounted industrial-type fluorescent luminaires. The luminaires have non-metallic housings, gasketed diffusers and T-8 lamps. The luminaires at the IPS appear to have replaced the incandescent luminaires indicated on the original construction drawings. Fluorescent luminaires at the Blower Building and EPS were installed with T-12 lamps when the EPS was originally constructed. However, it appears that the Blower Building and EPS luminaires were either replaced or retrofitted with T-8 lamps at some point.

The emergency lighting system consists of self-contained, dual-head emergency lighting units. Since emergency lights are not shown on the as-built drawings for the Blower Building or the IPS, it is assumed that these lights were added at a later date. The emergency lights were not tested to determine if they would be operational during failure of normal utility power.

2.5.5 Emergency Power

A 635 kW emergency generator, located in the Blower Building, is intended to provide full operation of the WWPTF during a power outage. The generator is diesel-fired and utilizes a CAT 3508 engine. The generator was installed in the early 1980s as part of the EPS construction project and appears to be in fair condition.

Provision for a portable generator connection has not been installed at the Blower Building. However, industrial-type receptacles were observed on the exterior wall of the IPS. These receptacles may have been originally provided to allow for connection of a portable generator or load bank to support the IPS.

Underground Storage Tank

The existing fuel system serving the emergency generator is over 30 years old. The system utilizes an underground, single wall, steel tank with a capacity of 5,000 gallons. The tank is anchored in place by a 6 feet x10 feet x 27 inches reinforced concrete pad. All existing fuel piping appears to also be single wall steel pipe. There is no secondary containment around the tank or at the fill pipe. This tank feeds to a 50 gallon per day tank in the generator room.

Soil sampling was conducted in the vicinity of the Underground Storage Tank (UST) as part of this study to determine if any fuel has leaked into the surrounding soil. The sampling was conducted by Element Environmental, LLC (E2) on November 14, 2014. Results of the study do not indicate a release of fuel from the UST, however, it is still recommended to replace the UST with an Aboveground Storage Tank (AST). The full soil sampling report can be found in the *UST Soil Sampling Report*, Element Environmental, July 2016.

2.5.6 Supervisory Control and Data Acquisition System (SCADA)

The existing SCADA system at the Ahuimanu WWPTF reflects a transition phase between the City's previous control and telemetry approach and the work-in-progress to upgrade all facilities to new standards based on modern hardware and software. The 2012 B&C Electrical Assessment documented that the WWPTF telemetry system was based on the previous City standard using equipment manufactured by Barrington. Since that report, the City replaced the Barrington platform with new Allen-Bradley/Rockwell programmable logic controllers (PLCs) that meet current City standards. This section describing the existing control system is based on the Ahuimanu SCADA system upgrade drawings developed by Dynatek, Inc., dated December 2011, as well as field observations.

Although the Barrington telemetry equipment has been replaced with new Rockwell hardware at the WWPTF, the SCADA functions at the facility are essentially limited to status monitoring. The transition from Barrington to Rockwell appears to have transferred the existing monitoring capability to the new platform with little improvements to the existing relay-based local controls.

The recent improvements at the WWPTF incorporate many of the City's existing standards. There are some apparent exceptions reflecting technology improvements subsequently adopted by the City after completion of the work at WWPTF. Other features of the existing PLC system include:

- Reliance on pre-existing, relay-based controls for operation of sewage pumps, blowers, chemical feed pumps, and other WWPTF process equipment; PLC control appears to have been implemented for grit screens, sump pump, and seal water pumps only. The City's current process control standard is to incorporate process control in PLC software logic
- The PLC ControlLogix platform featuring the Rockwell L73 processor; City's current standard is based on the Rockwell L72 processor
- Single non-redundant PLC; depending on the criticality of the facility, the City may implement redundant, hot standby PLC processors
- DeviceNet for equipment network monitoring is presently limited to the chemical feed pumps; City's current standard uses Ethernet/IP wherever available, intelligent motor controls (starters, drives), and other equipment for direct network access by the PLC to operating and control parameters
- Control panel fabrication with City standard features that include prefabricated I/O wiring harnesses, hot swappable panel uninterruptible power supplies (UPS), PLC rack resident Historian, panel mounted digital operator display (Rockwell PanelView), external Ethernet communication (see **Figure 2.5-2**) routed to Kailua WWTP for remote monitoring, and redundant panel component PLC power supplies.

Communications at the WWPTF utilizes a fiber optic cable provided by Spectrum. The fiber link has been connected to the existing PLCs, and has greatly increased data rates in and out of the WWPTF.

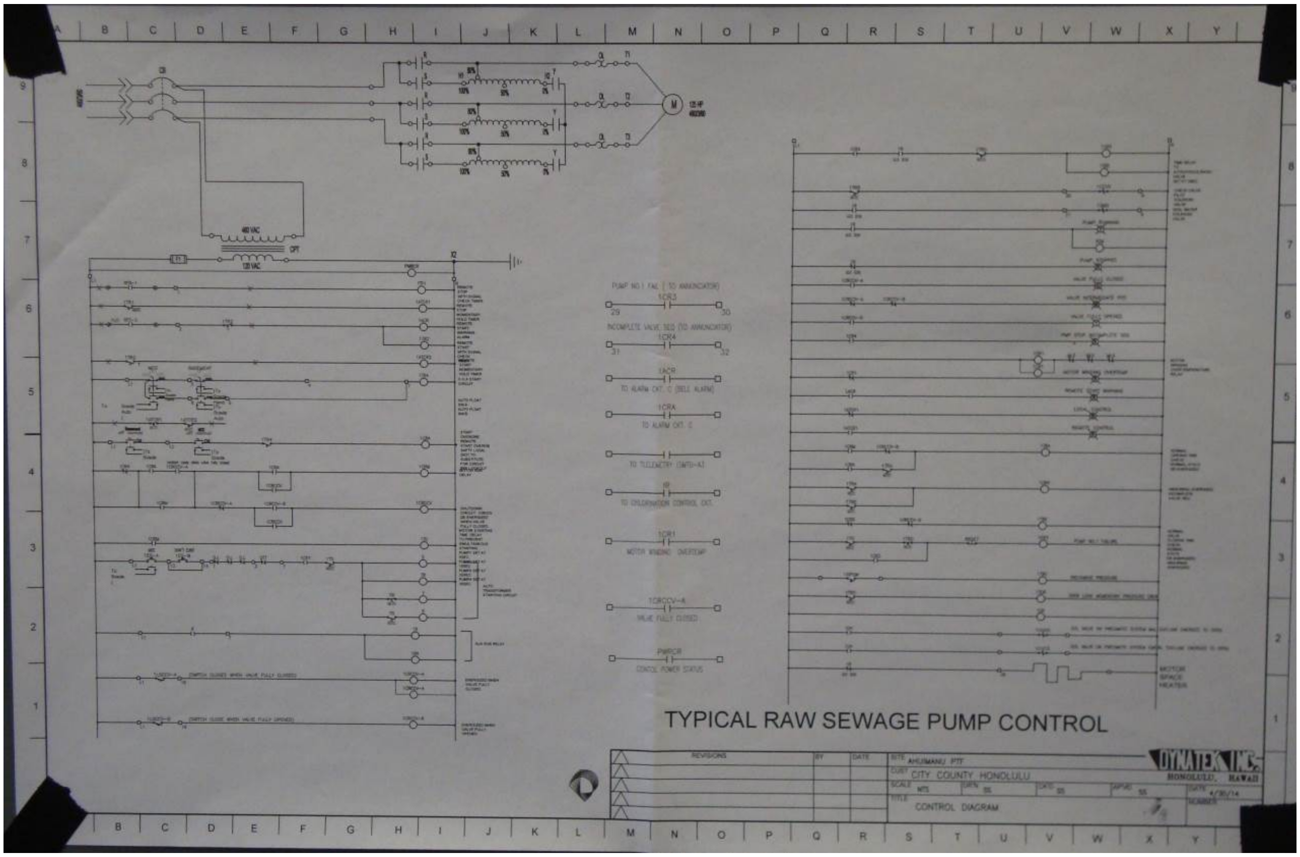

Figure 2.5-2. Ahuimanu WWPTF External Ethernet Communication Diagram

2.6 Environmental Site Assessment

An Environmental Site Assessment (ESA) was performed to determine the extent of hazardous wastes which may need to be removed prior to any demolition or renovation at the facility. The ESA was performed by E2 on August 19, 21, and 26, 2014. The ESA surveyed the following structures for asbestos and/or lead paint:

- Headworks – lead paint only
- EPS – asbestos and lead paint
- IPS – asbestos and lead paint
- On-Site Storage Facilities (Rapid Block Tank, Aerobic Digester, Primary Clarifier) – lead paint only
- Chemical Feed, Blower and Generator Building – asbestos and lead paint
- Old Generator Building – asbestos and lead paint
- Sludge Dewatering Building – lead paint only

The ESA found asbestos containing material (ACM) in the Chemical Feed, Blower and Generator Building, IPS and EPS which needs to be removed prior to any renovation or demolition. Additionally, asbestos in concentrations of less than 1% were found in the Old Generator Room (in the Sludge Dewatering Building) and the EPS. The prospective landfill needs to be consulted prior to disposal of these materials to determine whether or not they can be accepted as regular material. No asbestos was found in the Sludge Dewatering Building.

Lead-based paint (LBP) in poor condition was found in the Aerobic Digester, Primary Clarifier, Sludge Dewatering Building, and IPS. LBP in good condition was found in the Chemical Feed, Blower and Generator Building and IPS. No LBP was found in the Rapid Block Tank, Headworks, Old Generator Building or EPS. However, lead-containing paint (LCP) was found in all structures sampled. LBP is defined as paint containing at least 0.5% by weight, or 5,000 mg/kilogram (kg) of lead. LCP is defined as paint containing any detectable amount of lead up to 0.5% by weight or 5,000 mg/kg. Both LBP and LCP are worker protection and disposal issues, and it is recommended that any loose and flaking LBP be removed prior to starting any demolition work.

Prior to demolition or renovation, additional sampling for arsenic containing canec in the wall tiles of the Chemical Feed, Blower and Generator Building, and door tiles of the IPS and EPS, should be conducted. If detected, arsenic containing canec materials should be removed whole, segregated, wrapped in plastic or placed in plastic bags during transportation and disposed of similarly to asbestos at a permitted landfill facility.

The entire ESA report can be found in the Final *Asbestos and Lead Paint Survey Report*, Element Environmental, July 2016.

Section 3 - Design Basis

3.1 Regulatory Requirements

The following requirements for the Ahuimanu WWPTF are outlined in the FACD:

1. Maintain a minimum capacity of 600,000 gallons of wastewater storage until the KK Tunnel has completed an initial 2-year operational period. The KK Tunnel is expected to begin operation by July 1, 2018.
2. Implement and maintain a spill contingency plan for the Ahuimanu Force Main. The 2012 SCP fulfills this requirement. The 2012 SCP has identified a total of 800,000 gallons of storage currently available on-site.

3.2 Design Flows

3.2.1 Existing Flows

The highest recorded maximum hourly flows at the Ahuimanu WWPTF occurred in May 1998, July 1999, March 2000 and October 2001, with flows between 7.2 and 7.6 mgd. The *Ahuimanu Force Main Capacity and Odor Control Study*, Earth Tech, Inc., October 1997 recommended that the pump station be limited to 3.15 mgd to prevent problems with air binding in the gravity section of the force main. Operational controls at the EPS were established since October 2001, to keep peak flows below 4.7 mgd due to hydraulic limitations of the force main.

Since 2007, the pump station recorded flows have remained below 3.67 mgd. However, the *Ahuimanu Wastewater Pre-Treatment Facility Revised Condition Assessment Report*, *Force Main Condition Assessment,* RMTC, October 2011 (2011 RMTC Report) indicated that based on current pump information and a simulated model of the EPS and force main system, the firm capacity of the facility (3 of 4 pumps running) is calculated to be 3.67 mgd and the total capacity (all 4 pumps running) to be 3.83 mgd, provided there are no hydraulic limitations on the force main. Previously, with the assumption that the EPS was limited to a total pumping capacity of 3.83 mgd, all flows exceeding this pumping rate are assumed to be stored on-site in the existing storage basins.

The following **Figures 3.2-1** and **3.2-2** show average daily diurnal curves for the Ahuimanu WWPTF based on SCADA data taken in 1-minute intervals from December 2010 through June 2014. [Note: SCADA records only pump station discharge flow, wet well level, discharge pressure, and pump run time.] The influent flow rates were calculated based on the wet well fill and drain time, the pumping rate, and the pumping duration. **Figure 3.2-1** presents typical weekday flows and **Figure 3.2-2** presents typical weekend flows. Normal daily flows range from 0.31 mgd to 0.93 mgd, with an overall average of 0.64 mgd.

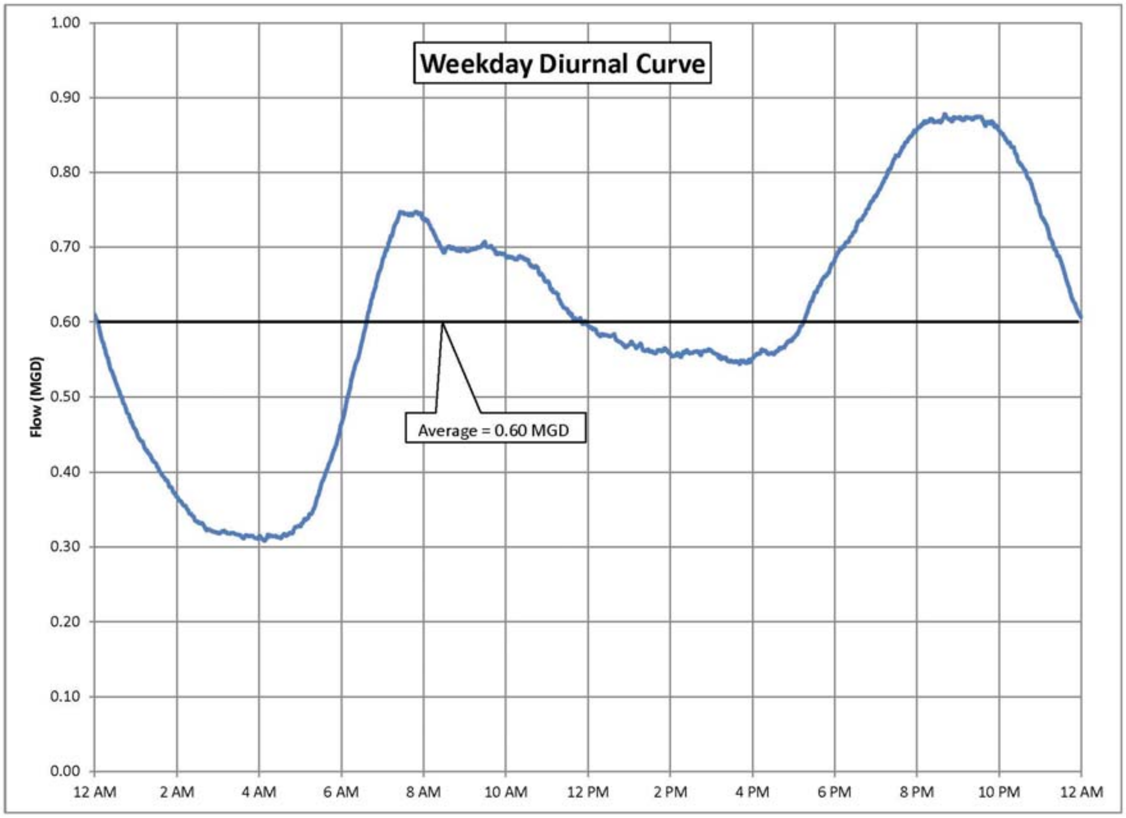

Figure 3.2-1. Ahuimanu WWPTF Average Weekday Diurnal Flows, Dec 2010-June 2014

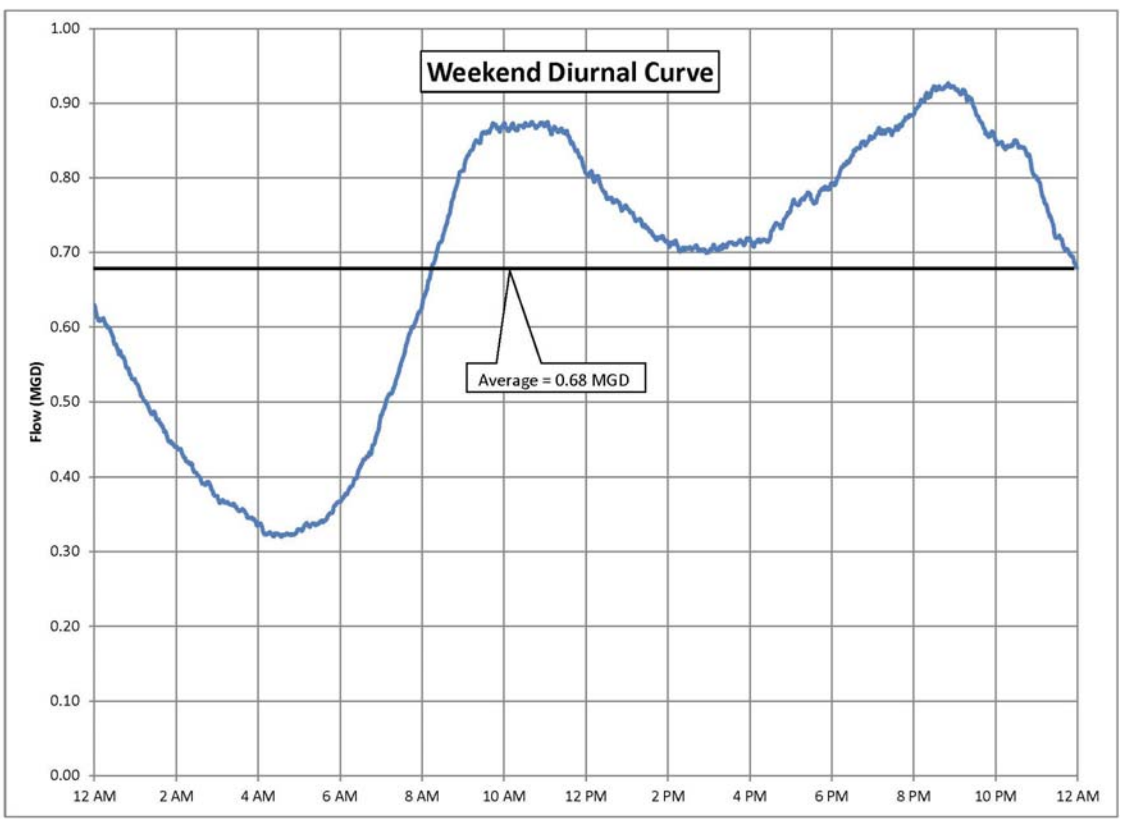

Figure 3.2-2. Ahuimanu WWPTF Average Weekend Diurnal Flows, Dec 2010-June 2014

3.2.2 Future Flows and Storage Requirements

Under worst-case conditions, the projected PWWF for 2030 is 8.11 mgd. At this condition, at least 730,000 gallons of storage will be required at the Ahuimanu WWPTF. This worst-case scenario was determined using the hydrograph for a projected 5-year, 24-hour storm provided by the City; see **Figure 3.2-3**. For this scenario, it was assumed at the time that the EPS pumps would be equipped with variable speed drives and limited to a maximum pumping rate of 4 mgd.

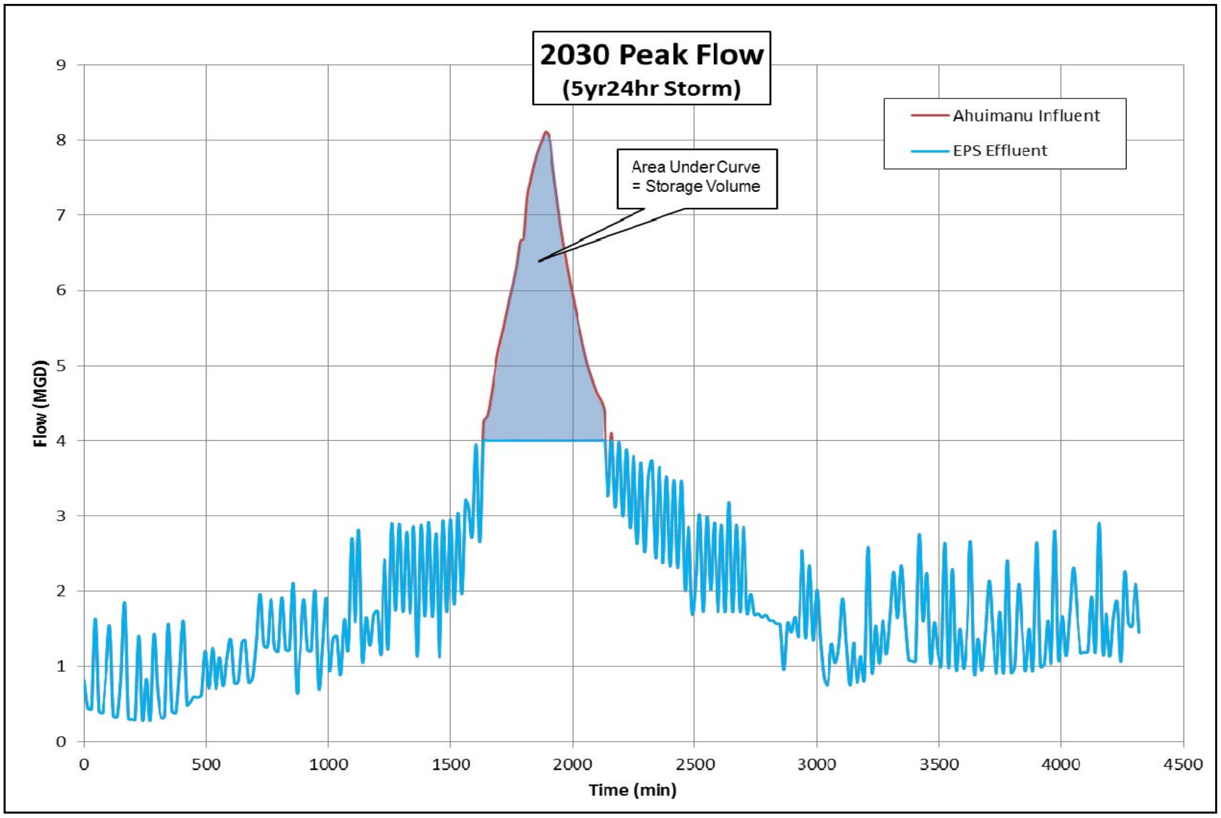

Figure 3.2-3. Projected 2030 PWWF for Ahuimanu WWPTF

In the November 2017 Technical Memorandum by Brown and Caldwell, two modelling scenarios were performed, (1) with the EPS at peak wet weather pumping capacity and (2) with at least 160,000 gallons of storage at the AWPTF. At peak pumping capacity, the downstream collection system would be able to convey the flows without spilling, however there would be surcharge at several capacity limited sewer pipes. With at least 160,000 gallons of storage available during wet weather conditions, the pumping capacity at the EPS could be reduced to 5.84 mgd, reducing the surcharge in the downstream collection system.

The City has set the design pump station capacity at 5.84 mgd. The existing EQ basins would remain and provide the minimum storage requirements. The following **Table 3.2-1** outlines the proposed flow and storage requirements used for sizing the major facilities at the Ahuimanu WWPTF.

Table 3.2-1.
Design Criteria for the New Ahuimanu WWPTF

Facility	Flow/Storage Requirement
Headworks	8.11 mgd peak flow
EPS	5.84 mgd (peak) 0.31 mgd (minimum)
Storage System	730,000 gallons minimum for spill contingency (until future backup force main) 160,000 gallons minimum to minimize surcharge in downstream sewer system

3.3 Grit Loadings

Grit characterization sampling at the Ahuimanu WWPTF was completed on September 10 and 11, 2014. Samples were taken from the influent manhole just upstream of the Headworks (see **Figure 3.3-1**). A vertically integrated sampler (VIS) was used to sample from the entire height of the water column entering the facility; samples were taken on a continuous basis from 7 AM to 1 PM on both days.

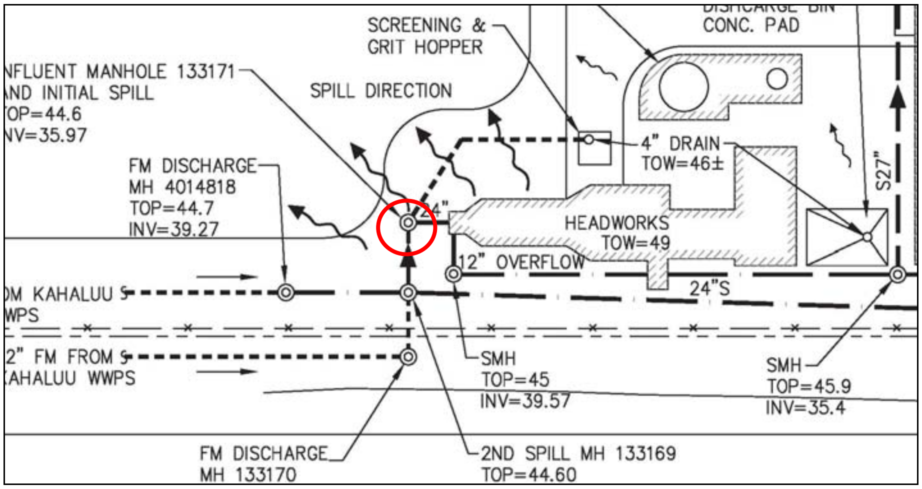

Figure 3.3-1. Grit Sampling Location

Sampling results showed a total grit concentration of 1.6 pounds (lbs)/MG and 2.0 lbs/MG collected on September 10 and 11, respectively. By comparison, the national average is 55 lbs/MG. The grit concentrations at Ahuimanu are very low, and indicate a) there is not much grit in the incoming flow and/or b) the grit is settling out upstream of the sampling location. It is possible that a majority of the grit remains in the collection system until a wet weather flow event; however, wet weather sampling would be required to confirm this. Alternatively, the surcharged condition of the influent manhole could be causing the grit to settle just prior to the sampling location.

Based on the grit settling characteristics and size distribution, the study determined that a grit removal system designed for 150-micron Sand Equivalent Size (SES) particles would collect 56-66% of the incoming grit, while a system designed for 100-micron SES would collect 85-90% of influent grit. A system designed for 300-micron SES would collect only 10-15% of influent grit, which is insufficient. An effective system would need to be designed for 100-micron SES or smaller.

A complete discussion of the grit sampling methodology and analysis can be found in **Appendix D**.

3.4 Site Constraints

3.4.1 Floodway

Approximately half of the Ahuimanu WWPTF site is located in flood Zone AEF or AE, which is within the 100-year flood zone of the Ahuimanu Stream. Facilities located outside of the flood zone include the majority of the Rapid Block Tank, the Blower and Generator Building, the EQ Basins and the Headworks. Facilities within the flood zone include the Primary Clarifier, Aerobic Digester, IPS and Sludge Dewatering Building. The flood elevations range from 48 to 56 feet; see **Figure 3.4-1**. Existing ground elevations in this area range from 45 to 55 feet.

Any proposed structure located within the floodway would need to be situated so that the same cross-sectional flow area in the existing condition would be provided in the proposed condition. The City and County of Honolulu would then approve a building permit. Furthermore, based on these flood elevations, the tank walls of the future storage system will have to be designed to be a minimum of one foot higher than the base flood elevation. No elevation modifications are necessary for the Headworks, EPS, EQ Basins, or Blower and Generator Building.

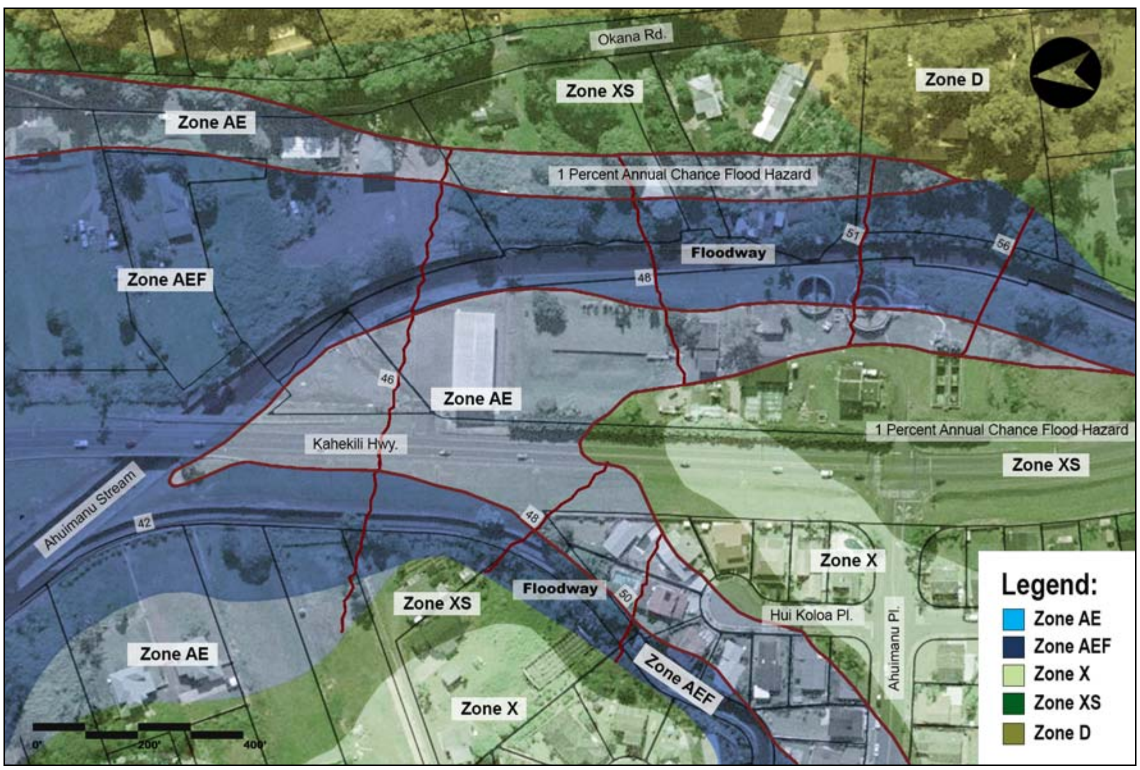

Figure 3.4-1. Flood Map for Ahuimanu WWPTF (Source: CCH GIS Website)

3.4.2 Storm Water Management

The existing Ahuimanu facility is approximately 3.2 acres and consists of several buildings, tanks, and a paved driveway. There are 0.75 acres of impervious surfaces consisting of pavement and buildings with 2.45 acres covered in grass and trees. Majority of the onsite runoff flows into the existing effluent holding pond based on the topography of the site while the remaining areas flow into Ahuimanu Stream. City and County of Honolulu storm water standards requires that the onsite drainage areas use a 50-year, 1-hour storm to calculate peak flow runoff flow rates and volumes.

Runoff from Kahekili Highway is designed to be collected in an adjacent roadway swale that flows to the north, along the WWPTF boundary. The swale discharges runoff water to a pipe culvert that runs along the northern border of the WWPTF and connects to the Ahuimanu Stream. State of Hawaii Department of Transportation Highways Division storm water standards requires that the roadway drainage areas use a 25-year, 1-hour storm to calculate peak flow runoff flow rates and volumes.

Low Impact Development (LID) is a storm water management strategy also required by the City and County of Honolulu for new projects. LID is 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 optimal LID site design minimizes runoff volume and preserves existing flow paths.

LID is required for this project since the proposed disturbed area and impervious areas total 1.1 acres. This project is classified as a Priority A2 project per the City and County of Honolulu's Storm water quality standards. The requirements for this project are to provide onsite retention of the water quality volume (WQV) and BMPs designed for a 1-inch rainfall event.

3.4.3 Soils and Groundwater

Geotechnical field exploration included three exploratory borings, drilling and installation of one groundwater monitoring well, installation of two vibrating wire piezometers in grouted boreholes, double ring infiltrometer test and water level monitoring at the two piezometers and inside the installed monitoring well. Drilling services was performed in February 2016. Groundwater level monitoring is on-going as of July, 2016.

Based on the exploratory borings and drill hole and the field and laboratory testing data, the anticipated subsoils encountered at the EQ Basin optional sites can be generalized into three (3) local geologic units, namely Fills, Alluvium, Residual Soil as further discussed below.

Fills

Fills were encountered below the existing ground surface to approximately 2.5 to 13.5 feet below ground surface (bgs) in the borings and well borehole. Fills primarily contained soft to stiff, brown sandy elastic silts with basalt gravels in and gray, very dense sandy gravel with silt and brown silty gravel with sand. A summary of the fills is shown in **Table 3.4-1**.

Table 3.4-1
Fill Materials: Summary of Blow Counts and Field/Laboratory Test Results

	No. of samples/tests	Range	Average
SPT sampler blow counts per foot (excluding refusal)	2	6 to 12	9
SPT refusal blow counts	1 out of 3 total samples		
D&M sampler blow counts per foot (excluding refusal)	5	3 to 23	11
D&M refusal blow counts	1 out of 6 total samples		
Moisture contents	3	27% to 72*%	46%
Dry densities	3	63 to 77 pcf	68 pcf

*72 percent moisture content sample obtained at Infiltration Test Pit which was located in the existing drainage basin.

Alluvium

Alluvial deposits result of sedimentation in ancient buried stream channels or accumulations in sedimentation basins or estuaries and are likely sourced from upland terrestrial sediments deposited from the Ahuimanu and North Halawa streams. This soil unit was found underlying the fill materials in the borings and well borehole. Alluvial deposits primarily contained very loose to medium dense silty sands and gravels. Alluvium consisting of soft to medium stiff, dark gray to brownish gray elastic silt with sand and/or basalt gravels was also encountered suggesting potential for significant consolidation settlements for moderate to heavily loaded structures founded on or above the Alluvium.

A summary of the field sampling blow counts and selected field and laboratory test results of the Alluvial Deposits unit is listed in **Table 3.4-2**.

Table 3.4-2
Alluvium: Summary of Blow Counts and Field/Laboratory Test Results

	No. of samples/tests	Range	Average
SPT sampler blow counts per foot (excluding refusal)	14	2 to 11	5
D&M sampler blow counts per foot (excluding refusal)	12	3 to 18	9
D&M refusal blow counts	1 out of 13 total samples		
Moisture contents	10	26% to 76%	59%
Dry densities	9	54 to 85 pcf	66 pcf

Residual Soil

Residual soil was encountered underlying the Alluvium, at depths ranging between 22 feet to 23.5 feet bgs through the explored depths in our exploratory borings and well borehole. Residual Soil consisted primarily of soft to stiff, orange to reddish brown elastic silt (MH) with varying amounts of sand and gravel.

A summary of the field sampling blow counts and selected field and laboratory test results of the residual soil is listed in **Table 3.4-3**.

Table 3.4-3
Residual Soil: Summary of Blow Counts and Field/Laboratory Test Results

	No. of samples/tests	Range	Average
SPT sampler blow counts per foot (excluding refusal)	15	3 to 13	7
D&M sampler blow counts per foot (excluding refusal)	14	5 to 23	13
Moisture contents	17	61% to 85%	69%
Dry densities	13	52 to 73 pcf	59 pcf

Groundwater

Artesian groundwater was encountered in all of the exploratory borings and drilled the water level monitoring borehole. Elevated groundwater levels ranging between approximately +34 feet MSL and +40 feet MSL were encountered. Piezometer groundwater level monitoring is on-going at three locations at the time of this report. Records obtained from the on-going piezometer groundwater level monitoring will be presented in subsequent Final Submittal Geotechnical Report by YKE.

Based on the subsurface conditions encountered in the geotechnical exploration and close proximity of the site to Ahuimanu Stream, it is anticipated that the groundwater at Ahuimanu WWPTF will fluctuate with stream water flows and rainfall events in the upland areas. Perched subsurface seepage or higher groundwater are also anticipated, particularly during or after rainy periods in the upland areas and/or high flood levels in the nearby stream. The Alluvial gravel and sand layers likely present preferential paths for horizontal groundwater seepage from upland areas contributing the perched artesian groundwater water levels at the site.

Further discussion on the soil conditions and groundwater are discussed in more detail in the draft submittal of the “Geotechnical Exploration and Evaluation Ahuimanu WWPTF Improvements Project”, dated June 2016 by YKE.

3.4.4 Noise

The Ahuimanu WWPTF is located in a “country” or Class C zoning district under Hawaii Administrative Rules (HAR) Title 11, Chapter 46. Under Class C zoning, the maximum permissible sound level is 70 dBA at or beyond the property fence line, 24 hours a day. However, the typical background noise levels in the area range from 40 to 50 dBA, which means noise emissions near 70 dBA would likely cause complaints from neighboring residences. Therefore, the acoustical design goal for the upgraded Ahuimanu WWPTF is set at 45 to 50 dBA at the closest residences, 70 dBA from the emergency generator at the mauka property line, and not to exceed existing generator noise levels at the makai property line. The complete noise assessment can be found in **Appendix A**.

3.4.5 Wetland Survey

On July 9, 2015, AECOS, Inc. conducted a wetlands survey following the *Corps of Engineers Wetland Delineation Manual and Regional Supplement* (Manual). The wetland survey report, including a U.S. Army Corp of Engineers Wetland Determination Data Form — Hawaii and Pacific Islands, is attached in **Appendix E**.

One (1) wetland determination sampling point (SP) was established at a low point of the abandoned effluent holding pond. This location was chosen as it is the lowest point on the property and the place most likely to exhibit all three (3) wetland characteristics. The survey determined that the site has hydrophytic vegetation and hydric soils, but no wetland hydrology. The report concludes that because the site exhibits only two of the required indicators, the site is not a wetland.

On January 15, 2016, Department of the Army, Corps of Engineers responded to the request for determination of permitting requirements. It was determined that construction within the effluent holding pond does not occur within jurisdictional limits of a Navigable Water of the U.S. as defined by Section 10 of the Rivers and Harbors Act of 1899 or within the limits of Waters of the U.S. as defined by Section 404 of the Clean Water Act. Therefore, a Department of Army permit would not be required.

Section 4 –Storage System Alternatives

The following three (3) storage system alternatives were evaluated as part of this study:

- Option 1 – Rehabilitate and re-use all existing storage tanks including the existing EQ Basins. These tanks currently provide about 800,000 gallons of wastewater storage. Existing pumps and interconnecting piping will also be rehabilitated or replaced.
- Option 2 – Construct a new EQ basin sized for 800,000 to 1,000,000 gallons of storage. All existing storage tanks will be demolished, including the existing EQ Basins.
- Option 3 – Retain the existing EQ Basins and demolish all other storage tanks. Construct a new EQ basin to provide total of 800,000 to 1,000,000 gallons of storage.

These alternatives are discussed in detail below.

4.1 Option 1: Re-Use Existing Storage Tanks

The Ahuimanu WWPTF currently utilizes the existing Aerobic Digester, Primary Clarifier, Rapid Block Tank, and two (2) EQ Basins to provide approximately 800,000 gallons of combined available storage during storage events or wet weather flow conditions. Storage System Option 1 involves continuing to pump and store wet weather flows into the existing tanks. However, because it is evident that the existing tanks, equipment and piping have deteriorated over the years, it would be prudent to rehabilitate or replace them in order to extend their useful service life.

4.1.1 Operation – Wet Weather Flows

The operation of the WWPTF for this option assumes that wet weather flows are diverted to the existing IPS wet well. From there the wet weather flows are pumped to the existing Aerobic Digester, the existing Primary Clarifier tank or the existing Rapid Block Tank for storage. Filling of each tank will be controlled by motorized gate valves that will be installed on the influent pipe to each existing tank and a level transmitter will be used to monitor the operating water levels.

Once the flow conditions entering the WWPTF return to normal, each of the existing storage tanks may be drained by gravity, sending wastewater to existing EQ Basin B and then pumped from the EPS to the Kaneohe WWPTF. Portable submersible pumps are needed to remove any residual wastewater that remain in the cone sections of the existing tanks and convey by gravity to the tank drainage system. The process flow diagram for Option 1 is shown in **Figure 4.1-1**.

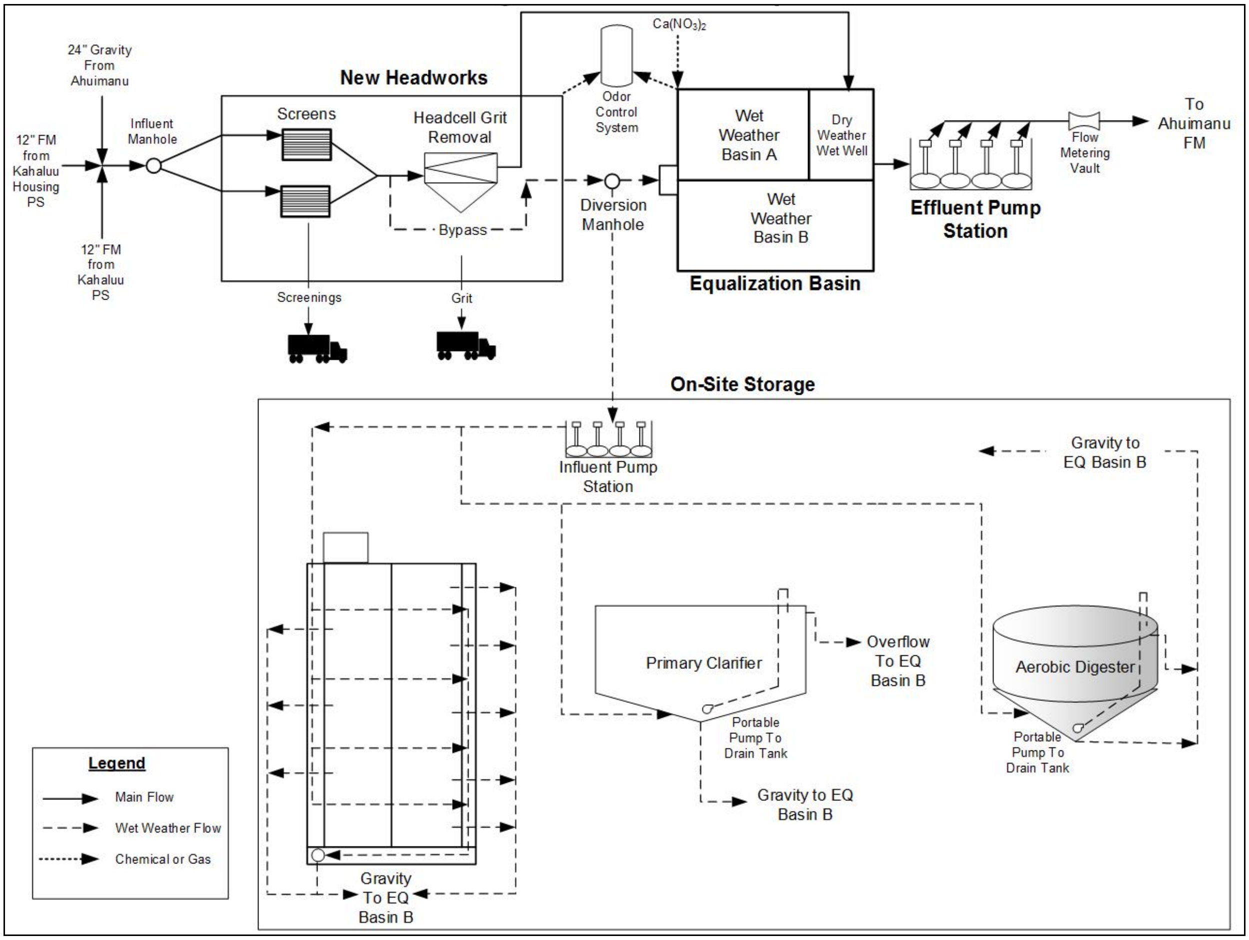

Figure 4.1-1. Option 1 - Process Flow Diagram

4.1.2 Existing Storage Tank Modifications

To improve the overall operation of the WWPTF under storage event or wet weather flow conditions, modifications to the existing tanks, equipment and piping are required. For Option 1, upgrades to the existing tanks include the demolition of unused equipment, rehabilitation of structural walls and replacement of aging piping and valves as discussed below. Additional modifications to the WWPTF, which are needed regardless of the storage system option chosen, are discussed in detail in **Section 5**.

Equalization Basin – Dry Weather Compartment

To reduce retention time, a dry weather compartment partitioned within the existing EQ Basin shall be constructed for daily normal operating conditions; see **Figure 4.1-2**. Dry weather flows will be re-routed from the Headworks through new influent piping to a drop pipe submerged below the operating water level in the dry weather compartment. With a submerged entrance, the turbulence generated by the incoming wastewater is reduced and thereby decreasing the amount of hydrogen sulfide that is released into the headspace of EQ Basin A. Currently, the total air requirement for EQ Basin A and B is 440 scfm. The aeration system for the dry weather compartment will be sized based on the lowest turndown ratio the selected new blower can achieve.

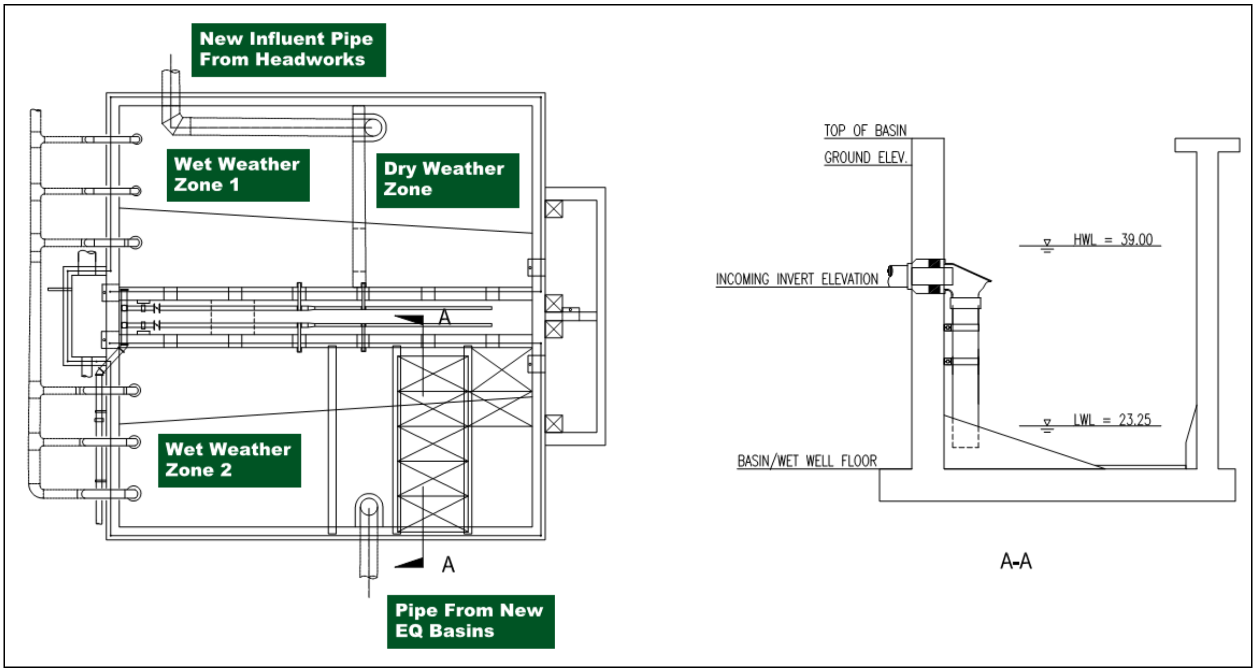

Figure 4.1-2. Existing EQ – Dry Weather Compartment

Primary Clarifier

The existing Primary Clarifier is no longer used for primary treatment and instead used only for the storage of wet weather flows. To better operate and maintain the Primary Clarifier as a storage tank, the following upgrades are required:

- Remove existing rake arms and center well equipment.
- Remove existing aboveground tank piping.
- Remove existing sludge piping and pump equipment.
- Install two new motor-operated 14-inch gate valves at the tee connection of the IPS force main and primary influent line to automate the filling of the clarifier.
- Install a new level transmitter in the Primary Clarifier to monitor the operating water levels and control the opening/closing of the motor-operated gate valves.
- Install a new washdown system and walkways for operators to clean the existing PC.

Stored wastewater from the Primary Clarifier will be drained via a new gravity drain system that is connected to the existing EQ Basin, as shown in **Figure 4.1-3**. Below is the additional work required that would allow for the complete draining of the clarifier:

- Connect the existing 6-inch sludge piping at the fitting outside of the clarifier wall to the new gravity drain system.
- Connect the existing 16-inch clarifier effluent piping to the new gravity drain system.
- Install motor-operated gate valves on the sludge and effluent piping.
- Install a submersible portable pump to drain the cone section of the clarifier.
- Install flexible piping from the submersible portable pump to the effluent launders to empty the wastewater into the gravity drain pipes.

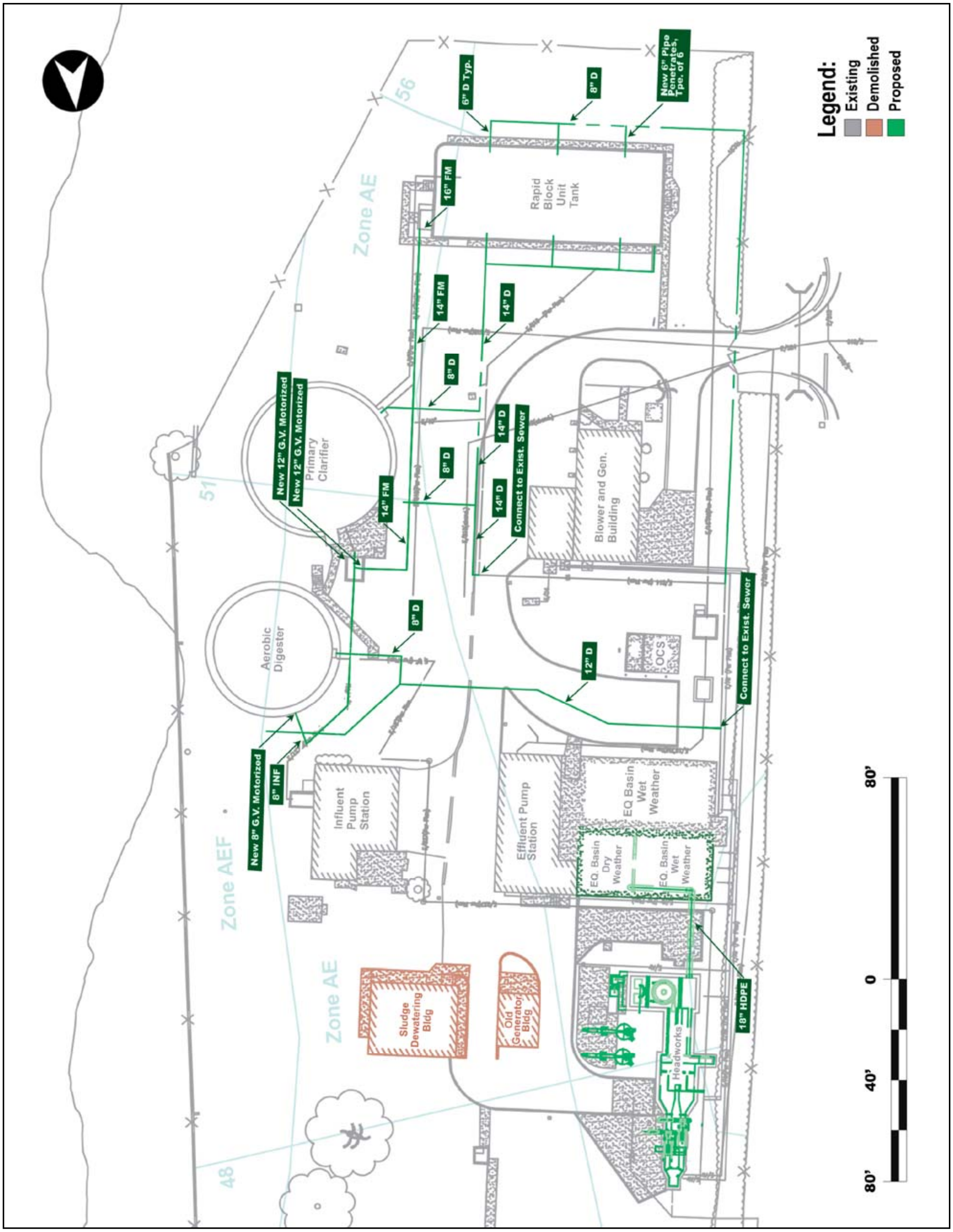

Figure 4.1-3. Option 1: Site and Yard Piping Plan

Aerobic Digester

The Aerobic Digester will only be used for the storage of wet weather flows and not for wastewater treatment. Modifications to the Aerobic Digester to improve the operation of the tank are included below:

- Remove existing internal baffles.
- Remove existing motor and equipment.
- Remove existing corroded aboveground tank piping.
- Remove existing 8-inch gate valve, sludge piping and fittings.
- Install a new 8-inch motor operated gate valve at the Aerobic Digester influent line to automate the filling process.
- Install a new level transmitter in the Aerobic Digester to monitor the operating water levels in the tank and control the opening/closing of the motor operated gate valves.
- Install a new washdown system and walkways for operators to clean the existing Aerobic Digester.

The existing Aerobic Digester currently drains any stored wastewater to the IPS, to be pumped to the Rapid Block Tank and then pumped again into the gravity system leading to the existing EQ Basin B. For Option 1, wastewater drained from the digester tank will be discharged directly to a new gravity system connected to the existing EQ Basin B. To alter the draining of the digester tank, the additional work listed below is required:

- Connect the existing 8-inch effluent piping to the new gravity drain system.
- Connect the existing 8-inch sludge piping at the 90-degree bend to the new gravity drain system.
- Install a submersible portable pump to drain the cone section of digester.
- Install flexible piping from the submersible portable pump to the launders to empty the wastewater into the gravity drain pipes.

Rapid Block Tank

During wet weather flow conditions, wastewater is pumped from the IPS to the entrance of the existing Rapid Block Tank. The flows will overflow the weirs, filling the existing aeration basin and settling tank compartments of the Rapid Block Tank. Upgrades to the existing Rapid Block Tank, such as those mentioned below would make this filling process automatic.

- Remove existing aboveground tank piping.
- Install a new motor-operated 16-inch gate valve at the Rapid Block Tank influent line to automate the filling process.
- Install a new level transmitter in the Rapid Block Tank to monitor the operating water levels in the tank and control the opening/closing of the motor operated gate valve.
- Install a new washdown system for operators to clean the existing Rapid Block Tank.

Because the existing Rapid Block Tank is compartmentalized and does not have any existing piping that penetrates the bottom of the tanks, the current draining process requires that the stored wastewater be pumped out to the drain pipes. To drain the Rapid Block Tank more efficiently, the following modifications to the tank and piping are needed:

- Provide three (3) new 6-inch pipe penetrations to the bottom of the aeration basin compartments.
- Provide three (3) new 6-inch pipe penetrations to the bottom of the settling tank compartments
- Install new drain piping to connect to each of the compartments and to the existing 16-inch effluent piping.

Plant-Wide

Replacement of any existing corroded drain pipes and installation of new buried 6-inch, 8-inch and 12-inch tank drain piping is required in Option 1. The tank drain pipes would be used to convey the wet weather flows by gravity from the existing storage tanks to EQ Basin B.

4.1.3 Structural Rehabilitation

In addition to the piping and equipment upgrades, it is recommended that the entire existing Primary Clarifier and sections of the existing Aerobic Digester be rehabilitated as the structural condition assessment found them both to have severe surface damage. The protective coating was damaged and cracks developed causing the reinforcing bars in the walls and slab to be corroded. Based on the condition assessment, the following is required so that the structural integrity of the existing clarifier and digester structures can be brought back to their original design level:

- Clean up and remove existing protective coating and other debris.
- Remove corroded concrete surface to sound concrete.
- Repair cracks, spalls, and other damaged concrete surfaces.
- Remove corroded reinforcing bars. Insert new reinforcing bars as needed.
- Pour new topping over the bottom slab.
- Apply new protective coating.

The existing Rapid Block Tank, EQ Basins and EPS wet well is considered in workable condition with reliable structural integrity. To maintain a good and long useful life of this tank, the following repairs are recommended on the Rapid Block Tank:

- Repair T-lock lining.
- Replace elastomeric protective coating.
- Repair cracks, spalls, water infiltration, corroded concrete, and reinforcing bars.
- Seal all damaged joint sealant.
- Recoat interior concrete surfaces.

4.1.4 Construction Phasing

The proposed construction phasing plan for Option 1 is presented in **Table 4.1-1.** Bypass pumps and piping would be required until all of the existing tanks are rehabilitated, and yard piping installed.

Table 4.1-1
Construction Phasing – Option 1

1. Rehabilitate the existing Aerobic Digester.
2. Replace portion of the existing IPS force main and digester influent piping and valves.
3. Rehabilitate the existing PC.
4. Replace portion of the existing IPS force main and clarifier influent piping and valves.
5. Repair and modify the existing Rapid Block Tank
6. Replace portion of the existing IPS force main and Rapid Block Tank influent piping and valves.
7. Replace the existing drain pipes to the EQ Basins.
8. Repair the existing EQ basins one at a time.
9. Repair the EPS wet well

4.1.5 Aeration vs. Non-Aeration

Aerating the existing EQ Basin compartments will re-suspend the solids and allow the solids to flow through to the EPS, minimizing solids settlement in the EQ Basin. Solids accumulation can cause high dissolved sulfide concentrations and lead to high H_2S concentrations in the headspace of the existing covered EQ Basins. In order, to minimize the amount of aeration required during normal operating conditions, the existing EQ basins may be reconfigured to have a smaller compartment for normal dry weather flows as described in **Section 4.1.2**. The diffusers in the existing EQ Basins may be redesigned to provide aeration to only the dry weather compartment during normal operating conditions and the entire EQ Basins during a storage event. This may minimize the power consumed for aeration.

Aeration is not required for the other existing storage tanks. A wash-down system will be provided for each existing tank to remove any solids which may reach these tanks. See **Section 4.1.7** for further information on the proposed wash down system.

4.1.6 Covered vs. Uncovered

Based on the odor sampling results (see **Section 5.5.2**), the average and peak hydrogen sulfide concentrations in the existing EQ basins are 45 and 195 ppm respectively. These results are with chemical dosing using calcium nitrate and with the aeration system down for maintenance in the existing EQ basins. Although the proposed new influent drop pipe will reduce the turbulence created by the 14-foot drop into the existing EQ basins as mentioned previously in **Section 4.1.2**, it will not eliminate the H_2S in the head space. Therefore, it is recommended to replace the covers over the existing EQ Basins with new fiberglass reinforced plastic (FRP) or aluminum covers so that odors may be captured and treated by a new Odor Control System (OCS).

Additional reasons to cover the EQ Basins include:

- The aeration of the dry weather compartment will likely cause a slight increase in the H_2S concentration in the headspace of the dry weather compartment, as compared to a non-aerated zone.
- Temporary or permanent shutdown of the proposed grit removal system will cause wastewater to flow directly to the existing EQ Basin A via bypass piping with high H_2S concentrations.
- By covering the entire existing EQ Basin, the airflow to a new OCS can be engineered to allow for the use of a carbon scrubber type odor control system.

Covering the rest of the existing tanks is not necessary. During wet weather flow, wastewater is typically diluted and uncovered wet weather storage tanks are not uncommon. For example, the wet weather EQ basins at the Schofield Barracks WWTP and Wahiawa WWTP are not covered. In addition, the current wet weather storage tanks at the Ahuimanu WWPTF are not covered.

The only exception to this is, at the Ahuimanu WWPTF, the wet weather EQ Basins may be used to store wastewater during a dry weather flow when shutdown of the force main is required for repair and maintenance. To mitigate the potential odor issue, the proposal is to continue to inject chemicals in this mode of operation.

4.1.7 Washdown System

For Option 1, the proposed wash down system will include wash down hydrants like that manufactured by Kupferle Foundry; see **Figure 4.1-4**. This hydrant is typically designed for wash down of clarifiers, sludge holding tanks and equalization basins. This hydrant consists of a stream shaper nozzle with a spray range of up to 190 feet without a hose. For a 2" washdown hydrant, the flow rate can reach 380 gpm at 75 psi. Additional walkways and access ladders shall be provided on the existing storage tanks so that the operators are able to safely clean the tanks after they are drained.

RMTC staff recently visited two WWTP that have installed this wash down hydrant; the North San Mateo Sanitation District WWTP in Daly City, California, and the Columbia Boulevard WWTP in Portland, Oregon. The North San Mateo WWTP uses the hydrants to wash down their equalization basins and the Columbia Boulevard WWTP uses the hydrants to wash down their wet weather flow in the primary clarifiers. A photo of the Columbia Boulevard WWTP is shown in **Figure 4.1-5**.

In order, to install the proposed wash down hydrants at the Ahuimanu WWPTF, a new service water system will be needed. The major components of the service water system include an air gap tank and high-pressure service water pumps. The Grundfos Hydro MPC package system that consists of vertical multistage centrifugal pumps, variable frequency drives (VFDs) and controllers is one option for the high-pressure service water pumps.

Figure 4.1-4. Washdown Hydrant
Source: Kupferle Foundry

Figure 4.1-5. Clarifier with Washdown Hydrant at Columbia Boulevard WWTP

4.2 Option 2: New Storage Tanks

Under Option 2, the existing EQ Basin is removed in its entirety and all incoming flows are routed directly to the EPS wet well. The IPS would remain and be used to pump flows to a new EQ Basin with a storage capacity of one (1) million gallons (MG) during a storage event. The following two proposed locations for the new EQ Basin were evaluated, 1) the site of the existing storage tanks, or 2) within the effluent holding pond. As part of this option, the existing storage tanks including the Primary Clarifier, Aerobic Digester, Rapid Block Tank, EQ Basin A and EQ Basin B would be demolished.

4.2.1 Operation – Wet Weather Flows

As in Option 1, wet weather flows are diverted to the IPS via the existing diversion manhole located upstream of the existing EQ Basin. From there, the IPS will pump wastewater to the new 1 MG EQ Basin for storage. With a 1 MG storage capacity, wastewater may be retained during a storage event for 31.6 hours based on a 0.76 mgd average daily flow. Filling will be controlled by the level transmitters installed in each of the new EQ Basin compartments. After the storage event is over, the new EQ Basin will drain by gravity back to the EPS wet well and pumped via the force main to Kaneohe WWPTF. The process flow diagram for Option 2 is shown in **Figure 4.2-1**.

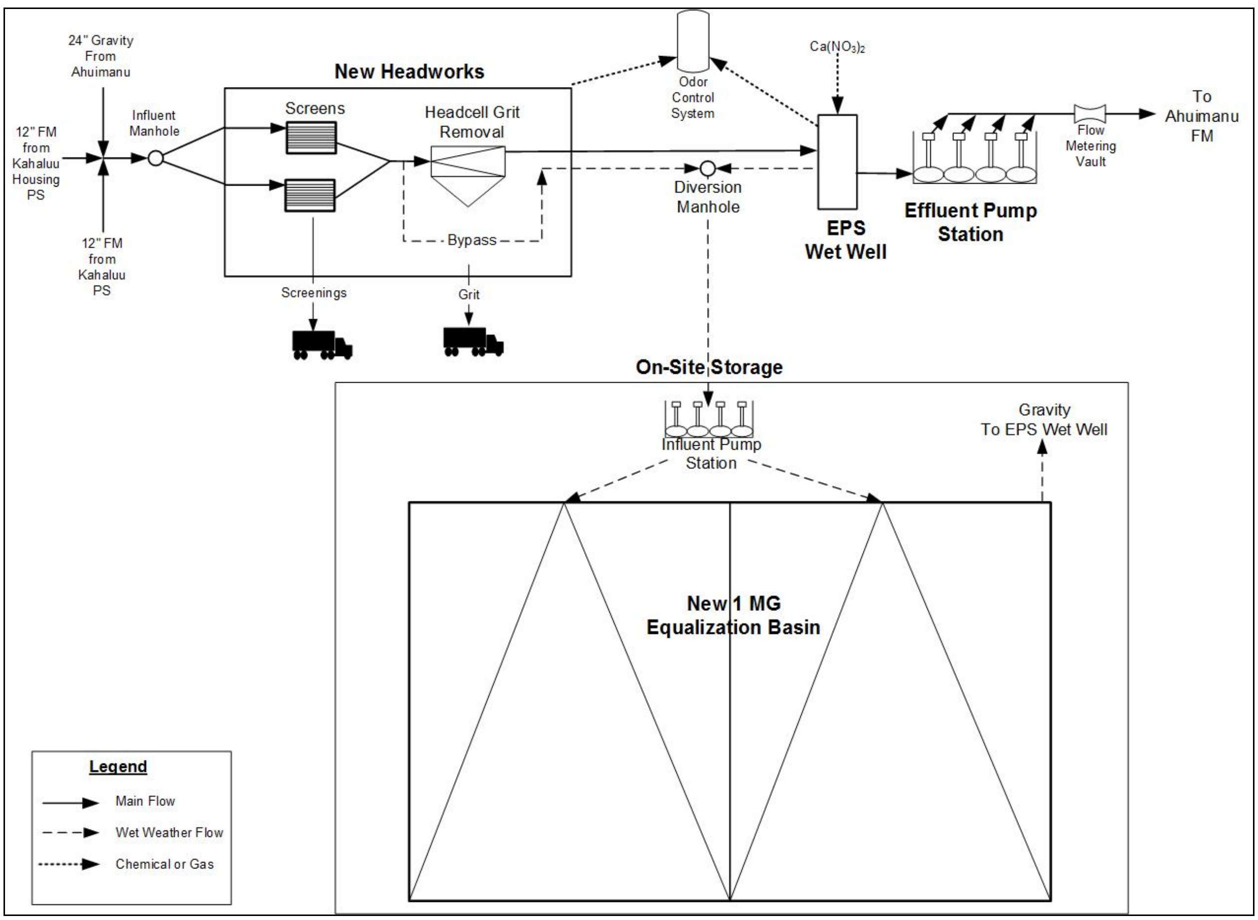

Figure 4.2-1. Option 2 - Process Flow Diagram

4.2.2 New 1 MG Storage Tank

Site of Existing Storage Tanks

At this location, the new 1 MG EQ Basin is situated at the site of two of the existing storage tanks, the Aerobic Digester and Primary Clarifier, as shown in the site plan in **Figure 4.2-2**. The 2010 Consent Decree states that the WWPTF needs to maintain at least 600,000 gallons of storage until the KK Tunnel has been in operation for at least 2 years. Because of this stipulation, only one existing storage tank may be taken offline initially and demolished so that one compartment of the new 1MG EQ Basin may be constructed. Phasing the construction and demolition of storage tanks would be difficult and increase the overall construction costs.

Although the new 1 MG EQ Basin is within the floodway designated Zone AEF, the cross-sectional flow area calculated is comparable to that in the existing conditions. The proposed EQ Basin does have a larger footprint within the floodway, which will obstruct more flow than the existing condition. To provide an equivalent cross-sectional flow area with the proposed structure, the ground between the structure and the stream will be lowered. Concrete or A.C. pavement will be used between the structure and the stream to improve the roughness of the ground surface in the cross-sectional flow area. These improvements are necessary to achieve an equivalent conveyance flow and maintain the existing flood elevation. During the construction plan phase, a “no-rise” form will be submitted to the City for review and approval with cross section drawings to illustrate the equivalent cross-sectional flow areas are provided for each cross section taken.

Additional improvements that are required for Option2 at this location are included below:

- Demolish existing Aerobic Digester, Primary Clarifier, EQ Basin A and B.
- Construct a new EPS Influent Chamber.
- Install new sliding gates between the EPS Influent Chamber and existing wet well.
- Install a new 18-inch influent piping from the Headworks to the new EPS Influent Chamber.
- Install a new 18-inch force main from the IPS to the new EQ Basin.
- Install a new 14” sewer line from the EQ Basin to the EPS Influent Chamber.
- Install a new level transmitter in each EQ Basin compartment to monitor the operating water levels in the tank and control the opening/closing of the motor operated gate valves.
- Install a new washdown system.
- Demolish the existing Rapid Block Tank, if required.

Plan and section views of the new 1 MG EQ Basin at this location is shown in **Figures 4.2-3**.

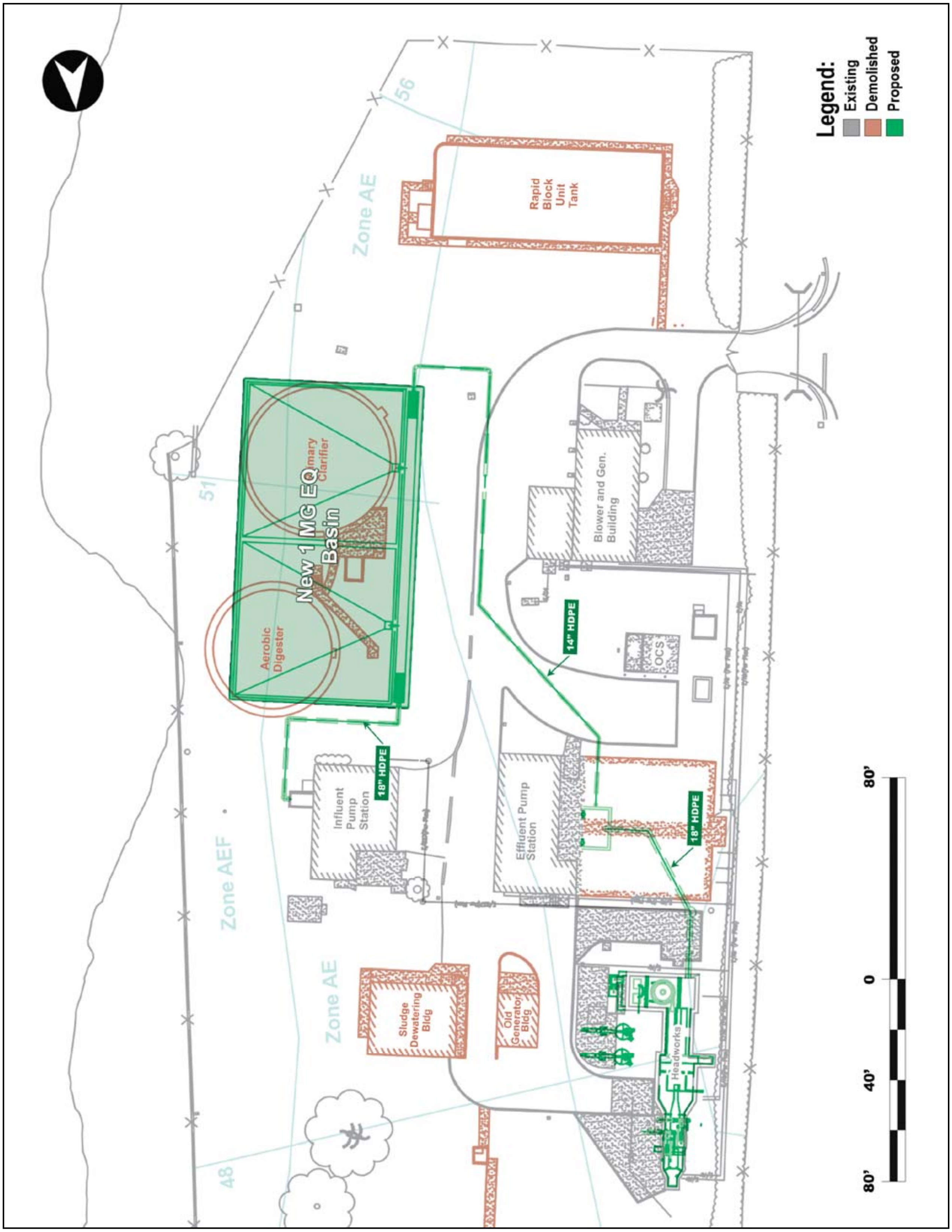

Figure 4.2-2. Option 2: 1 MG EQ Basin at Ex. Storage Tank Site

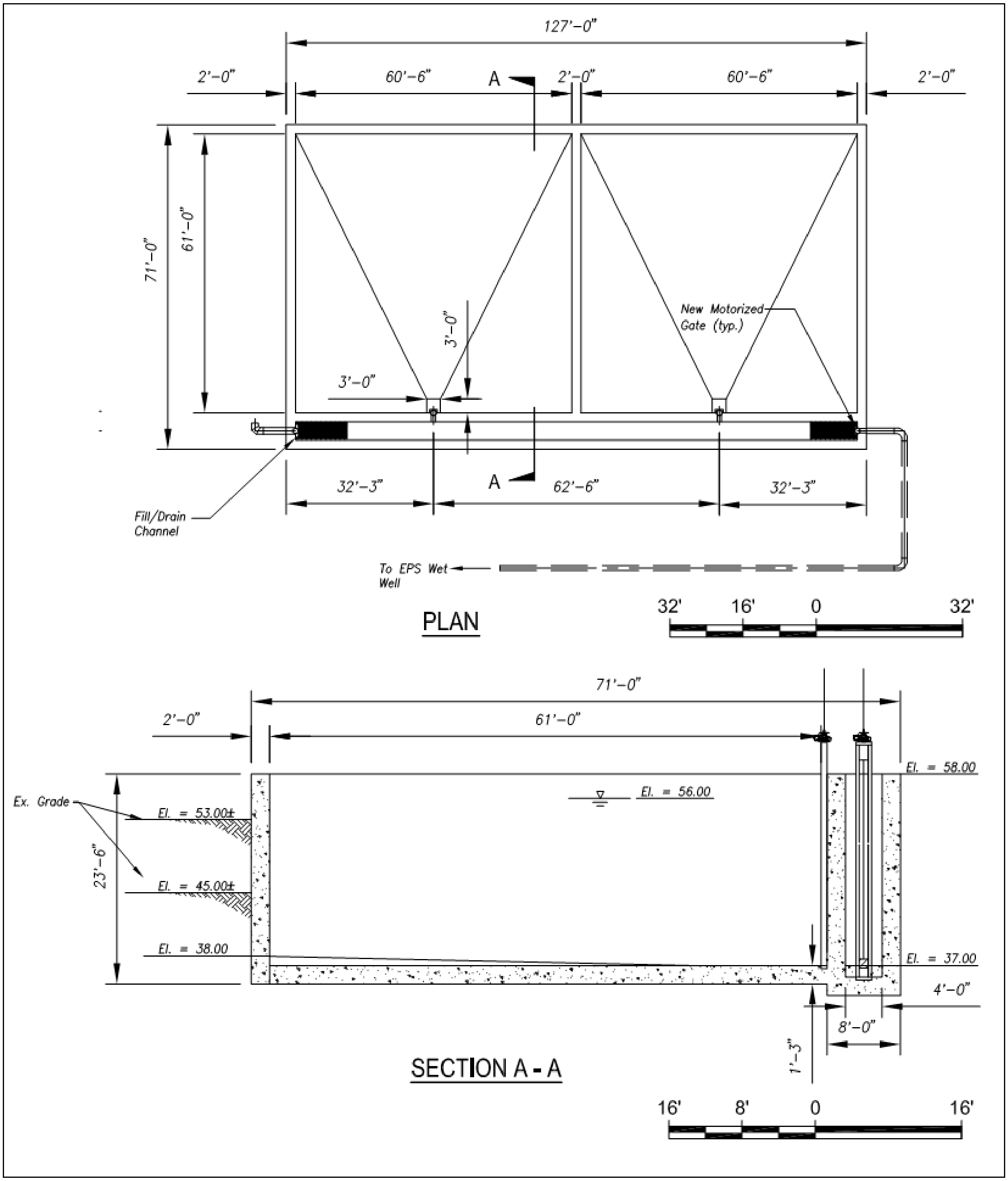

Figure 4.2-3. Option 2: Plan and Section Views - 1 MG EQ Basin at Ex. Storage Tank Site

Effluent Holding Pond

As an alternate, the new 1MG EQ Basin may be located in the Effluent Holding Pond as shown in **Figure 4.2-4**. With the new EQ Basin in the effluent holding pond area, the existing storage tanks can remain in service while the new EQ Basin is being constructed. The WWPTF would be able to easily maintain 800,000 gallons of storage or more during the first two years of operation of the KK Tunnel.

The new 1 MG EQ Basin is not within the floodway at this location, but still with Zone AE and would need to have wall elevations higher than the base flood elevation. Improvements required for Option 2, to be located at Effluent Holding Pond are the same as those required to construct the EQ Basin near the existing storage tanks.

Plan and section views of the 1 MG EQ Basin in the holding pond is shown in **Figure 4.2-5**.

A comparison of the design information for the new 1MG EQ Basin in Option 2 at each location is presented in **Table 4.2-1**.

Table 4.2-1.
Option 2 - New EQ Basin Design Information

Parameter	Location	
	Ex Storage Tank	Effluent Holding Pond
FEMA Flood Elevation	51 ft	48 ft
Number of Chambers	2	2
Top of Wall Elevation	58 ft	50 ft
Bottom Elevation	37 ft	33 ft
Water Level Elevation	56 ft	46 ft
Total Length	121 ft	163 ft
Total Width	61 ft	64 ft
Total Depth	19 ft	13 ft

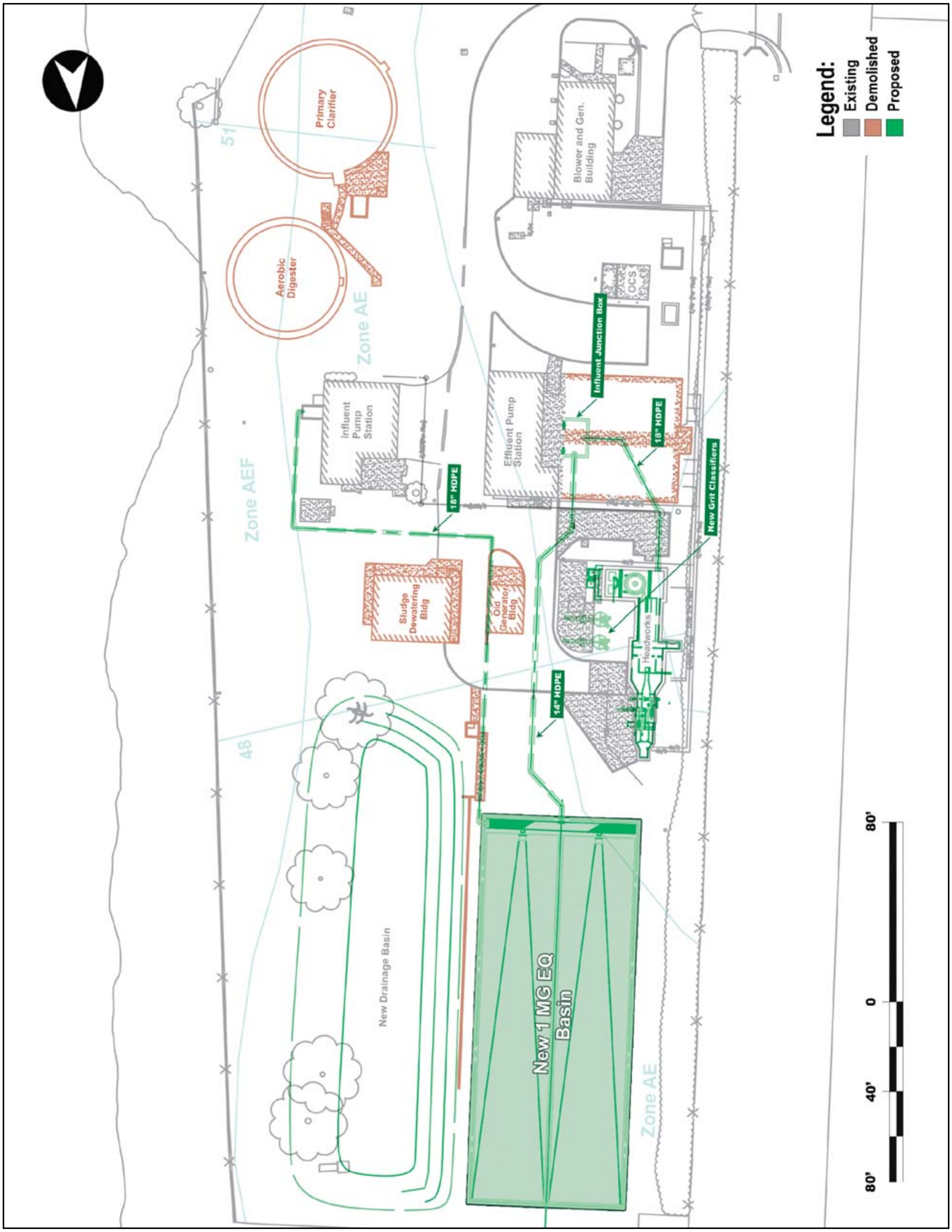

Figure 4.2-4. Option 2: 1 MG EQ Basin at Ex. Effluent Holding Pond

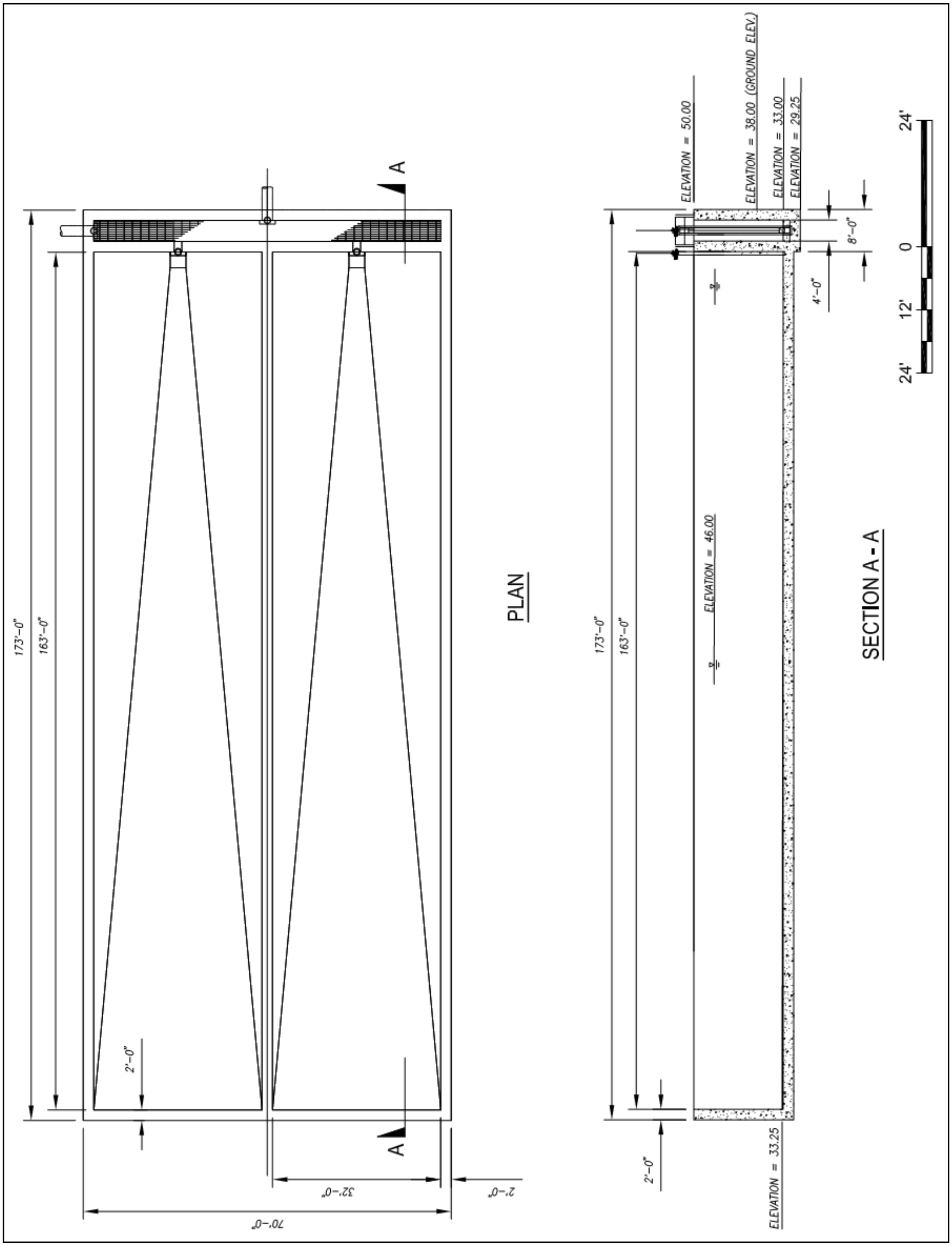

Figure 4.2-5. Option 2: Plan and Section Views – 1 MG EQ Basin at Effluent Holding Pond

4.2.3 Structural Foundation

Based on the findings discussed in *Draft Geotechnical Exploration and Evaluation Report Ahuimanu WWPTF Improvements Project*, YKE, June 2016, the structural foundation for the new 1MG EQ Basin would need to be adequate to resist the buoyant uplift forces due to the high groundwater table. Because the EQ Basin would remain dry and filled only with wastewater during a storage event, the weight of the EQ basin would need to offset the buoyant forces due to the high groundwater levels and additionally with elevated groundwater levels during or after rainfall or flood events. Properly designed and full-perimeter water tight temporary excavation support with adequate bottom ground water cut-off are required to support the anticipated deep excavations and provide bottom stability against heave and boiling. Temporary excavation support system may include interlocking steel sheet piles, interlocking concrete caissons or concrete slurry diaphragm walls.

The bottom plug for groundwater cut-off may utilize either tremie concrete or jet grouted bottom plug. Excavation supports may also be embedded to sufficient depths to encompass a plug of soil with minimum thickness to provide a safety factor of 1.5 against buoyant uplift pressure and bottom heave at the base of the open excavation. The use of the soil plug would be advantageous in that it would reduce project costs.

The structural foundation of the 1 MG EQ Basin at the site of the existing storage tanks is shown in **Figure 4.2-6**. The key features of the foundation include the following:

- Key-in slabs 7’-0” in width along four sides of the basin structure with middle partition wall used as a wall beam to resist uplift force acting underneath of the base slab. Wall braced by 5’-0” x 1’-6” slab beam on the top for lateral bracing.
- Buttress wall are provided on top of the key-in slabs to strengthen the slabs and the walls.
- Cantilevered type of sheet piling without a complicated bracing system.

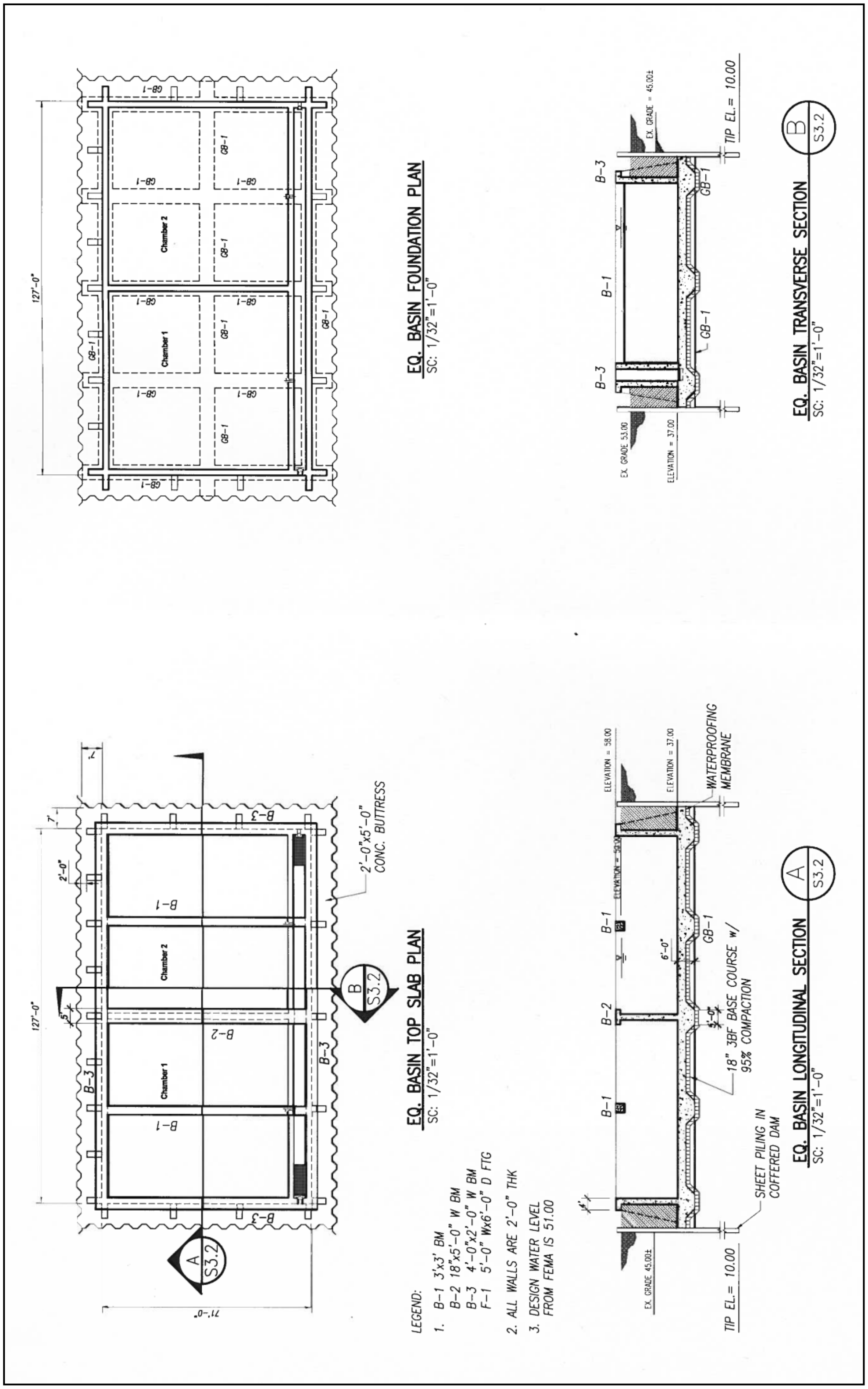

Figure 4.2-6. Option 2: Structural Foundation – 1 MG EQ Basin at Ex. Storage Tank Site

The foundation for EQ Basin at the effluent holding pond location is displayed in **Figure 4.2-7**. The main difference in the foundation at this location is that a 10’-0” wide key-in slabs surrounding the basin structure is required to hold the backfill soil above and to provide additional resistance to the uplift buoyancy force. Further details on the structural foundation for the 1 MG EQ Basins are discussed in **Appendix E**.

4.2.4 Structural Rehabilitation

The only existing structure that will need rehabilitation under Option 2 is the EPS wet well. Structural repairs needed for the EPS wet well are as described in **Section 4.1.3** for Option 1. All other existing storage tanks may be demolished.

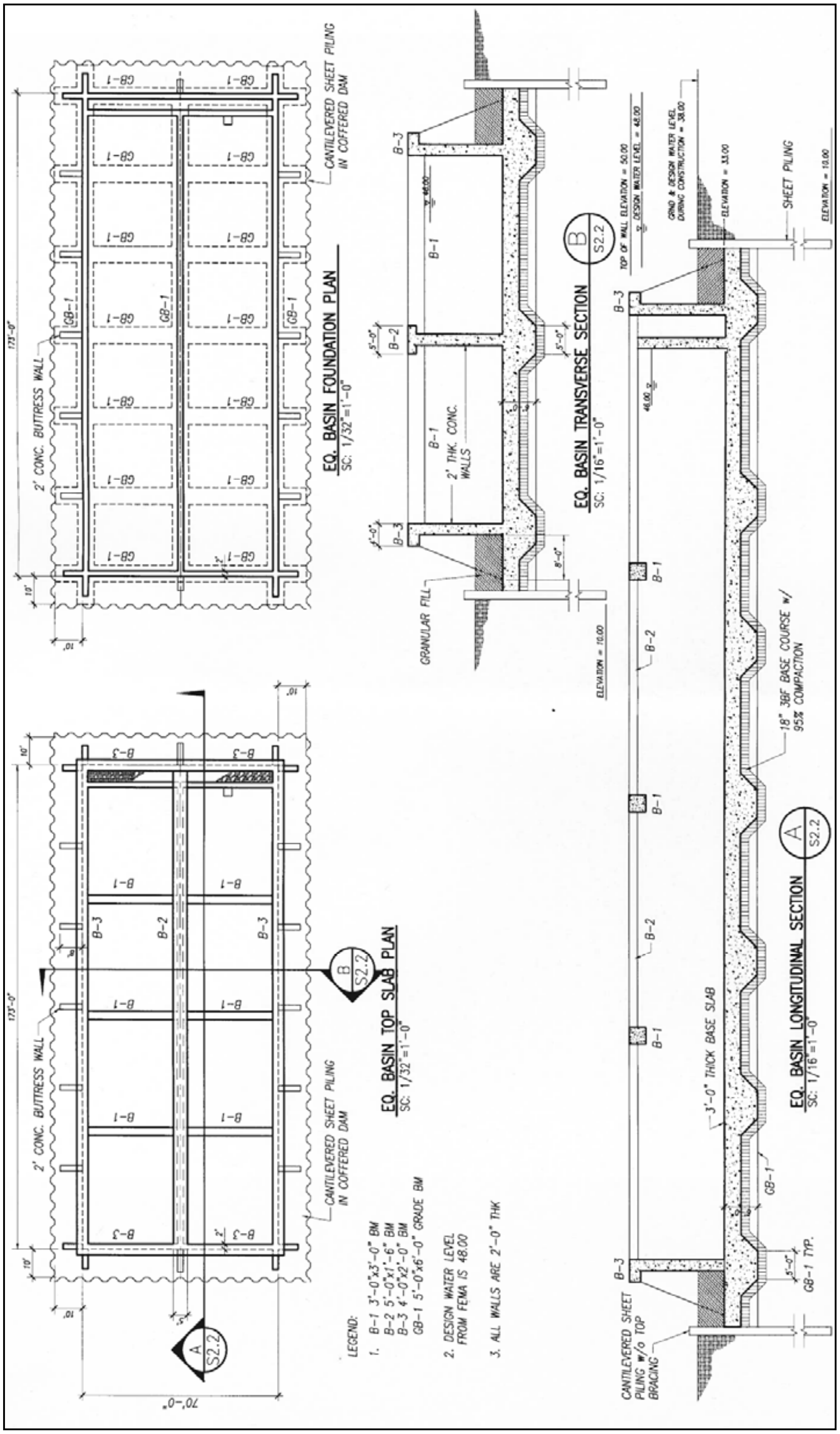

Figure 4.2-7. Option 2: Structural Foundation – 1 MG EQ Basin at Effluent Holding Pond

4.2.5 Construction Phasing

The proposed construction phasing plan for Option 2 is presented in **Table 4.2-2.**

Table 4.2-2.
Construction Phasing – Option 2

Option 2 - Ex. Storage Tank Site	Option 2 – Effluent Holding Pond
1. Demolish the Digester Tank. 2. Construct one of the two new EQ chambers. 3. Perform hydrostatic pressure testing for watertightness when the new EQ basins are completed. 4. Construct temporary piping from the IPS to the new EQ basins to allow for the new EQ basins to be placed into operation. 5. Demolish the Primary Clarifier. 6. Construct the second EQ chamber. 7. Perform hydrostatic pressure testing for watertightness. 8. Construct the permanent piping from the IPS to the new EQ Basin and from the new EQ Basin to the EPS wet well. 9. Demolish the Rapid Block Tank 10. Construct temporary bypass piping and portable pumps from the Headworks to the EPS wet well. Route flows to one side of the wet well only. 11. Close interconnecting gates and shutdown the other side of the wet well. 12. Repair the shutdown side of the wet well. 13. Reroute bypass piping to the repaired side of the wet well. 14. Close interconnecting gates and shutdown the other side of the wet well. 15. Repair the shutdown side of the wet well. 16. Reroute bypass piping to both sides of the wet well. 17. Demolish the existing EQ Basins. 18. Construct new permanent piping (with valves and valve boxes) from the Headworks to the EPS wet well. 19. Remove temporary bypass piping.	1. Construct one of the two new EQ chambers. 2. Perform hydrostatic pressure testing for watertightness when the new EQ basins are completed. 3. Construct the second EQ chamber. 4. Perform hydrostatic pressure testing for watertightness. 5. Construct permanent piping from the IPS to the new EQ Basin and from the new EQ Basin to the EPS wet well. 6. Close interconnecting gate to EQ Basin A and to wet well and route flows to EQ Basin B. 7. Construct one side of the influent chamber in EQ Basin A and connect the permanent piping from the new EQ Basin. 8. Close interconnecting gates between the EQ Basin and the EPS wet well. 9. Construct temporary bypass piping and portable pumps from the Headworks to the EPS wet well. 10. Construct the other side of the influent chamber in EQ Basin B. 11. Construct new permanent piping from the Headworks to the influent chamber. 12. Connect the IPS to the permanent piping to the new EQ Basin. 13. Demolish the existing EQ Basins. 14. Remove temporary bypass piping and portable pumps. 15. Demolish the Primary Clarifier. 16. Demolish the Aerobic Digester 17. Demolish the Rapid Block Tank.

4.2.6 Aeration vs. Non-Aeration

Aeration is not necessary for the new EQ Basin. In many applications mixing (whether by aeration or mechanical mixing) of the EQ basin used only for wet weather is not provided and is not recommended here. A washdown system will be provided for the new EQ Basin to remove any solids that may accumulate at the bottom of the basin compartments.

4.2.7 Covered vs. Uncovered

Covering the new EQ Basin is not required since this basin will be used infrequently. As mentioned in **Section 4.2.6**, wet weather raw wastewater is usually dilute. However, the new chemical injection system is recommended to be expanded to include chemical injection at the new 1 MG EQ Basin. This would only be used when the new EQ Basin is used to retain dry-weather flows when the EPS and force main is the shut down for repair and maintenance.

4.2.8 Washdown System

The EQ basin compartments are to be washed down after each use. The washdown system for the new 1 MG EQ Basin in Option 2 is the same as the washdown system proposed for Option 1.

4.3 Option 3A: Existing EQ Basins with New EQ Basin (Pumped)

Under Option 3A, the existing EQ basin will remain in place and a new 0.84 MG EQ Basin will be constructed to provide additional storage volume for wet weather flows. The existing EQ Basin will be re-configured to include a dry weather compartment while maintaining an estimated volume of 160,000 gallons for wet weather events. A new EQ Basin sized for 840,000 gallons, combined with the existing EQ Basin wet weather compartments provide a total storage volume of 1 MG at the WWPTF. Option 3A assumes the existing IPS will remain in operation and is able to pump wet weather flow to the new 0.84 MG EQ Basin. The new EQ basin in this pumped scenario was analyzed at two different locations, 1) at the site of the existing storage tanks and 2) in the Effluent Holding Pond.

4.3.1 Operation – Wet Weather Flows (Pumped Scenario)

Under dry weather conditions, wastewater will normally flow from the Headworks directly into the dry weather compartment partitioned in EQ Basin A. New influent piping will be installed and connected to the dry weather compartment where wastewater will discharge through a drop pipe submerged below the operating water level. Because the drop pipe is submerged, the generated turbulence will be minimized and thereby reduce the release of H2S gas.

Incoming flows that exceed 4.0 mgd, will initially overflow to the remaining wet weather compartments in the existing EQ Basin. If the water level continues to rise, wastewater will surcharge to the existing diversion manhole and be routed to the IPS. From the IPS, wastewater will be pumped to the new 0.84 MG EQ Basin. When the incoming flows return to normal, wastewater stored in the new EQ Basin will be drained by gravity back to the existing EQ Basin B and pumped out via the EPS. This wet weather storage control strategy can be programmed into the PLC to allow remote operation of the facility. A process flow diagram for the pumped flow scenario is shown in **Figure 4.3-1**.

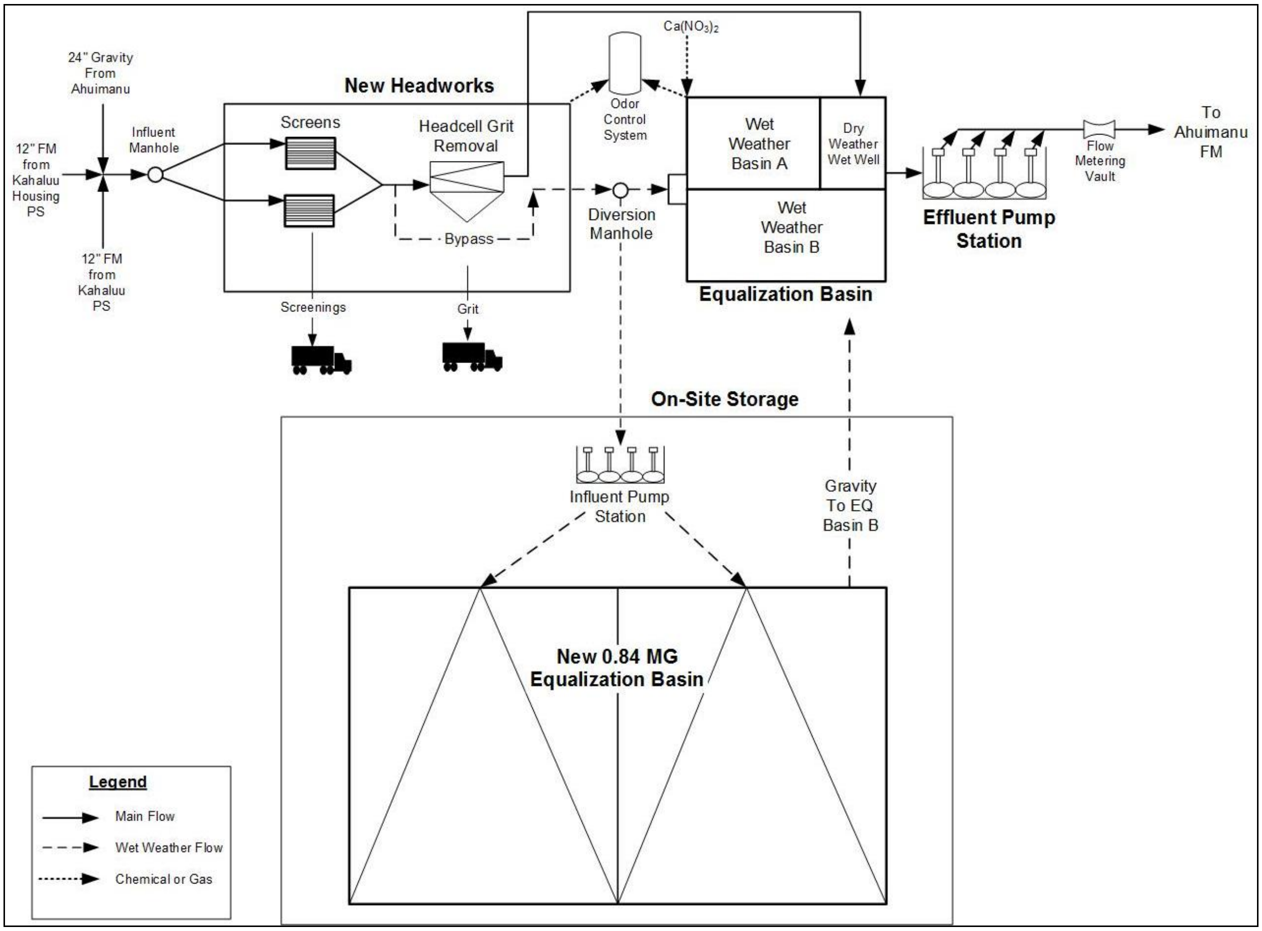

Figure 4.3-1. Option 3A – Flow Process Diagram

4.3.2 New 0.84 MG EQ Basin (Pumped Scenario)

Site of Existing Storage Tanks

As previously mentioned in **Section 4.2.2**, the new 0.84 MG storage tank is situated at the site of two of the existing storage tanks and within floodway zone AEF, see the site plan in **Figure 4.3-2**. Therefore, construction phasing and cross-sectional flow area impacts are in effect and need to be taken into consideration during design.

Improvements that are required for this option at this location are included below:

- Demolish existing Aerobic Digester and Primary Clarifier.
- Construct a dry weather compartment with interconnection to the existing wet weather compartment.
- Install a new 18-inch influent piping from the Headworks to the new dry weather compartment in the existing EQ Basin A.
- Install a new 18-inch force main from the IPS to the new 0.84 MG EQ Basin.
- Install a new 14" sewer line from the EQ Basin to the existing EQ Basin B.
- Install a new level transmitter in each EQ Basin compartment to monitor the operating water levels in the tank and control the opening/closing of the motor operated gate valves.

- Replace the existing aeration system and blower system for the ex. EQ Basin.
- Replace the existing FRP covers on the existing EQ Basin with new aluminum covers.
- Install a new washdown system.
- Demolish the existing Rapid Block Tank, if required.

Plan and section views of the new 0.84 MG EQ Basin at this location is shown in **Figures 4.3-3**.

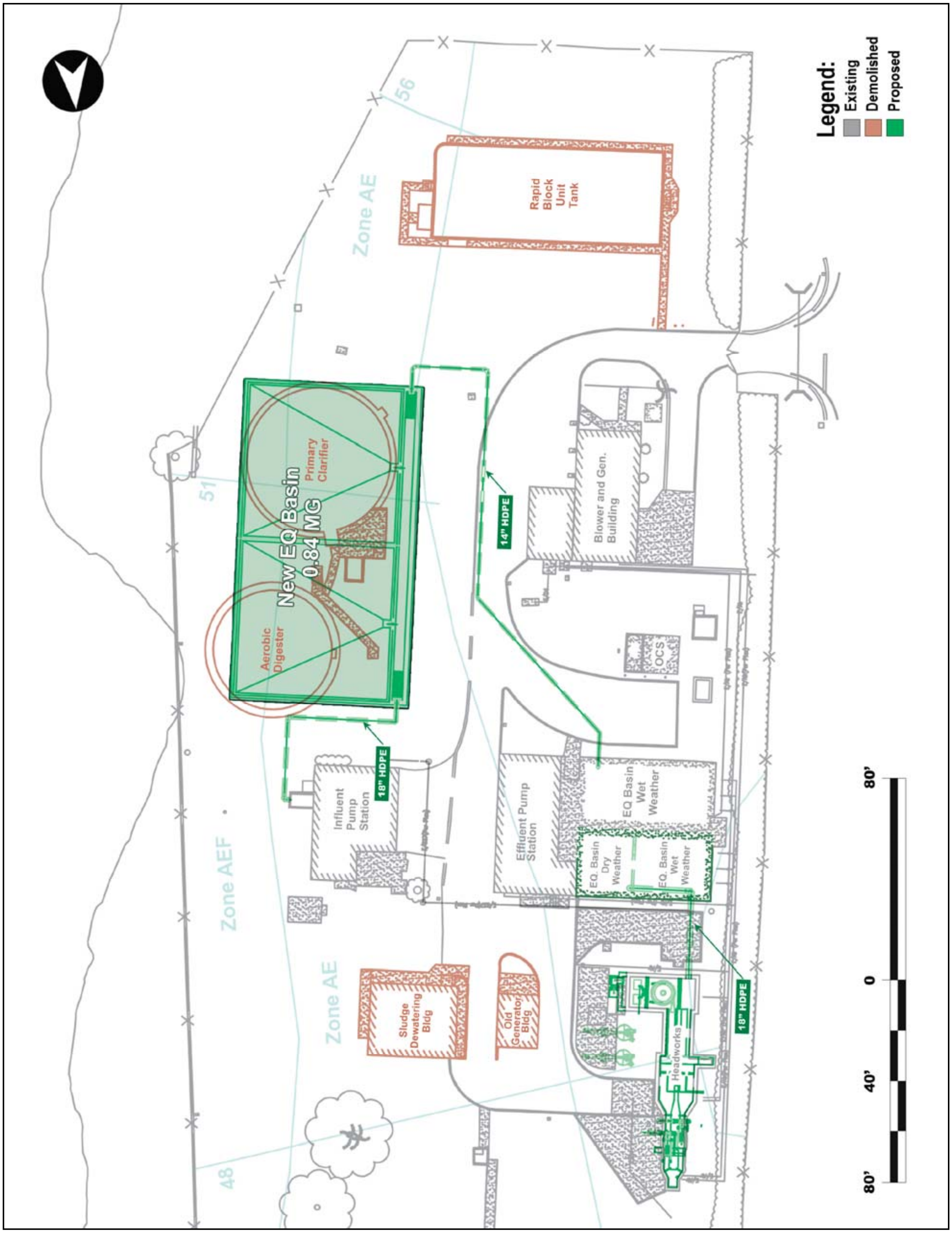

Figure 4.3-2. Option 3A – Site Plan at Site of Ex. Storage Tanks

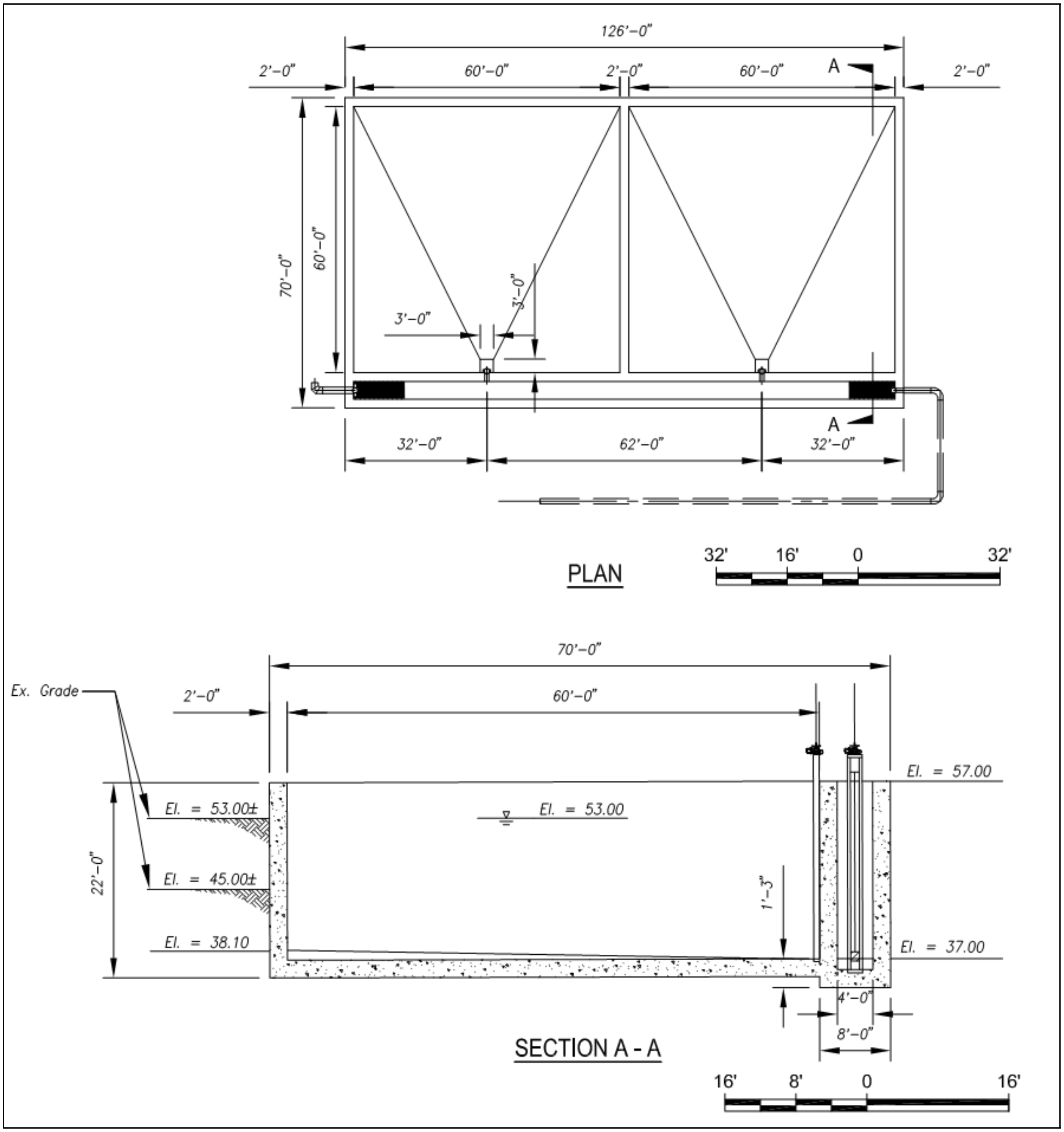

Figure 4.3-3. Option 3A – Plan and Section Views – 0.84 MG EQ Basin at Site of Ex. Storage Tanks

Effluent Holding Pond

The new 0.84 MG EQ Basin located in the Effluent Holding Pond is shown in **Figure 4.3-4**. At this location, the existing storage tanks will remain in service while the new EQ Basin is being constructed, lessening the impacts on construction. The new EQ Basin is not within the floodway but still situated in zone AE. Therefore, requiring the EQ Basin wall elevations to be higher than the 48-foot flood elevation. Additional improvements that may be required to construct Option 3A in the effluent holding pond are the same as those required to construct the EQ Basin near the existing storage tanks.

Plan and section views of the 0.84 MG EQ Basin in the holding pond is shown in **Figure 4.3-5**.

A summary of design information for the pumped flow scenario is presented in **Table 4.3-1**.

Table 4.3-1.
Option 3A – Design Information

Parameter	Location	
	Ex Storage Tank	Effluent Holding Pond
FEMA Flood Elevation	51 ft	48 ft
Number of Chambers	2	2
Top of Wall Elevation	57 ft	50 ft
Bottom Elevation	37 ft	33 ft
Water Level Elevation	53 ft	46 ft
Total Length	120 ft	163 ft
Total Width	60 ft	54 ft
Total Depth	16 ft	13 ft

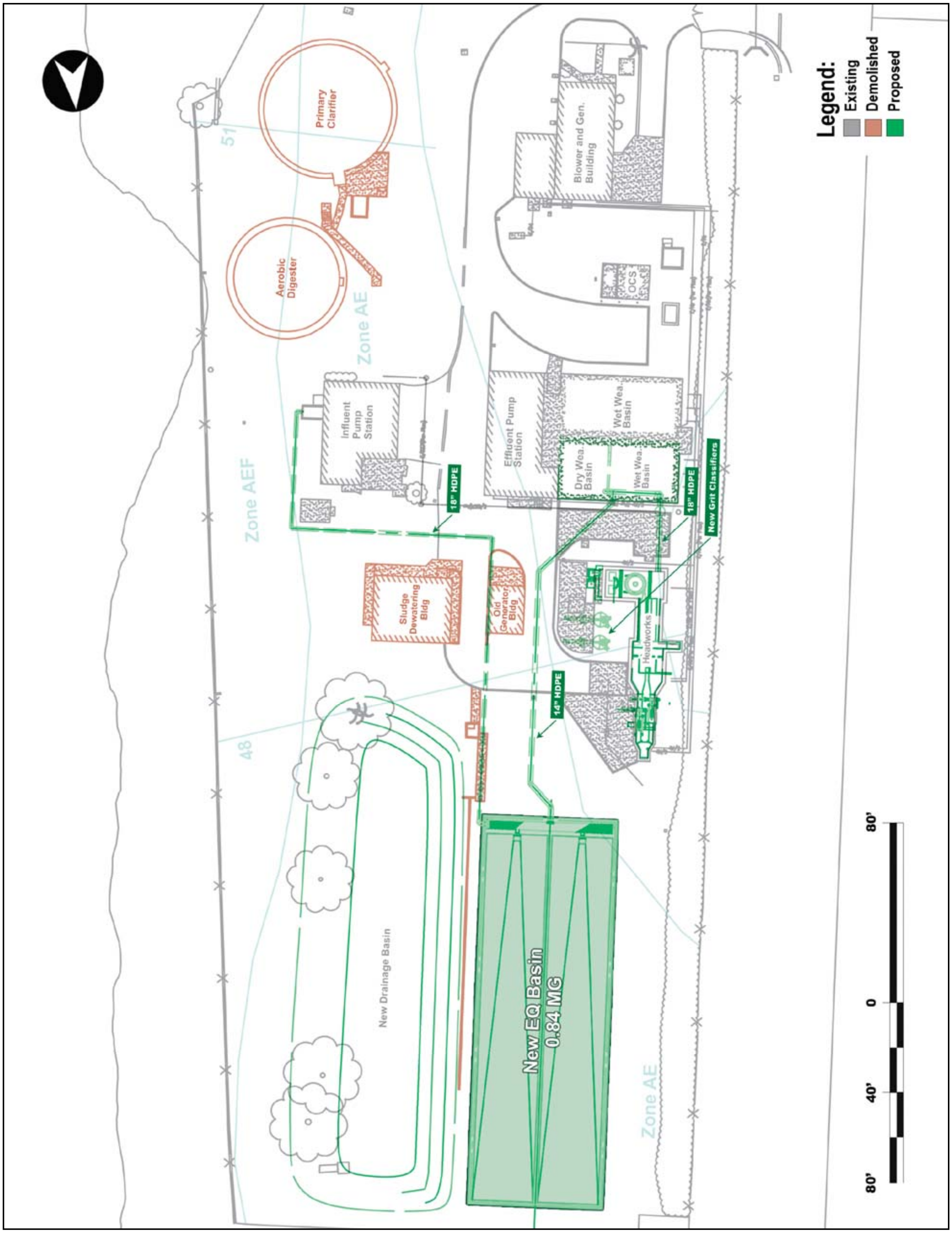

Figure 4.3-4. Option 3A: 0.84 MG EQ Basin at the Effluent Holding Pond

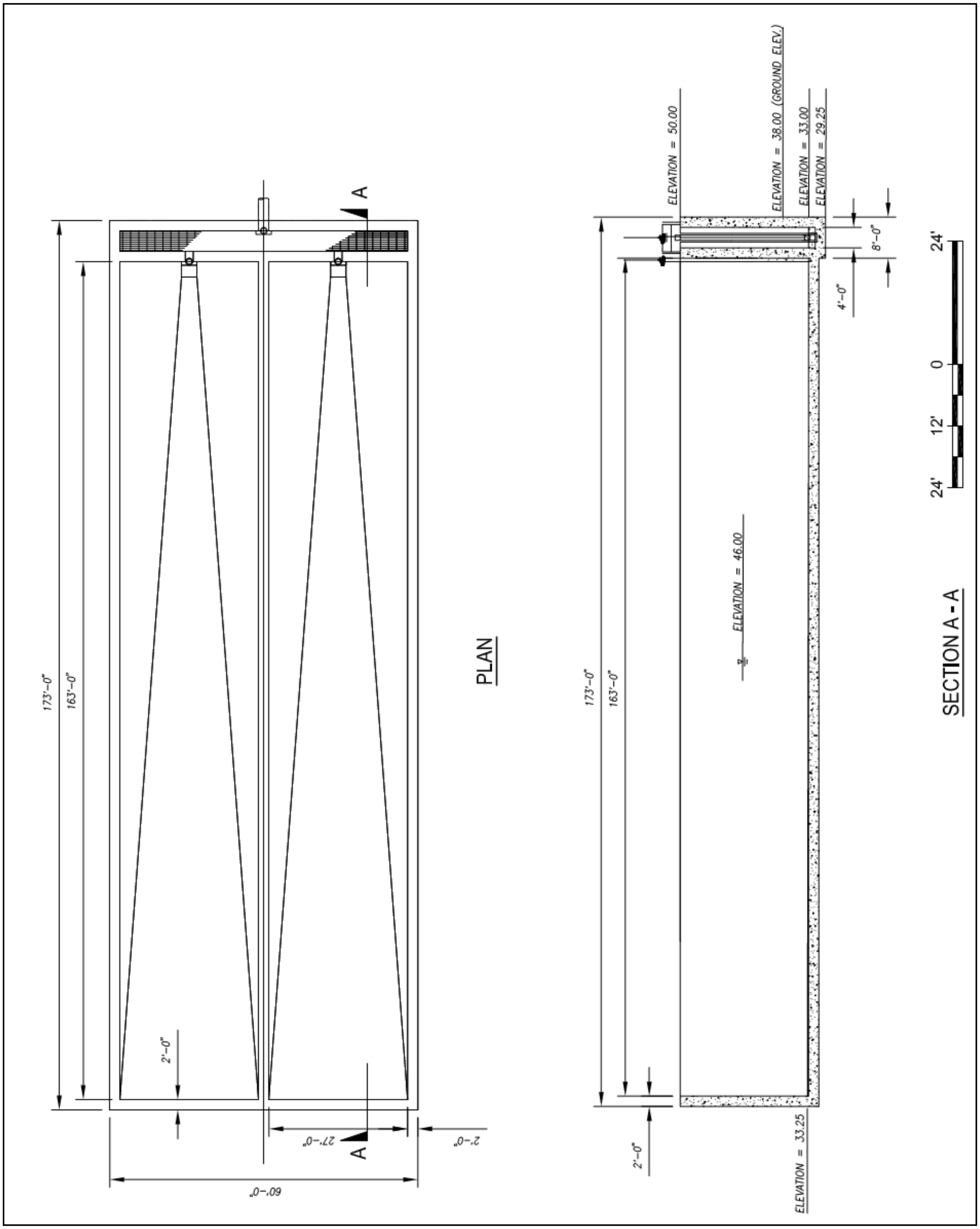

Figure 4.3-5. Option 3A: Plan and Section Views - 0.84 MG EQ Basin at Effluent Holding Pond

4.3.3 Structural Foundation

The foundation of the new 0.84 MG EQ Basin requires full-perimeter water tight temporary excavation support with adequate bottom ground water cut-off because of the deep excavations.

The structural foundation of the 0.84 MG EQ Basin at the existing storage tank and effluent holding pond are shown in **Figure 4.3-6 and Figure 4.3-7**, respectively. The key features of the foundation include the following:

- Key-in slabs 7'-0" in width (at the existing storage tank site) along four sides of the basin structure with middle partition wall used as a wall beam to resist uplift force acting underneath of the base slab.
- Key-in slabs 10'-0" wide surrounding the basin structure at the effluent holding pond.
- Wall braced by 5'-0" x 1'-6" slab beam on the top for lateral bracing.
- Buttress wall are provided on top of the key-in slabs to strengthen the slabs and the walls.
- Cantilevered type of sheet piling without a complicated bracing system.

4.3.4 Structural Rehabilitation

Rehabilitation of the existing EQ Basins and EPS wet well is required for Option 3. For the proposed repairs of the existing EQ basins and EPS, see **Section 4.2.3.**

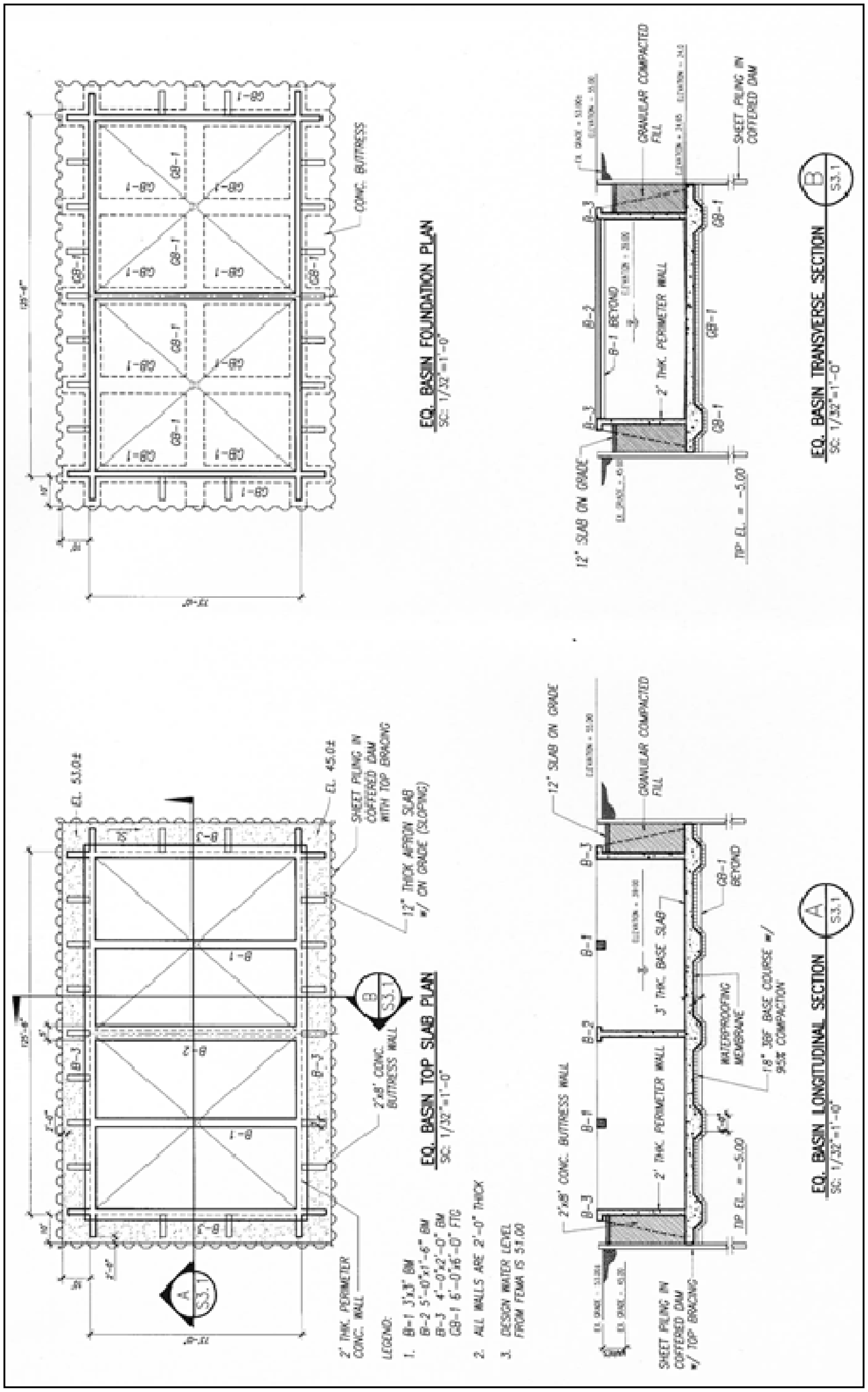

Figure 4.3-6. Option 3A: Structural Foundation – 0.84 MG EQ Basin at Site of Ex. Storage Tanks

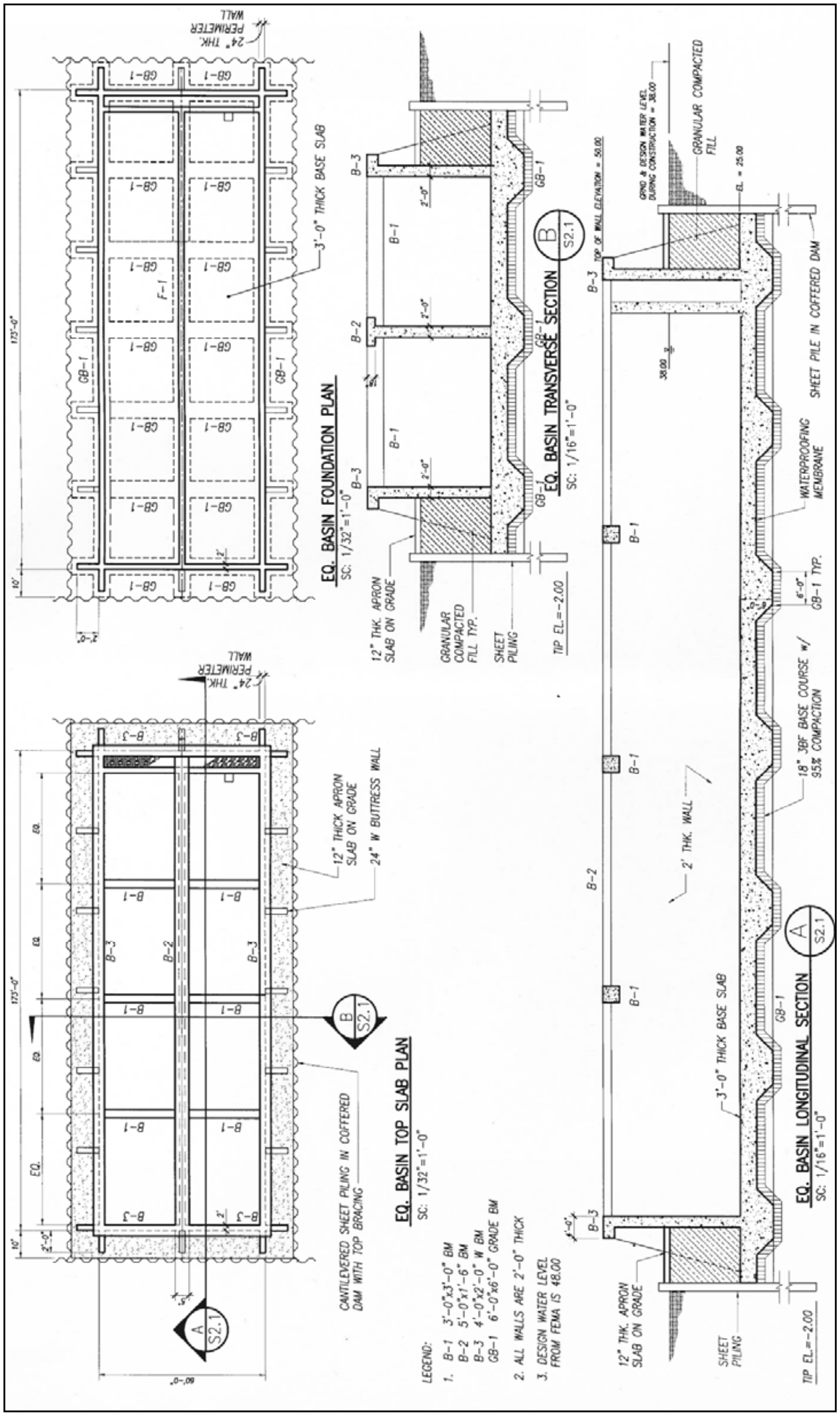

Figure 4.3-7. Option 3A: Structural Foundation – 0.84 MG EQ Basin at Effluent Holding Pond

4.3.5 Construction Phasing

The proposed construction phasing for Option 3A is presented in **Table 4.3-2.**

Table 4.3-2.
Construction Phasing – Option 3A

Option 3A - Site of Ex. Storage Tanks	Option 3A – Effluent Holding Pond
1. Demolish the Aerobic Digester Tank. 2. Construct temporary bypass piping and pumps for the remaining storage facilities. 3. Install cofferdam or other groundwater control method. 4. Construct one of the two new EQ chambers. 5. Perform hydrostatic pressure testing for watertightness when the new EQ basin is completed. 6. Construct temporary piping from the IPS to the new EQ basin and from new EQ basin to the existing EQ Basin B. Place the new EQ basin in operation. 7. Demolish the Primary Clarifier Tank. 8. Construct the second EQ chamber. 9. Perform hydrostatic pressure testing for watertightness. 10. Construct the permanent piping from the IPS to the new EQ Basin and from the new EQ Basin to the existing EQ Basins. 11. Rehabilitate the existing EQ Basins one at a time and install the dry weather compartment. 12. Demolish the Rapid Block Tank.	1. Install cofferdam or other groundwater control method. 2. Construct the new 0.84 MG EQ Basin. 3. Perform hydrostatic pressure testing for watertightness when the new 0.84 MG EQ basin is completed. 4. Construct the permanent piping from the IPS to the new EQ Basin and from the new EQ Basin to the existing EQ Basins. 5. Place the new EQ basin in operation. 6. Rehabilitate the existing EQ Basins one at a time and install the dry weather compartment. 7. Demolish the Primary Clarifier Tank. 8. Demolish the Aerobic Digester Tank. 9. Demolish the Rapid Block Tank.

4.3.6 Aeration vs. Non-Aeration

For Option 3A, the existing EQ Basins should be aerated for the reasons described in **Section 4.2.5**. For normal dry weather flow, only the “dry weather zone” will be aerated. The rest of the “wet weather zones” will only be aerated when they are used during the wet weather flow conditions. This aeration strategy will minimize the power needed for aeration.

Aeration is not recommended for the new EQ Basin in order to save on power cost. In order for wastewater to reach the new EQ Basin, the wastewater surcharges the sewer line to the IPS, therefore the majority of the solids should be retained in the existing EQ Basins. In addition, a wash-down system will be provided for the new EQ Basins to remove any solids which may reach these tanks. **Section 4.2.7** will provide further information on the proposed wash down system.

4.3.7 Covered vs. Uncovered

The recommendations for Option 3A are the same as the Option 1: replace the covers of the existing EQ basins and leave the new EQ Basins uncovered. For further discussion, see **Section 4.2.6**.

4.4 Option 3B: Existing EQ Basins with New Storage Tank (Gravity)

Under Option 3B, the existing EQ basin will remain in place and a new 0.84 MG EQ Basin will be constructed to provide additional storage volume for wet weather flows. The existing EQ Basin will be re-configured to include a dry weather compartment while maintaining an estimated volume of 160,000 gallons for wet weather events. A new EQ Basin sized for 840,000 gallons, combined with the existing EQ Basin wet weather compartments provide a total storage volume of 1 MG at the WWPTF. Option 3B assumes the existing IPS will be demolished and the wet weather flows are able to be filled and drained by gravity to/from the existing EQ Basin to the new 0.84 MG EQ Basin. The new EQ basin in this gravity scenario was also evaluated at two different locations, 1) at the site of the existing storage tanks and 2) in the Effluent Holding Pond.

4.4.1 Operation – Wet Weather (Gravity Flow Scenario)

For the gravity flow scenario, the wastewater flow path will be the same as the pumped flow scenario under dry weather conditions. When the incoming flow rate exceeds 4.0 mgd, the excess flow will fill up the both the existing EQ Basins and the new EQ Basin concurrently. When the incoming flow decreases to less than 4.0 mgd, wastewater in the new EQ Basin will flow by gravity back to the existing EQ Basins, depending on the water level in the existing EQ Basins. The gravity scenario would be the simplest to operate of all the storage system alternatives. A flow process diagram for the gravity flow scenario is shown in **Figure 4.4-1**.

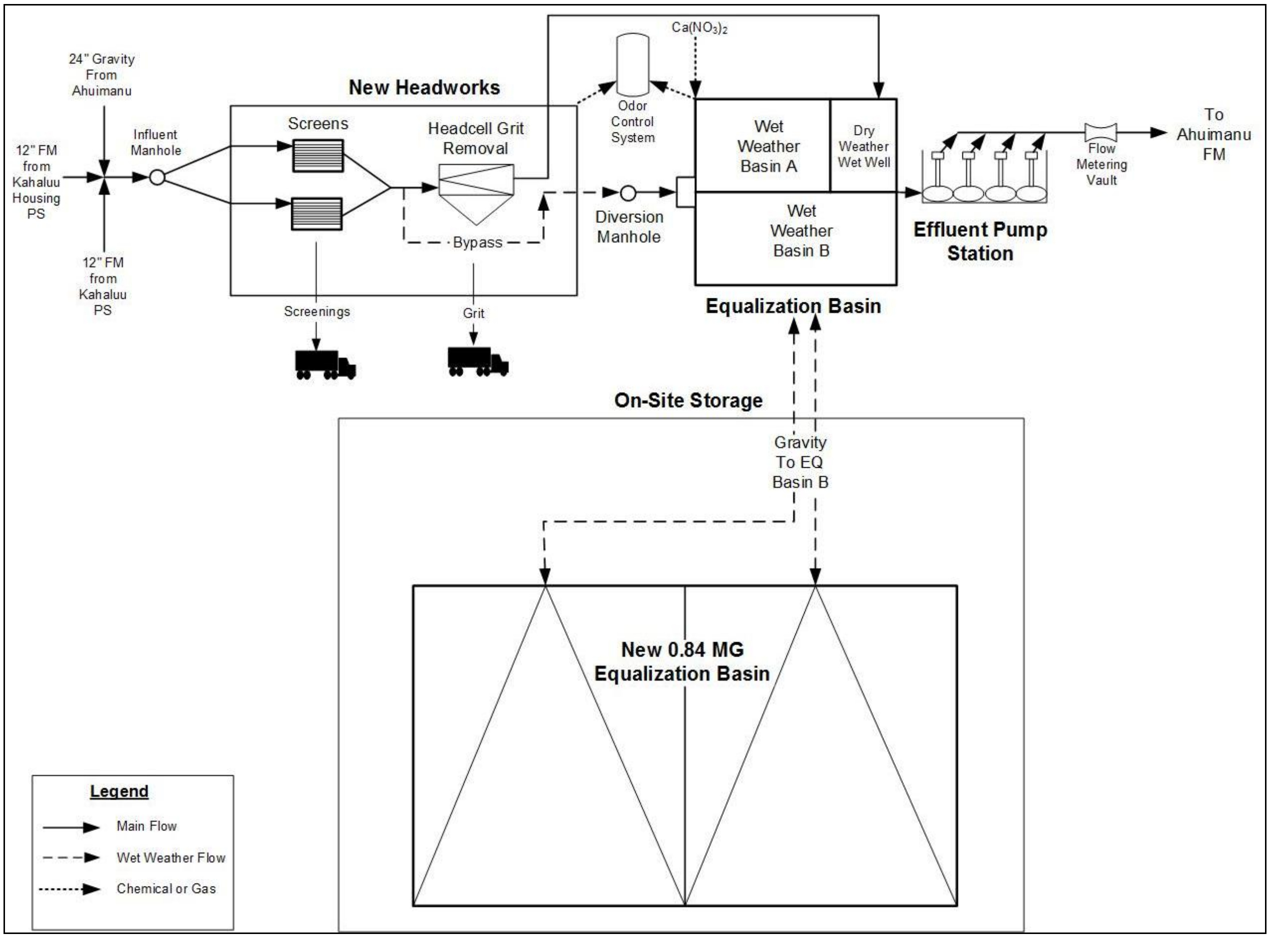

Figure 4.4-1. Option 3B – Flow Process Diagram

4.4.2 New 0.84 MG Storage Tank (Gravity Scenario)

Site of Existing Storage Tanks

As previously discussed in **Section 4.2.2**, the new 0.84 MG storage tank, situated at the site of two of the existing storage tanks is within floodway zone AEF, see the site plan in **Figure 4.4-2**.

Improvements that are required for this option at this location are included below:

- Demolish existing Aerobic Digester and Primary Clarifier.
- Construct a dry weather compartment with interconnection to the existing wet weather compartment.
- Install a new 18-inch influent piping from the Headworks to the new dry weather compartment in the existing EQ Basin A.
- Install a new 16” sewer line from the EQ Basin B to the new 0.84 MG EQ Basin.
- Install a new 16” sewer line from the new 0.84 MG EQ Basin to the existing EQ Basin B.
- Install a new level transmitter in each EQ Basin compartment to monitor the operating water levels in the tank and control the opening/closing of the motor operated gates.
- Replace the existing aeration system and blower system for the ex. EQ Basin.

- Replace the existing FRP covers on the existing EQ Basin with new aluminum covers.
- Install a new washdown system.
- Demolish existing IPS.
- Demolish the existing Rapid Block Tank, if required.

Plan and section views of the new 0.84 MG EQ Basin at this location is shown in **Figures 4.4-3**.

Effluent Holding Pond

The new 0.84 MG EQ Basin located in the Effluent Holding Pond is shown in **Figure 4.4-4**. The improvements that may be required to construct Option 3B in the effluent holding pond are the same as those required to construct the EQ Basin near the existing storage tanks with the exception of the following:

- Install a new 18" sewer line instead of a 16" sewer line from the new 0.84 MG EQ Basin to the wet weather compartment in existing EQ Basin A.
- Only one 18" sewer line will be installed to fill and drain the new 0.84 MG EQ Basin.

Plan and section views of the 0.84 MG EQ Basin in the holding pond is shown in **Figure 4.3-5**.

A summary of design information for both gravity and pumped flow scenarios is presented in **Table 4.4-1**.

Table 4.4-1.
Option 3B – Design Information

Parameter	Location	
	Ex Storage Tank	Effluent Holding Pond
FEMA Flood Elevation	51 ft	48 ft
Number of Chambers	2	2
Top of Wall Elevation	55 ft	50 ft
Bottom Elevation	24 ft	25 ft
Water Level Elevation	39 ft	38 ft
Total Length	119.5 ft	163 ft
Total Width	69 ft	54 ft
Total Depth	15 ft	13 ft

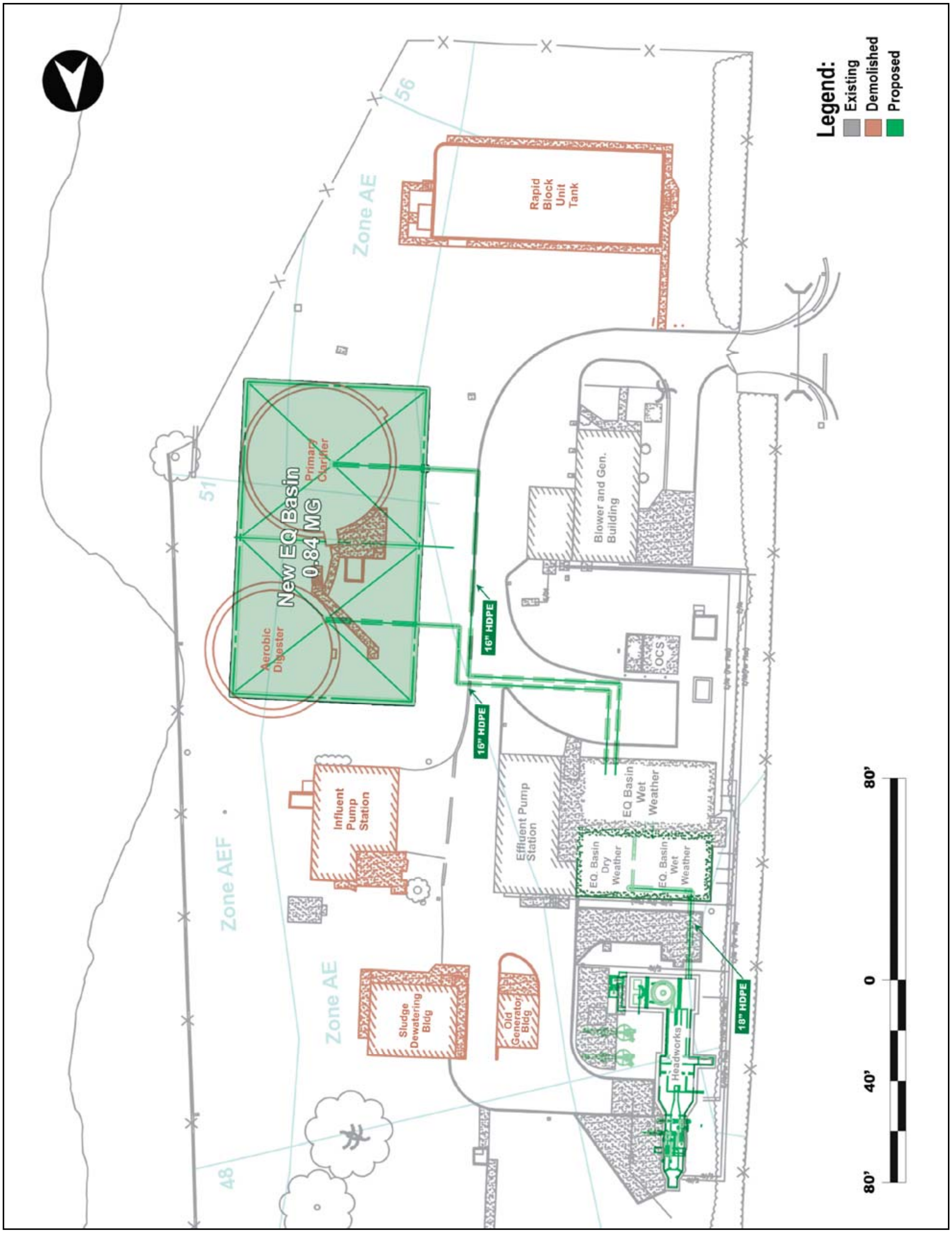

Figure 4.4-2. Option 3B: Site Plan

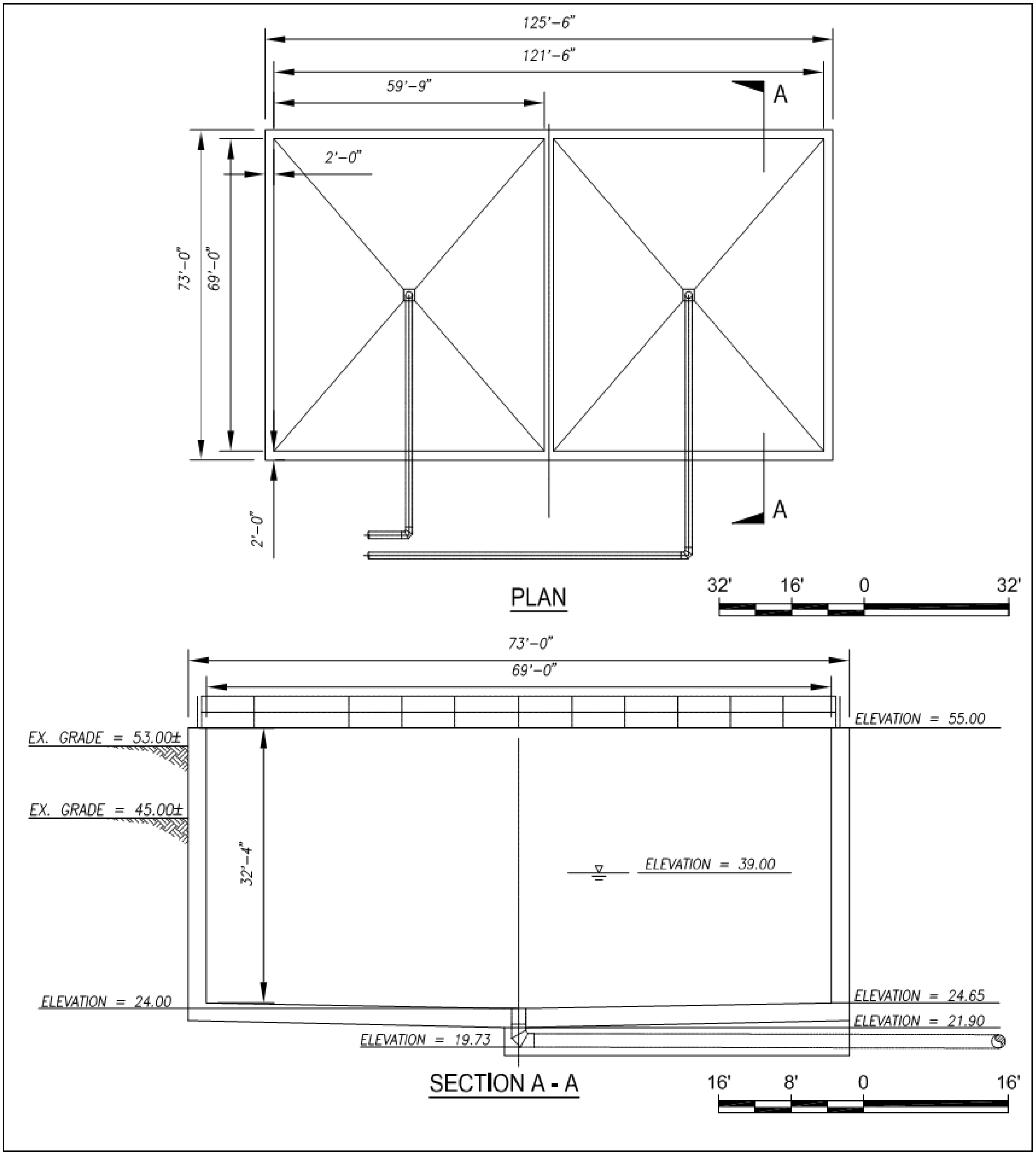

Figure 4.4-3. Option 3B: Plan and Section Views – 0.84 MG EQ Basin at Ex. Storage Tank

Figure 4.4-4. Option 3B: 0.84 MG EQ Basin at the Effluent Holding Pond

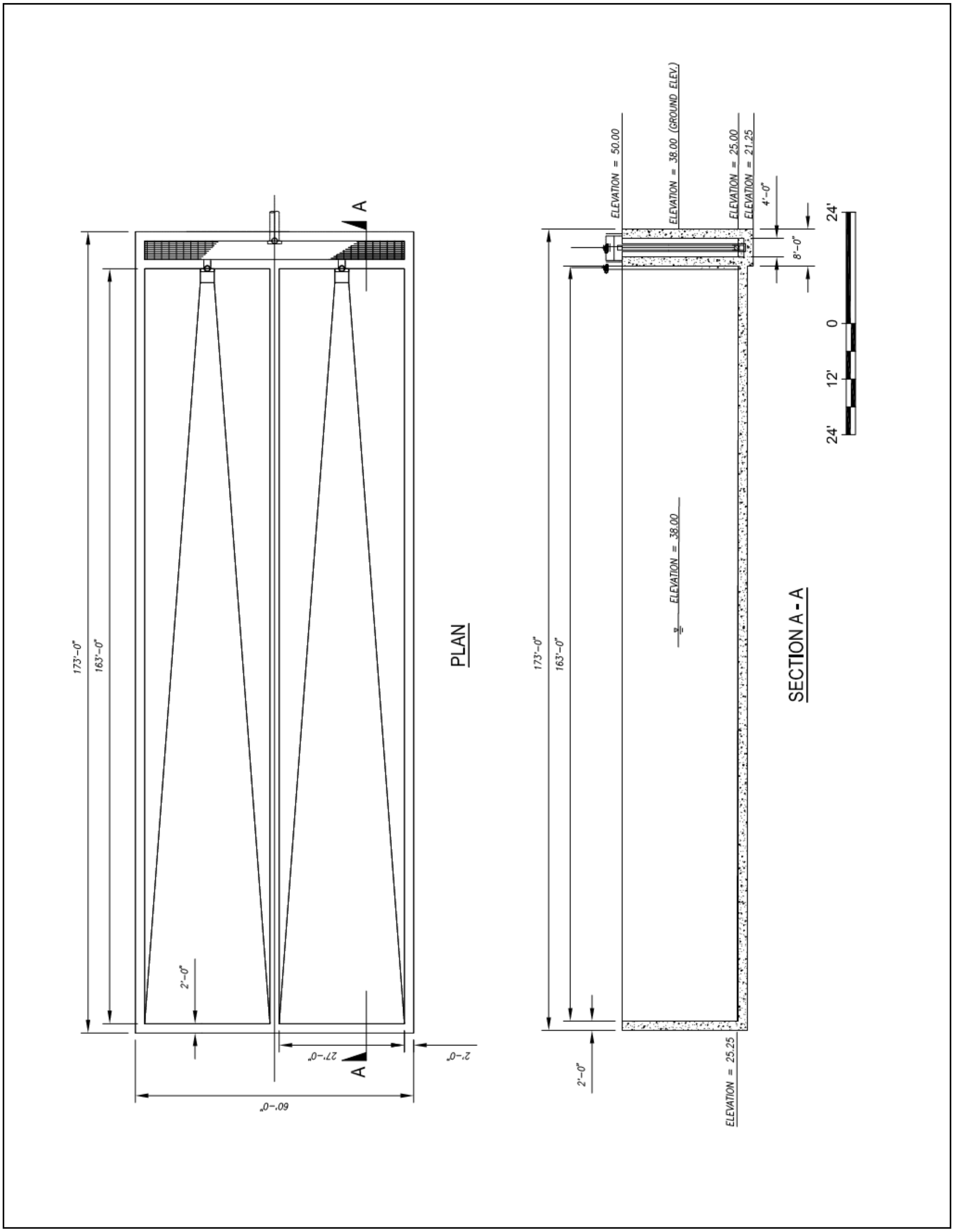

Figure 4.4-5. Option 3B: Plan and Section Views - 0.84 MG EQ Basin at Effluent Holding Pond

4.4.3 Structural Foundation

The foundation of the new 0.84 MG EQ Basin at both locations requires full-perimeter water tight temporary excavation support with adequate bottom ground water cut-off because of the deep excavations.

The structural foundation of the 0.84 MG EQ Basin at the site of the existing storage tanks and effluent holding pond have the following key features:

- 10’-0” wide key-in slabs along four sides of the basin structure with middle partition wall, separating the North and South tanks, designed as a wall with a 5’-0” x 1’-6” slab beam on the top for lateral bracing.
- 12” thick apron slab provided on top of the finished ground surface for soil protection and wall bracing.
- Buttress wall are provided on top of the key-in slabs to strengthen the slabs and the walls.
- Two cross grade beams at each tank are used to divide and support the base slab and transfer the unbalanced uplift force to the key-in slabs.
- Base slabs, grade beams, buttress walls and key-in slabs will be heavier due to larger uplift buoyance force as compared to Option 3A. Base slab is reinforced by 6’x6’ grade beams.
- Coffered dam sheet piling will be heavy and should be braced by wale beams and other horizontal beams at the top.

4.4.4 Structural Rehabilitation and Foundation

Rehabilitation of the existing EQ Basin and EPS wet well are required for Option 3B. For the proposed repairs of the existing EQ basins and EPS, see **Section 4.2.3.**

4.4.5 Construction Phasing

The proposed construction phasing for Option 3B scenario is presented in **Table 4.4-2.**

Table 4.4-2.
Construction Phasing – Option 3B

Option 3B - Site of Ex. Storage Tanks	Option 3B – Effluent Holding Pond
1. Demolish the existing Aerobic Digester. 2. Construct temporary bypass piping and pumps for the remaining storage facilities. 3. Install cofferdam or other groundwater control method. 4. Construct one of the two new EQ Basin chambers. 5. Perform hydrostatic pressure testing for watertightness when the new EQ basin chamber is completed. 6. Construct temporary piping from the IPS to the new EQ basin chamber and from new EQ basin chamber to the existing EQ Basin B. 7. Place the new EQ basin chamber in operation. 8. Demolish the Primary Clarifier tank. 9. Construct the second EQ chamber. 10. Perform hydrostatic pressure testing for watertightness. 11. Construct the permanent piping from the new EQ Basin to the existing EQ Basin B. 12. Remove temporary bypass piping and pumps from the storage facilities. 13. Rehabilitate the existing EQ Basins one at a time. 14. Demolish the existing Rapid Block Tank. 15. Demolish the existing IPS.	1. Install cofferdam or other groundwater control method. 2. Construct the new 0.84 MG EQ Basin. 3. Perform hydrostatic pressure testing for watertightness when the new 0.84 MG EQ basin is completed. 4. Place the new EQ basin in operation. 5. Construct the permanent piping to/from the new 0.84 MG EQ Basin to the existing EQ Basins. 6. Rehabilitate the existing EQ Basins one at a time and install the dry weather compartment. 7. Demolish the Primary Clarifier tank. 8. Demolish the existing Aerobic Digester. 9. Demolish the existing Rapid Block Tank 10. Demolish the existing IPS.

4.4.6 Aeration vs. Non-Aeration

For Option 3B, the existing EQ should be aerated for the reasons described in **Section 4.2.5**. In addition, a wash-down system will be provided for the new EQ Basins to remove any solids which may reach these tanks. Further information on the proposed wash down system is presented in **Section 4.2.7**.

4.4.7 Covered vs. Uncovered

The recommendations for Option 3B are the same as the Option 1: replace the covers of the existing EQ basins and leave the new EQ Basins uncovered. For further discussion, see **Section 4.2.6**.

4.5 Comparisons and Recommendation

For comparison purposes, Option 1 will serve as the base option. The following criteria are used to compare Options 2 and 3 with the base option:

- Total wet weather storage capacity
- Constructability
- Cost
- Ease of operation
- Feasibility of adding septage receiving manhole, package system and driveway
- Available space that may be dedicated for CSM drying bins

The pros and cons for each option are presented in **Table 4.5-1**. Summary design information for each of the options is presented in **Table 4.5-2.**

Table 4.5-1.
Storage System Alternatives – Comparison of Pros and Cons

Pros	Cons
Option 1: Re-Use Ex. Storage Tanks	
Pros	Cons
1. Construction cost is the lowest among the options. 2. Construction phasing is simple. 3. Space available for drying bins.	1. Total wet weather storage capacity of 0.8 MG which is the smallest among the options. 2. Rehabilitation and modification of the existing tanks are required. 3. The operation of filling and draining multiple storage tanks could be complicated and would still require additional submersible pumps operated manually. 4. The IPS is required for wet weather storage operation. 5. Maintenance is required for multiple tanks. 6. Constructing septage receiving manhole and driveway inside of ex. fence line is not feasible.
Option 2: New Storage Tanks	
Pros	Cons
1. Total wet weather storage capacity is 1 MG. 2. No rehabilitation or modifications to the existing tanks are required. 3. Operation of the wet weather storage is simple and able to be fully automated. 4. Potentially eliminate all the aeration used in the plant. 5. Constructing a septage receiving manhole and driveway is feasible. 6. Space available for drying bins.	1. Construction phasing is the most complex. 2. Construction cost is the second highest. 3. Demolition of the existing EQ Basins and reconfiguration of the influent piping to the EPS wet well is very challenging and requires an extended bypass period. 4. No dry weather compartment provided to reduce retention times. 5. The IPS is required for wet weather storage operation.
Option 2: New Storage Tanks at Effluent Holding Pond	
Pros	Cons
1. Total wet weather storage capacity is 1 MG. 2. No rehabilitation or modifications to the existing tanks are required. 3. Construction phasing is simple. 4. Operation of the wet weather storage is simple and able to be fully automated. 5. Potentially eliminate all the aeration used in the plant. 6. Constructing a septage receiving manhole and driveway is feasible. 7. Space available for drying bins.	1. Construction cost is the second highest. 2. Demolition of the existing EQ Basins and reconfiguration of the influent piping to the EPS wet well is very challenging and requires an extended bypass period. 3. No dry weather compartment provided to reduce retention times. 4. The IPS is required for wet weather storage operation.
Option 3A: Ex. EQ Basin with New EQ Basin at Ex. Storage Tank – Pumped Flow	
Pros	Cons
1. Total wet weather storage capacity is 1 MG. 2. Construction cost is the third lowest.	1. The IPS is required for wet weather storage operation.

3. Dry weather compartment for daily flows. 4. Operation of the wet weather storage is relatively simple since it only involves the existing and new EQ Basins and able to be fully automated. 5. Constructing a septage receiving manhole and driveway is feasible. 6. Space available for small drying bins.	2. Construction phasing is difficult. 3. Existing EQ Basins to continue to be aerated.
Option 3A: Ex. EQ Basin with New EQ Basin at Effluent Holding Pond – Pumped Flow	
Pros	Cons
1. Total wet weather storage capacity is 1 MG. 2. Construction cost is the second lowest. 3. Construction phasing is simple. 4. Dry weather compartment for daily flows. 5. Operation of the wet weather storage is relatively simple since it only involves the existing and new EQ Basins and able to be fully automated. 6. Constructing a septage receiving manhole and driveway is feasible. 7. Space available for drying bins.	1. The IPS is required for wet weather storage operation. 2. Existing EQ Basins to continue to be aerated.
Option 3B: Ex. EQ Basin with New EQ Basin – Gravity Flow	
Pros	Cons
1. Total wet weather storage capacity is 1 MG. 2. Dry weather compartment for daily flows. 3. Operation of the wet weather storage is the simplest because wastewater flows back and forth by gravity. 4. Pumping is not required; therefore, the IPS can be demolished. 5. Constructing a septage receiving manhole and driveway is feasible.	1. Construction cost is the highest. 2. Construction phasing is difficult. 3. Any unknown underground obstruction could make this option infeasible.
Option 3B: Ex. EQ Basin with New EQ Basin at Effluent Holding Pond – Gravity Flow	
Pros	Cons
1. Total wet weather storage capacity is 1 MG. 2. Construction phasing is simple. 3. Dry weather compartment for daily flows. 4. Operation of the wet weather storage is the simplest because wastewater flows back and forth by gravity. 5. Pumping is not required; therefore, the IPS can be demolished. 6. Constructing a septage receiving manhole and driveway is feasible.	1. Construction cost is the second highest. 2. Any unknown underground obstruction could make this option infeasible.

Table 4.5-2.
Storage System Alternatives - Design Summary

	Option 1	Option 2	Option 2	Option 3A (Pumped)	Option 3A (Pumped)	Option 3B (Gravity)	Option 3B (Gravity)
New Tank Location	-	Ex. Storage Tank	Holding Pond	Ex. Storage Tank	Holding Pond	Ex. Storage Tank	Holding Pond
Existing EQ Basin to remain?	Yes	No	No	Yes	Yes	Yes	Yes
Total wet weather storage volume (MG)	0.80	1.0	1.0	1.0	1.0	1.0	1.0
Constructability ranking[1]	1	4	4	2	2	3	3
Ease of operation ranking[1]	4	2	2	2	2	1	1
Construction of a septage receiving manhole and driveway possible?	No	Yes	Yes	Yes	Yes	Yes	Yes
Space available for drying bins?	No	Yes[2,3]	Yes[2,3]	Yes[2,3]	Yes[2,3]	Yes[3] (largest)	Yes[3] (largest)
Influent Pump Station to be used?	Yes	Yes	Yes	Yes	Yes	No	No
Potential risk[4]	No	No	No	No	No	Yes	Yes
Construction cost[5]	$12.4M	$33.5M	$32.8M	$30.0M	$29.1M	$34.3M	$33.5M

Footnote:
1. Rankings: 1 is the best and 4 is the worst.
2. Same footprint for Option 2 and Option 3A.
3. The available land is in the flood zone.
4. Any unknown underground obstruction will make the option infeasible.
5. Cost includes new EQ and associated work related to EQ option only (see Section 6). Cost includes 35% contingency.

Based on the above criteria, the apparent best alternative is Option 3A – Combination of New Storage Tank and Existing EQ Basins by Pumping at the effluent holding pond. This alternative had relatively high rankings for constructability and ease of operation. It also has the second lowest construction cost and able to include space for a new septage receiving facility and CSM drying bin. Although the construction cost for Option 1 is considerably less than Option 3A, Option 1 does not satisfy any other criteria and the wet weather storage control strategy is the most complicated and not fully automated.

Section 5 – Facility Improvements

This section discusses needed improvements to the Ahuimanu WWPTF, outside of the wastewater storage system. This includes replacement of Headworks screening and grit removal equipment, replacement of IPS and EPS pumps, installation of a new OCS and septage receiving facility.

5.1 Headworks

5.1.1 Screening System

The projected 2030 PWWF at the Ahuimanu WWPTF is 8.11 mgd. Each of the existing screening systems can only treat up to 7 mgd of flow. Therefore, both screening systems would be required to operate in order to handle the projected PWWF. There would be no redundant screening equipment available for maintenance shutdowns. Additionally, operation of the horizontal conveyor has triggered noise complaints by neighboring residences.

Since the Ahuimanu WWPTF provides only pre-treatment and does not have any downstream process equipment to protect, a 6 mm screen size is adequate for this application. In fact, finer screens may cause a reduction in upstream flow capacity. The design criteria used in the evaluation of proposed screening manufacturers and equipment are presented below:

- Capable of treating the future peak flow of 8.11 mgd.
- Equipment fits within the existing Headworks structure without requiring major structural modifications.
- Low head loss to minimize impacts upstream of the screen.
- Noise level not to exceed 50 Dba at 50 feet.

New JWC Auger Monsters sized for PWWF is able to capture the solids using a perforated plate screen and remove them by a rotating auger. However, installation of new in-channel grinders with a design capacity that meets the PWWF would significantly increase the overall head loss of the system. Therefore, the existing in-channel grinders would be removed completely and not replaced with new higher capacity ones. By eliminating the in-channel grinders from the Headworks, the solids removal efficiency of the new Auger Monsters would decrease. Replacement of the aging and corroded screening conveyor system with a new one should address the noise issue.

An alternate to the JWC Auger Monster, the Huber step screen consists of slowly rotating stationary bars that are set parallel to each other. The bars move in an elliptical motion, lifting the screenings up on the stationary steps, and eventually discharging into the discharge chute (see **Figures 5.1-1** and **5.1-2**).

There are currently three Huber step screen installations in Hawaii; one at Fort Kamehameha WWTP, one at Wahiawa WWTP and another one recently installed at the Eleele WWTP on Kauai. The operators at the Fort Kamehameha WWTP stated they have not had issues with the Huber step screens. At the Wahiawa WWTP, the operator stated that the screenings are too wet. Based on the communications with the manufacturer, the screw and wash water timing and duration maybe adjusted to reduce the moisture in the screenings. From a maintenance standpoint, the linkage bushings will typically need replacement every three years.

Figure 5.1-1. Rotating Bars with "Steps"

Figure 5.1-2. Huber Step Screen

A comparison of the screening system alternatives are presented in **Table 5.1-1**.

Table 5.1-1.
Screening System Alternatives

Selection Criteria	Auger Monster	Step Screen
Able to treat peak flow	Yes	Yes
Able to fit in existing structure	Yes	Yes
Head loss @ peak flow	13.3 in[1]	7.4 in
Screen motor size	2 HP	3 HP
Solids capture Ratio	48%[2,3]	45%[4]

1. *Head loss for screen only*
2. *Reference: UK Water Industry Research Report*
3. *Combined with grinder, solids capture ratio drops without grinder*
4. *No third party test, manufacturer's estimation*

Although the step screen has slightly higher power consumption, the operation of the step screen is based on the pressure differential upstream and downstream of the screen. Therefore, the screen will only move when the pressure differential upstream and downstream of the screen hits the preset level. This mode of operation minimizes the run time of the unit, thus reducing overall energy consumption. Huber step screens are preferred over the Auger Monsters because of the lower head loss to the plant hydraulics.

5.1.2 Grit Removal System Alternatives

Based on the information provided by the *Ahuimanu WWPTF Improvements and Equalization Facility Project Charter,* CCH, August 2013 (Project Charter) the current grit removal system is not functioning properly and requires rehabilitation or replacement. A new type of grit removal system would provide the following additional benefits:

- Isolation of each screening channel by removing the existing grit conveyors.
- Improved grit removal would mitigate any grit settling in the force main if the EPS is operating in variable speed mode.

Installation of a different type of grit removal system would:

- Require structural modifications to the tank.
- Increase head loss to the system.

The Hydro International (previously Eutek) HeadCell was the only grit removal system evaluated since it has been widely accepted as having the highest grit removal efficiency when compared to other grit removal technologies. In Hawaii, there is one Headcell unit in operation at the Waimea WWTP on Kauai. The new Headworks for the Kailua RWWTP, which is currently in construction also includes the Headcell as part of their grit removal system.

RMTC staff visited the Waimea WWTP in November 2014. The Headcell unit, which has been in operation for just over a year, has not yet required a shutdown for maintenance purposes nor has there been any further evaluation of grit removal for this unit. However, operators indicated that they do like the unit and do not have any issues with the system.

The Headcell is a modular, multiple-tray settleable solids concentrator designed to remove grit in a small footprint. The incoming tangential flow establishes a vortex flow pattern causing solids to fall into a boundary layer on each tray. Grit settles out by gravity along the sloped surface of each tray, slides to the center opening and falls to a common collection sump. A typical Headcell unit is as shown on **Figure 5.1-3**. The proposed grit removal system consists of the following components:

- Headcell grit concentrator
- Grit pumps
- Grit washing/classification units
- Grit dewatering units

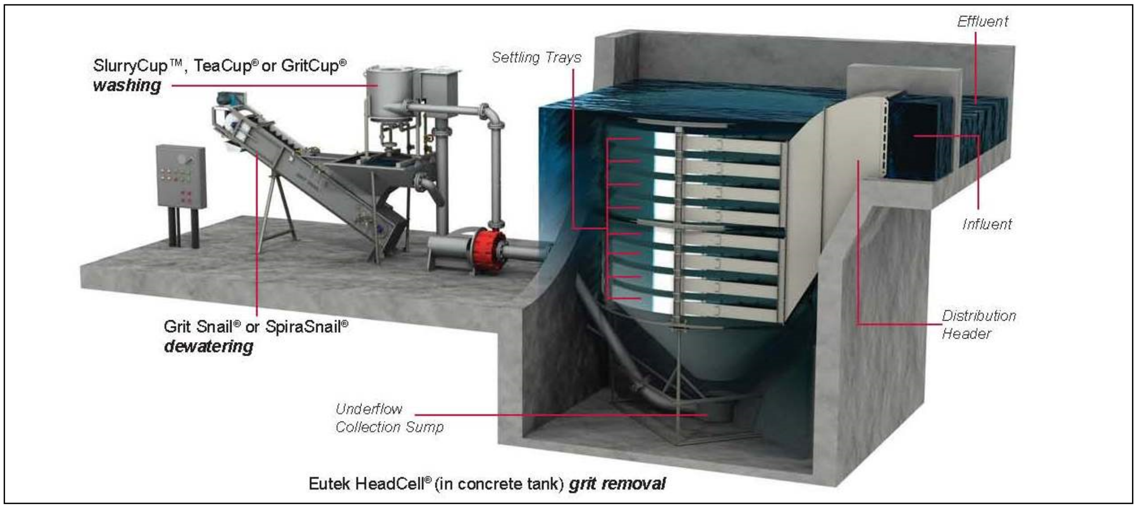

Figure 5.1-3. Hydro International HeadCell (Source: Hydro International)

Based on the grit characterization sampling results, a 100-micron SES design will remove between 85% and 91% of the incoming grit and a 75-micron SES design will remove up to 99.7% of the incoming grit. **Table 5.1-2** presents the grit removal performance claimed by the manufacturer. At the peak flow rate, in order to achieve 95% grit removal, based on a 75-micron SES design, the Headcell needs to be upsized from 9-foot to 12-foot tray. Upsizing the Headcell to a 12-foot tray would increase the footprint of the tank structure required and encroach into the easement of the existing water line. Due to this constraint, the current recommendation is to use a 9-foot tray Headcell system. If the larger Headcell unit is preferred, then the terms or conditions of the existing Board of Water Supply easement needs to be further verified.

Table 5.1-2.
Predicted Grit Removal Performance of a 9 ft. Tray Headcell System

	100-micron SESDesign	75-micron SES Design	75-micron SES Design
Percent Incoming Grit	85%-91%	99%-99.7%	99%-99.7%
Percent Removal of Headcell	95%	95%	45%
Flow rate	8.11 mgd	5.0 mgd	8.11 mgd

To determine if the installation of the Headcell in the existing Headworks structure is indeed feasible, the overall plant hydraulic profile needs to evaluated. The rationale is to verify that the hydraulic profile for future peak hourly flow is at least the same as the peak hourly flow under the current conditions. A comparison of the current hydraulic profile with a peak flow of 5.1 mgd and future hydraulic profile for a peak hourly flow of 8.11 mgd is as shown in **Figures 5.1-4** and **5.1-5**. A high-water elevation of 39 feet in the equalization basin was assumed in all hydraulic profile calculations. Based on the results from the hydraulic modeling, installation of the Headcell would not have a detrimental impact to the system hydraulics.

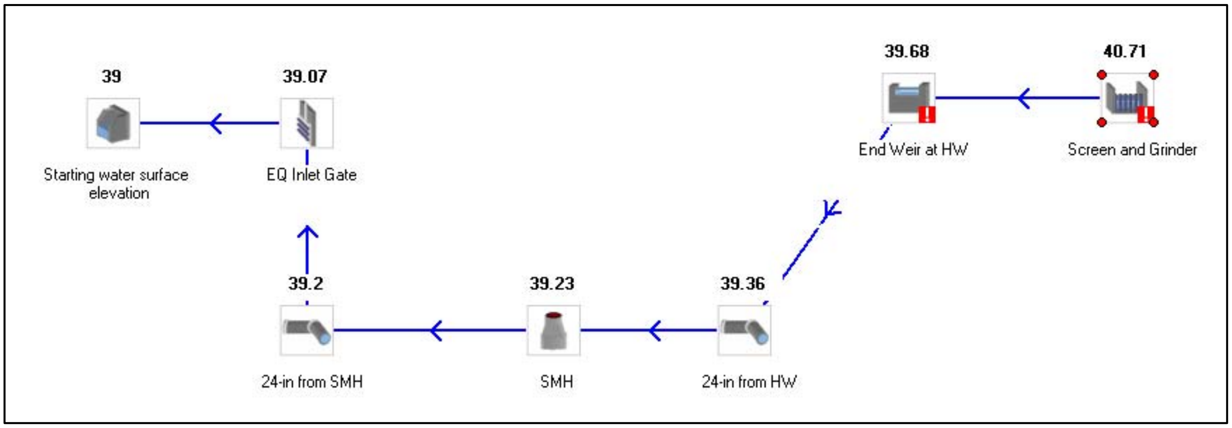

Figure 5.1-4. Hydraulic Profile for Current Peak Hourly Flow

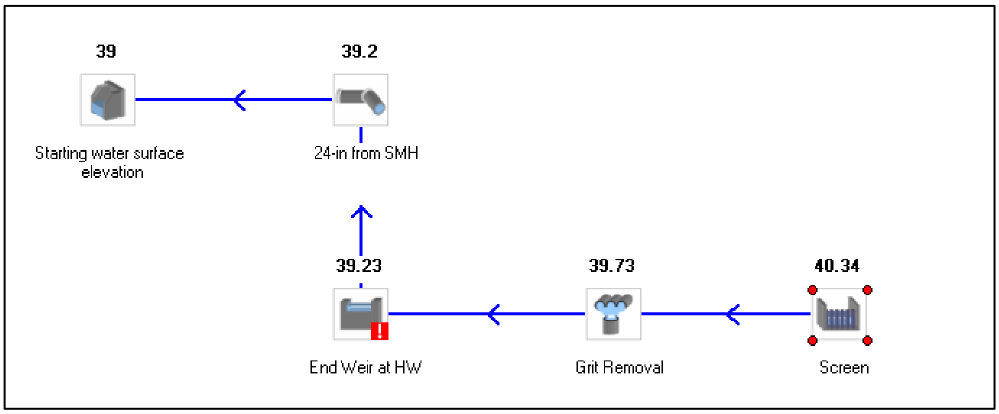

Figure 5.1-5. Hydraulic Profile for Future Peak Hourly Flow

Based on site constraints, only one Headcell unit is able to fit within the existing tank dimensions with structural modifications to the floor slab. Plan and section views of the proposed Headworks is as shown in **Figure 5.1-6**. For a small WWTP, it is common to have only one Headcell unit since there are no moving parts in the Headcell. New influent piping from the Headcell effluent chamber to the new dry weather compartment in the EQ Basin would also be required.

In accordance with the manufacturer's Operation and Maintenance (O&M) manual, the manufacturer recommends shutting down the Headcell unit every six months to perform the followings tasks:

- Drain the Headcell.
- Hose down the entire unit to remove grease and deposits.
- Inspect trays and hardware for foreign objects or rags.
- Clean and repair as necessary.

So that operators are able to shut down the Headcell for maintenance, slide gates should be installed in the channels to isolate the Headcell. The other existing aerated grit chamber channel may be converted to a bypass channel.

The grit sampling results indicated a low grit concentration at Ahuimanu WWPTF as compared to the national average. The existing aerated grit chambers has not been functioning properly for the past 5-10 years, similar to the existing screenings system. There has been known grit issues in the Headworks and in the Ahuimanu force main due to grit build-up at the location of the siphon along Kamehameha Highway. CSM at this location routinely flush out the siphon of the force main once a year.

Tthe Ahuimanu WWPTF Force Main – Haiku Road Bypass Sewer project was completed in 2018, wastewater flows are diverted to a new 18" sewer along Haiku Road and the connecting 27" Kamehameha-Heeia Interceptor Sewer. With flows diverted away from the siphon in Kamehemeha Highway, the force main should no longer have grit build-up at this location. The remaining segments of the force main and connecting gravity sewers should continue not to have grit accumulation provided proper self-flushing velocities (> 2 fps) are maintained throughout. The existing aerated grit chamber and conveyor is recommended to be removed and replaced with a new grit removal system.

Regardless of whether the existing Headworks remains or proposed Headworks is installed, a new 24" sewer line may be installed from the influent chamber of the Headworks to the existing 24" influent piping to allow flows to bypass the entire Headworks to the EQ Basin.

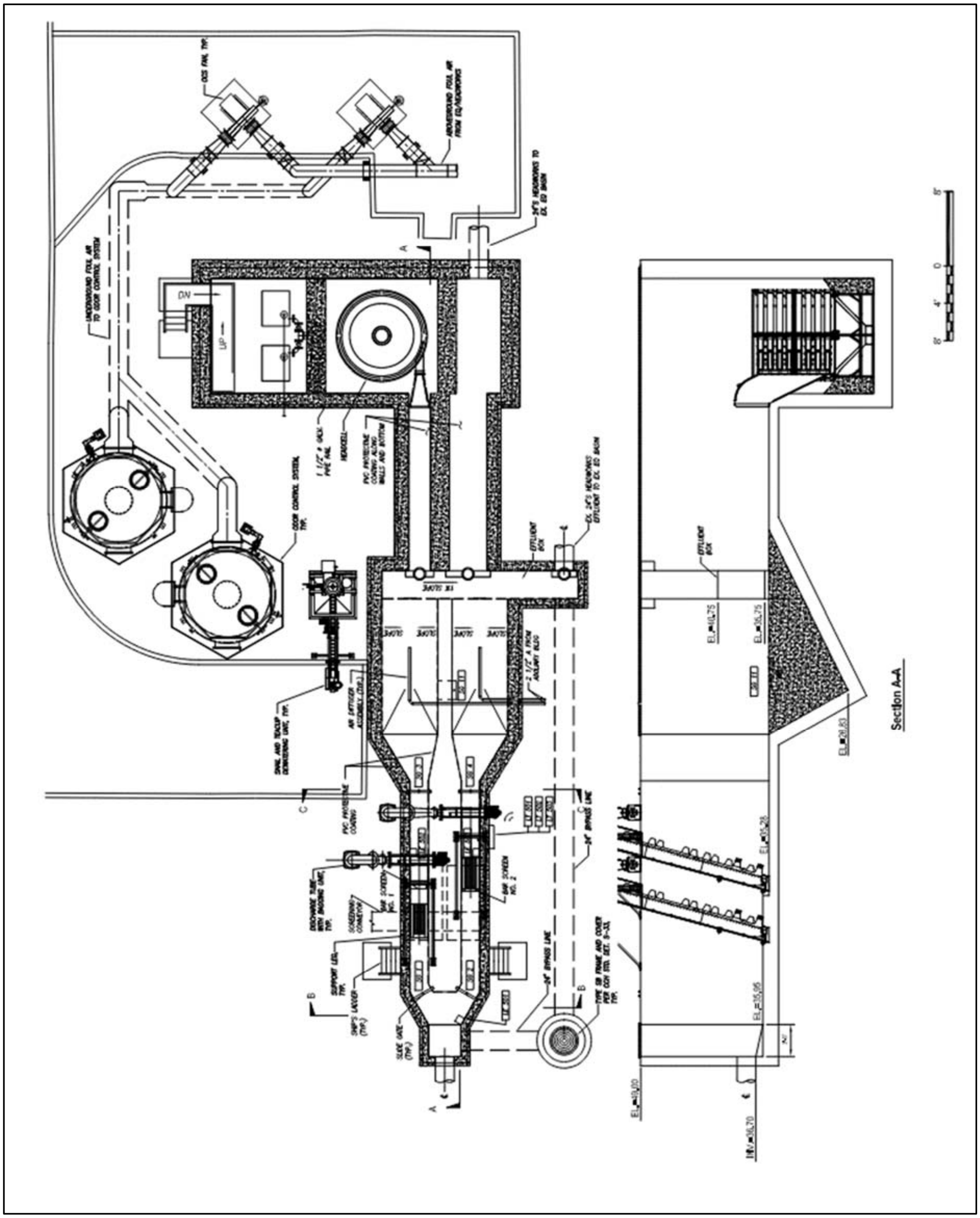

Figure 5.1-6. Headworks Proposed System – Plan and Section View

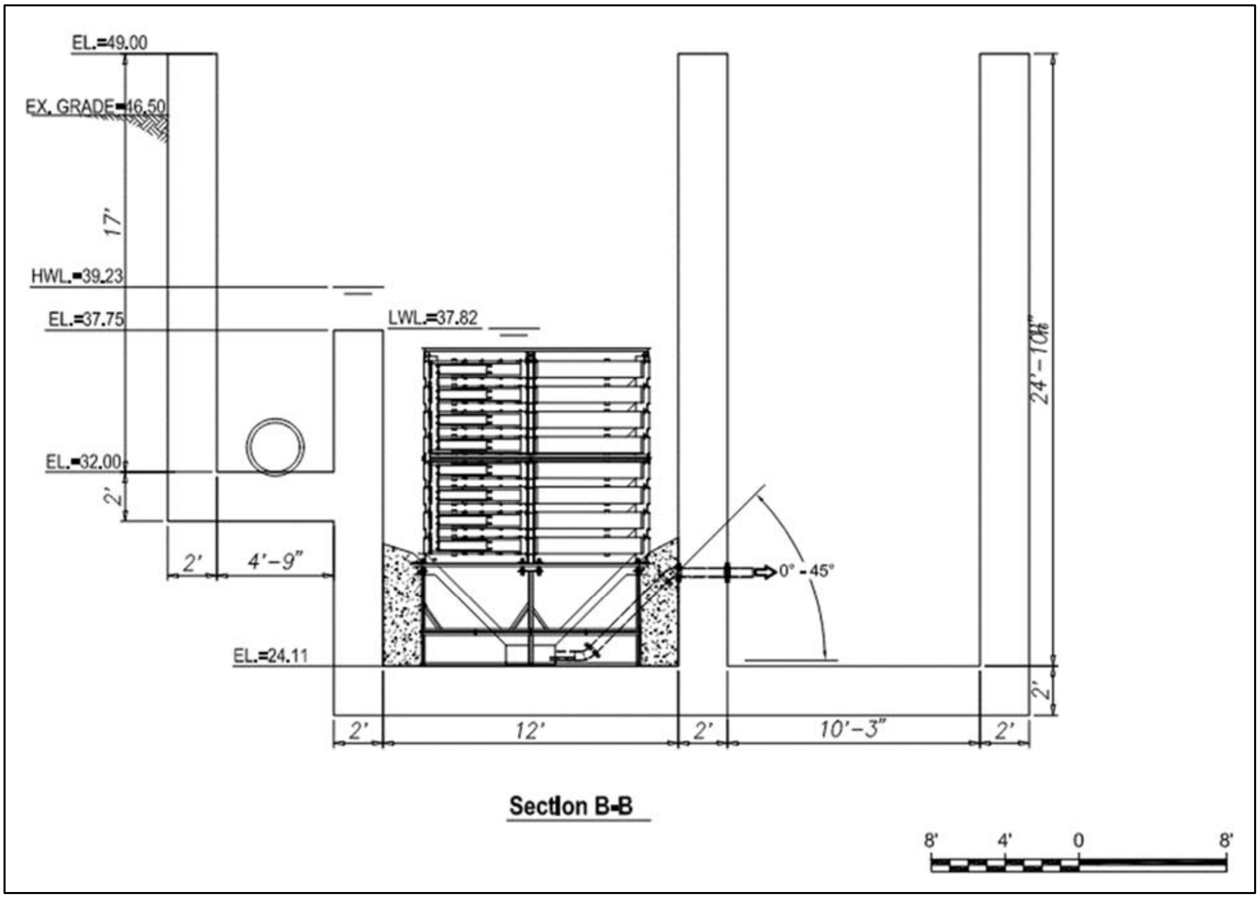

Figure 5.1-7. Headworks Proposed System –Section Views

5.2 Effluent Pump Station

The future peak design capacity of the EPS will be 5.84 mgd, with any higher flow stored onsite. The stored wastewater is pumped to Kaneohe WWPTF when the influent flow rate drops below 5.84 mgd. The current average diurnal flow rate ranges between 0.3 mgd and 1.0 mgd. The velocity in the existing Ahuimanu Force Main at various flow rates are presented in **Table 5.2-1**.

Table 5.2-1.
Force Main Velocity at Different Flow Rates

Flow Rate (mgd)	Velocity (fps)
0.3	0.33
1.0	1.11
2.0	2.21
4.0	4.43
5.0	5.53
6.0	6.64

5.2.1 Variable Frequency Drives (VFD)

WWPTF operators have previously stated their preference to have pumps with VFDs instead of the currently installed constant speed pumps so that they are able to accommodate low flows at night. Installation of VFDs may also have the following advantages over constant speed pumps:

- Reduction in energy consumption.
- Pumping speed can match the influent flow rate, which minimizes sewage retention time in the equalization basin and reduces septicity of the wastewater.
- Eliminate the need for most (or all) of the EQ Basins during the dry weather operations.
- Prevent air pressure spikes in the existing force main.

The recommendation from the *Ahuimanu Gravity Sewer Odor Study*, V&A (November 2014) suggested that the most efficient and effective way to prevent odor releases from the existing Ahuimanu force main gravity segment is to install VFDs on the pump controls. The VFDs are able to modulate the pumps to match the wastewater flow rates and prevent the air pressure spikes observed, making the airflows more predictable and manageable as opposed to constant speed pumping. Any siphons in the downstream gravity sewer will still stop all airflow and have a zone of increased pressure, but the pressure will be constant and the magnitude will be much lower. There would still be concern for odor release of constant airflow at the manholes immediately upstream of the siphons.

Since the Ahuimanu WWPTF Force Main - Haiku Road Bypass Sewer project is complete, the gravity segment of the original force main will activate only as an emergency backup. The new Haiku Road Bypass Sewer has very different sewer ventilation dynamics than the original force main. The sewer does not have multiple slope changes or siphons that could impede airflow and cause extreme pressurization. Installing variable speed pumps will not dramatically improve the sewer ventilation or have significant impact on the release of H_2S gas at the force main discharge as compared to constant speed pumps. An update to the previous study is in the *Technical Memorandum Draft Haiku Road Bypass Sewer and Ahuimanu WWPTF Desktop Odor Evaluation*, V&A (August 2016). The onsite chemical injection system should be used to reduce wastewater septicity and prevent the regeneration of dissolved sulfides in the force main.

In regards to reducing the sewage retention time in the equalization basin, as mentioned in **Section 4.1.2**, a dry weather compartment shall be installed to reduce the size of the equalization basin and minimize the retention time of low flows as well.

The major disadvantage of installing VFDs at the Ahuimanu EPS is the potential for slow velocities in the force main during dry weather flows and low flow periods. Based on the CCH Design Standards for Wastewater Facilities, the absolute minimum velocity in the force main is 1.75 feet per second (fps). As shown in **Table 5.2-1**, the minimum velocity requirement under typical dry-weather flows does not meet CCH Design Standards. If the screening and grit removal system upstream of the EPS is upgraded and remains, that will mitigate settling of rags and grit in the force main. On the other hand, if the Headworks equipment is eliminated, the EPS pumps should operate at constant speeds with the pumps providing velocities above the minimum in order to prevent grit accumulation in the low spots of the existing force main pressure segments.

5.2.2 Variable Pump Sizing and Type

Two pumping scenarios were investigated, constant speed and variable speed operation. With upgrades to the Headworks, the EPS may install and operate variable speed pumps to handle 2030 flow conditions.

Variable Speed Pumps

The EPS shall include two main pumps and one standby sized to handle the peak wet weather flow of 5.84 mgd with an additional jockey pump to manage the low flow conditions at night. There is no standby jockey pump provided because of a lack of available space in the existing building. One of the main pumps is able to operate at a lower speed if the single jockey pump is down for maintenance. The main pumps should be run periodically to flush the existing force main and prevent grit accumulation after periods of low flow as the jockey pumps will be pumping at low velocities.

The Ahuimanu WWPTF and force main system was modeled using Pipe-Flo software; see **Figure 5.2-1** for the program results. The pump sizing modeling results are presented in **Table 5.2-2**.

Table 5.2-2.
EPS Pump Sizing Based on Pipe-Flo Results

Main Pumps	2,030 gpm @ 294 ft TDH
Main Pumps – Reduced Speed	1,390 gpm @ 211 ft TDH
Main Pumps Impeller Diameter	430 mm
Jockey Pump	600 gpm @ 150 ft TDH
Jockey Pump – Reduced Speed	200 gpm @ 145 ft TDH
Jockey Pump Impeller Diameter	195 mm

Two types of centrifugal pumps, vertical dry-pit with intermediate shaft (current pump type installed in the station) and dry-pit submersibles, were evaluated based on their pump efficiency. A list of pump manufacturers for each type of pump is in **Table 5.2-3**.

Table 5.2-3.
Pump Manufacturers Contacted

Vertical Dry-Pit	Submersible Dry-Pit
Cornell	Wilo
Yeomans	KSB
Pentair	Flygt
Flowserve	Flowserve
	ABS

Information provided by the pump manufacturers' show that the efficiencies for both types of pumps are similar; both types of pumps have low efficiency under low flow and high head conditions.

Although the pump efficiencies are approximately the same between the two types of pumps, there are advantages to using dry-pit submersible pumps:

- The pumps can remain in operation when the dry-pit pump room is flooded.
- Reduced operation and maintenance cost without the intermediate flexible shaft.
- Water conservation by eliminating the need for seal water.
- Potentially more space for ventilation ductwork.

Based on the above benefits, the recommendation is to install dry-pit submersible pumps at the EPS. Plan and section views of the EPS with new dry-pit submersible pumps are in **Figure 5.2-2** through **5.2-5**.

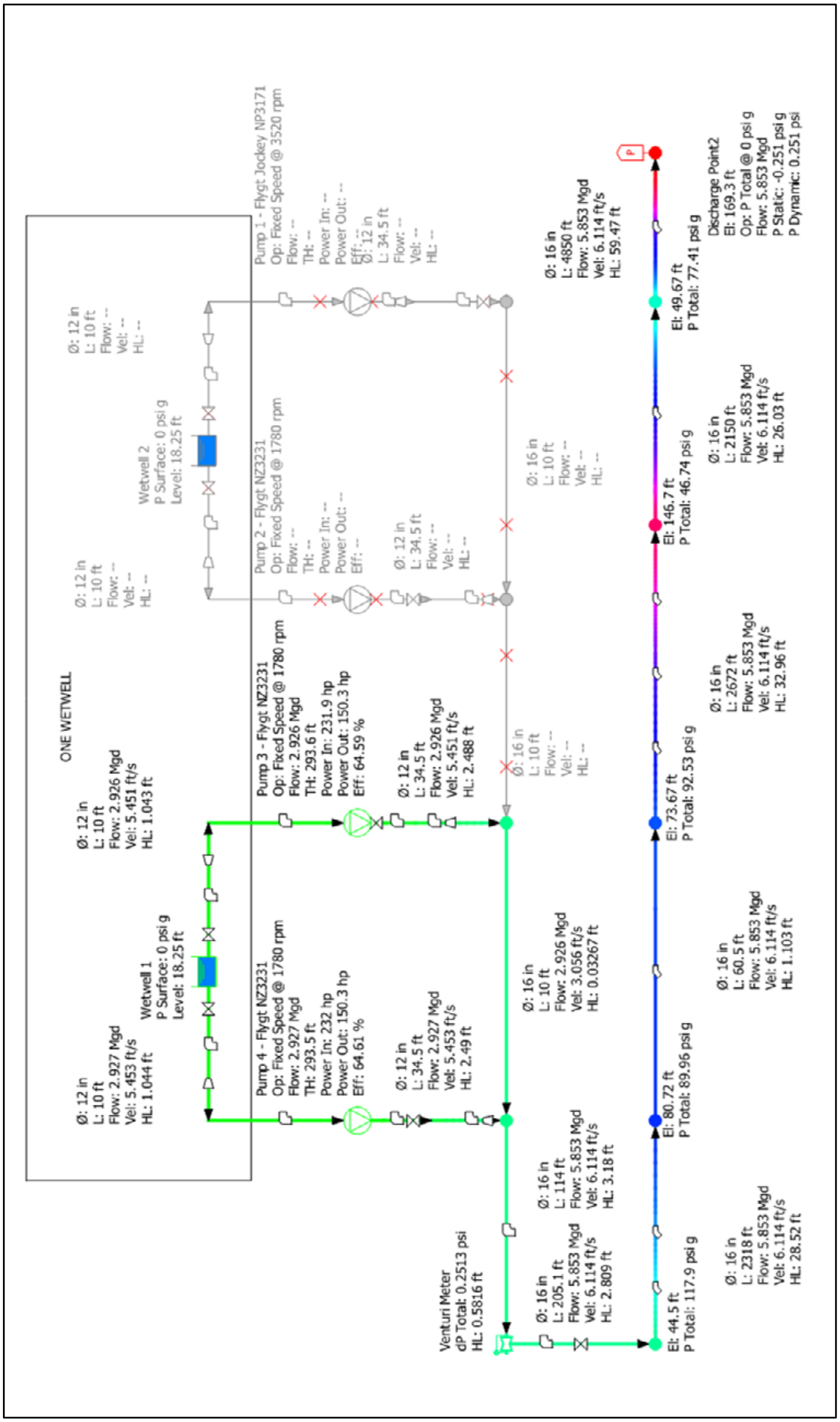

Figure 5.2-1. Pipe-Flo Model for New EPS Pumps

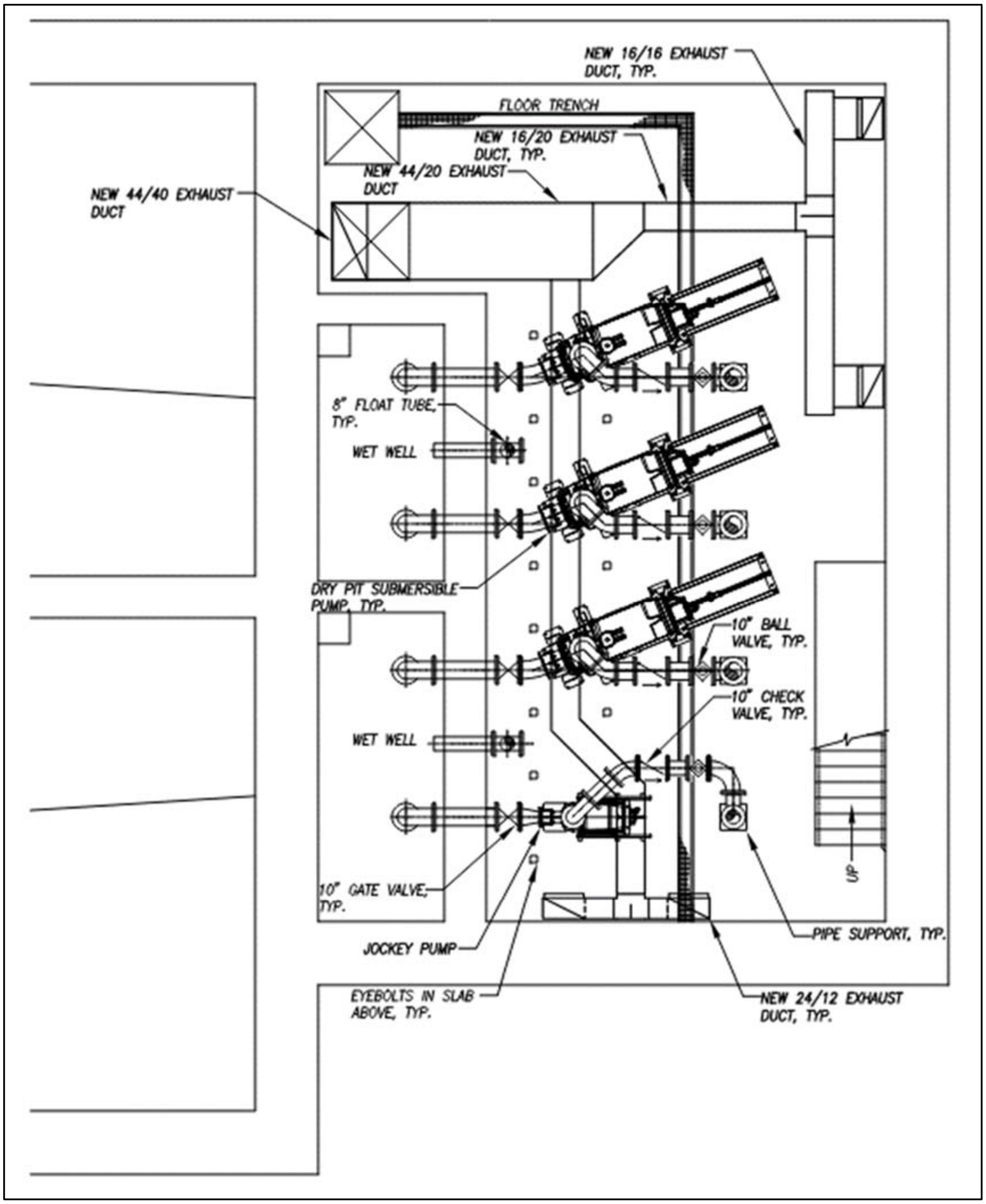

Figure 5.2-2. EPS with New Dry Pit Submersible Pumps (Variable Speed) – Pump Room

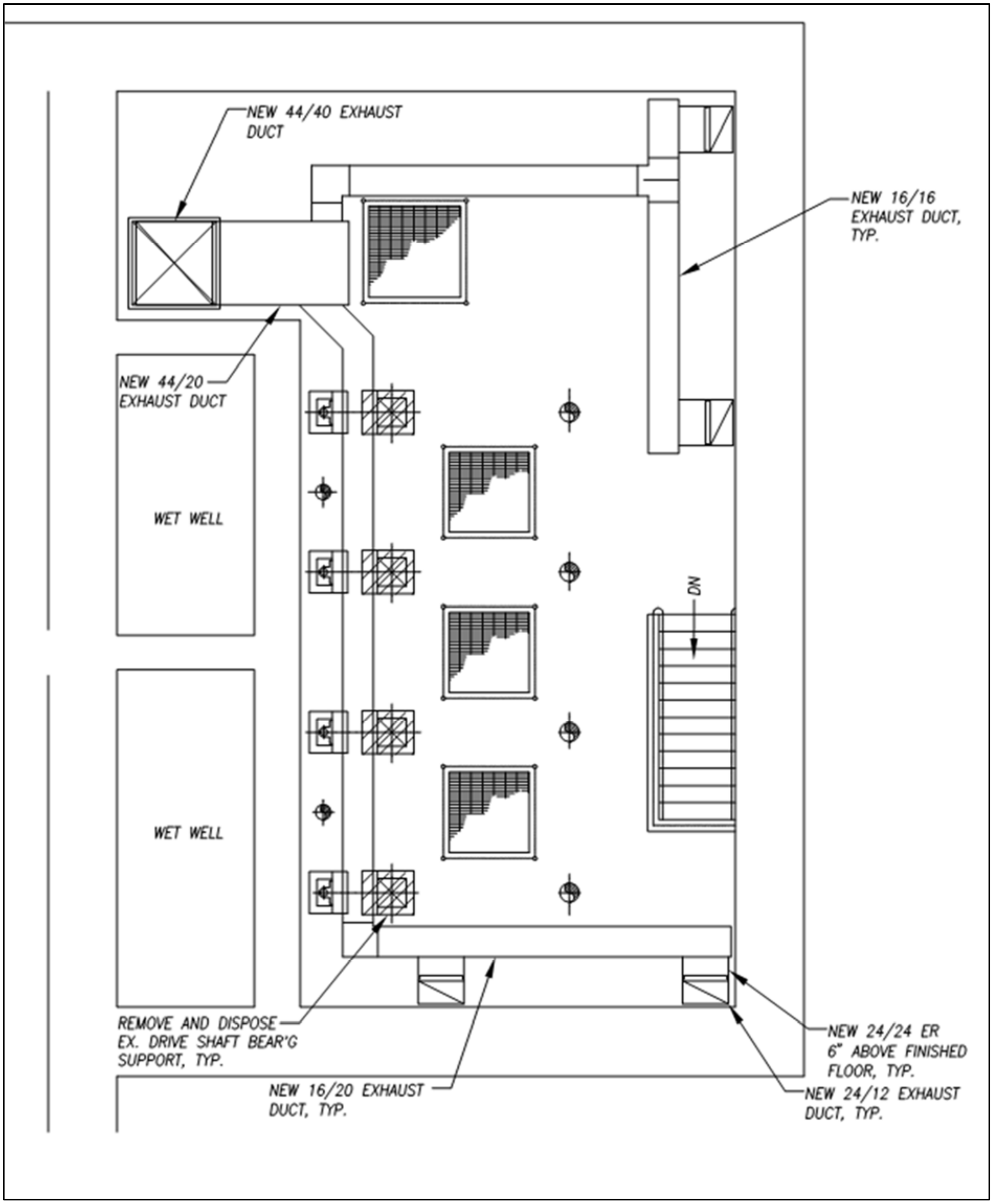

Figure 5.2-3. EPS with New Dry Pit Submersible Pumps (Variable Speed) – Intermediate Floor

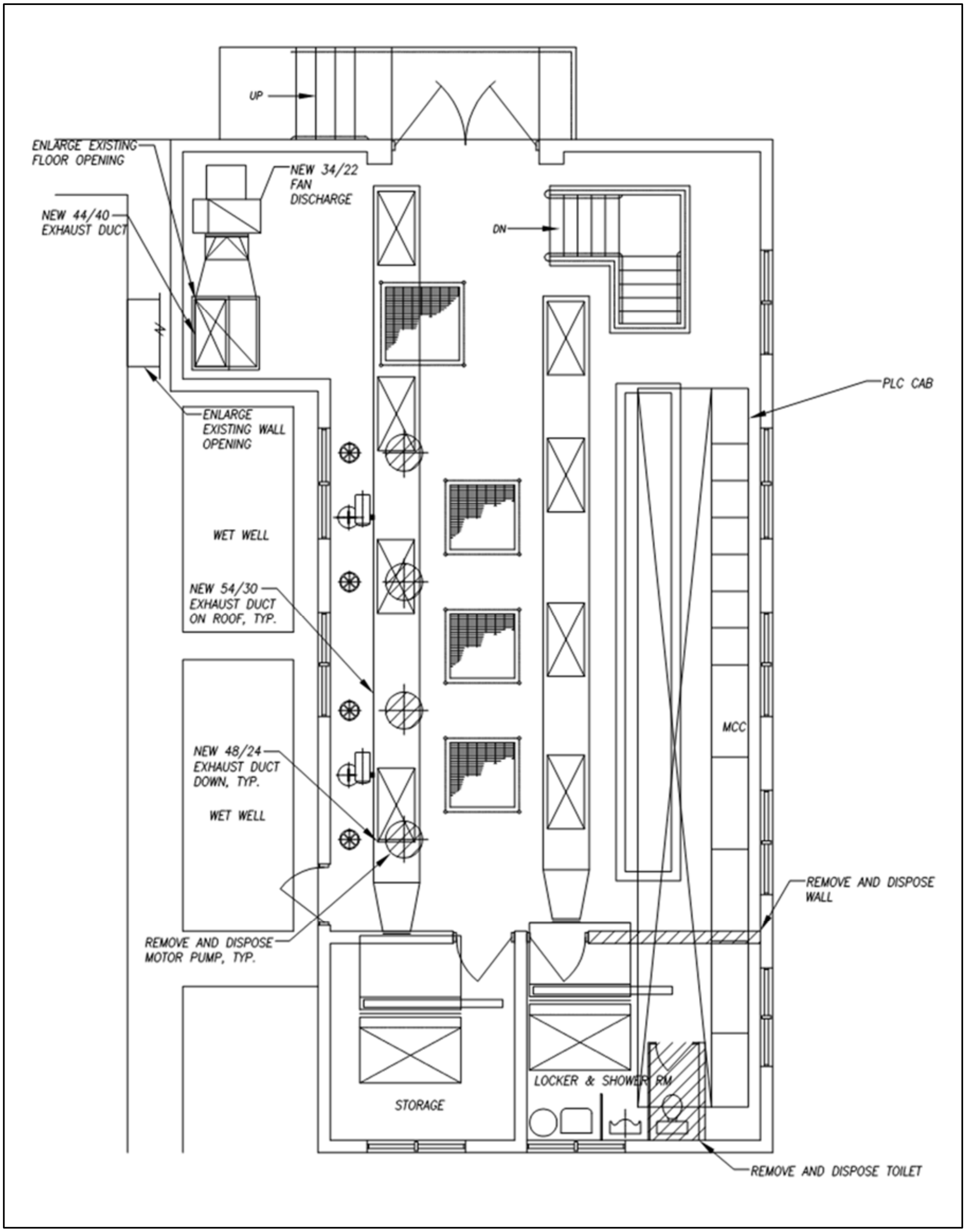

Figure 5.2-4. EPS with New Dry Pit Submersible Pumps (Variable Speed) – Ground Floor

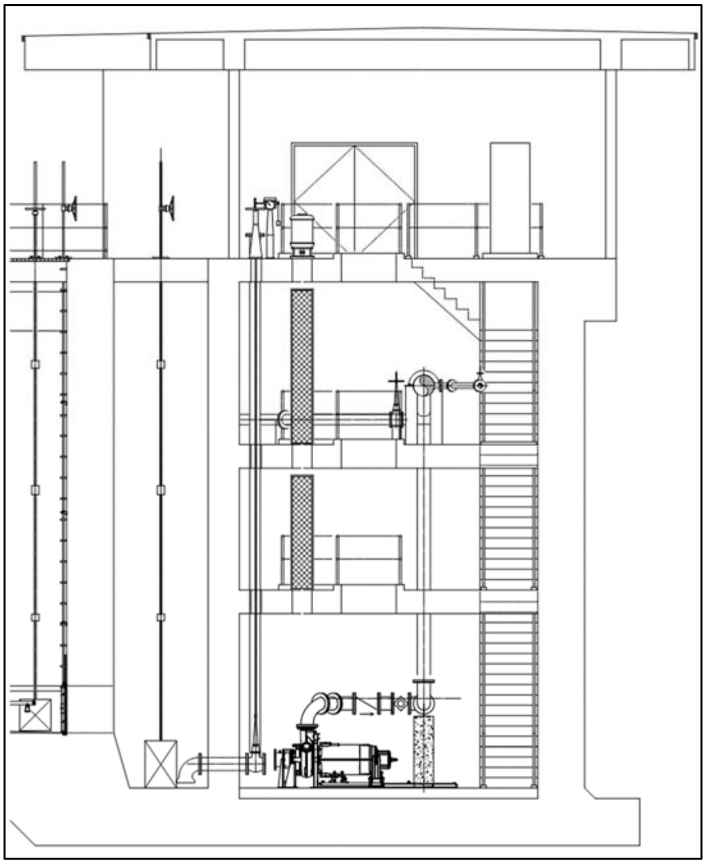

Figure 5.2-5. EPS with New Dry Pit Submersible Pumps - Section View

Constant Speed Pumps

As stated in **Section 5.2.1**, if the Headworks is removed, the EPS pumps should operate at constant speed to prevent grit accumulation in the low points of the force main. In this scenario, the EPS shall include three pumps plus one standby sized to handle the peak wet weather flow of 5.84 mgd. No jockey pump will be included to handle low flow conditions, as the force main velocities would not be able to meet minimum velocity standards at low flow conditions. The EPS constant speed pump information was modelled using the Pipe-flo software and is as shown in **Table 5.2-4**. The pump room floor layout for this constant speed pump scenario is similar to the plan and sections views shown in **Figures 5.2-6.**

Table 5.2-4.
Constant Speed Pump Information

Type	Dry-Pit Submersible
No. of Pumps	3+1 Standby
Main Pumps	1,385 gpm @ 299 ft TDH
Pump Impeller Diameter	420 mm

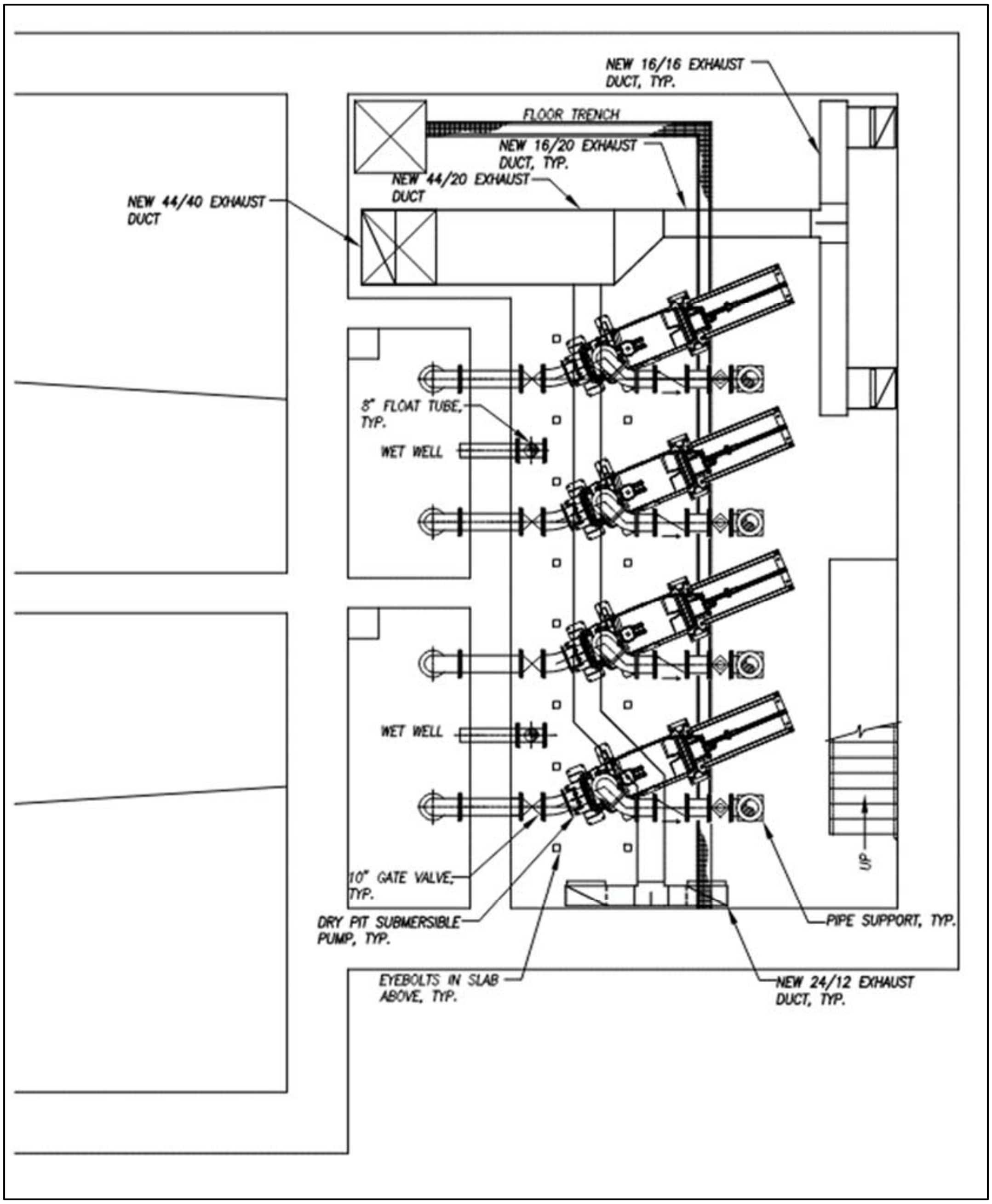

Figure 5.2-6. EPS with New Dry Pit Submersible Pumps (Constant Speed) - Plan View

5.2.3 Structural Rehabilitation

The EPS wet well is lined with T-Lock lining, which has allowed the concrete to retain its structural integrity over its lifetime. The following repairs are recommended to ensure a long-continued service life of the EPS wet well:

- Repair T-Lock lining.
- Replace elastomeric protective coating.
- Repair any cracks, spalls, water infiltration, corroded concrete and rebar.
- Seal all damaged joint sealant.

Additionally, minor repairs of cracks and spalls on the EPS building structure are recommended. With these minor repairs the EPS building should maintain a long service life.

5.2.4 Surge Protection

The EPS is currently equipped with a 3,000 gallon surge tank for surge protection during loss of power or startup of the Ahuimanu EPS. The tank is located outside the EPS and is connected to the force main discharge manifold by a 6-inch pipe. Additionally, each pump discharge is equipped with a 10-inch cone valve and a 10-inch gate valve.

An updated surge analysis of the Ahuimanu Force Main was completed in included in the *Ahuimanu Force Main Pressure Surge Analysis*, Flow Science, April 2014. Results of the updated surge analysis includes the following surge protection recommendations:

- Upsize the surge tank connector pipe from 6” to 10”.
- Retrofit the A.R.I combination air and vacuum valve at STA 48-90 with a controlled venting feature.

The Department of Environmental Services, Collection System Maintenance (CSM) has already retrofitted the A.R.I combination ARVs as part of their maintenance work. The surge tank connector pipe will be upsized as part of this project. With both of these recommendations implemented, the existing cone valves should be replaced with new check valves. In communications with the operator, the operator prefers having check valves for the maintenance aspects.

5.2.5 Noise control

The new pumps should be specified not to exceed 85 dBA at 3 feet from each assembly. Additionally, 12” x 12” acoustical ceiling tiles on the ceiling of the pump room are recommended to reduce the reverberant sound build up in the pump room to meet the noise level requirements.

5.2.6 Ventilation System

The current ventilation requirement for the EPS (per NFPA 820) is 12 air changes per hour. The basis of design for a new ventilation system would be 15 AC/h. The EPS has an approximate total volume of 56,700 ft^3 on all four levels. At 15 AC/h, the capacity of the new exhaust fan will need to be 14,150 cfm at 0.75” static pressure with a 7.5 hp motor and noise level of 74 dBA.

The new exhaust fan would be relocated to the top floor and ducted down to the lower levels, with the exhaust discharging through the side of the top floor. The new duct down to the pump room floor would be a 44/44 duct, which will require enlargement of the existing floor openings, as well as enlargement of the discharge exhaust opening. Ductwork will be provided for each of the subgrade levels in order to allow for enhanced air circulation at each level. Exhaust air intakes will be located throughout the subgrade levels with the bottom of the exhaust intake at 12” above the floor.

Make-up air will be provided by two (2) make-up air handling units located on the roof. Ductwork will penetrate the roof structure to allow make-up air into the facility. The grated service openings will remain as the means for the make-up air to access the subgrade levels.

5.2.7 Instrumentation

Level Control

The current radar level transmitters will remain in place and be supplemented by new differential pressure transmitters. Both instrumentation devices will be installed using the existing stilling wells. A vent line will be provided for each stilling well. In addition, a backup float switch will be installed to serve for the high-high water level.

Gas Monitoring

Previously, a combustible gas detector would be required in each wet well to be in accordance with NFPA 820. The 2016 NFPA no longer requires combustible gas monitors be installed.

5.3 Influent Pump Station

All of the storage system alternatives include the IPS as part of the wet weather storage operation, with the exception of Option 3B – Combination of New Storage Tank and Existing EQ Basins by Gravity. Currently, the maximum capacity of the IPS is 3.82 mgd. Based on the design peak hourly flow rate of 8.11 mgd and maximum design pumping rate of 5.84 mgd for the EPS, the IPS needs to be sized to handle at a minimum 2.27 mgd. Based on the design peak hourly flow rate of 2.27 mgd, the proposed design information of the IPS presented in **Table 5.3-1**.

Table 5.3-1.
Influent Pump Station Design Information

Pump type	Submersible dry pit
Variable/constant speed drive	Constant speed
Pump size	525 gpm
Number of pumps	3+1 Standby

5.3.1 Piping

The challenge of upsizing the IPS is the space constraint. It would be the most cost-effective to place the new pumps at the same location as the existing pumps so that the space around the pumps are not affected; see **Figure 5.3-1 and Figure 5.3-2**. The proposed design pipe velocities and the City's Design Standards pipe velocities are presented in **Table 5.3-2**.

Table 5.3-2.
Piping Velocities

	Pipe Size (in)	Flow rate (gpm)	Proposed Design Velocity (fps)	City's Design Stds Desirable Max Velocity (fps)	City's Design Stds Absolute Max Velocity (fps)
Suction from wet well	12 8	1460 700	3.80 4.12	5	6
Discharge to header	10 6	1460 700	5.58 7.39	7	8
Header	14	2860	5.59	6	7

The following are the proposed changes to fit the new piping within the current footprint of the IPS:

- Suction isolation gate valve: Provide either motorized actuator or manual handwheel in the pump room to eliminate the use of valve stands on the ground floor.
- Pump discharge piping: Use flange filler in lieu of standard reducer.
- Discharge isolation gate valve: Provide chain wheel actuator to install the valve in a vertical position rather than a horizontal position.
- Flow meter: Replace the venturi flowmeter with an electromagnetic flowmeter.

5.3.2 Structural Rehabilitation

The structural condition assessment found the IPS wet well to be in good condition. Only small touch ups of the protective coating and cleaning of the walls are recommended to ensure a continued useful life of this structure.

5.3.3 Ventilation System

Similar to the EPS, the basis of design for the IPS ventilation system would also be 15 AC/h. The IPS has an approximate total volume of 10,825 ft^3 on both levels. At 15 AC/h the capacity of the new exhaust fan will need to be 2,710 cfm at 0.5" static pressure with a ¾ HP motor and a noise level of 9.2 sones.

The new exhaust fan would be located in a similar location as the existing fan on the top floor and ducted down to the lower floor. The discharge duct would be modified to exhaust through the roof. The new duct down to the lower floor will be 24/20 and will require enlargement of the existing floor opening as well as a new roof opening. The existing wall discharge opening will need to be sealed. Additional ductwork will be provided for the lower level for enhanced air circulation. Exhaust air intakes will be located throughout the lower level with the bottom of the intake at 12" above the floor.

Make-up air will be provided by a make-up air fan located on the roof of the IPS. Ductwork will penetrate the roof structure to allow make-up air into the facility. The grated service openings will remain as the means for the make-up air to access the lower level.

5.3.4 Instrumentation

Level Control

The IPS contains only one stilling well to serve both the wet well compartments. The current radar level transmitter will remain in place and be supplemented with a differential pressure transmitter. These instruments will be installed at the current single stilling well. A vent line will be provided for the stilling well. In addition, backup float switches will be installed to serve for the high-high water level.

Gas Monitoring

Previously, a combustible gas detector would be required in each wet well to be in accordance with NFPA 820. The 2016 NFPA no longer requires combustible gas monitors be installed.

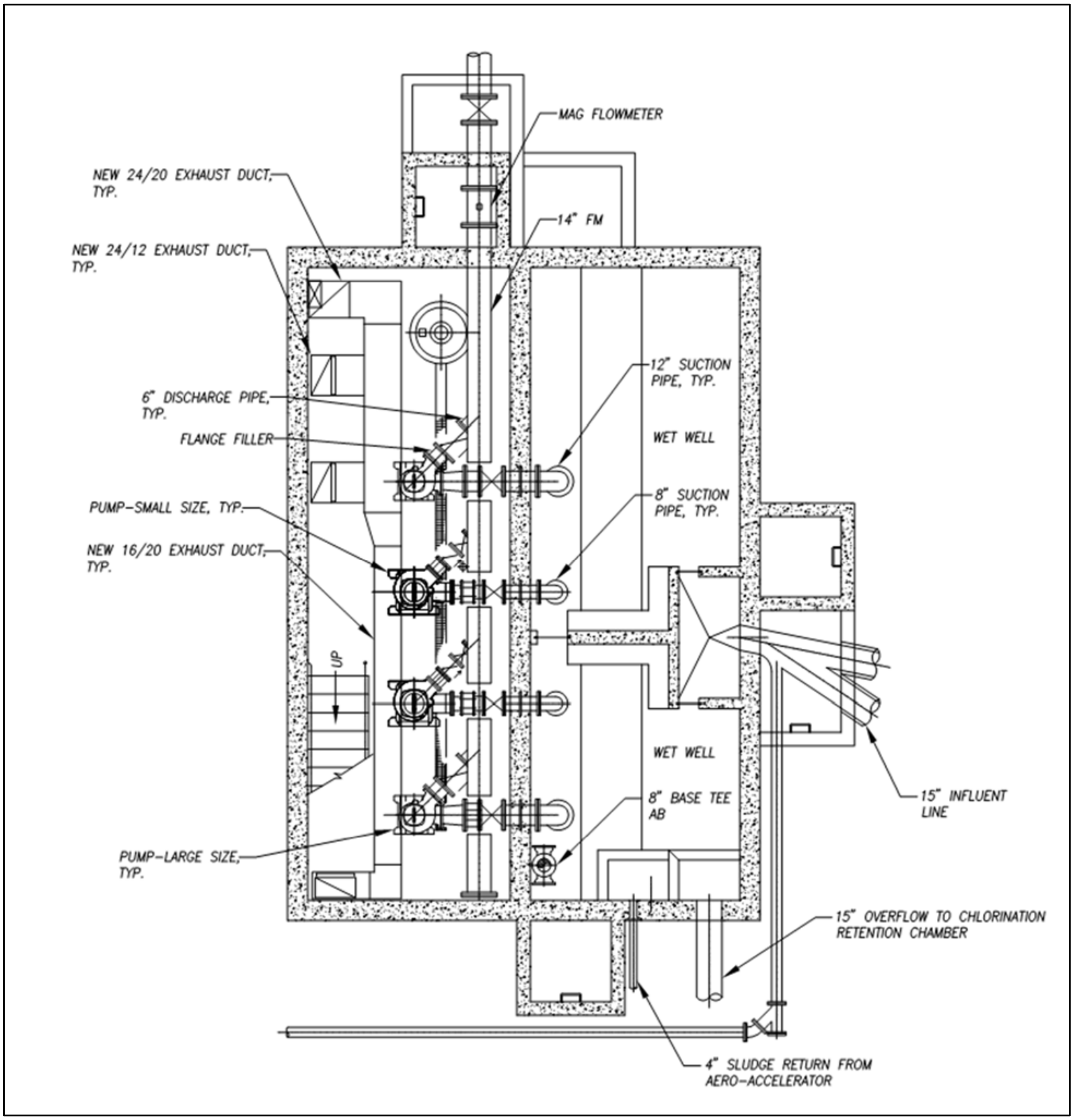

Figure 5.3-1. IPS Proposed Layout – Pump Room Floor

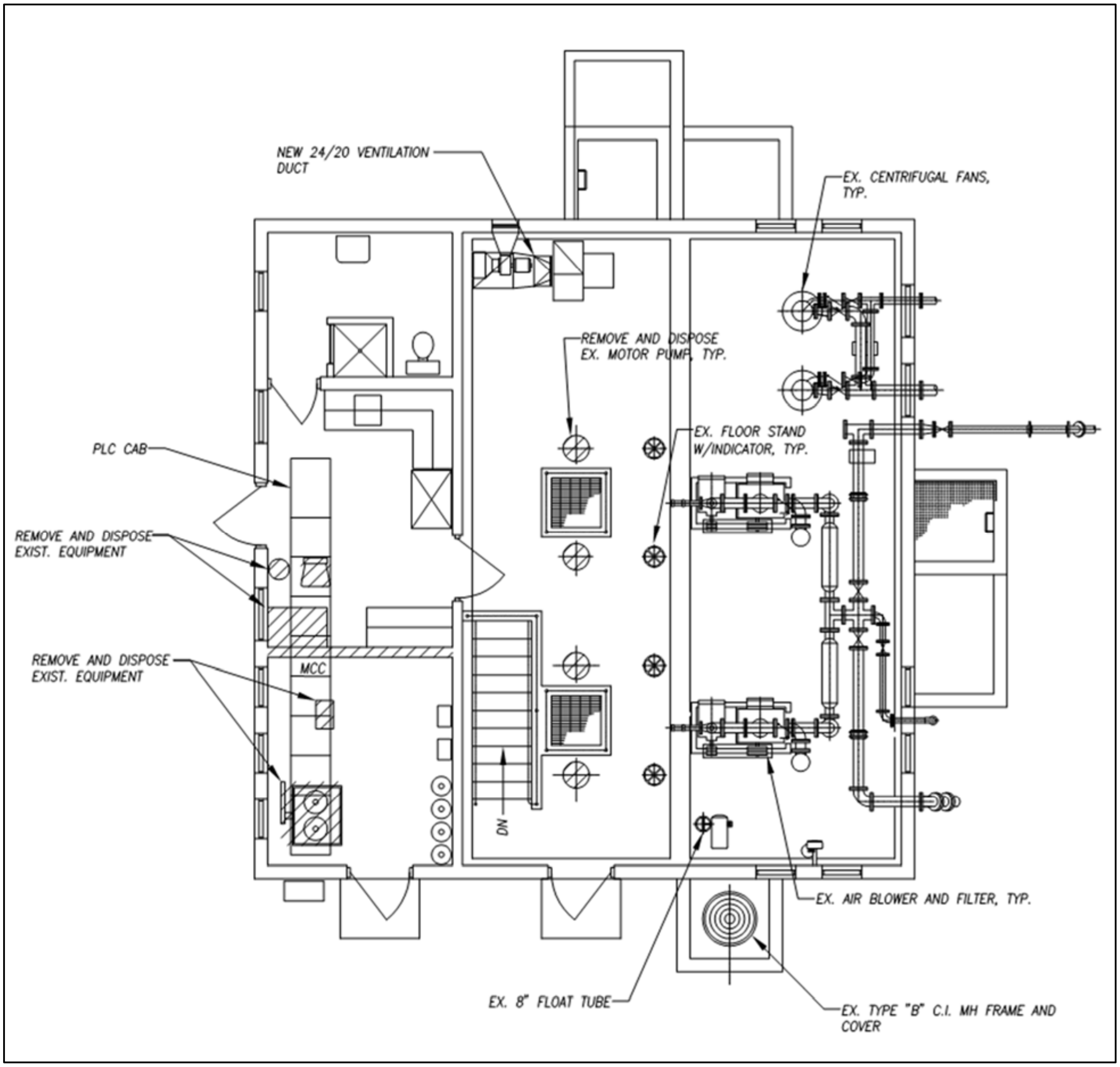

Figure 5.3-2. IPS Proposed Layout – Ground Floor

5.4 Support Systems

5.4.1 Blowers

The existing blowers were originally designed to provide aeration to the existing Rapid Block Tank (RBU), the existing EQ Basin and the existing aerated grit chamber. However, the RBU is not used as a process unit anymore and does not require aeration. If the proposed Headcell grit removal system is used instead of the aerated grit chambers or if the Headworks is completely removed, aeration would not be required at the Headworks either. Therefore, the recommendation is for the proposed aeration system to aerate the existing EQ Basin compartments only. Depending on which storage system alternative is selected, the aeration system should be re-configured to continuously aerate the dry weather compartment of EQ Basin A, to ensure the solids remain in suspension. The wet weather compartments would be aerated intermittently and only when being used.

Currently, the total air requirement for EQ Basin A and B is 440 scfm. The blower size may be adjusted based on the lowest turndown ratio the selected blower can achieve. Energy efficient blowers such as turbo blowers, similar to the blowers installed at Wahiawa WWTP, will be evaluated along with rotary screw compressors to replace the existing blowers. The proposed blower design information is shown in **Table 5.4-1**. The final blower type and size will be determined after the storage system alternative is selected.

Table 5.4-1.
Blower Design Information

No. of Pumps	2+1 standby
Main Pumps	268 scfm @ 8.01 psig

5.4.2 Odor Control System

An odor field assessment was completed between October 8 to October 15, 2014. OdaLogs were installed in three (3) locations in the Headworks and one (1) location in the existing EQ Basins; see **Figure 5.4-1**. A summary of collected data is presented in **Table 5.4-2** below and a complete set of raw OdaLog results are presented in **Appendix C**. During the sampling period, the aerated grit chamber and the EQ Basins were not aerated.

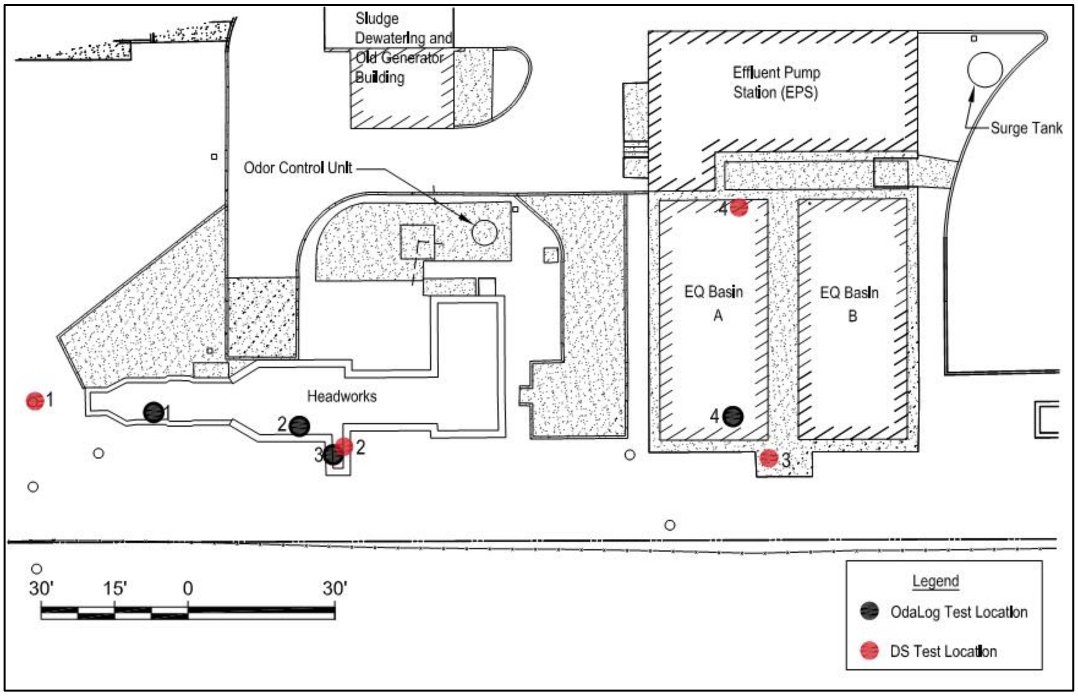

Figure 5.4-1. Odor Testing Locations

Table 5.4-2.
Summary of OdaLog Test Results

Location	Average H_2S (ppm)	Peak H_2S (ppm)	Typical Daily Peak H_2S (ppm)
1. Behind Grinder	11	170	55 to 75
2. Aerated Grit Chamber	8	52	35 to 45
3. Effluent Chamber	23	185	100 to 130
4. EQ Basins	45	195	80 to 120

Results from the odor field assessment show an overall average H_2S concentration at the Headworks of about 15 ppm and an overall peak of about 135 ppm. The EQ Basins demonstrated higher H_2S concentrations, however, this is likely due to the turbulence created by the large drop in elevation where wastewater discharges into the EQ basin. The upgraded facility will provide a re-configured aeration system for the dry weather and wet weather compartments of the existing EQ Basins. With an aeration system the dissolved sulfides are stripped from the incoming wastewater and the H2S gas that is released into the headspace of the EQ Basin may be treated with a new OCS.

Under the current H_2S levels, biological odor treatment would typically be recommended. However, due to the maintenance requirements of biofilters (irrigation) and bio-trickling filters (irrigation and nutrient addition), a carbon system would be preferred at this location. In order for carbon scrubbers to be a viable alternative, the ventilation at each process location will be engineered to reduce the average H_2S concentrations to below 15 ppm. The final sizing of the new OCS is dependent upon the selected storage system alternative.

Preliminary sizing of the new odor control system if the existing EQ Basin remains in place would pull 5,100 cubic feet per minute (cfm) of air from the existing Headworks, existing EQ basins, and wet wells. Of this, 2,600 cfm would be from the wet weather portion of the EQ basins. If a non-biological carbon odor control system is preferred, a 10-foot diameter dual carbon adsorber vessel could convey the pulled air. There is adequate spacing near the Headworks for the proposed vessel and a back-up vessel as seen in **Figure 5.4-6**.

More recently, testing of the liquid dissolved sulfide (DS) was completed on August 15, 2016. Test locations are indicated on **Figure 5.4-1** and test results are presented in **Table 5.4-3**. The aeration system was being used to aerate both EQ Basin A and EQ Basin B at the time of testing. Based on the DS test results, the aeration system is successfully removing all liquid sulfides in the incoming wastewater.

Table 5.4-3.
Dissolved Sulfide Test Results

Location	Concentration (mg/L)	Notes
1. Influent Manhole	1-2	
	2-3	Took a second sample when influent flows appeared to increase; assumed upstream pump station turned on.
2. Headworks Effluent	1-2	
3. EQ Influent	1	
4. EQ Effluent/Wetwell	~ 0	Couldn't sample from wet well due to solids accumulation on water surface.

The existing chemical injection system is designed to feed calcium nitrate into the force main via the existing EQ basins and wet well. The purpose of the system is to both remove DS going into the force main and prevent generation of more DS downstream. Since the aeration system is able to reduce DS going into the force main to almost 0, the nitrate injection is now needed only to prevent re-generation of sulfides in the force main. The chemical injection system has has been accepted and is being operated by the City. An analysis of dissolved sulfide concentrations in the force main is recommended to be completed once the injection system is in full operation.

5.5 Demolition of Unused Facilities

An ESA was performed at the Ahuimanu WWPTF. ACM, LBP and LCP was found throughout the facility. These hazardous materials will need to be removed and properly disposed of prior to beginning any demolition or construction work. Results are presented in the *Draft Asbestos and Lead Paint Survey Report*, Element Environmental, December 2014.

5.6 Power and Instrumentation

5.6.1 Off-Site Electrical Distribution System

The Hawaiian Electric Company (HECo) is responsible for the pad-mounted transformer, primary ductlines and cables and HECo meter. The City only becomes involved if there are changes concerning the service capacity and/or modification/relocation of any of these items.

The project proposes to upgrade/replace three (3) of the EPS wastewater pump motors from 150 HP to 335 HP and replace the fourth EPS wastewater pump motor from 125 HP pump motor to 40 HP. The 40 HP EPS pump motor will be a jockey pump, which will operate during low flow events. It is assumed that the 40 HP pump and two of the three 335 HP wastewater pumps will operate under worst-case conditions.

In addition, proposed modifications to the IPS include replacement of the existing IPS wastewater pumps from one (1) 20 HP, one (1) 15 HP and two (2) 7.5 HP motors to one (1) 20 HP and two (2) 12 HP motors.   It is assumed that under worst case conditions, the 20 HP pumps and two of the 12 HP pumps will operate simultaneously.

If the EPS and IPS pumps simultaneously operate under the worst-case condition, the existing 300 kVA HECo transformer would not have sufficient capacity to support this load. It is estimated that a 1,000 kVA HECO transformer will be required to support the worst-case electrical load.

The existing service entrance conductors also do not have sufficient capacity to support the EPS and IPS pump modifications and new secondary service conductors will need to be provided to the service equipment location.

In addition, to minimize down time during cutover from the existing transformer to the new transformer, recommend that the new transformer is located at a different location from the existing transformer. This approach will allow the existing transformer to remain in operation until the new transformer is installed, tested and energized.

Telephone System

Hawaiian Telcom is responsible for the existing telephone service cable to the WWPTF. The City only becomes involved if changes are required to the type of service required by the WWPTF.

The existing Hawaiian Telcom service to the WWPTF will remain for telephone (voice) service connectivity only.

Spectrum Communications System

Spectrum is responsible for the existing fiber link to the WWPTF. The City only becomes involved if changes are required to the type of service required by the WWPTF.

The existing Spectrum fiber link will continue to be used for remote monitoring and control functions at the WWPTF.

5.6.2 On-Site Electrical Distribution System

Factors which impact the electrical service equipment and MCCs include proposed increases in size and/or sequence of operation of the wastewater pumps; additional or increased loads of process equipment; age of the existing switchboard and MCCs; construction phasing; and the operational importance of the WWPTF.

The switchboard, MCCs, and electrical distribution equipment are close to 30 years old and the Cutler Hammer *MP 200* series switchboard and *Unitrol* series MCC are obsolete. The typical life of electrical equipment is 25 years. Fortunately, the existing switchboard and MCCs have surpassed the typical life and are still operational.

Given the age, condition and available capacity of the existing switchboard and MCCs, the most conservative and recommended course of action is to install a new service entrance switchboard, EPS MCC and Blower Building MCC. The existing service entrance switchboard and EPS MCC do not have sufficient capacity to support the proposed increase in EPS pump capacity, and a new service entrance switchboard and EPS MCC will be required. Given the age and condition of the existing Blower Building MCC, the most conservative and recommended course of action is to install a new. New feeders will be extended from the new service entrance switchboard to the new MCCs and various buildings/facilities at the WWPTF. A new electrical site plan of the facility is shown in **Figure 5.6-1**.

To minimize down time during cut over from the existing equipment to the new equipment, it is preferable that the new switchboard and MCCs are installed different locations from the existing switchboard and MCCs. This approach will allow the existing switchboard and MCCs to remain in operation until the new switchboard and MCCs are installed, tested and accepted.

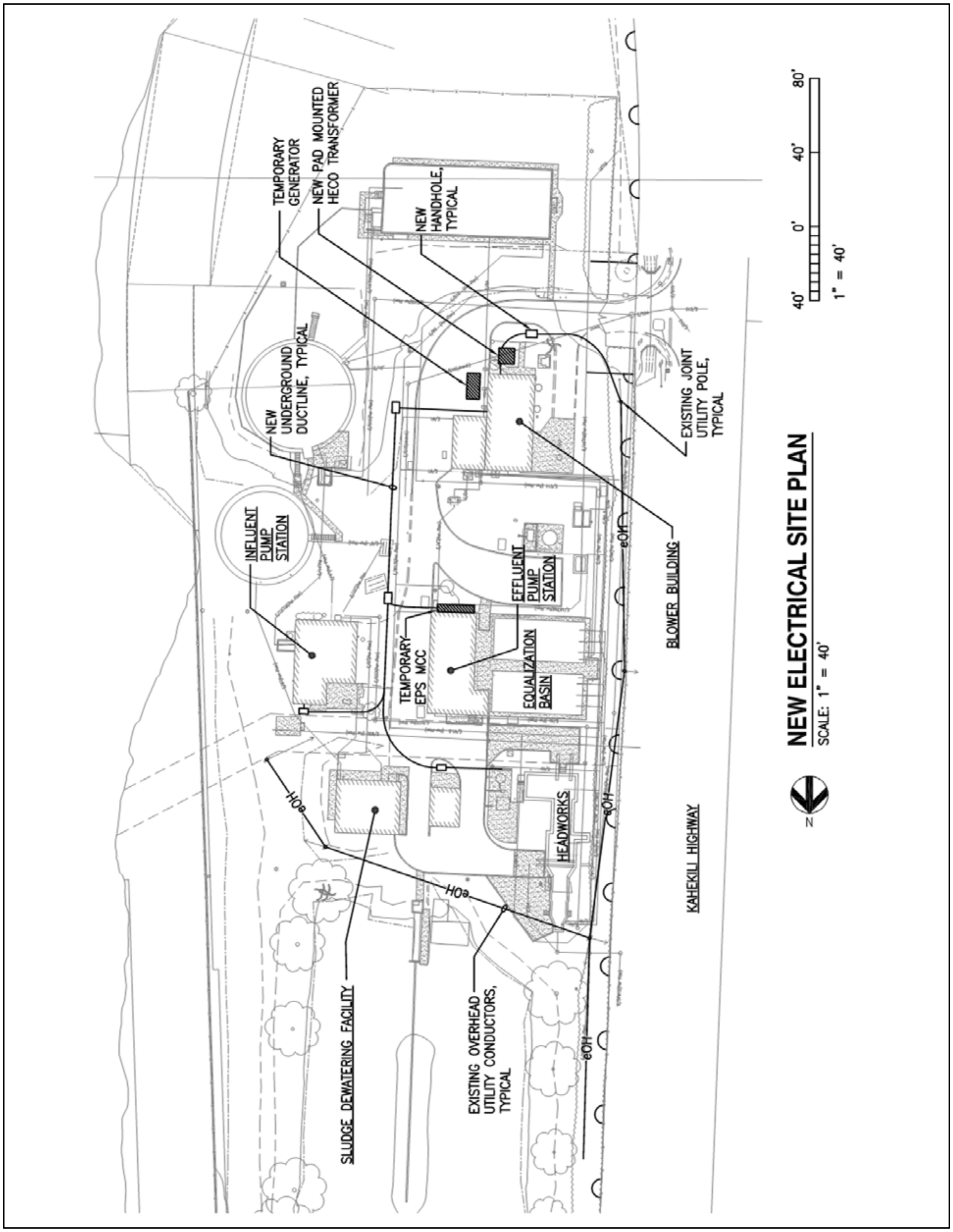

Figure 5.6-1. New Electrical Site Plan.

The 2012 Brown and Caldwell report recommended placement of the new service entrance switchboard and EPS MCC on the Operating Floor of the EPS. However, there is insufficient space within the EPS for the new service entrance equipment and MCC, particularly since the MCC will be upgraded/replaced with an “intelligent” MCC and variable speed drives with reduced voltage bypass starters for the EPS wastewater pumps.

Because two of the three existing blowers are currently inoperable, recommend that the inoperable blowers are removed and the new service entrance switchboard and Blower Building MCC is installed at the Blower Building, in the same general location as the inoperable blowers. This will allow the existing service entrance switchboard to remain in operation until the new switchboard and HECo service is installed and energized, thereby minimizing down time for the facility. Proper phasing during construction and temporary connections to existing/new equipment will be necessary to ensure that possible construction delays or problems will not jeopardize the operation of the WWPTF.

The current floor plan configuration at the Operating Floor of the EPS, does not have sufficient available space for the EPS MCC, even if the new MCC is installed in the same location as the existing EPS MCC. The “intelligent” MCCs and variable speed drives /bypass starters for the wastewater pumps, which are preferred by the City, are expected to have a larger footprint than the existing EPS MCC. Given the lack of available floor space at the EPS, the new MCC will generally be located in the same location as the existing MCC. However, the larger footprint of the new MCC will require removal or modification to the locker/shower room at the EPS. To maintain operation of the EPS during construction, proper phasing, temporary feeders and a temporary MCC will be needed to minimize down time for the facility and to ensure that possible construction delays or problems will not jeopardize the operation of the WWPTF.

The IPS electrical distribution equipment is close to 50 years old and well beyond the typical life of electrical equipment. If the IPS is planned to remain in service for a significant period, recommend replacing the existing IPS distribution equipment with a new “intelligent” MCC to support the IPS equipment loads. The proposed IPS wastewater pumps will operate at constant speed so the IPS MCC will incorporate reduced voltage starters for the new IPS wastewater pumps. Recommend that the new IPS MCC is located in the spaces occupied by the Break Room and Office, adjacent to the IPS Motor Room. This will allow the existing IPS distribution equipment to remain in operation until the new IPS MCC is tested and operational, and will minimize down time during cut over from the existing IPS distribution equipment to the new IPS MCC.

Because the IPS is located within the 100-year flood zone of Ahuimanu Stream, consideration may need to be given to locating the new MCC and other IPS electrical distribution equipment above the flood elevation.

5.6.3 Secondary Electrical System

The City has been fortunate to, generally, not have experienced problems with the secondary electrical distribution system at the WWPTF. Again, the typical life of electrical equipment, wiring systems and devices are assumed to be 25 years. With the relatively clean and protected environment within the interior of the WWPTF buildings, and the infrequent use of many devices, the secondary electrical distribution system has been operational for close to 30 years at the Blower Building and EPS and close to 50 years at the IPS.

If the service life of the secondary electrical distribution system is expected to continue for a significant period, recommend that the City consider replacement of the entire electrical distribution system. This would include all dry-type step down transformers, branch circuit panelboards, raceways, conductors and wiring devices (receptacles, light switches, etc). All new light switches and duplex convenience receptacles should be located to conform to current ADA accessibility guidelines.

5.6.4 Lighting Systems

The exterior wall mounted luminaires provide general illumination of the WWPTF site. The luminaires are showing signs of age and deterioration due to the elements. Recommend that the luminaires be replaced with new luminaires utilizing energy LED lamps. The illumination levels and area of coverage of the new exterior lighting should conform to Illuminating Engineering Society (IES) criteria for security lighting due to the sensitive nature of the facility.

In addition, new pole mounted LED luminaires will be provided to illuminate driveways and other exterior areas that cannot be effectively illuminated by wall mounted luminaires.

In addition, recommend that the emergency lights are tested to determine whether they are operational or in need of repair or replacement.

5.6.5 Emergency Power

Although the existing 635 kW emergency generator appears to be in good condition and startup and load tests on the generator are regularly performed, the generator does not have sufficient capacity to support the additional electrical load associated with the new EPS pumps. A new 1,000 kw generator (1,250 kVA at 0.8 power factor) will be needed.

The new generator is proposed to be located in the same general location within the Blower Building as the existing generator. Therefore, the existing generator will need to be disconnected and removed before the new generator can be installed, tested and accepted. To support continued operation of the WWPTF during construction, recommend that a temporary generator is provided along with temporary feeders and connections to existing/new equipment as necessary to until the new generator is placed in operation.

The existing automatic transfer switch will be removed as it is integral to the existing service entrance switchboard which is recommended to be removed. A new automatic transfer switch with a bypass-isolation feature should be provided. The bypass-isolation switch provides the ability to withdraw the automatic transfer switch for testing and maintenance without interrupting the served load. The new automatic transfer switch can be located adjacent to the new service switchboard, which allows the existing automatic transfer switch to remain in operation until the new automatic transfer switch is connected to the temporary or permanent generator.

In addition, recommend that the electrical distribution system include a provision for connection of a portable generator. The portable generator connection could be used in the event of a failure of the emergency generator set. The connection will consist of a tap box with Cam-Lock type connectors mounted on the exterior of the Blower Building. The feeder circuit breaker for the portable generator will be interlocked with the feeder circuit breaker for the emergency generator to ensure that only one of the generator circuit breakers will be closed at a time.

Under the acoustical design goals stated in **Section 3.4**, noise levels from the emergency generator will need to be reduced by approximately 21 dBA along the mauka property line. Acoustical treatments for the new emergency generator will likely include the addition of 4" thick acoustical wall and ceiling panels, the addition of sound rated doors, the replacement of the existing exhaust silencer, and the replacement of existing louvers with duct silencers located at the revised North ventilation openings. Discharge will be moved to the North facing wall to address current sound level issues. Extension of the building to accommodate the new duct silencers would be built in order to provide adequate clearances around the new generator.

The 1,000 kw generator option will have a ventilation will system with the generator orientation as shown in **Figure 5.6-2**. The radiator discharge will be through the North wall and treated with 10' long sound silencers and lined ductwork. Approximately 84 sq.ft. of silencer bank will be needed for the radiator discharge. This engine may require an additional exhaust fan for remaining heat removal from the room. This exhaust fan will also have 3' long silencers. During design, the generator manufacturer will be asked if there is a larger radiator that can be coupled to this engine, thereby, eliminating the need for the supplemental room exhaust. The engine exhaust piping will be 12" diameter with dual Nelson series 200 residential grade engine silencers installed in series, discharging through the North wall.

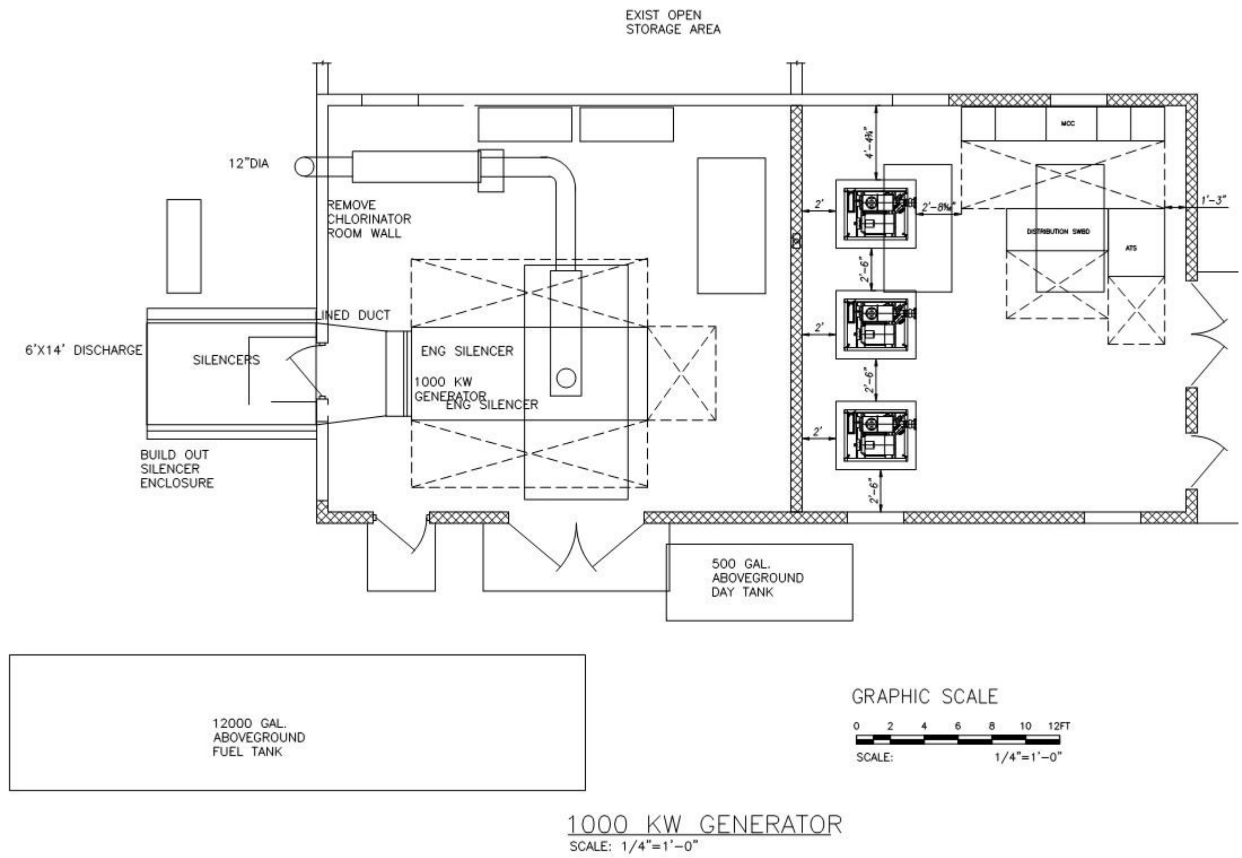

Figure 5.6-2. 1,000 KW Generator Building Floor Plan

As stated in **Section 2.6**, it is recommended that the existing underground fuel tank and piping for the emergency generator be replaced with an aboveground double-walled tank with double walled fuel piping, where applicable. Current industry standards require that the tank have some secondary containment protocol and double-walled fuel piping for pipes located underground. Fortunately, results of the soil sampling around the UST do not indicate any fuel leakage from the tank, so hazmat removal of hydrocarbons is not necessary.

The new AST would need to be installed on a concrete containment area and protected by bollards if located in an area susceptible to traffic damage. The new tank would then feed a new 500-gallon day tank exterior to the generator room.

The size of new fuel storage tank would be approximately 12,000 gallons based on the size of the new emergency generator.

5.6.6 SCADA and Instrumentation

The City's existing SCADA system at the Ahuimanu Wastewater Pretreatment Facility (WWPTF), is comprised of Allen-Bradley/Rockwell PLCs and SCADA hardware, and older relay-based controls that operate much of the facility's process equipment. This existing equipment was installed sometime after the panel as-builts were developed in 2011 and has reached the end of its useful life. Under the proposed improvements the existing control components will be replaced with a new SCADA system design to meet current technological standards and the design standards of the City and County of Honolulu (CCH). The strategies that will be implemented in the design, which take into consideration the City's standards and preferences, include the following:

- New PLC cabinets in the facility: a PLC control panel at the Blower Building and a new PLC remote I/O (RIO) panel at the Effluent Pump Station (EPS)). Due to the distribution of I/O, two panels are proposed, and the estimated distance between the panels suggests interconnection with fiber optic cabling. Both panels will be integrated into the overall facility network ring for reliability.

- An Ethernet based protocol (Ethernet/IP, Profinet, or other) network implemented as the standard for communication within the SCADA system. Ethernet/IP networks are currently used at the City's Wastewater Treatment Plants although remote sites in the collection system use other networks as well (Modbus, Profibus). The decision on which protocol to use at the Ahuimanu facility should be made during final design or left as an option for the construction system integrator to develop based on hardware selection and cost effectiveness while complying with CCH guideline and standards. Network topology details may also change somewhat depending on the selected hardware and protocol.

- Networked RIO ring topology to/from the PLC cabinet for reliability. The ring forms a bidirectional continuous pathway for RIO signals between devices to travel. If any link or device fails in the ring, the RIO signal information can travel in the opposite direction back to the PLC.

- Hardwired I/O for command and control of process equipment per City preferences as documented in the Design Build Electrical and SCADA Improvements for Various Wastewater Pump Stations project (2019-present). Control of the hardwired signals will remain active even in the event of network loss on the communication ring, improving overall control system reliability.

- Networked I/O to new intelligent MCCs and devices for additional diagnostics and monitoring of equipment; these I/O signals will be sent back to the PLC on the network ring.

- Redundancy engineered into the SCADA cabinets to minimize possibility of a single point of failure; redundant components (network switches, power supplies, etc.) and cabling.

- Isolated marshaling panel provided with interposing relays to avoid having 120VAC foreign voltages within the PLC cabinets. Approach will help protect District instrumentation technicians from voltage spikes and accidental contact with the 120VAC "hot" foreign circuits.

- Elimination of "stranded" protocol converters throughout the facility to the greatest extent possible; consolidate protocol conversion into the PLC cabinets to the greatest extent possible. Intelligent equipment will communicate using the "native" protocol integral to the equipment. Communication modules for the various native network protocols will be installed in the SCADA cabinets.

- Communication means for equipment that do not use an Ethernet based protocol provided over the ‘Fieldbus Device Network’ as shown in **Figure 5.6-3** (e.g., the existing chemical feed pumps communicate using a DeviceNet network protocol).

- Control panel fabrication with City standard features that include prefabricated I/O wiring harnesses, hot swappable panel uninterruptible power supplies (UPS), PLC rack resident Historian, panel mounted digital operator display (Rockwell PanelView), and redundant panel component PLC power supplies.

- The PLC programming software formats based on existing CCH standard add on instruction (AOI) modules. If standard AOI instruction sets are not available for a particular process control function, the CCH AOI structure shall be followed for development of new AOI modules as required.

- Historical data access (HDA) with an OPC HDA-certified server. Local storage of site data will be enabled at the PLC to upload stored historical data to SCADA Central in the event that remote communication is lost.

- Operator Interface Terminal (OIT) installed at each PLC Panel for local SCADA access to local processes and CPU status information. The OIT shall have a touchscreen display with configurable applications and graphics, configured to match existing CCH graphic standards.

- Local data uploaded and delivered to remote SCADA Central at Honouliuli and Sand Island WWTP. Ahuimanu presently connects to the CCH wide area network shall be via the Kailua WWTP as shown on the Diagram included in **Figure 5.6-3**. this connection via the Kailua WWTP is expected to remain.

- Refer to the proposed network architecture diagram in **Figure 5.6-3**. The diagram shows the main elements of the key design approaches described

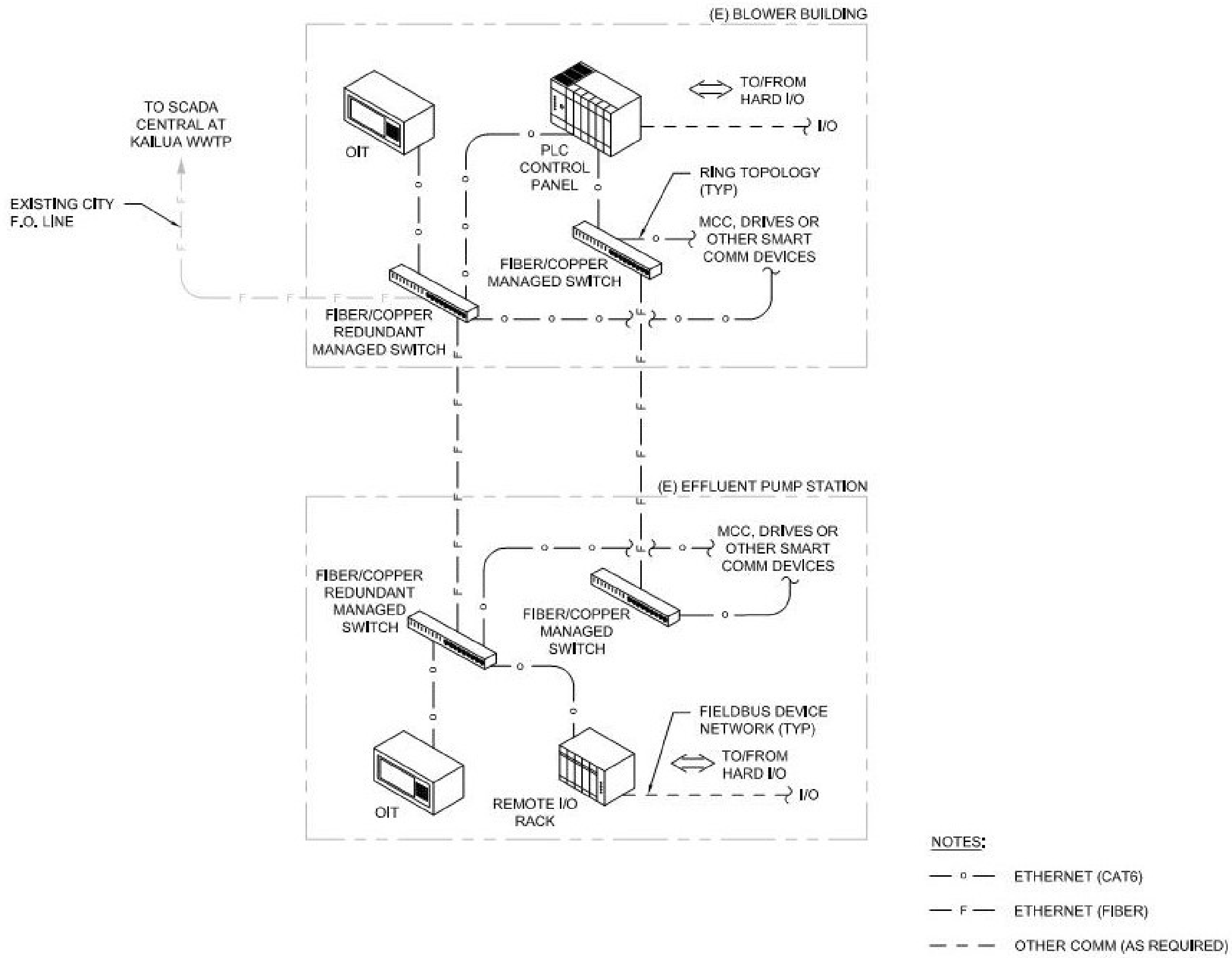

Figure 5.6-3. Network Architecture

5.7 Other Facilities

5.7.1 Septage Receiving Facility Site

A septage receiving manhole will be used to receive septage materials from City tanker trucks and private haulers. The reason for installing a septage receiving manhole and package system at the Ahuimanu WWPTF is to reduce the haul time and distance for haulers currently driving to the Kaneohe WWPTF. Septage is expected to be hauled from Kahuku and other small plants on the Windward side as well as from individual septic tanks systems. In the future, the Ahuimanu WWPTF may also accept private haulers from the Laie area.

In accordance with the Project Charter, the following two options were evaluated:

- Option 1: Installing a septage receiving manhole within the adjacent vacant area on the south end of the parcel, owned by the City, and with a new driveway entrance.
- Option 2: Installing a septage receiving manhole within the existing Ahuimanu WWPTF fenced area using the existing signal controlled driveway.

For both options, fencing is required, to separate the area designated for private haulers from the City's WWPTF area.

Option 1: Adjacent Vacant Area

For Option 1, a septage receiving manhole would be located within the vacant area adjacent to the Ahuimanu WWTPF, and a new driveway entrance would be provided along the Kahekili Highway. The proposed 40-foot driveway is approximately 275 feet south of the existing facility driveway and would be wide enough to accommodate a 69-foot tractor-trailer or 7,000-gallon tanker truck as shown in **Figure 5.7-1**. State Department of Transportation (SDOT) approval is required for this proposed driveway connection since access along the highway in this area is restricted. This process is a lengthy process and the outcome is uncertain. A formal request for access to the highway would be submitted to SDOT after one of the options is selected, to determine if this proposed driveway connection would be allowed.

This vacant site will need to be cleared of trees and thick vegetation and graded, to provide relatively flat grades for the driveway. An asphalt concrete paved waiting area is provided for up to two (2) trucks. The facility will have a 6' chain link fence around the perimeter and gate at the highway connection.

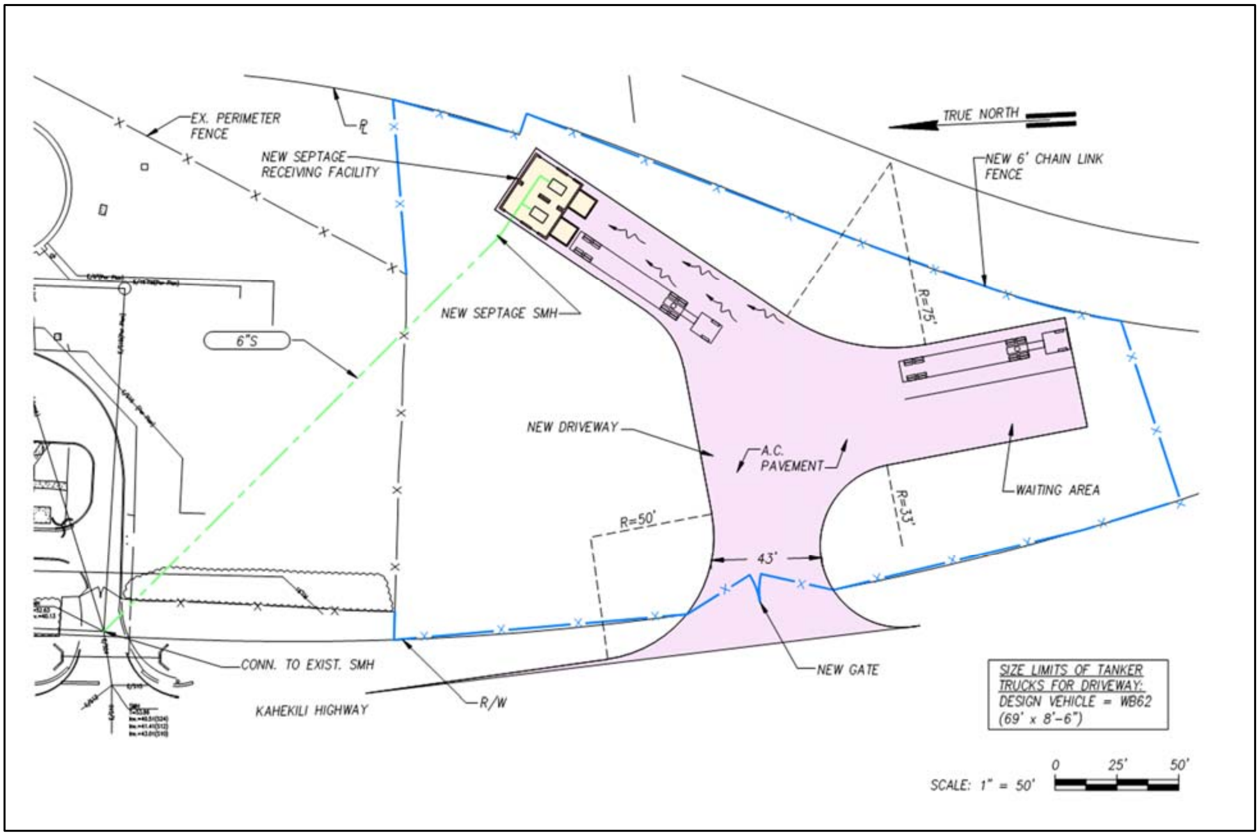

Figure 5.7-1 Septage Receiving Facility (Source: Elemech Inc.)

Option 2: Within Ahuimanu WWPTF

Option 2 is an onsite driveway using the existing driveway from Kahekili Highway and the available area within the existing facility. The existing Rapid Block Unit Tank will be demolished and removed to provide space for the proposed improvements. The site will also need to be graded to provide relatively flat grades for the driveway. A 20-foot wide connection will be made to the existing driveway, as seen in **Figure 5.7-2**. The design vehicle for this layout is a 30-foot long single-unit truck, similar to a 3,000-gallon tanker truck. Larger trucks will not be able to turn into the facility from the highway without widening the existing driveway and expanding into the vacant area. Due to the limited width of the existing driveway, trucks entering or exiting the facility will need to share the driveway. An asphalt concrete paved waiting area for up to three trucks has been provided. The septage receiving facility will be separated from the rest of the WWPTF by a 6' chain link fence and gates.

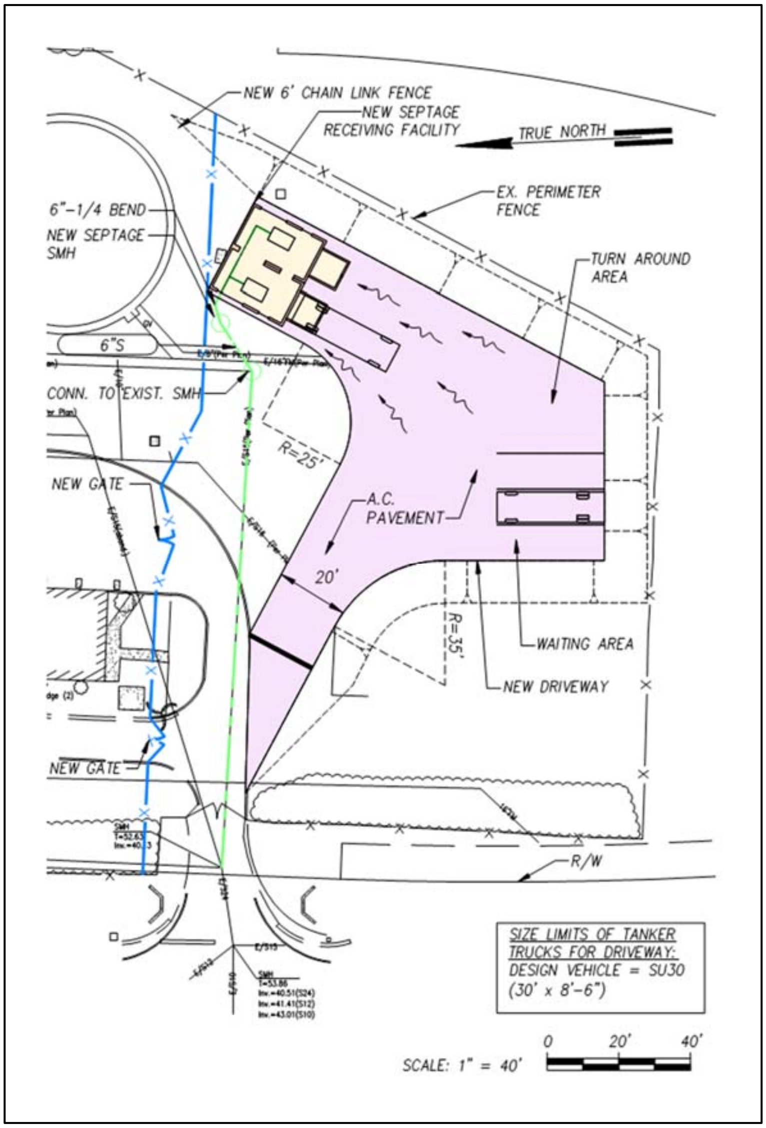

Figure 5.7-2. Septage Receiving Facility Within AWWPTF

5.7.2 Septage Receiving Facility Requirements

Typically, there are three (3) different categories of wastewater that may be handled at the septage handling facility. The three different types of wastewater are described below:

- Type 1: Domestic wastewater
- Type 2: Wastewater consisting of non-petroleum grease and oil (i.e. grease interceptor wastewater or other wastewater containing fats, oils and grease of animal, fish, marine, mammal or vegetable origin)
- Type 3: Specialized wastewater that has gone through pretreatment at a private facility
    - If the wastewater contains machine oils or petroleum hydrocarbons, then the wastewater must be taken to a permitted petroleum recycling facility and cannot be discharged without appropriate and approved pretreatment.

- o Monthly self-monitoring for BOD, BODs, oil and grease, total petroleum hydrocabons, chlorides, TSS and pH is required and must be submitted prior to discharge.

According to the CCH Department of Environmental Services (ENV), only Types 1 and 3 are permitted to be discharge at approved septage disposal sites. Type 2 wastewater must be taken to a permitted recycling facility, which is typically a private treatment facility. Other prohibited discharges include storm water, surface water, groundwater, roof runoff, subsurface drainage, and any other wastewater that does comply with the Revised Ordinances of Honolulu are strictly prohibited.

For septage receiving facilities located at other WWTPs, ENV has mentioned several requirements that they would prefer to have. The assumption is that the septage receiving facility at Ahuimanu WWPTF would follow the same requirements previously mentioned by ENF and as listed below:

- Ability to obtain samples and measure the quantity discharged
- Identify party who discharged
- Ability to reject "bad" load

In addition, the septage handling facility must include the following:

- Security camera and lighting
- Flushing system
- Wash water hookup (re-use water)
- Driveway sloped towards drain
- Two (2) units for redundancy
- Area must be fenced off
- Entrance/exit gate bars
- Roofed work area
- Positive identification system

5.7.2.1 Septage Receiving Facility Components

At each of the site locations of the septage receiving facility and driveway, the package system would include the following components:

- Secure hauler access by PIN or magnetic swipe card
- Quick-connect hookup
- Enclosure with an electrically actuated valve, flow meter, pH sensor and external sampler
- Management software for record keeping, billing, monitoring and reporting
- Sampling frequency can be set as desired
- Flushing system hookup for wash-down of the area.

- Security cameras to allow for remote monitoring of the septage facility.

The packaged septage receiving facilities shall be designed as two complete units to allow for redundancy. However, in order to prevent dual hookups, only one truck will be allowed to discharge at any one time. Collection and storage of samples are done externally; therefore, there is no need for the haulers to discharge into a wet well to “hold” the septage. Instead, the septage may be discharged directly into a new influent sewer line. Due to the location of the new septage facility, the easiest sewer connection is through a 6-inch diameter pipe to the existing sewer manhole (SMH) 133242, which is located at the entrance to the Ahuimanu WWPTF as shown in **Figures 5.7-1 and 5.7-2**.

Photos of the exterior and interior of typical septage receiving facilities are shown in **Figure 5.7-3**. A side view drawing that shows the interior of the facility is shown in **Figure 5.7-4**.

Figure 5.7-3. Exterior Photos of Septage Receiving Facility

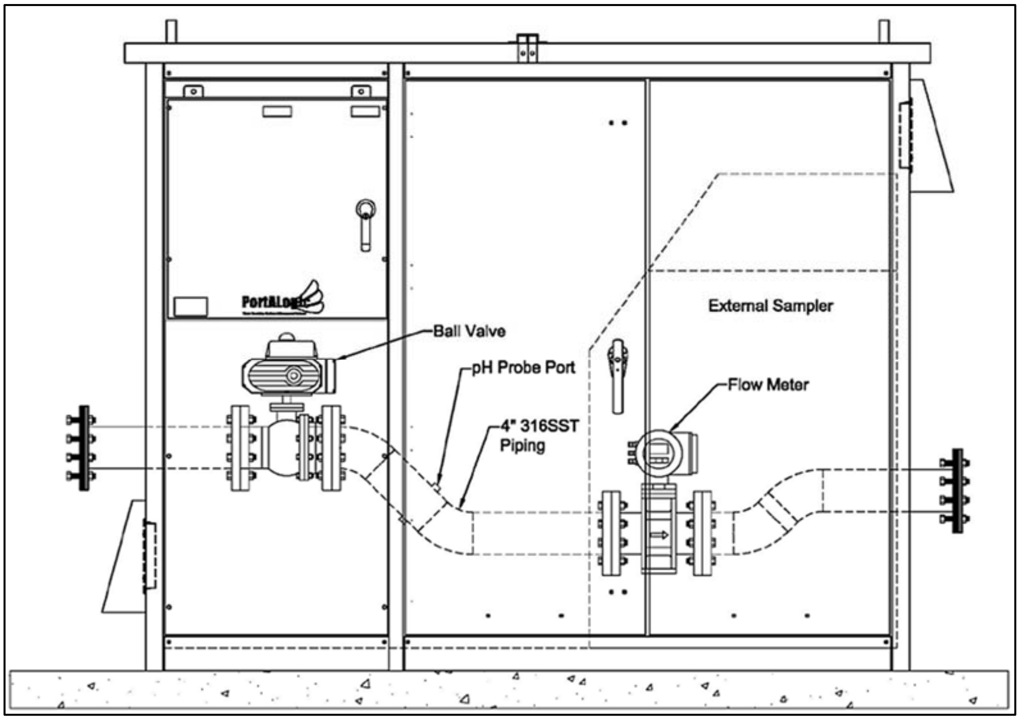

Figure 5.7-4. Septage Receiving Facility Side View (Internal)

5.7.3 CSM Drying Area

The location of a future CSM drying area will be determined once the storage system alternative has been selected and upon receiving the required footprint of the drying area from the City. Space may be available for the drying area at the location shown in **Figure 5.7-5** after the existing structures are demolished, however, which is outside of the flood zone.

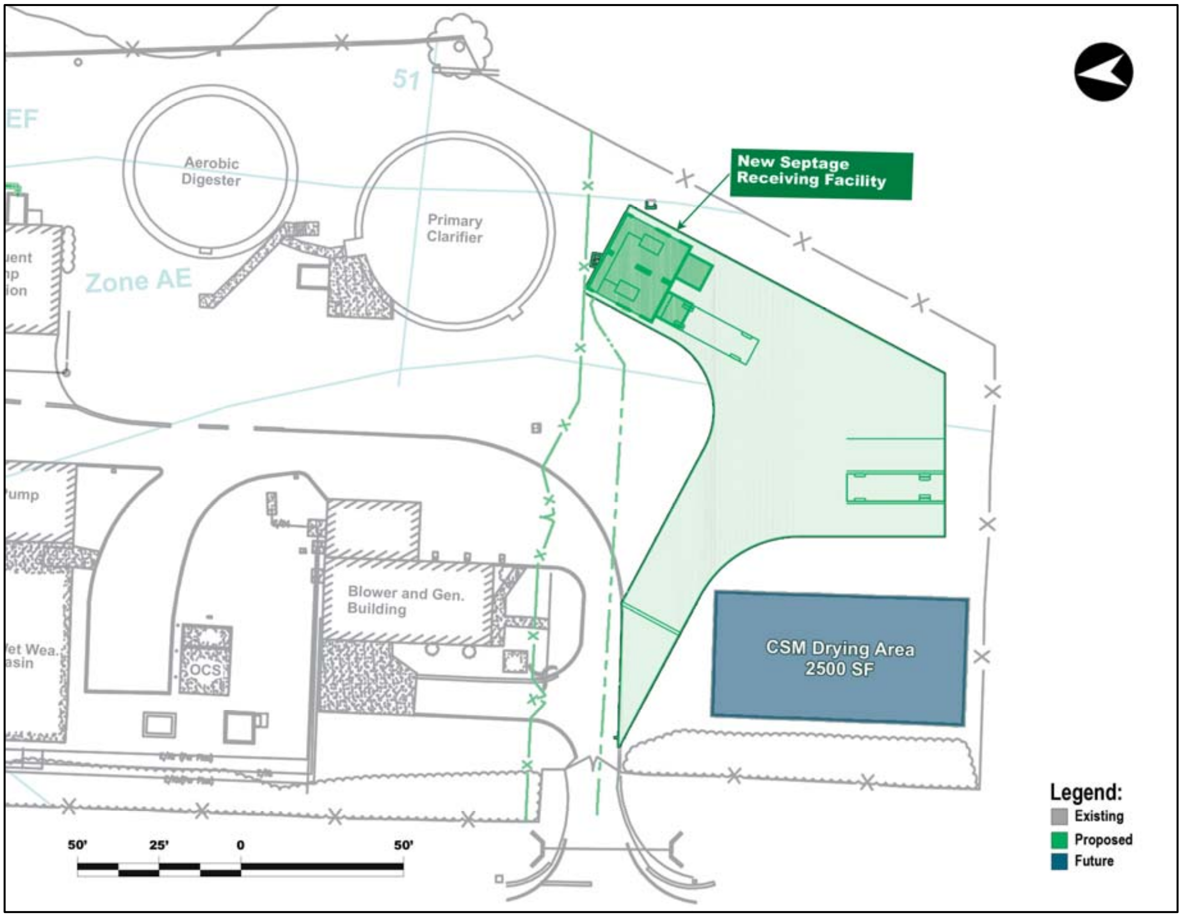

Figure 5.7-5. CSM Drying Bin Location

5.8 Other Facility Improvements

5.8.1 Site Grading and Drainage

The proposed facility improvements will increase the impervious area onsite and the quantity of runoff. A proposed retention basin within the existing basin shown in **Figure 4.3-4**, to provide storage for onsite runoff and stormwater treatment. The existing retention basin will have adequate storage capacity to contain the increase in runoff generated onsite from a 50-year, 1-hour storm event.

The Kahekili Highway roadway swale does not have adequate capacity at two locations along the highway, adjacent to the facility. If the swale invert is not corrected in these areas, the highway runoff will overflow into the facility proposed drainage basin. Although the basin will have adequate capacity to accommodate the additional runoff from the highway, it is recommended that the swale be excavated to provide the required capacity. The proposed retention basin will also provide the storage required to comply with the city's stormwater quality standards.

5.8.2 Landscaping

The landscape concept is to maintain the visual screen and to reduce the landscape maintenance within the facility.

- The Palm grove along Kahekili Highway is to be removed and Hibiscus trees are to be reinstated along Kahekili Highway. The existing palm grove is approximately 20 ft wide. The Hibiscus planting can reduce the planting width to 16 ft. and Hibiscus trees planted in a triangle pattern at 6 ft between each plant.
- The Hibiscus "Waterfall" or "Butterfly Pink" plants are still available at nurseries and are usually sold as hedge plants so are usually in 3-gallon containers. In order to secure larger plant material, a nursery will have to Contract grow the plant in larger containers of 5 gallon or 7-gallon.
- Ground cover under the Hibiscus trees will be mulch over weed barrier.
- The backside of the facility along the drainage canal may need some screening trees to control the views back into the facility from the adjacent neighboring homes. Trees to be added as required and kept to a minimum.
- The Albizia trees along the edge of the property should be cut down to avoid any future trees falling on or near the neighboring properties.
- Depending on which WWPTF improvement options are selected, the interior grassy area can be replaced with gravel placed over weed barrier to minimize lawn mowing and overall maintenance.

The general public complaint of the Wastewater Pre-treatment Facility are the noise and odor. The landscape palms screening the facility will help mitigate some of the noise and odor issues by being out of sight out of mind sense.

Section 6 – Preliminary Engineering Cost Estimates

Preliminary engineering cost estimate for the construction of the proposed upgrades at the Ahuimanu WWPTF are presented in **Table 6.1-1** based on different storage system alternatives. Detailed cost breakdown of each storage system alternative and other upgrades are included in **Appendix G**.

Table 6.1-1.
Cost Estimate Breakdowns for All Storage System Options

Storage System Alternative		Effluent Pump Station Upgrades	Generator/ Blower Room Upgrades	Septage Receiving Facility	Headworks	Total
1[1,2,3]	$20.0M			$1.2M		$43.1M
2[2,4,5]	$34.2M					$57.0M
2[2,4,5,6] (Pond)	$34.0M					$56.8M
3A[2,3,7]	$30.7M	$8.7M	$5.4M	$0.9M	$7.8M	$53.5M
3A[2,3,6,7] (Pond)	$30.4M					$53.2M
3B[3,7]	$35.3M					$58.1M
3B[3,6,7] (Pond)	$35.0M					$57.8M

1 Option includes rehabilitation of aerobic digester, primary clarifier, rapid block tank, and yard piping.
2 Option includes upgrades at IPS.
3 Option includes new aeration in existing EQ basin.
4 Option includes new storage tank and dry-weather junction box.
5 Option includes demolition of existing EQ basin.
6 Option includes new drainage basin.
7 Option includes new storage tank and modifications to existing EQ basin.

Section 7 – Implementation

7.1 Permits and Approvals

This section will discuss the various permits and regulatory requirements that applies to the Ahuimanu WWPTF. Additionally, this section will identify the agency or organization that is responsible for granting the permit or approval, the conditions or trigger, and the relevance to the project. The following permits that are applicable to this project includes:

1. Federal Permits
    a. Section 404 permit (Not Required)
2. State Permits
    a. HRS Chapter 343 Compliance
    b. Air Pollution Control Permit
    c. Noise Permit
    d. National Pollutant Discharge Elimination System (NPDES)
    e. Disability and Communication Access Board Plan Review
    f. State Historic Preservation District Review
3. City and County of Honolulu Permits
    a. Flood Hazard Variance
    b. Building Permit

These permits will be discussed in the following sections.

7.1.1 Federal Permits

The Army Corps of Engineers (ACOE) under the Clean Water Act Section 404 regulatory program requires a permit for dredged or fill material into waters of the United States, including wetlands. Under this program, wetlands are identified and delineated based on evidence of hydrophytic vegetation, hydric soils and wetland hydrology (all three must be present) in order for a jurisdictional wetland determination. Ahuimanu WWPTF effluent holding pond has been not been identified as a wetland and does not fall under the jurisdiction of the ACOE.

7.1.2 State Permits

HRS Chapter 343 Compliance

The main objective of the State of Hawaii Department of Health, Office of Environmental Quality Control is implementing Chapter 343 HRS (Environmental Impact Statement Law). It is anticipated that this project will not cause any significant impact, therefore the recommended action is to complete an Environmental Assessment in place of the Environmental Impact Statement to satisfy compliance.

Air Pollution Control Permit

The State of Hawaii Department of Health, Air Quality Branch regulates air emissions under Hawaii Administrative Rules (HAR) 11-60, Hawaii Revised Statutes (HRS) 342B and Federal Regulations Title 40. A non-covered source permit must be acquired prior to starting construction of an emission unit or air pollution control equipment of any non-covered source such as an odor control system.

Noise Permit

The State of Hawaii Department of Health, Indoor & Radiological Health regulates the noise permits and variances under HAR 11-46 and HAR 19-342F. The Ahuimanu WWPTF is located within a Class C "Country" zoning district. For Class C zoning, the maximum permissible sound level is 70 dBA at or beyond the property fence line, 24 hours a day. The surrounding background noise levels are within the range of 40 to 50 dBA, which means that sound levels near 70 dBA would likely cause complaints from neighboring residences. Therefore, the design goal is set the sound level to 45 to 50 dBA at the closest residences, while 70 dBA would be tolerable from the emergency generator at the mauka property line.

NDPES Permit

The CCH Department of Health, Clean Water Branch requires a NDPES Permit under HAR Chapter 11-55 when a project disturbs one (1) or more acres of land. Examples of land disturbances includes, but not limited to, clearing, grading, grubbing, uprooting of vegetation, demolition (with or without touching the foundation or slab), staging, stockpiling, baseyards, storage areas, paving activities that disturb base course, and all areas used or blocked off to operate construction equipment or vehicles.

State Historic Preservation District Review

The State of Hawaii has a Historic Preservation District (SHPD) under HRS Chapter 6E examines projects with soil excavation to determine the impact on potential historical sites. To mitigate adverse impacts in the immediate vicinity and historical properties, it is recommended that the construction shall proceed under an archaeological monitoring program using archaeological inventory survey (AIS) protocols. This monitoring program will facilitate the identification of any additional historical properties that may be discovered during construction.

Disability and Communication Access Board Plan Review

The State of Hawaii Department of Health, Disability and Communication Access Board (DCAB) reviews and provides recommendations on State and County plans to ensure designs and constructions are accessible to persons with disabilities.

7.1.3 City and County of Honolulu Permits

Flood Hazard Variance

The City and County of Honolulu assists the Federal Emergency Management Agency (FEMA) with regulating construction from special flood hazards, which is regulated by the Revised Ordinances of Honolulu (ROH) Chapter 21A. Items include elevating ground levels and flood proofing buildings. Approximately half of the Ahuimanu WWPTF site is located in flood Zone

AEF or AE, which is within the 100-year flood zone of the Ahuimanu Stream. Any proposed structure that is located within the floodway will have to be designed to be a minimum of one foot higher than the base flood elevations and determined to not have any adverse impact on the existing cross sectional flow area.

Building Permit

The City and County of Honolulu Department of Planning and Permitting requires that all work that involves the construction of any new buildings, structures, electrical or plumbing type work obtain a building permit. Reviews are to ensure that the design meets the latest adopted building codes, ordinances, and industry standards.

7.2 Schedule

The construction schedule for this project are as follows:

- The Ahuimanu WWPTF must maintain capacity of 600,000 gallons of wastewater storage until the KK Tunnel has completed an initial 2-year operational period. The KK Tunnel is expected begin its operations on July 1, 2018.
- The construction and upgrades to the Ahuimanu WWPTF is projected to take 3 years with construction expected to begin in the Summer of 2023.

Section 8 – Summary and Recommendations

This section summarizes the options and improvements discussed throughout the report for the Ahuimanu WWPTF and recommends which storage system and the facility improvements to perform.

8.1 Storage System

This report discussed options which would increase the storage capacity of Ahuimanu WWPTF. The following three (3) storage system alternatives were evaluated as part of this study:

- Option 1 – Rehabilitate and re-use all existing storage tanks and EQ Basins.
- Option 2 – Construct a new tank for all storage and demolish all other tanks.
- Option 3A (Pumping) – Construct a new tank fed via pump and re-use EQ Basins.
- Option 3B (Gravity) – Construct a new tank fed via gravity and re-use EQ Basins.

A full comparison of these options can be observed in **Section 4.5**.

The recommended option is Option 1 due to its high ranks in terms of cost and constructability. Also, Option 1 is preferred since the City has plans to construct a new backup force main in the future which would eliminate the need for a new Equalization Basin for spill contingency.

Option 1 has the lowest construction cost and least constructability difficulty, it would be the most difficult option to operate however, require the most maintenance with the use of several existing storage tanks, and provide the least amount of wet weather storage. The existing storage tanks would also not be able to drain fully without continuing to use a portable submersible pump for the cone sections. Option 1 does not provide space for an onsite Septage Receiving Facility or drying bins, which the other options do.

8.2 Facility Improvements

Facility improvements were presented in **Section 5**, which would better prevent impacts on the Ahuimanu WWPTF and force main, and ease issues brought up by the public.

8.2.1 Headworks

This section will discuss the proposed upgrades to the existing Headworks.

8.2.1.1 Screening System

In **Section 5.1.1,** new screening systems were proposed to replace the existing system. The screening conveyors currently installed have corroded and triggered noise complaints from nearby residences. The new systems would be able to treat the projected peak wet weather flows while the current system is unable to. Additionally, the footprint and dimensions of the proposed screening systems would not affect the headworks to the point where structural modifications would be required.

The proposed screening systems would be able to remove screenings from the wastewater running throughout the WWPTF with a reduced noise pollution, it should be noted that the existing system has not been operating properly for the last 5-10 years. . It is for these reasons that the recommended action would be to upgrade the existing screening system.

8.2.1.2 Grit Removal System

In **Section 5.1.2,** a new grit removal system was proposed to replace the existing aerated grit chamber. The proposed system would mitigate settling grit in the EQ Basin and in the force main should the EPS operate at variable speed and lower velocities in the force main. .

The new system would require significant structural modifications to the existing headworks costing nearly one-million dollars ($1,000,000). The grit sampling results have demonstrated that the grit concentration is relatively low, plus the existing aerated grit chambers has not been operating properly for the past 5-10 years, but the facility has a history of of grit build-up at the AWPTF. The only portion of the sewer system noticing grit issues is the siphon along Kamehameha Highway, which won't be used after the Haiku Road Bypass Sewer is completed. However because the continued grit issues at the plant, the recommended action would be to demolish the existing conveyors and grit chamber and replace them.

8.2.2 Effluent Pump Station

Improvements to the existing Effluent Pump Station (EPS) are recommended.

In **Section 5.2,** alternatives for the EPS are discussed to either be equipped with new constant speed pumps or variable frequency drive (VFD) pumps. The current pumps in the EPS are recommended to be replaced with three new variable speed pumps, two plus one standby and a jockey pump. These new pumps would be able to handle the projected future peak wet weather flow conditions with 160,000 gallons of storage.

The system improvements would also include structural rehabilitation, and replacement of the existing surge protection, noise control, ventilation, and level control system.

8.2.3 Influent Pump Station

Improvements to the existing Influent Pump Station (IPS) are recommended.

As discussed in **Section 5.3**, if the IPS is needed for wet weather storage operation, it should be upgraded to accommodate the projected peak wet weather flow being stored. Because Option 1 is recommended, the IPS will be needed and therefore it is a recommended facility improvement. Four new constant speed pumps are recommended to replace the existing pumps at the IPS.

The system improvements would also include structural rehabilitation, and replacement of the existing piping, ventilation, level control, and gas monitoring system.

8.2.4 Generator and Blower Room

Improvements to the existing Generator and Blower Room are recommended.

Because Option 1, IPS, and EPS improvements are recommended, necessary improvements to the Generator and Blower Room must also be implemented. A new 1,000KW generator and electrical/control system is recommended to replace the existing units. Because the existing aerated grit chamber at the Headworks is recommended to be replaced, new smaller and energy efficient blowers are recommended to replace the existing blowers. These blowers would aerate the existing EQ Basin A and B..

8.2.5 Septage Receiving Facility

An onsite Septage Receiving Facility is recommended to be constructed in the future.

As discussed in **Section 5.7**, a Septage Receiving Facility would greatly reduce haul time and travel distance for City and private haulers coming from the Windward side. Because the proposed option is Option 1, there will be enough space to construct an onsite Septage Receiving Facility in the future after the storage tanks are demolished and a backup force main is constructed. The design vehicle for this layout is a 30-foot long single-unit truck, similar to a 3,000-gallon tanker truck. Larger trucks will not be able to turn into the facility from the highway without widening the existing driveway and expanding into the vacant area.

8.2.6 Miscellaneous Additional Improvements

As indicated in the Final Submittal Workshop on October 16, 2020, additional improvements were mentioned by the CITY to be included in the as part of this project. These improvements include the following items:

- Automatic gate and security cameras at the WWPTF entrance driveway.
- ACAMS security system and card readers on all facility entrance doors.
- Video cameras within the work areas.
- Demolish the existing Laboratory extension.
- Enclose the Old Chlorine Storage area with screens to store a forklift and pipe materials.
- Spare jockey pump.
- New office space to replace the existing office that will be demolished in the existing Generator Building.
- New restroom to replace the existing restroom that will be demolished in the EPS.
- Demolish the existing Dewatered Sludge Building.

- Re-landscape the frontage of the WWPTF to include trees that require less maintenance.

8.3 Recommendation Summary

The recommended storage option for Ahuimanu WWPTF is Option 1, which utilizes the existing EQ Basins and storage tanks to store up to 800,000 gallon of wastewater during a wet weather event or a pump station/force main shutdown. With the additional storage capacity, the Ahuimanu WWPTF would be able to continue to provide a retention time of 25.3 hours based on a 0.76 mgd average daily flow. This option is recommended because it ranks highly in most of the conditions and criteria discussed in **Section 8.2** and because a future backup force main is being planned.

Additionally, the recommended facility improvements for Ahuimanu WWPTF to support Option 1 are to improve the EPS, IPS, Generator and Blower Room. Upgrading the Headworks is recommended because the existing equipment has not been operational for 5-10 years and to alleviate any impacts on the downstream equipment and force main. Construction of a new onsite Septage Receiving Facility is recommended in a future phase to allow private haulers a more convenient location to discharge.

A cost breakdown of the recommended option and improvements is presented in **Table 8.3.1**.

Table 8.3-1.
Cost Estimate Breakdown for Recommended Storage Option and Improvements

Description	Costs ($ in Millions)
Site Work	$2.50M
Headworks	$4.27M
Option 1 – Storage Alternative	$8.51M
EPS Improvements	$4.74M
Aux Bldg. Improvements	$2.94M
Direct Costs (Subtotal)	$22.96M
Mobilization	$1.38M
OH, Profit, Bond, Insurance, Tax	$6.69M
Total Costs	$31.04M
Design Contingency (35%)	$10.86M
Total Budgetary Estimate	$41.90M

The new site plan of the recommended option and improvements is shown in **Figure 8.3-1**.

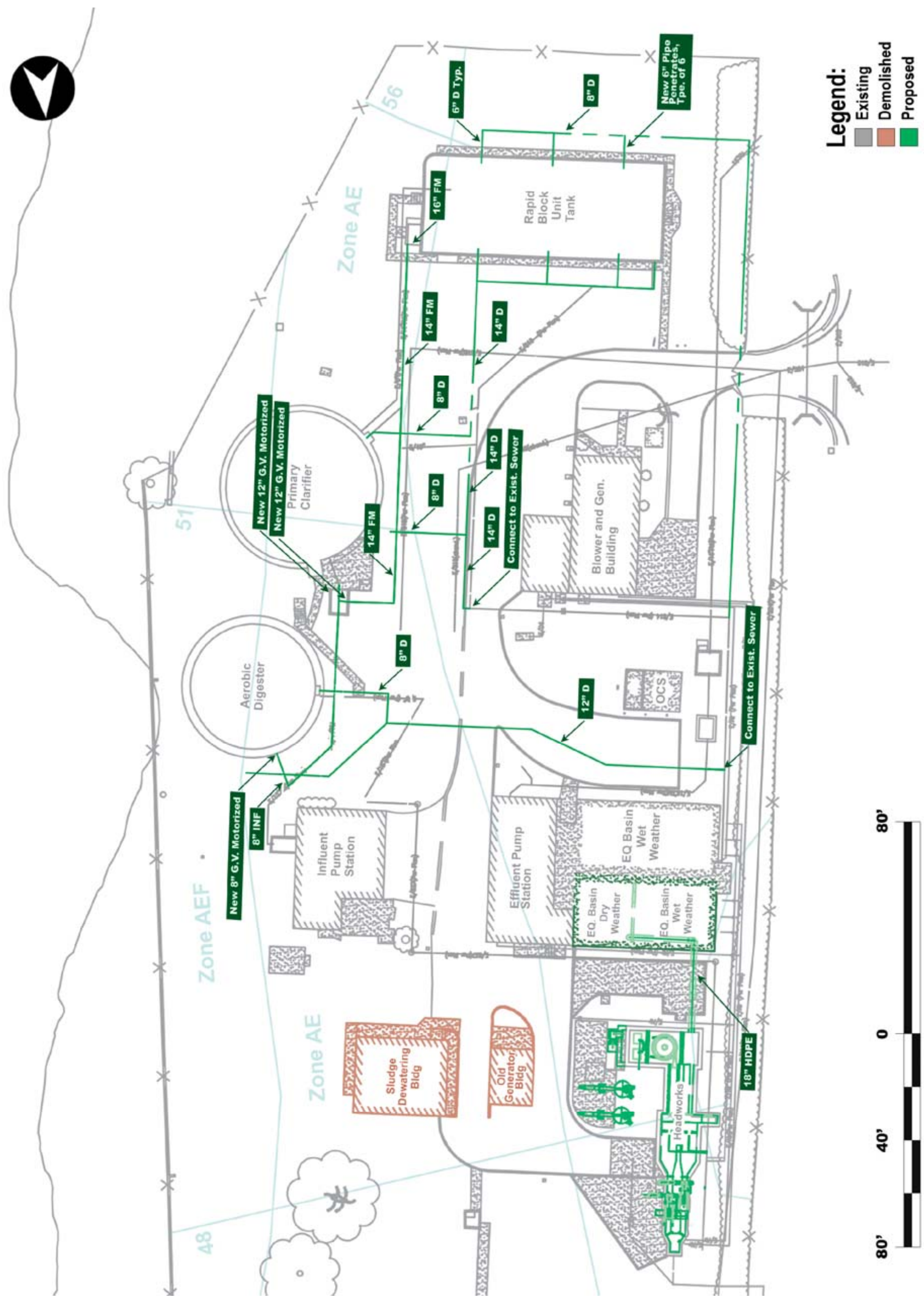

Figure 8.3-1. Option 1 with Improvements Site Plan

Section 9 – References

- *Ahuimanu Wastewater Pre-treatment Facility Force Main - Haiku Road Bypass Sewer, Job No. W2-16. RM Towill Corporation, June 2019.*
- *Ahuimanu Sewage Pump Station As-Built Plans*, *Job No. W4-81*. RM Towill Corporation, May 1987.
- *Ahuimanu Sewage Treatment Plant As-Built Plans*. Austin, Smith & Associates, Inc., April 1964.
- *Ahuimanu Sewage Treatment Plant Expansion – Phase 1 As-Built Plans*. Austin, Smith & Associates, Inc., August 1972.
- *Ahuimanu Wastewater Pre-Treatment Facility Revised Condition Assessment Report, Force Main Condition Assessment*. RM Towill Corporation, October 2011.
- *Ahuimanu WWTPF Improvements and Equalization Facility Project Charter*. City and County of Honolulu, August 2013.
- *Draft Ahuimanu Wastewater Pretreatment Facility Electrical I&C Condition Assessment Summary*. Brown and Caldwell, July 2012.
- *Final Engineering Design Report, Ahuimanu Sewage Pump Station and Force Main*. RM Towill Corporation, May 1981.
- *Final Peak Flow Cost-Effective Analysis Report*. AECOM, December 2012.
- *Final Spill Contingency Plan for Ahuimanu Force Main*. Fukunaga & Associates, Inc., December 2012.
- *Island-Wide Assessment of Wastewater Pump Stations, Ahuimanu Pre-Treatment Facility, Final Report*. URS, July 2011.

APPENDIX A

Acoustical Analysis and Basis of Design

Y. Ebisu & Associates
Acoustical and Electronic Engineers

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Honolulu, Hawaii 96816
Ph. (808) 735-1634 – Fax (808) 732-0409
e-mail: ebisuyassoc@aol.com

YEA Job #52.023
September 26, 2014

R.M. Towill Corporation
2024 North King Street, Suite #200
Honolulu, Hawaii 96819

Attention: Mr. Kyle Yukumoto, P.E.

Subject: Results of Sound Level Measurments and Acoustical Basis of Design; Ahuimanu Wastewater Preliminary Treatment Facility (WWPTF)

Dear Mr. Yukumoto:

We performed sound level measurements at the Ahuimanu WWPTF on September 23, 2014, which were focused on determining the sound levels of the Emergency Generator, Effluent Pump Station, and Headworks equipment. The results of the A-Weighted sound levels with equipment ON and OFF are shown in Figure 1. The noise levels of the three sources were measured with the other two sources in OFF mode. In Figure 1, the measured sound levels during the OFF condition were obtained with all three groups of equipment secured, and were controlled by traffic on Kahekili Highway and roosters. The background ambient noise levels along the east (makai) property line were too high to obtain accurate measurements of the Effluent Pump Station or Headworks equipment. Estimates of their sound levels were made based on calculations which extrapolated their sound levels to the more distant locations from the sound levels measured at the closer distances.

<u>Acoustical Basis of Design</u>. The Ahuimanu WWPTF is on lands zoned as "Country", which allows for sound levels of 70 dBA at or beyond the facility's property lines, 24 hours a day. Because the residual, steady, daytime and nighttime background noise levels are well below 70 dBA, and probably in the 40 to 50 dBA range, emissions from the facility at or slightly below 70 dBA would probably cause complaints from neighboring residences. Therefore, the acoustical design goal for this project was to not exceed existing noise levels from operating equipment if they are between 45 to 50 dBA at the closest residences, and to not exceed 70 dBA from the emergency generator at the west (or mauka) property line and to not exceed existing generator noise levels at the east (or makai) property line.

Using these design goals, generator noise levels will need to be reduced by approximately 21 dBA along the west (mauka) property line. Effluent Pump Station noise levels should be reduced by approximately 8 dBA toward the west and by approximately 2 dBA toward the east; and Headworks noise levels should be reduced by approximately 10 dBA toward the west and approximately 7 dBA toward the east.

Acoustical Treatment Recommendations.

A. Headworks. The existing Headworks' horizontal screw conveyor was the dominant noise source, with an estimated noise level of 55 dBA at the east (makai) property line. Its noise levels increased with operating time (5 dBA in 10 minutes), and the WWPTF operator indicated that adding water (a lubricant) to the conveyor would reduce its noise level. The Grinder and Auger motors were quiet, and less than 45 dBA at the closest residences. Because the horizontal screw conveyor will be replaced, the replacement unit should be specified to have a noise level which is similar to the existing Auger unit, and not more than 50 dBA at 50 feet.

B. Effluent Pump Station. Because the existing motors and pumps are planned to be replaced with drywell pump/motor units located at the -3 Level, it is recommended that they be specified to not exceed 85 dBA at 3 feet from each assembly. The current pumps which are located at the -3 Level were measured at approximately 101 dBA space averaged noise level with Pumps #1 and #2 operating. With new 85 dBA pump/motor assemblies, plus the addition of 12" x 12" acoustical ceiling tiles (Armstrong #741) on the ceiling of the -3 Level, the acoustical design goal for the Effluent Pump Station should be achievable.

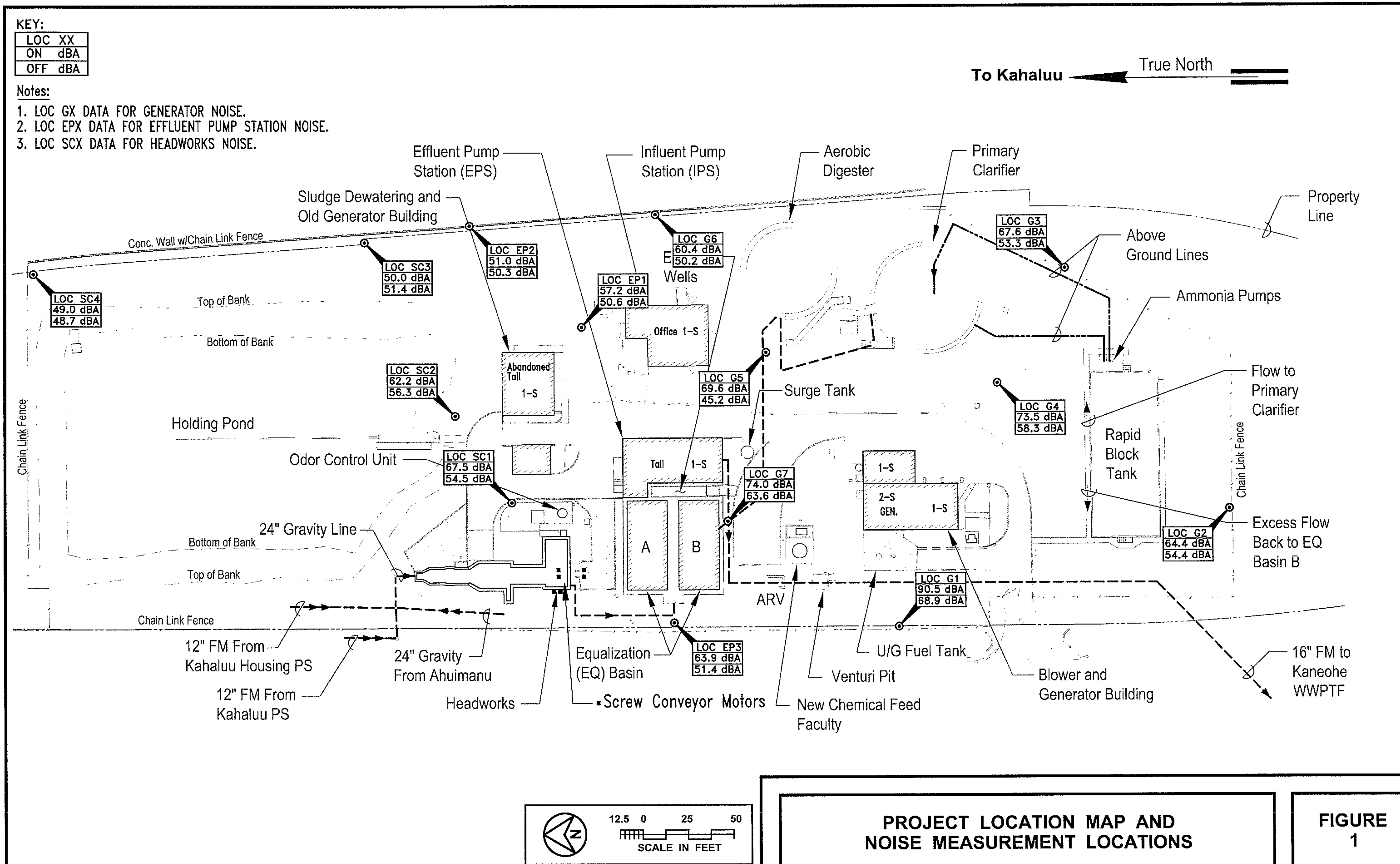
C. Emergency Generator. The Emergency Generator is planned to be replaced with a smaller unit. Following selection of the new Emergency Generator, acoustical treatments to the Generator Room and Booster Pump/Switchgear Rooms will be required to achieve compliance with the 70 dBA noise limit at the west (mauka) property line. These acoustical treatments will probably include the addition of 4" thick, acoustical wall and ceiling panels, the addition of sound rated doors, the replacement of the existing exhaust silencer, and the replacement of the existing louvers with duct silencers located at the existing ventilation openings.

Let me know if you have any questions regarding these findings and recommendations.

Sincerely,

Yoichi Ebisu, P.E.

encl.



PROJECT LOCATION MAP AND NOISE MEASUREMENT LOCATIONS

FIGURE 1

APPENDIX B

Structural Evaluation Report

NTW ASSOCIATES, INC.
STRUCTURAL CONSULTING ENGINEERS

STRUCTURAL EVALUATION REPORT

FOR

AHUIMANU WASTEWATER PUMP TREATMENT FACILITY

Kahaluu, Oahu, Hawaii

EXPIRATION 04/30/2016

THIS PROJECT WAS PREPARED BY ME OR
UNDER MY SUPERVISION

Ntw Associates, Inc
1542 Young Street, Suite 300
Honolulu, Hawaii 96826
Phone (808) 942-8880

December 24, 2014

AHUIMANU WASTEWATER TREATMENT PLANT FACILITY

SECTION 1 – GENERAL PROJECT DESCRIPTION

SECTION 2 – PRIMARY CLARIFIER

SECTION 3 – AEROBIC DIGESTER TANK

SECTION 4 – RAPID BLOCK UNIT

SECTION 5 – EQUALIZATION BASIN AND WETWELL

SECTION 6 – EFFLUENT PUMP STATION

SECTION 7 – WETWELL AT INFLUENT PUMP STATION

SECTION 8 – ELECTRICAL ROOM

Section 1 – General Project Description

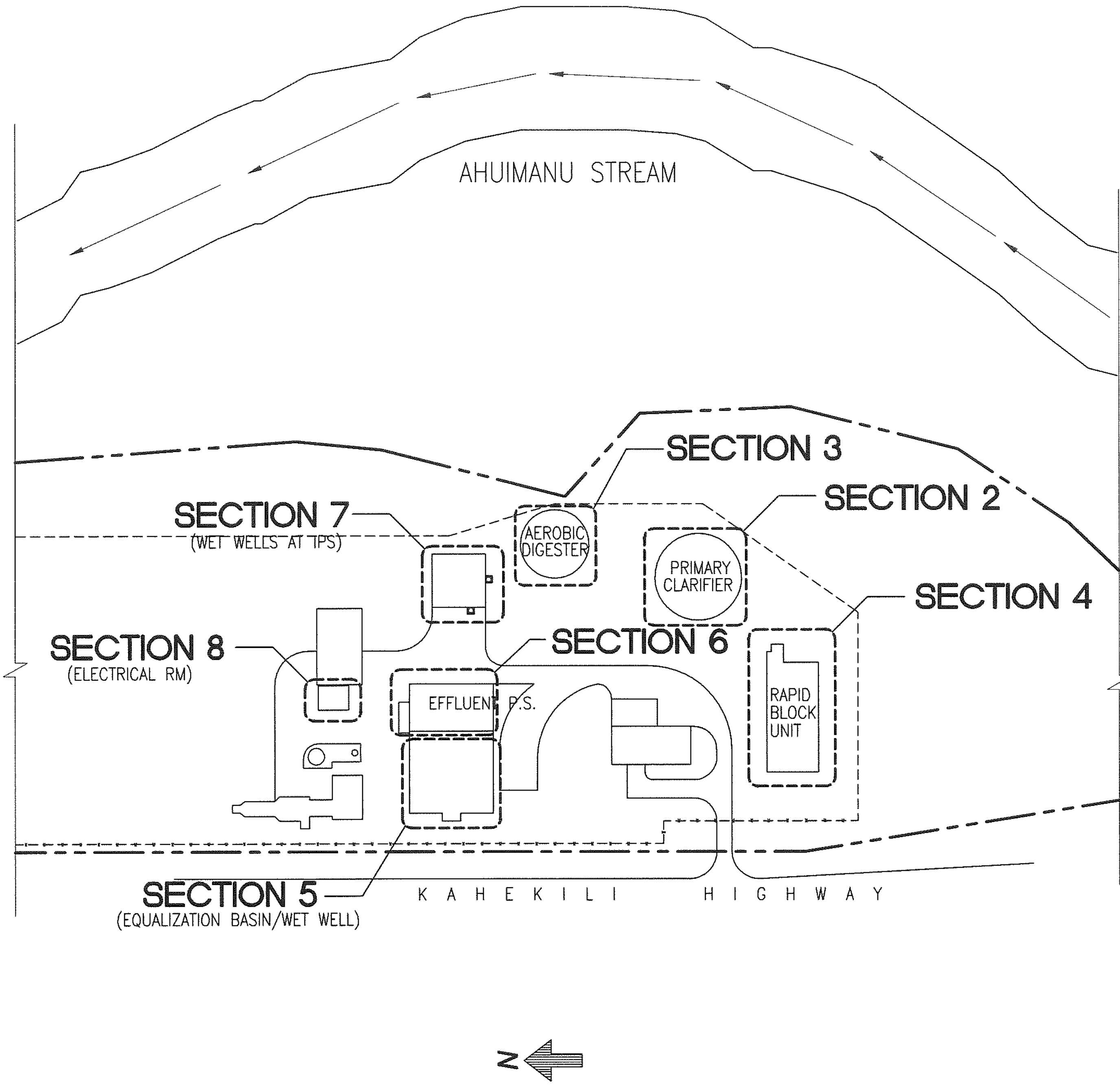
1.1 Description of Project site

Located at 47-305 Kahekili Highway the construction of Ahuimanu Wastewater Pre-Treatment Facility (AWWPTF) could be traced as back in 1963. Since then the facility had been undergoing numerous renovation and expansion. Situated between the Kahikili Highway on the West Side and the Ahuimanu Stream on the East Side the facility mainly served to store sewage from the Ahuimanu and Kahalu'u area. See SK-1.1. Most of structures were constructed of concrete with foundations bearing on compacted granular fill or base course.

1.2 Scope of Work

As part of the improvement plan for AWWPTF the structural engineer performed the following tasks in this project:

1. Performed site observation and investigation of numerous facility structures including Primary Clarifier, Aerobic Digester Tank, Rapid Block Unit, Equalization Basin, Effluent Pump Station, Wetwell at influent pump station, and Elecrical Room. Due to a certain retrains during the field observation the previously planned concrete coring and tests were not conducted.
2. Evaluated the structural strength of each element in terms of resisting the original design loads.
3. Provided recommendations for refurbish the existing structures with budgetary cost.
4. Prepared an evaluation report.
5. Assisted the Civil/Mechanical engineers in the structural aspects.



AHUIMANU WWPTF IMPROVEMENTS	GENERAL SITE PLAN	SK-1.1

Section 2 – Primary Clarifier (P C)

2.1 Description of structure

The existing P C is a concrete circular tank with an inside diameter of 55 feet and a wall height of 9'-2-1/2" measured from the wall base to the top of launder channel. A 12" thick slab is constructed on the bottom of the tank with 2" thick grout topping. The bottom slab serves as a mat footing bears on compacted granular fill. The interior surfaces of the walls and slab were protected by elastomeric coating. +

2.2 Existing conditions as observed

1. The entire tank structure appeared severely deteriorated. Defects were observed and described in the following.
2. Vertical cracks due to thermal expansion and contraction were observed on the exterior walls surfaces. However, the cracks were not an indication of foundation movement.
3. Horizontal cracks were observed on the soffit surfaces of the launder overhang slab.
4. Most of the interior protective coating was gone. The topping on the bottom slab appeared gone.
5. Random hairline cracks were observed on the entire interior walls.
6. Weeds and vegetation grow on the bottom slab near the center of the tank.
7. Coating on the launder walls and slab were gone. Vegetation grows in the launder.
8. Hollow sounds were detected on the bottom slab and the wall surfaces.

2.3 Evaluation, recommendations, and estimated cost to refurbish.

1. The existing PC structure is severely deteriorated. Due to the fact that the protective coating had been damaged and cracks developed, we suspect that some reinforcing bars in the walls and the slab may have been corroded. The concrete surfaces would be corroded. Learning from previous experience in repairing other structures with similar condition suggests that more concrete defects and damages would likely be observed after the cleaning out of all the coating and loose concrete on the surface. We estimate that the structural capacity at the current condition would be below 70% of the original design.
2. If the existing PC structure is required to be refurbished and repaired to match the original design level a certain measures would be required. We recommend the following:
   A. Clean up and remove existing protective coating and other debris.
   B. Remove corroded concrete surface to sound concrete.
   C. Repair cracks, spalls, and other damaged concrete surfaces.
   D. Remove corroded reinforcing bars. Insert new reinforcing bars as needed.
   E. Pour new topping over the bottom slab.

F. Apply new protective coating.

See photos 2.1 through 2.4 and Sketches SK-2.1 through SK-2.3 after this section.

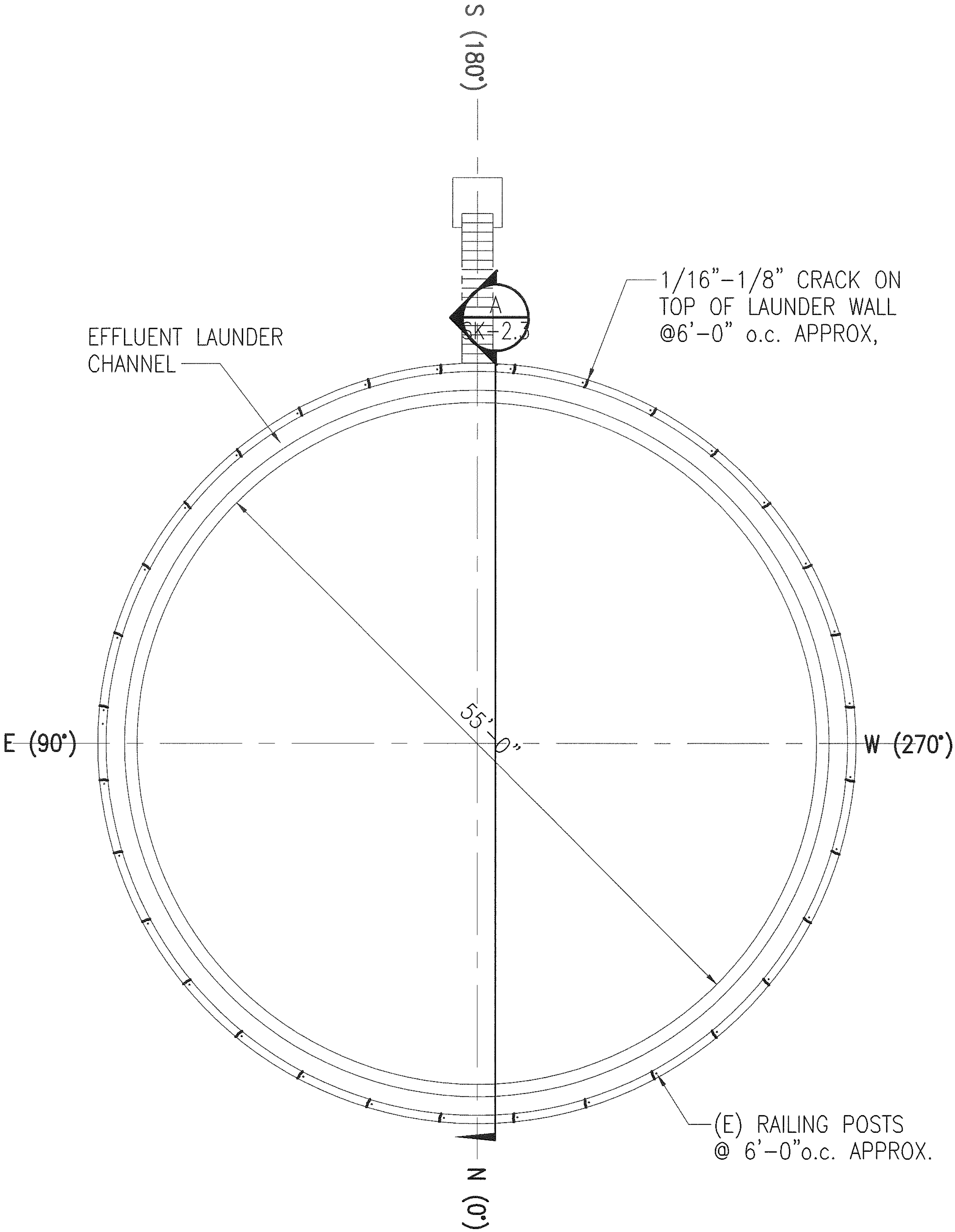
3. Estimate cost for structural refurbishing cost: $520,000.00

PHOTO 2.1 – OVERVIEW OF PRIMARY CLARIFIER

PHOTO 2.2 – EXTERIOR CRACKS

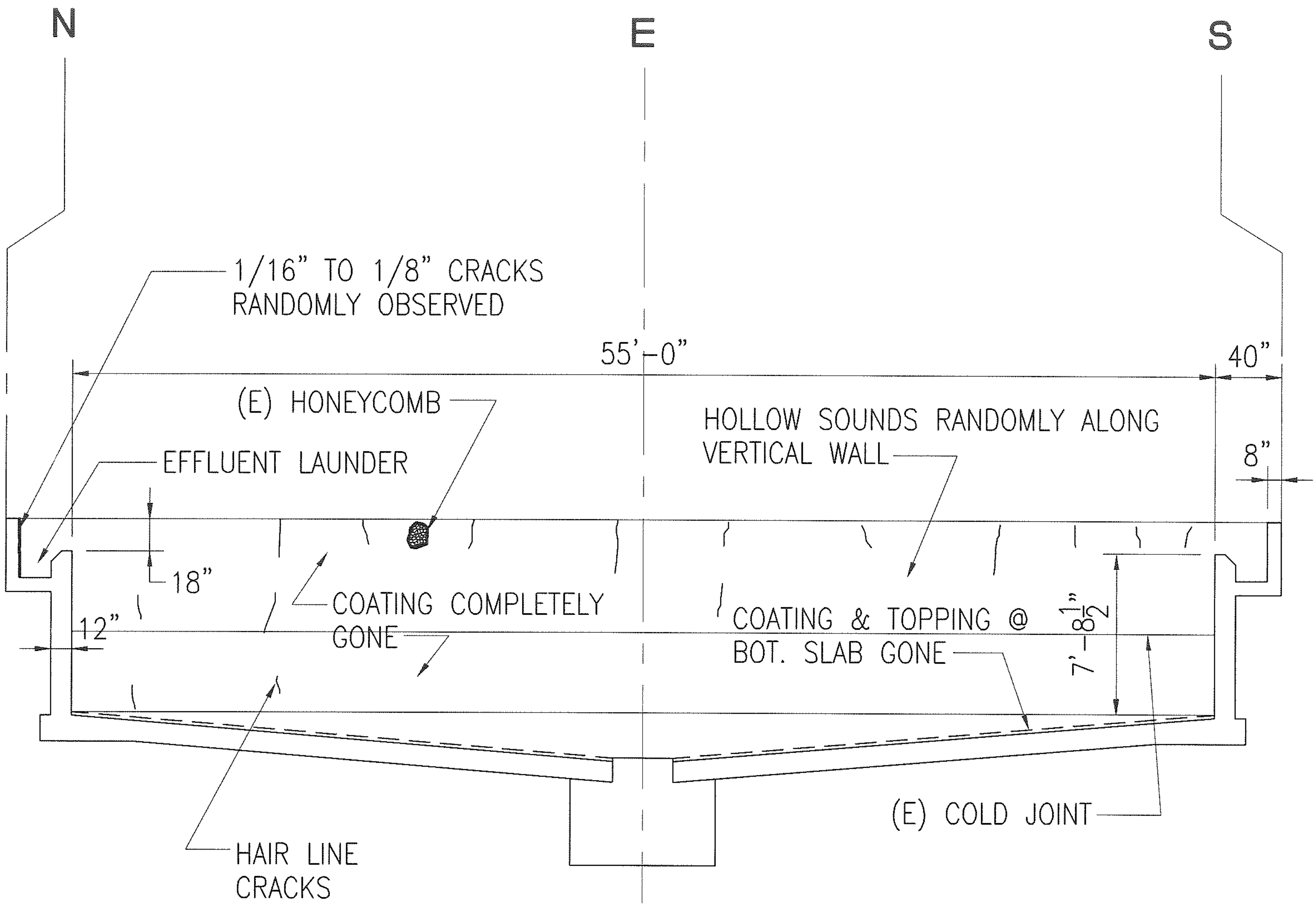
PHOTO 2.3 – EFFLUENT LAUNDER

PHOTO 2.4 – WEEDS GROWING ON INTERIOR SLAB



SCALE: 3/32"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	PRIMARY CLARIFIER TOP PLAN	SK-2.1



A
SK-2.3

TYPICAL CROSS SECTION

SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	PRIMARY CLARIFIER CROSS SECTION	SK-2.3

Section 3 – Aerobic Digester Tank (DT)

2.1 Description of structure

The existing DT is a concrete circular tank with an inside diameter of 45 feet and a wall height of 19'-0" measured from the wall base to the top of launder channel. A 12" thick slab is constructed on the bottom of the tank serving as a mat footing, which bears on compacted granular fill. A launder channel is constructed on top of the tank. The interior surfaces of the walls were protected by elastomeric coating. +

2.2 Existing conditions as observed

1. The entire tank structure appeared in fair condition. Defects were observed and described in the following.
2. Vertical cracks due to thermal expansion and contraction were observed on the exterior walls surfaces.. However, the cracks were not an indication of foundation movement.
3. Horizontal cracks were observed on the soffit surfaces of the launder overhang slab.
4. Most of the interior protective coating was gone. There was no grout topping over the bottom slab.
5. Random hairline cracks were observed on the entire interior walls. There were several cracks on top of the wall that are between 3/16" and ¼" wide.
6. Weeds and vegetation grow on the bottom slab near the center of the tank.
7. Coating on the launder walls and slab were gone or peeling. Vegetation grows in the launder.
8. Hollow sounds were detected on the bottom slab and the wall surfaces.
9. Horizontal cracks were observed on the bottom slab, particularly near the wall base.

2.3 Evaluation, recommendations, and estimated cost to refurbish.

1. The existing DT structure is undergoing a certain degree of deterioration or damages. . Due to the fact that the protective coating had been damaged and cracks developed, we suspect that some reinforcing bars in the walls and the slab may have been corroded. The concrete surfaces would be corroded. Learning from previous experience in repairing other structures with similar condition suggests that more concrete defects and damages would likely be observed after the cleaning out of all the coating and loose concrete on the surface.
   We estimate that the structural capacity at the current condition would be below 85% of the original design.
2. If the existing DT structure needs to be refurbished and repaired to match the original design level a certain measures would be required. We recommend the following:
   A. Clean up and remove existing protective coating and other debris.

B. Remove corroded concrete surface to sound concrete.
C. Repair cracks, spalls, and other damaged concrete surfaces.
D. Remove corroded reinforcing bars. Insert new reinforcing bars as needed.
E. Pour new topping over the bottom slab.
F. Apply new protective coating.
G. See photos 3.1 through 3.6 and sketches SK-3.1through SK-3.3 for more information.

3. Estimate cost for structural refurbishing cost: $450,000.00

PHOTO 3.1 - INTERIOR VIEW OF WALL

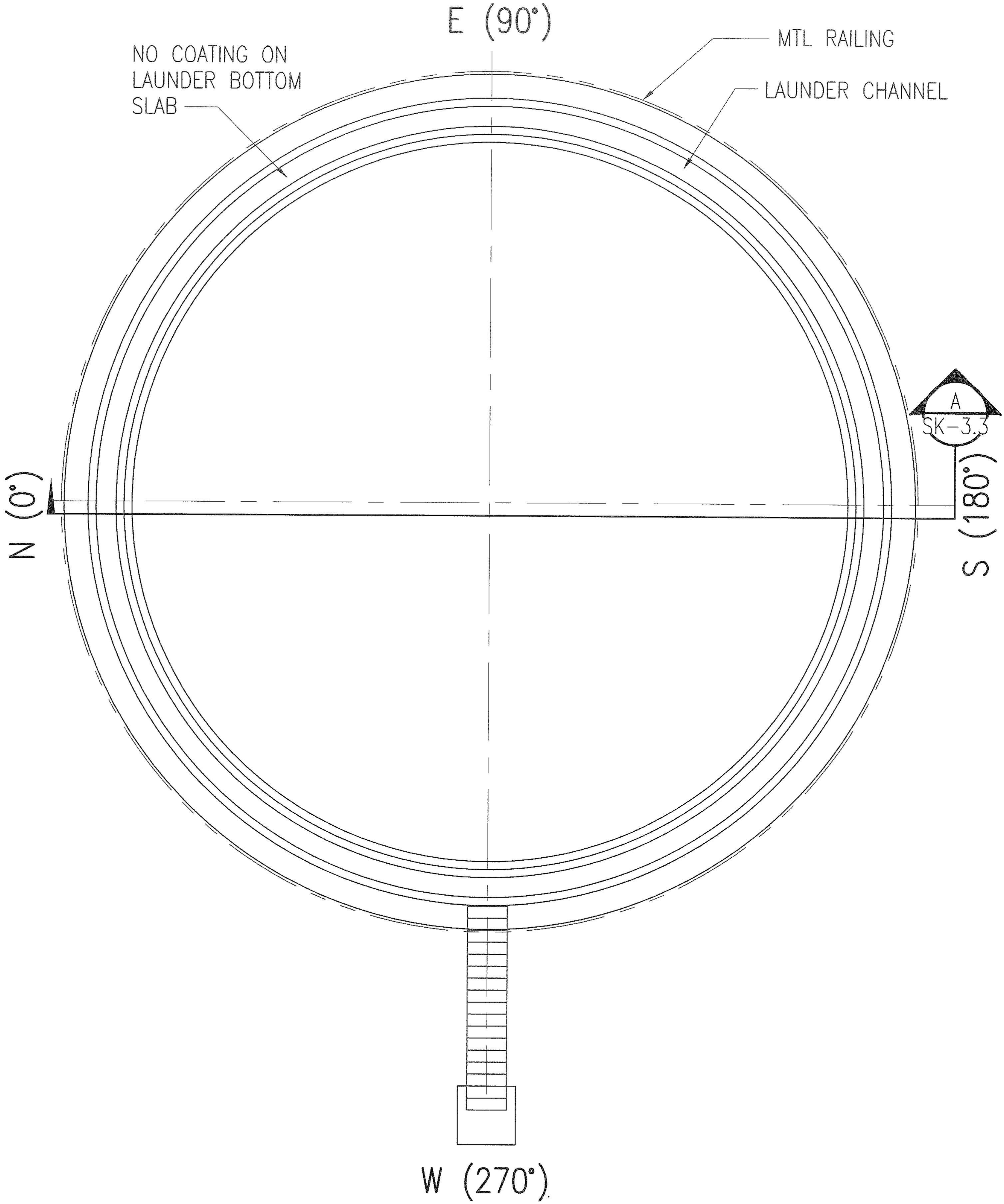
PHOTO 3.2 – WEEDS GROWING ON INTERIOR SLAB

PHOTO 3.3 – CRACKS ON WALL BASE

PHOTO 3.4 – SEVERE CRACKS ON TOP OF WALL

PHOTO 3.5 – CRACKS ON OVERHANG SOFFIT

PHOTO 3.6 – OVERVIEW OF DIGESTER TANK



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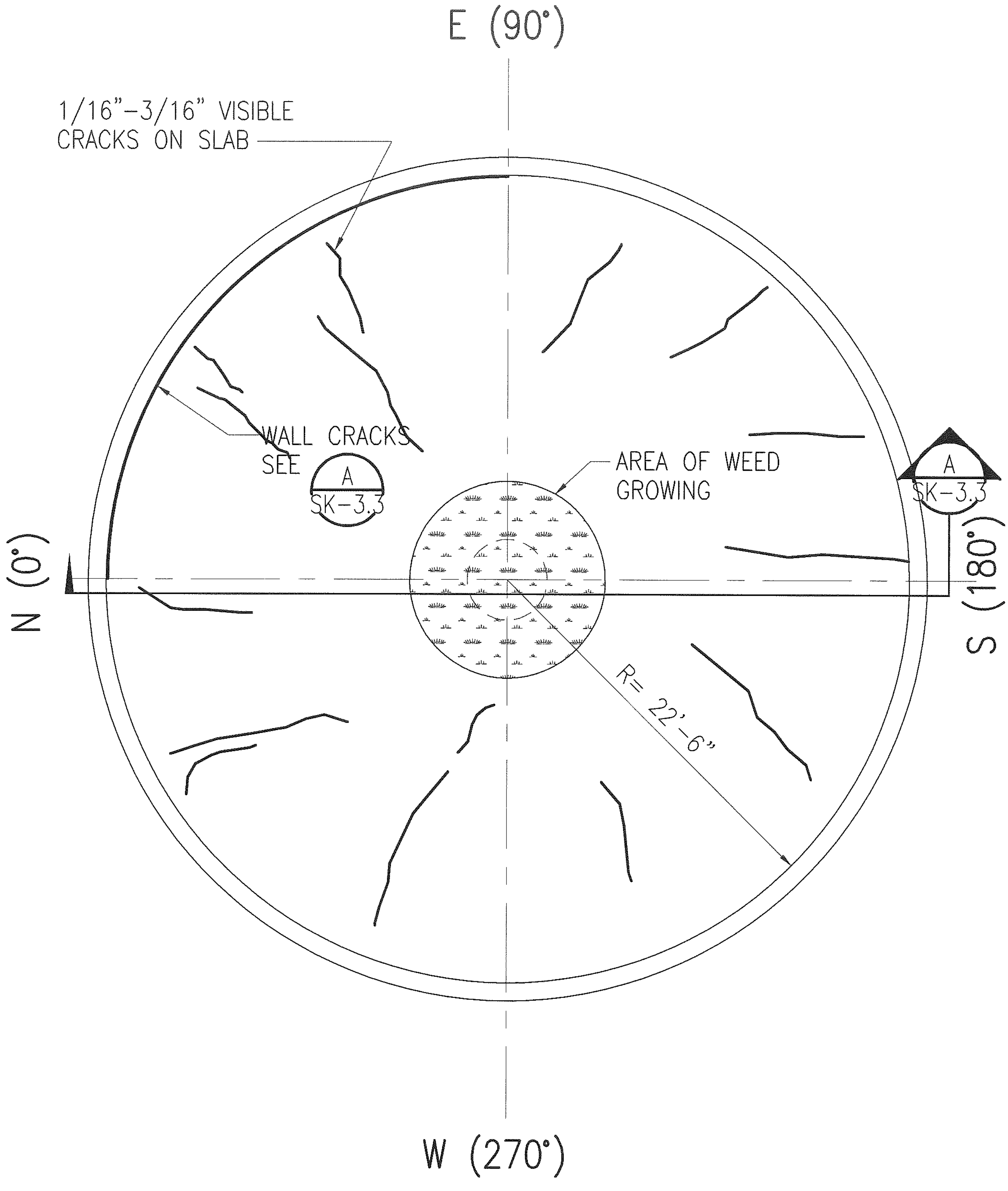
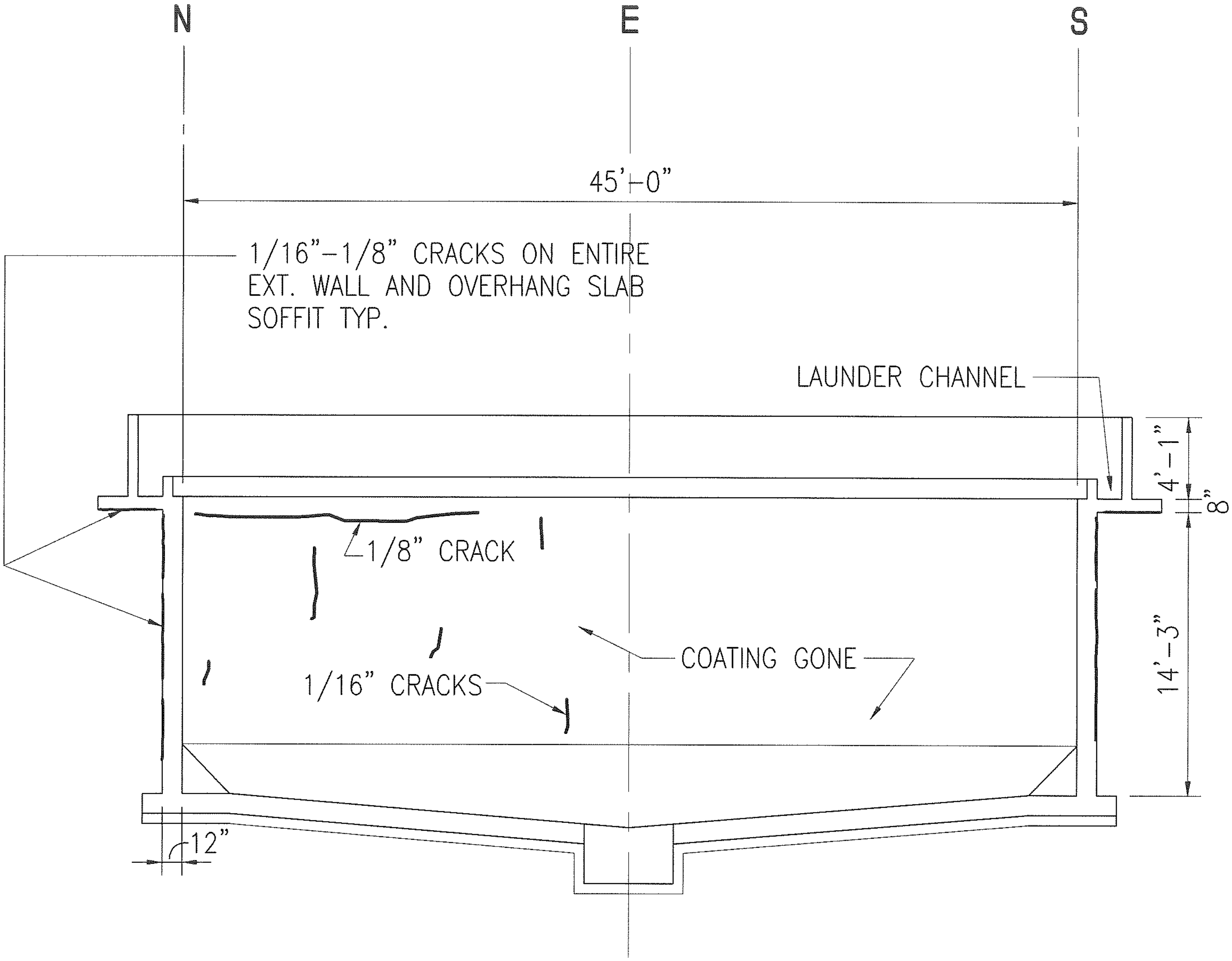
AHUIMANU WWPTF IMPROVEMENTS	AEROBIC DIGESTER TOP PLAN	SK-3.1



SCALE: 1/8"=1'–0"

AHUIMANU WWPTF IMPROVEMENTS	AEROBIC DIGESTER BOTTOM SLAB PLAN	SK–3.2



A
SK-3.3

CROSS SECTION

SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	AEROBIC DIGESTER CROSS SECTION	SK-3.3

Section 4 – Rapid Block Unit (RBU)

2.1 Description of structure

The existing RBU is a concrete rectangular open tank with plan dimensions of 83'-4" X 37'-11". RBU mainly consists of three (3) settling tanks on one side and three (3) aeration tanks on the other side separated by concrete walls. See Sketch SK-4.1 and SK-4.2. The depth of the tanks is approximately 11'-6". An outlet channel and an inlet channel were constructed on top of the tank. A 14" thick bottom slab serving as a mat footing bears on compacted granular fill. The interior surfaces of the walls were protected by elastomeric coating. +

2.2 Existing conditions as observed

1. The entire tank structure appeared in fairly good condition. Concrete appeared to be sound with only several hairline cracks and spalls. Most of the wall coating had peeled off. A certain steel steps and grating were corroded.

2.3 Evaluation, recommendations, and estimated cost to refurbish.

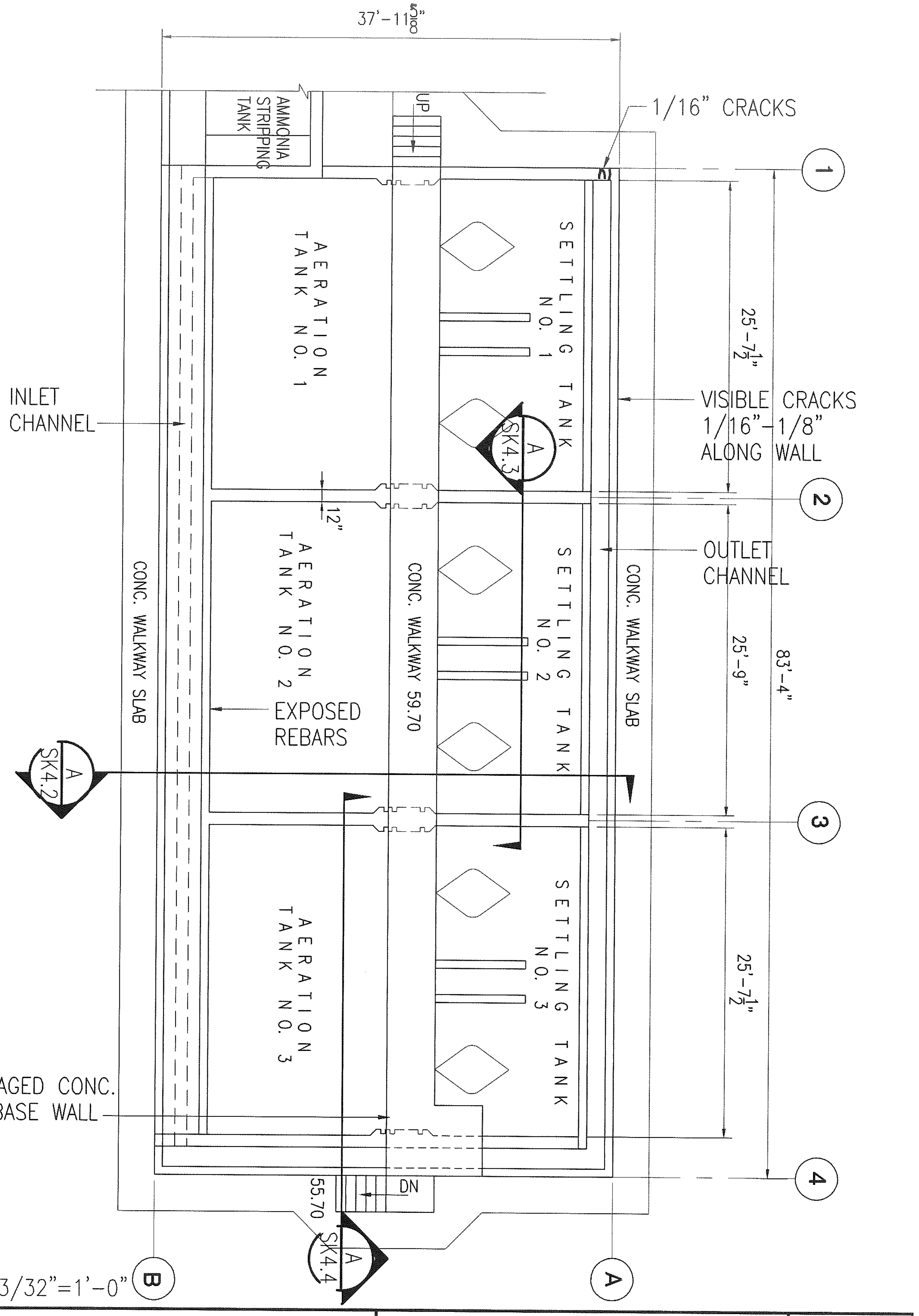
1. The existing RBU structure is at workable condition with reliable structural integrity. To maintain a good and long useful life, the structure needs minor repairs, which includes sealing of cracks, repair of spalls and recoating of interior concrete surfaces. We estimate that the structural capacity at the current condition can still serve its original design load.
2. The minor repair and recoating is estimated to cost approximately $ 250,000.00

PHOTO 4.1 – OVERVIEW OF SETTLING TANKS

PHOTO 4.2 – OVERVIEW OF AERATION TANKS

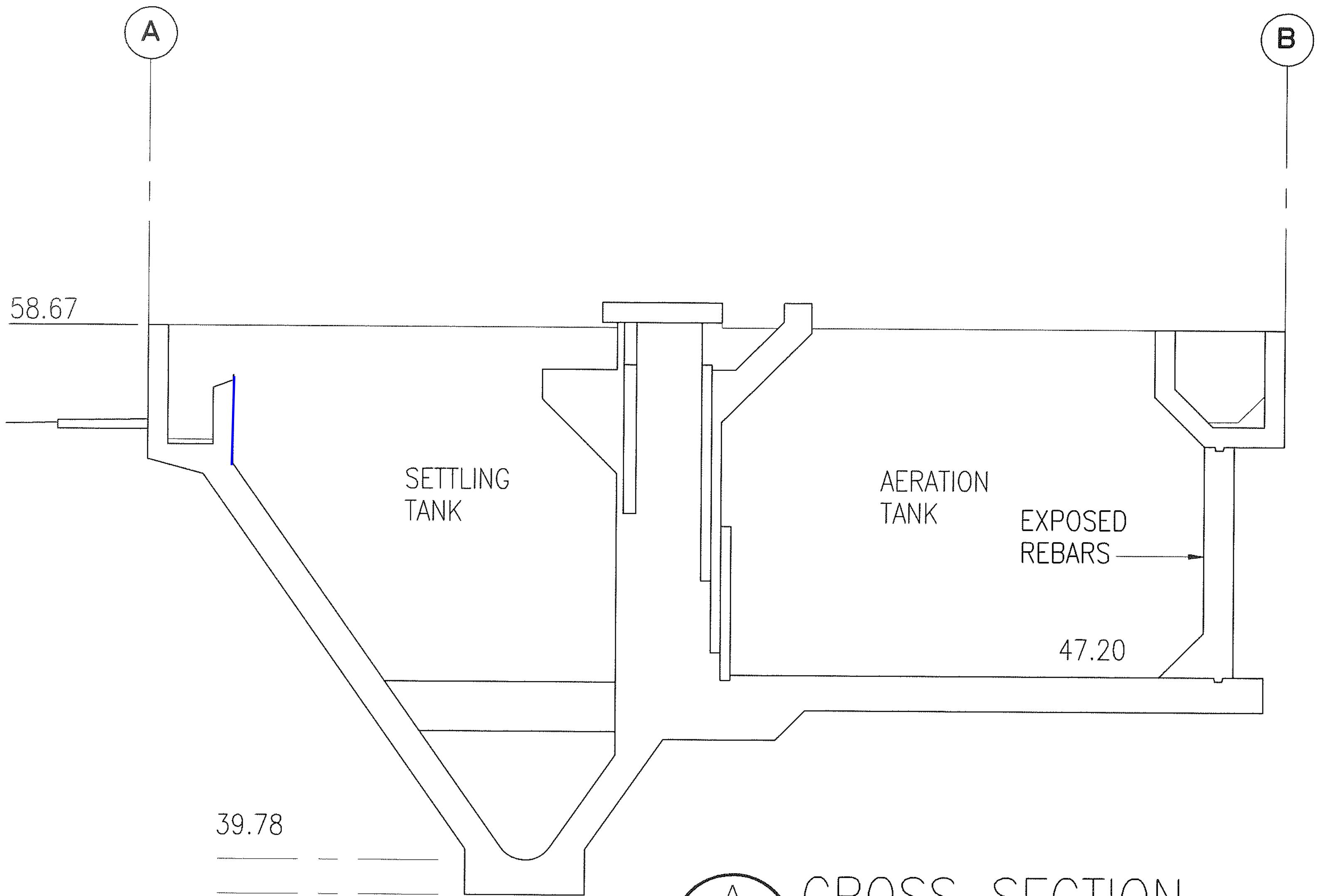
PHOTO 4.3 – CORRODED STEEL STEPS

PHOTO 4.4 – CORRODED GRATING



SCALE: 3/32"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	RAPID BLOCK UNIT FLOOR PLAN	SK-4.1



A
SK-4.2

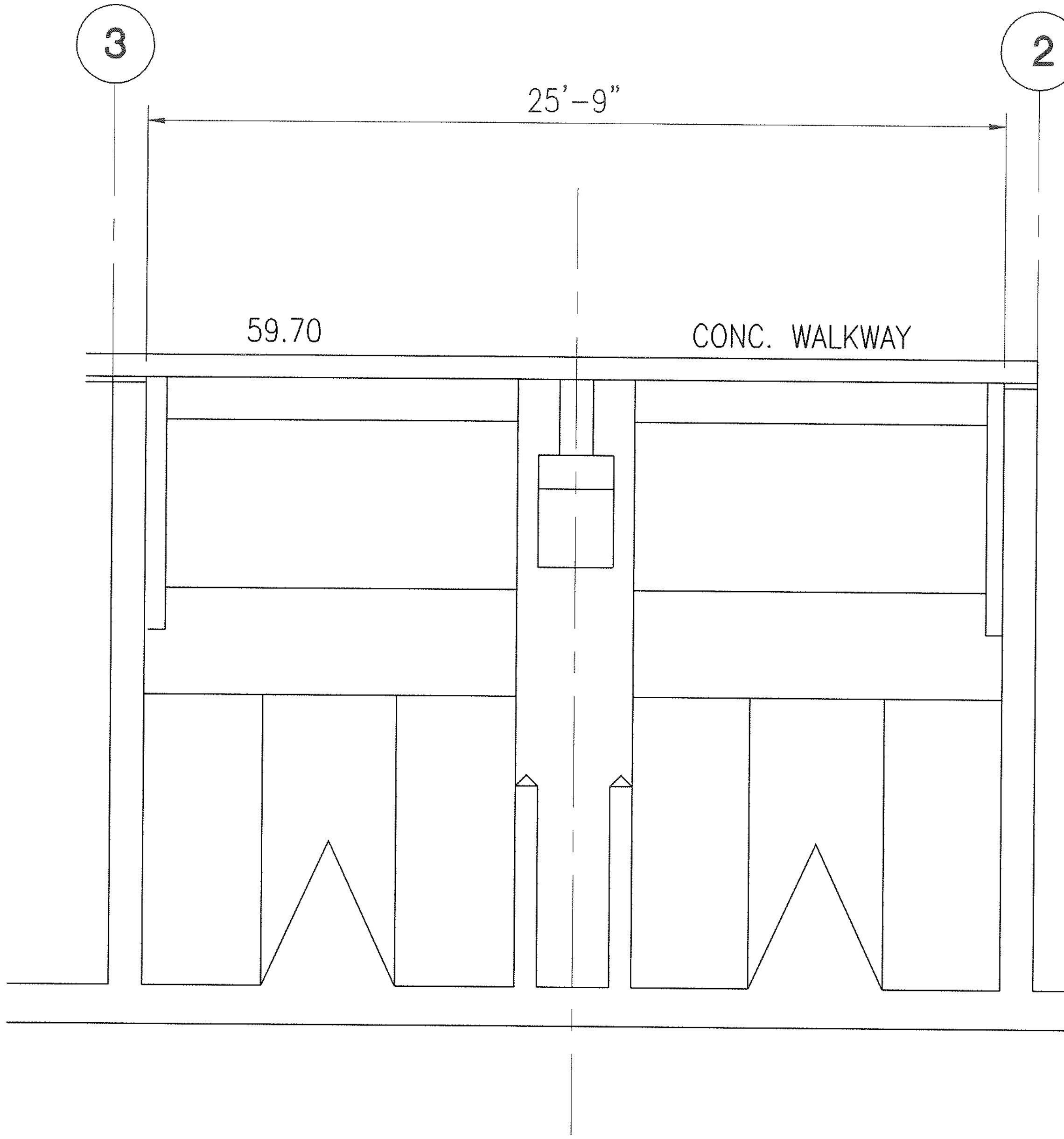
CROSS SECTION

SCALE: 3/16"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS

RAPID BLOCK UNIT CROSS SECTION

SK-4.2

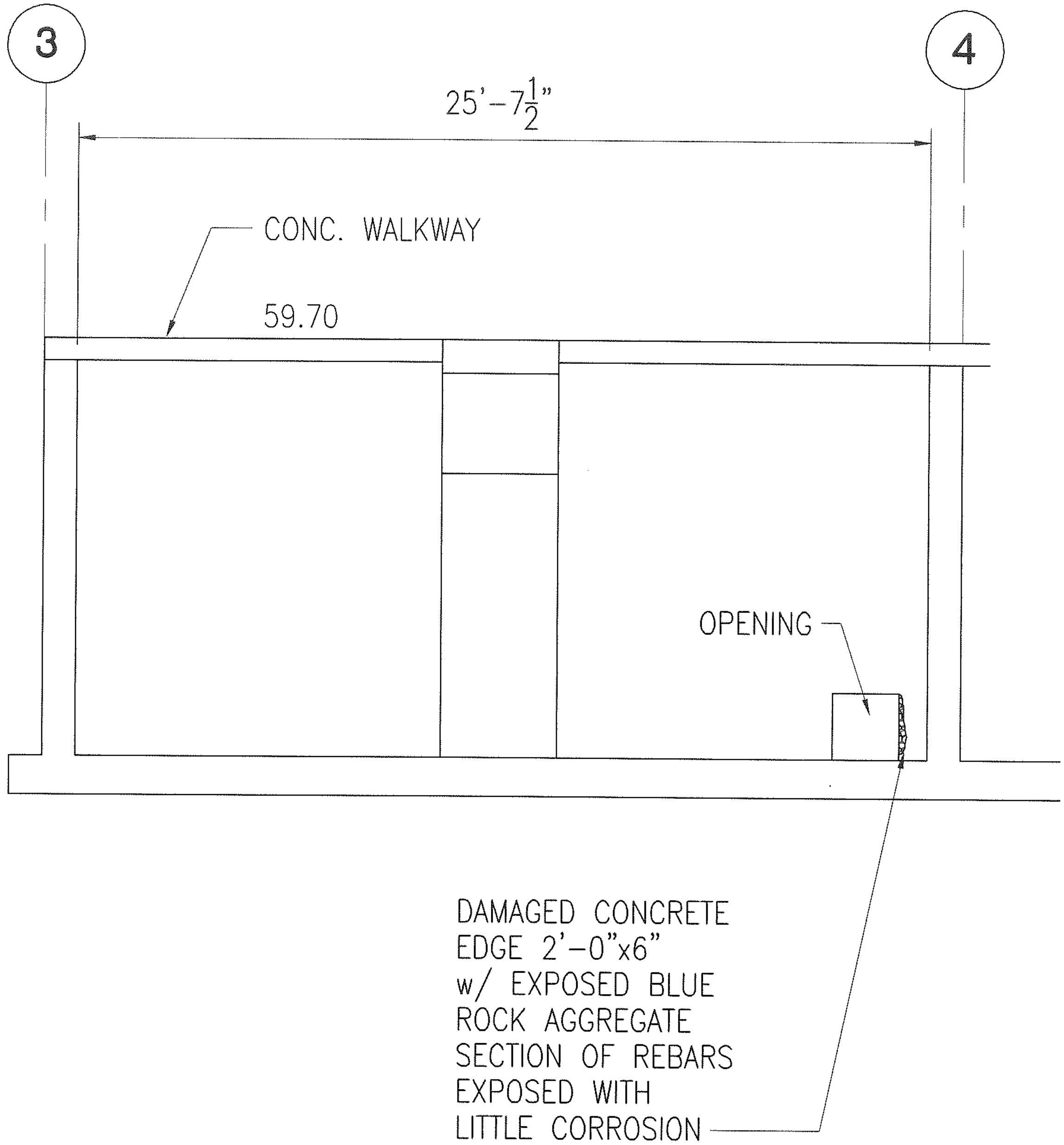


A
SK-4.3

INTERIOR SECTION

SCALE: 3/16"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	RAPID BLK UNIT SETTLING TANK INTERIOR SECTION	**SK-4.3**



A / SK-4.4 INTERIOR SECTION

SCALE: 3/16"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	RAPID BLOCK UNIT AERATION TANK INTERIOR SECTION	SK-4.4

Section 5 – Equalization Basin (EQ) and Wet Well

2.1 Description of structure

The existing EQ is a concrete rectangular tank with plan dimensions of 55'-0" X54'-0". EQ mainly consists of two (2) chambers. Chamber No.2 was inspected and evaluated in this project while chamber No.1 was still in operation and was not available to be inspected. See Sketch SK-5.1 through SK-5.4. The depth of the tanks is approximately 30'-3". A 3'-0" thick bottom slab serving as a mat footing bears on 24" thick base course. The interior surfaces of the walls were protected by T-lock lining and elastomeric coating. The top of the tank is covered by removable steel panels.+

2.2 Existing conditions as observed

1. The tank structure appeared in fairly good condition. The thick walls and mat footing created an impression that the structure looked strong and sturdy. Concrete appeared to be sound with some damages as described below.
2. T-lock lining has bubbles, blistering, and delaminations. Water was detected between the T-lock and the concrete surface, dripped down to the bottom of the lining and squeezed out from the joint between the T-lock and the elastomeric coating.
3. Elastomeric coating below the T-lock was damaged and peeled off. Blistering was noted on the coating surfaces
4. Water infiltration was noted at a couple spots on the floor slab.
5. Corroded concrete and reinforcing bars were observed at gate openings.

2.3 Evaluation, recommendations, and estimated cost to refurbish.

1. The existing EQ structure is at workable condition with reliable structural integrity. To maintain a good and long useful life, the structure needs repairs, which includes:
   A. Repair of T-lock lining.
   B. Replace elastomeric protective coating.
   C. Repair cracks, spalls, water infiltration, corroded concrete and reinforcing bars.
   D. Seal all damaged joint sealant.

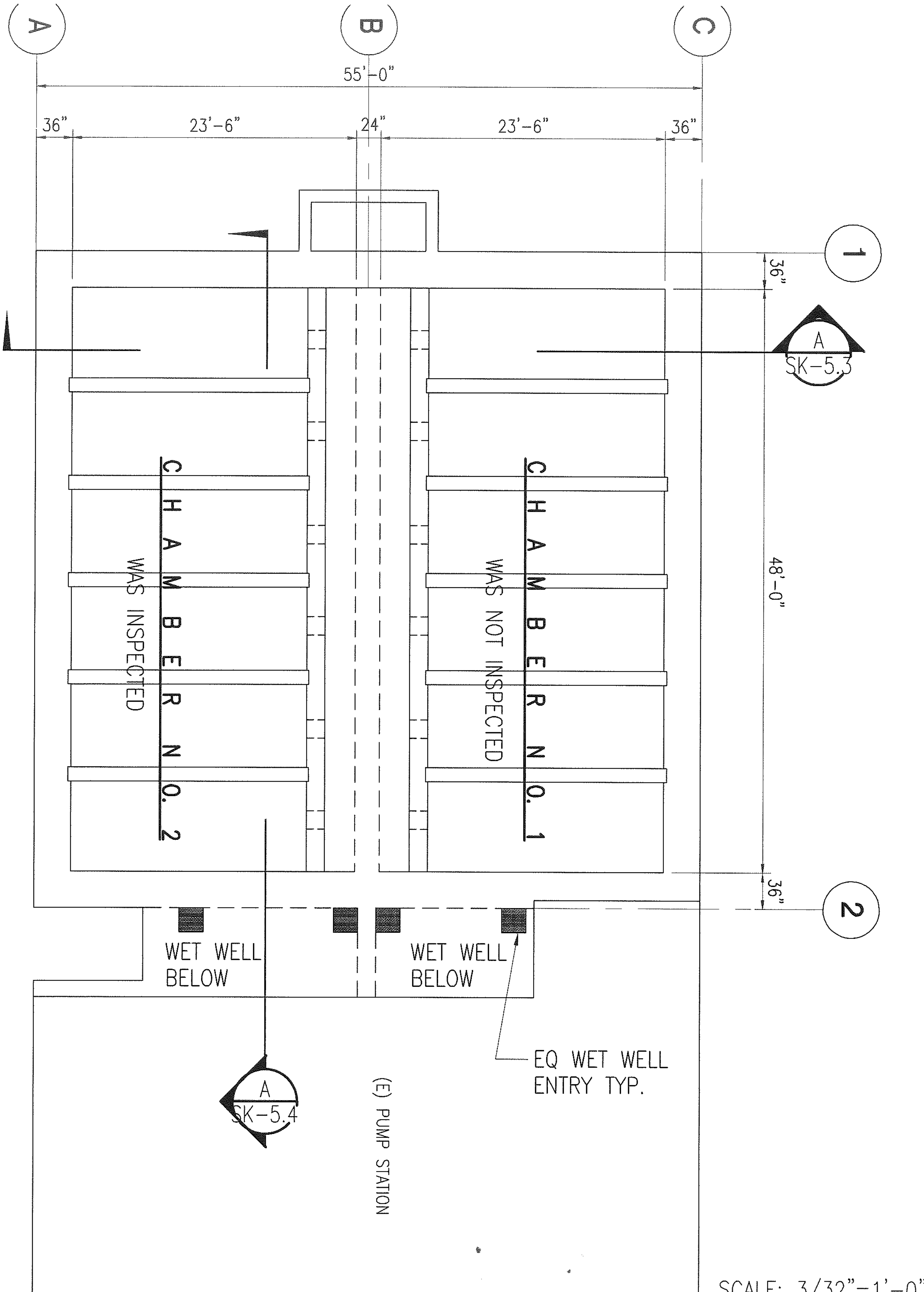
   We estimate that the structural capacity at the current condition can still serve to resist its original design load if the above mentioned repairs are implemented.
2. Presume that chamber No.1 is of similar conditions. The repair work for both chamber No.1 and No.2 is estimated to cost approximately $300,000.00. This cost does not include any repair work for steel panels.

PHOTO 5.1 – STEEL COVER OF EQUALIZATION BASIN

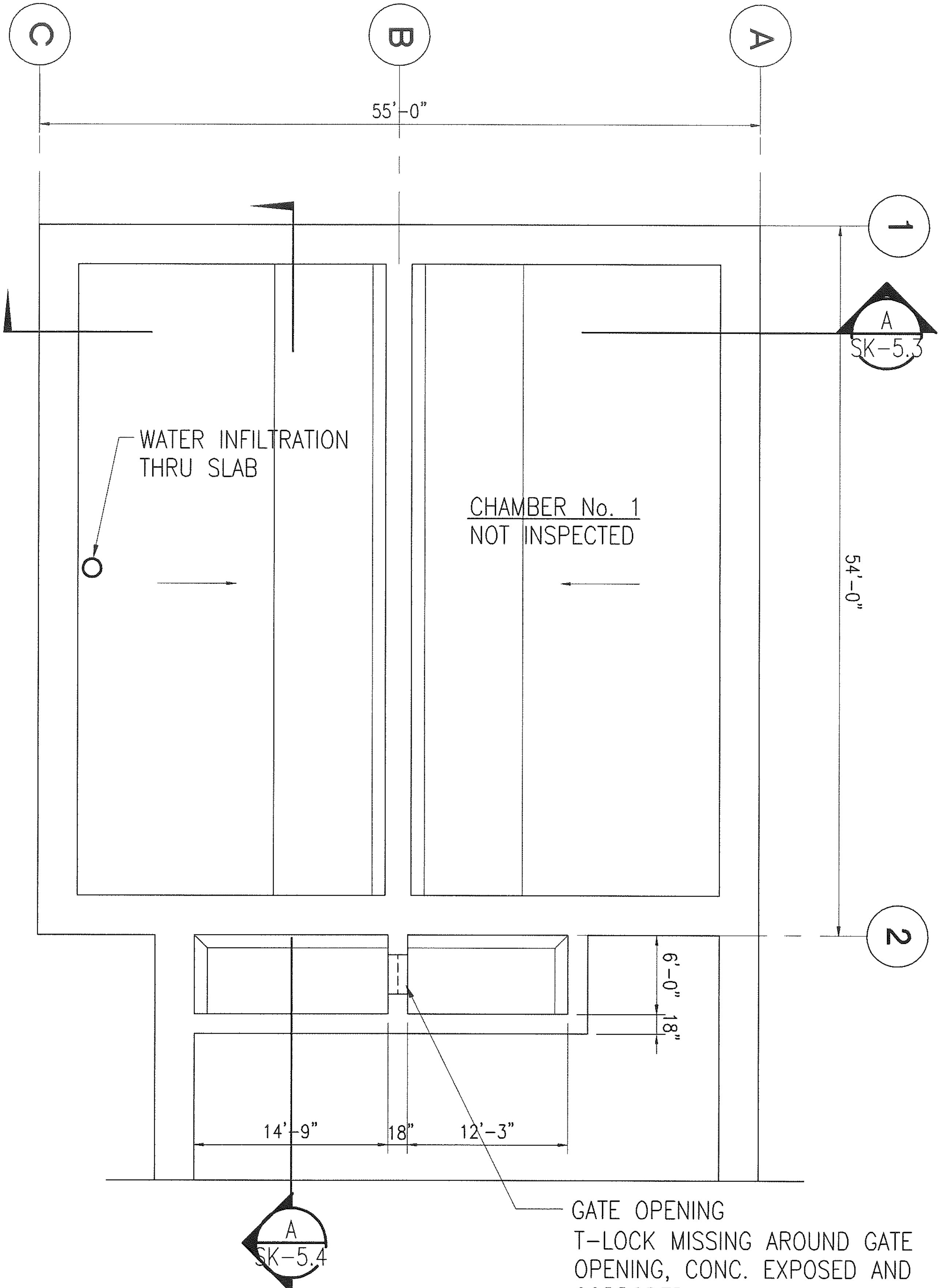
PHOTO 5.2 – T-LOCK DAMAGED AROUND GATE OPENING

PHOTO 5.3 – TYPICAL WALL T-LOCK

PHOTO 5.4 – WATER INFLITRATION IN SLAB

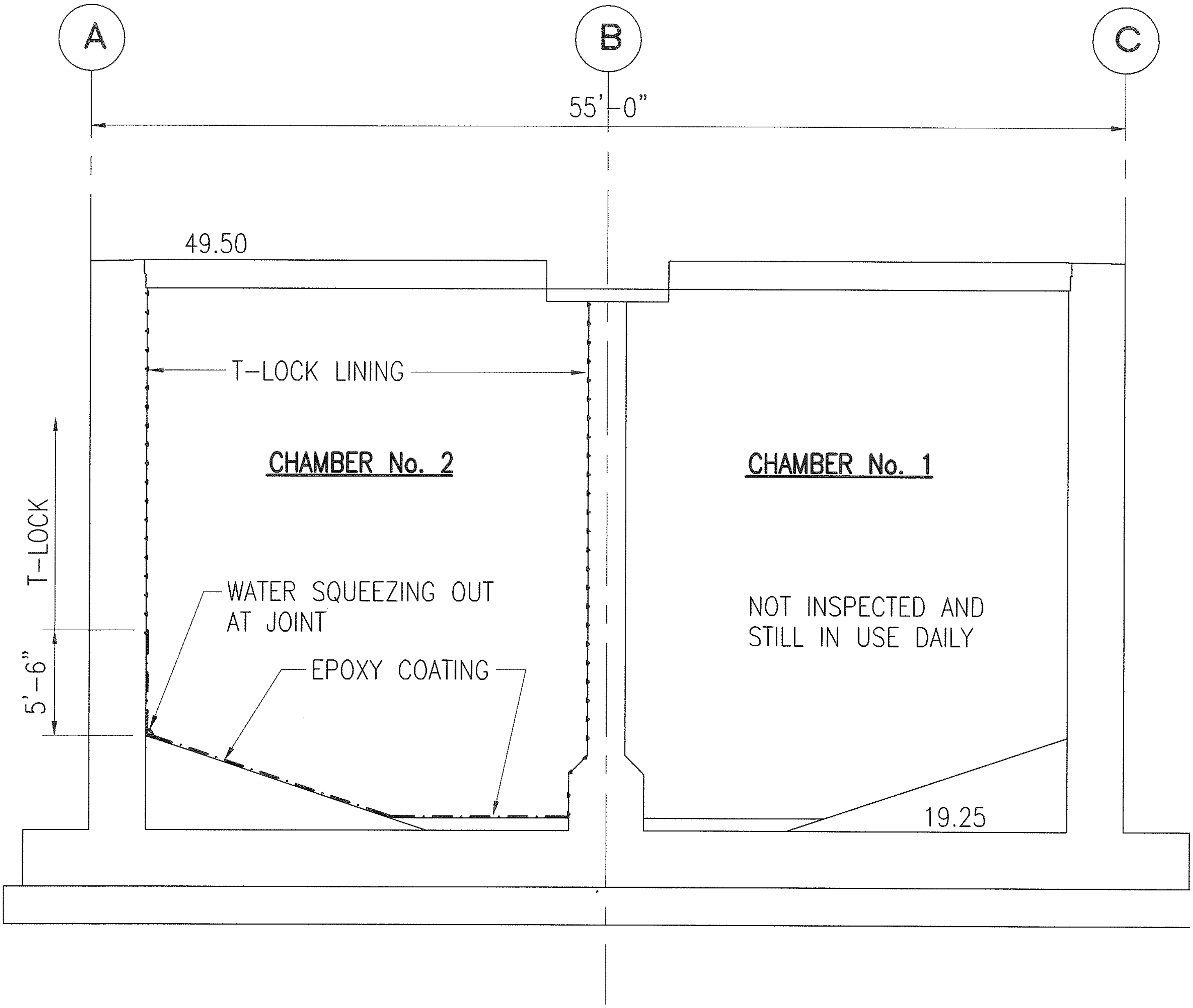


AHUIMANU WWPTF IMPROVEMENTS	EQUALIZATION BASIN/WET WELL TOP PLAN	SK-5.1



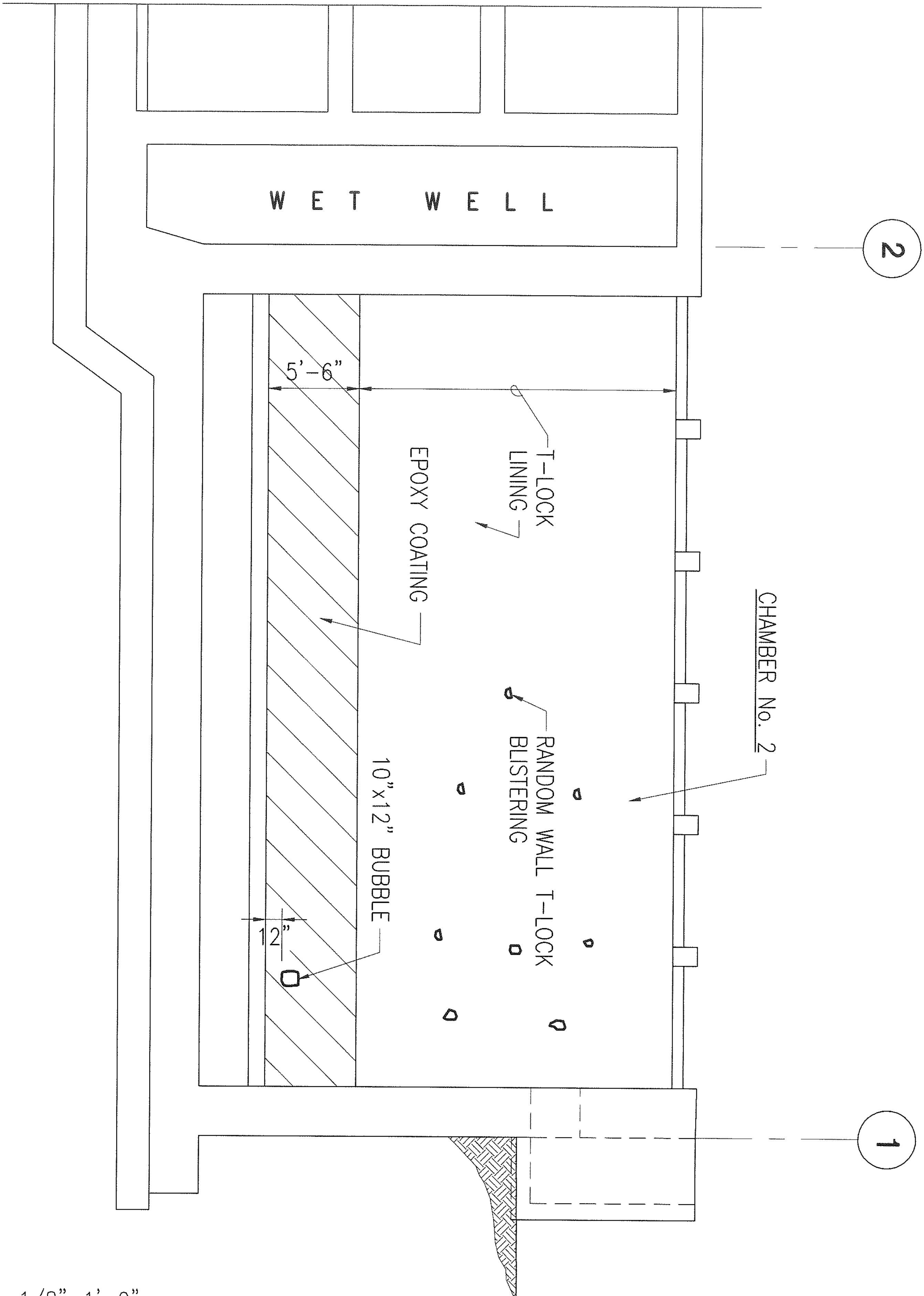
SCALE: 3/32"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	EQUALIZATION BASIN/WET WELL BOTTOM SLAB PLAN	SK-5.2



SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	EQUALIZATION BASIN SECTION A	SK-5.3



SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	EQUALIZATION BASIN LONGITUDINAL SECTION A	SK-5.4

Section 6 – Effluent Pump Station (EPS)

2.1 Description of structure

The existing EPS is a three story concrete rectangular building with plan dimensions of 55'-0" X 24'-8". EPS mainly consists of Four (4) levels of floors: Pump Room Floor, Bottom Intermediate Floor, Top Intermediate Floor, and Top Floor. See Sketch SK-6.1 through SK-6.6. The building was buried below ground for approximately 35feet. The three feet thick pump room floor slab at elevation 15.75 serves as a mat footing to support the entire building. The pump room floor bears on 24" thick granular fill with a 2" mud slab and waterproofing membrane directly below the slab. The building was not exposed to sewage and therefore there was no protective coating on the walls and slabs.

2.2 Existing conditions as observed

1. The entire building appeared in very good condition. Concrete appeared to be sound with only several hairline cracks and spalls on the wall surfaces and floors. The cracks were caused by thermal volume changes or shrinkage of the concrete and shall not cause any structural concern. There was not sign for noticeable foundation settlement. Due to its massive structural dimension vibration form operating pumps seems minor.

2.3 Evaluation, recommendations, and estimated cost to refurbish.

1. The existing EPS structure is at good workable condition with reliable structural integrity. To maintain a good and long useful life, the structure needs minor repair for cracks and spalls.
   We estimate that the structural capacity at the current condition can still serve to resist its original design load.
2. The minor repair is estimated to cost approximately $50,000.00

PHOTO 6.1 – TOP FLOOR PLAN LOOKING SOUTH

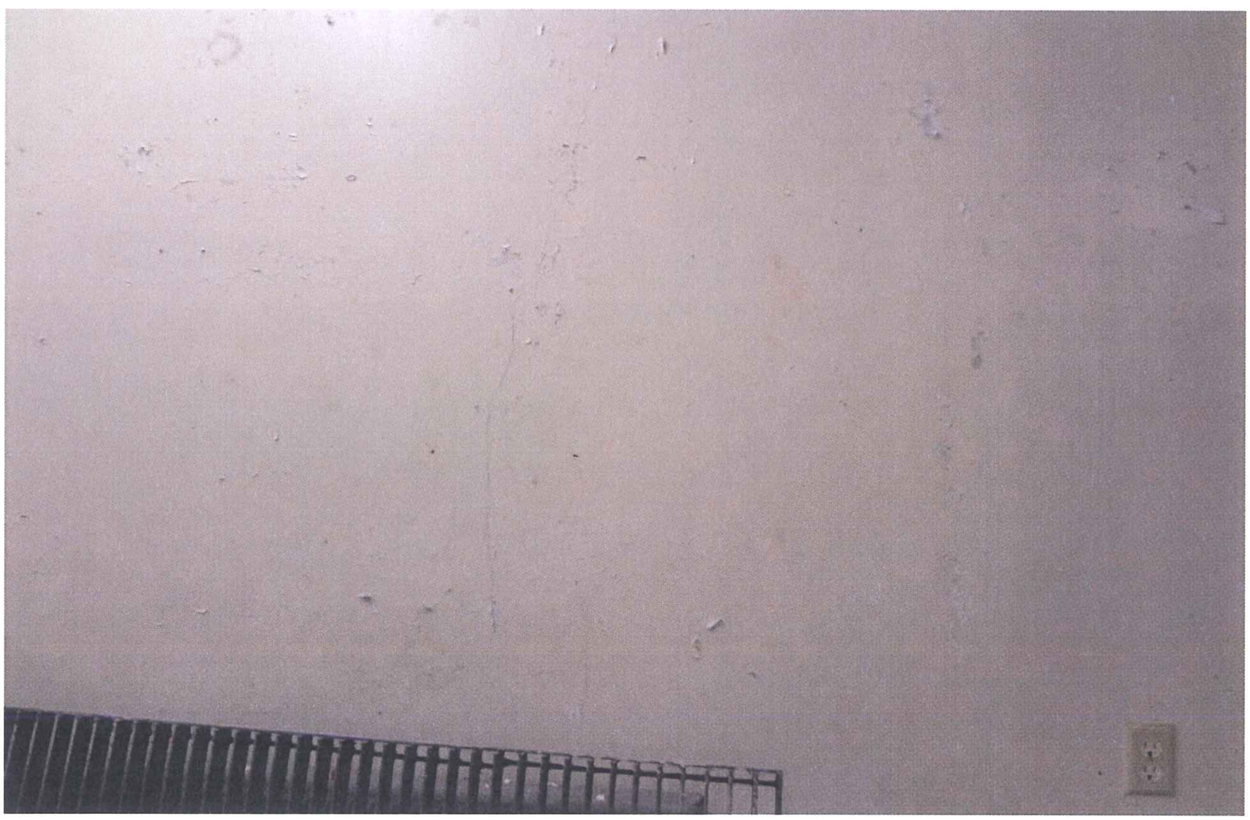
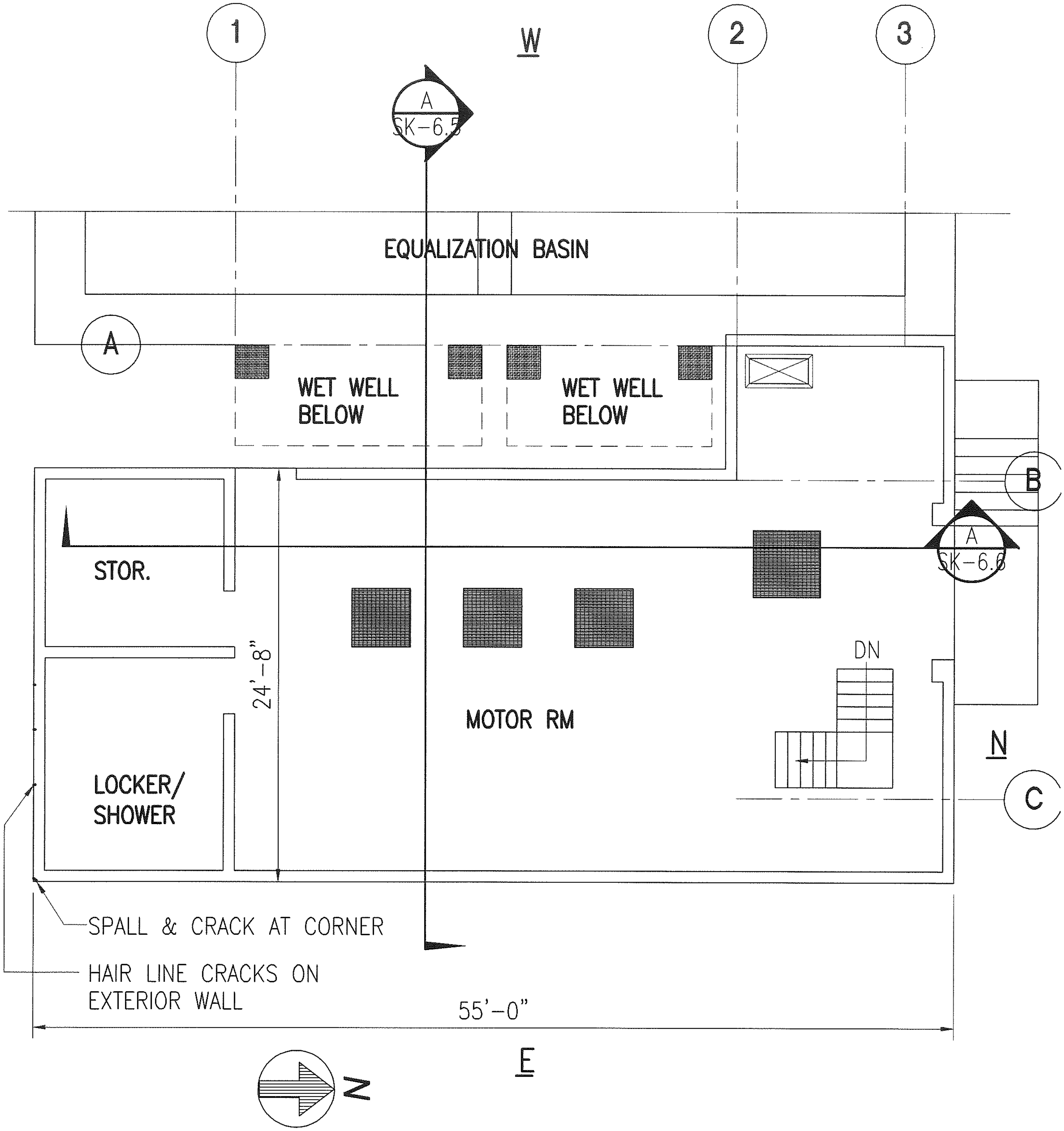
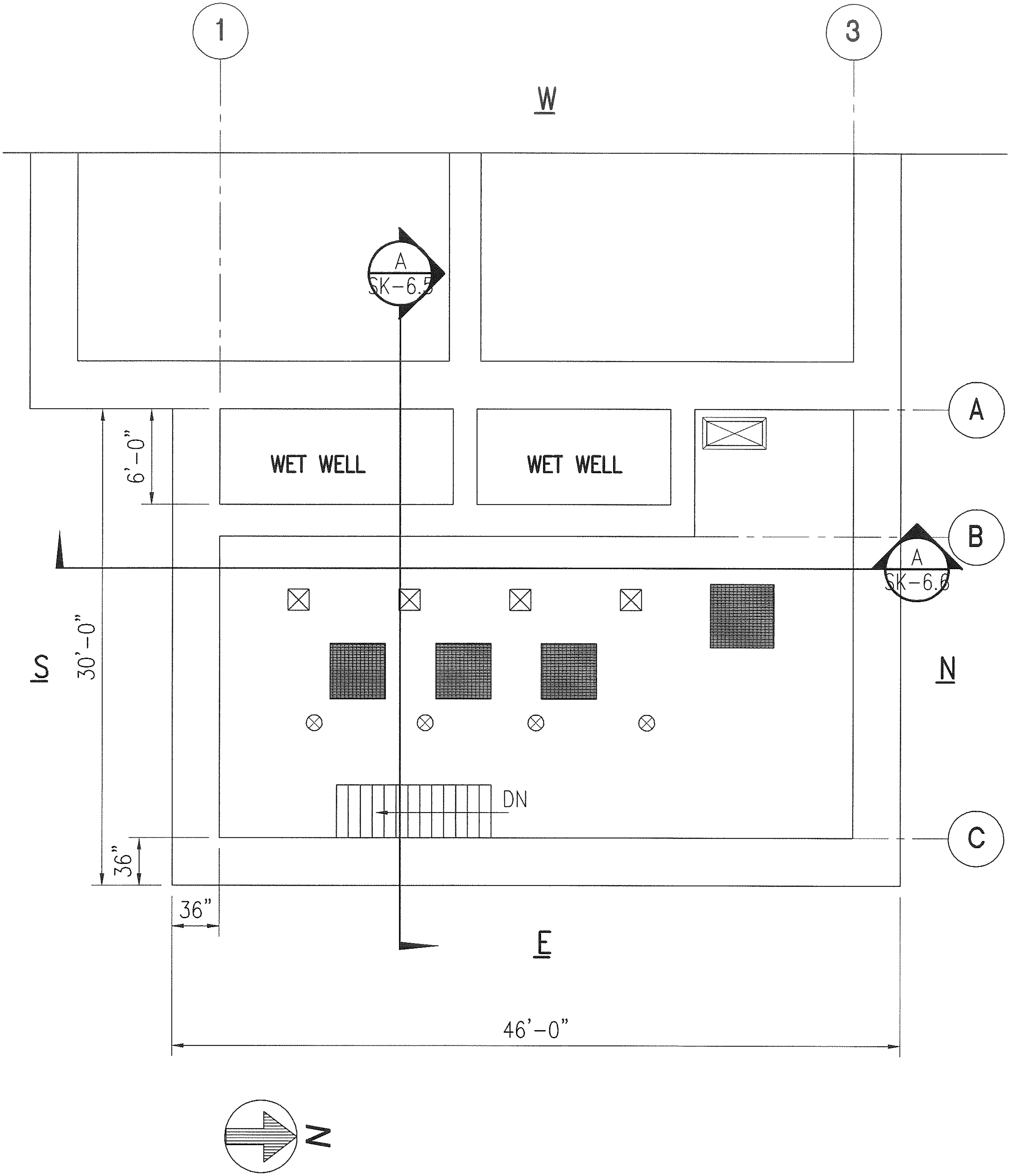


PHOTO 6.2 – WALL CRACK ON PUMP ROOM WALL



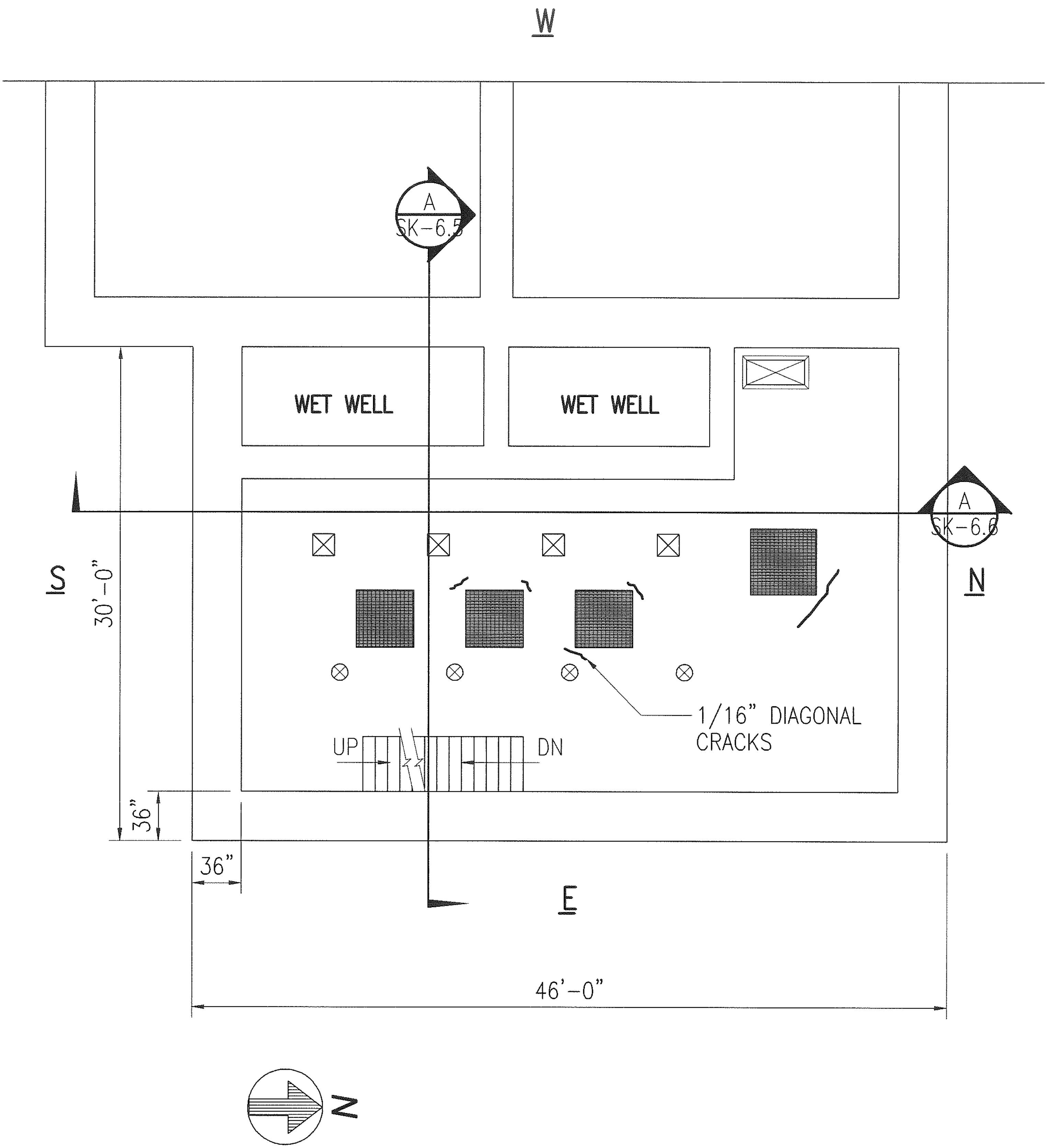
SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	EFFLUENT PUMP STATION TOP FLOOR PLAN	SK-6.1



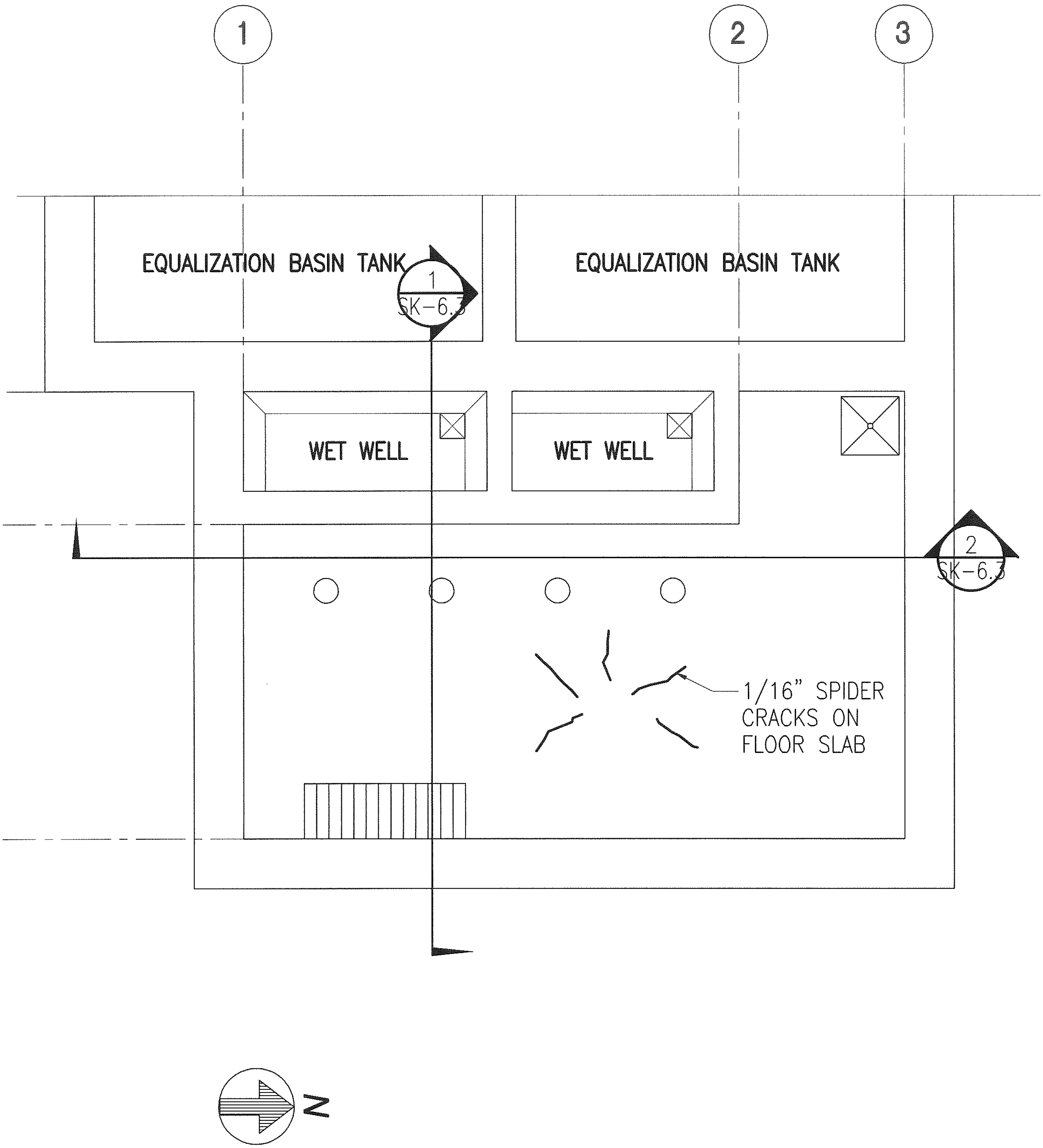
SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	EFFLUENT PUMP STATION INTERMEDIATE FLOOR PLAN	SK-6.2



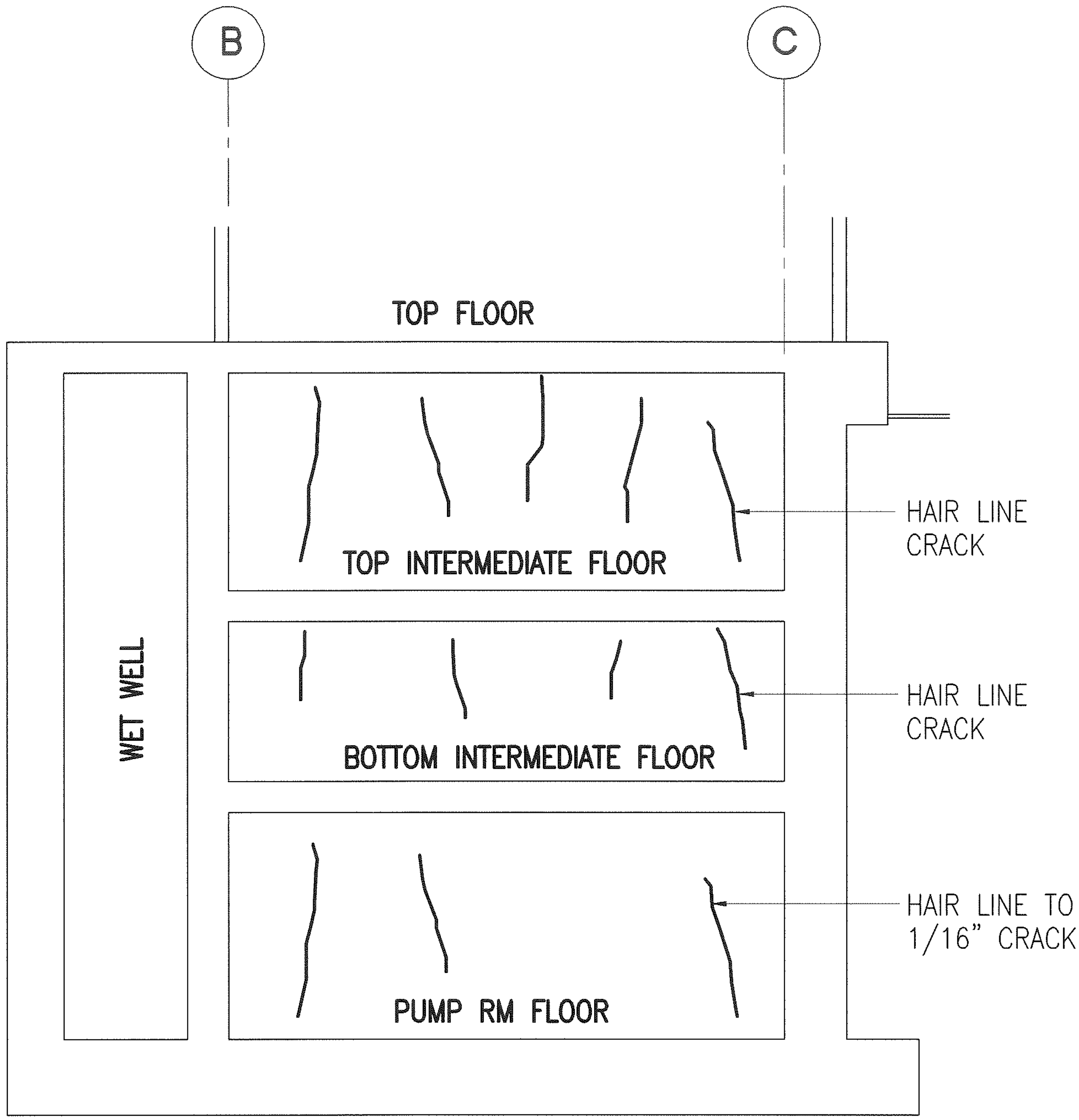
SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	EFFLUENT PUMP STATION BOTTOM INTERMEDIATE FLOOR PLAN	SK-6.3

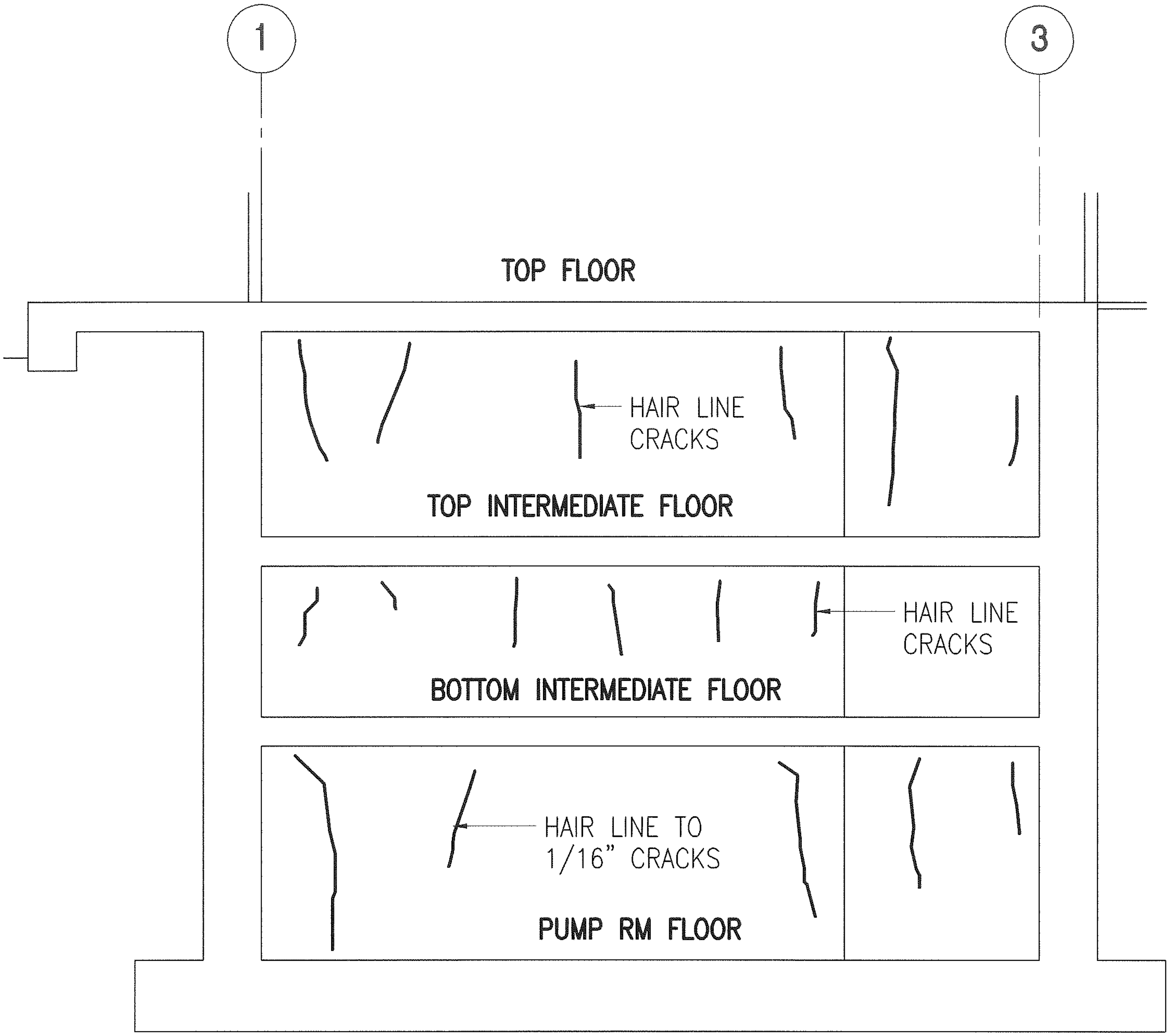


SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	EFFLUENT PUMP STATION PUMP ROOM FLOOR PLAN	SK-6.4



AHUIMANU WWPTF IMPROVEMENTS	EFFLLUENT PUMP STATION CROSS SECTION A/SK6.5	SK-6.5



AHUIMANU WWPTF IMPROVEMENTS	EFFLUENT PUMP STATION LONGITUDINAL SECTION A/SK6.6	SK-6.6

Section 7 – Wet Well at influent pump station

2.1 Description of structure

The existing Wet Well is below the ground floor of the existing influent pump station with plan dimensions of approximately 11'-0" X 33'-4". The depth of the Wet Well is about 13feet. Being inaccessible, the inspection of the Wet Well main body was not included in this project. Only the condition of the two entries to the Wet Well was inspected. See Sketches SK-7.1 through SK-7.3. Wet Well entry #1 was a circular opening covered by an iron plate. Wet Well entry #2 was a rectangular opening covered by a rectangular steel box.

2.2 Existing conditions as observed

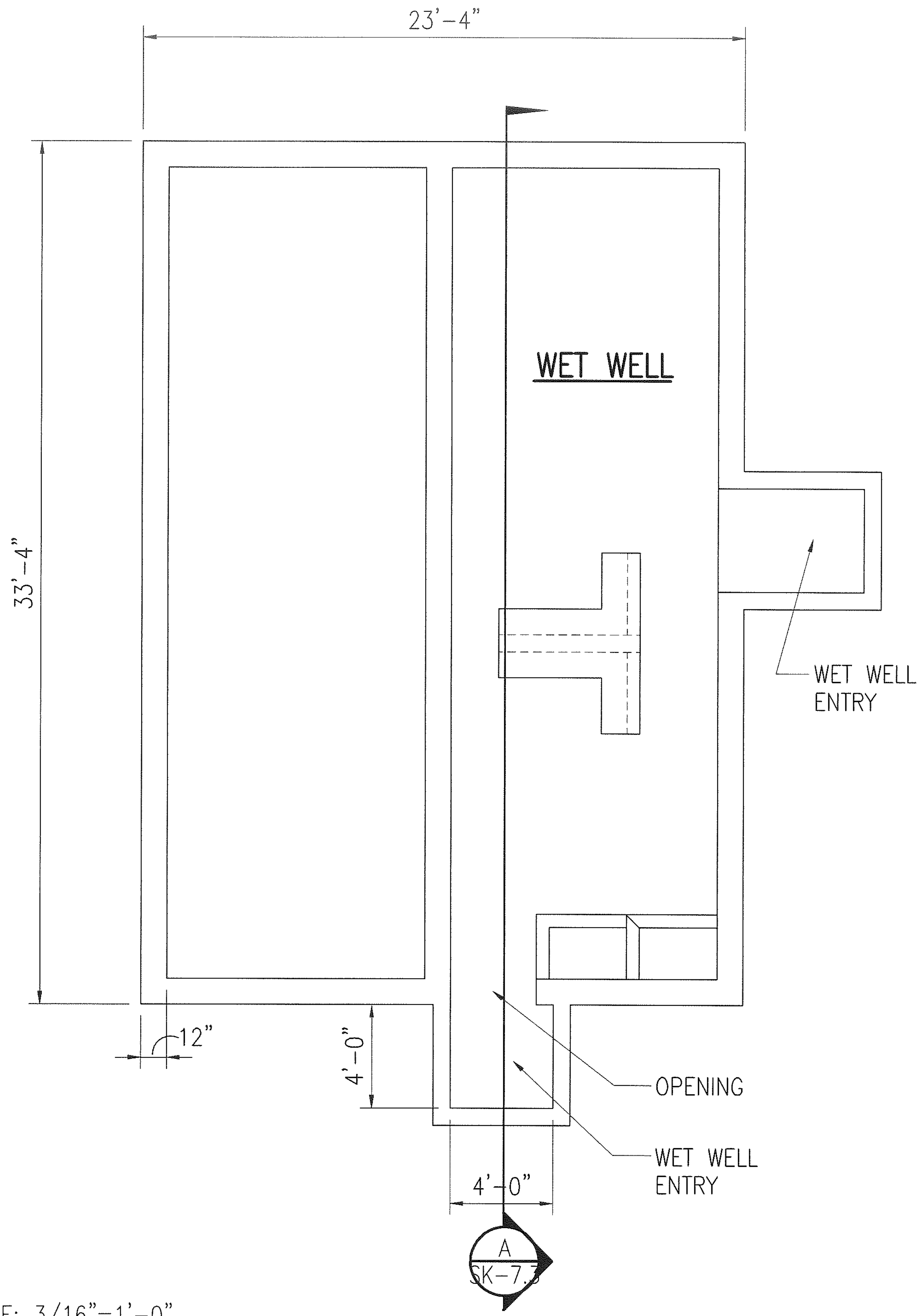
1. Looking down through the entry opening the condition of the Wet Well appeared fairly good. Although attached with sludge the wall surface and the wall concrete appeared sound and smooth. The elastomeric protective coating remained intact.

2.3 Evaluation, recommendations, and estimated cost to refurbish.

1. Except for the corroded steel covers the concrete of the Wet Well entries appeared in good condition. Judging from the condition of the entries the main body of the Wet Well would most likely be in fairly good condition. It seems unnecessary to do extensive repair work to the Wet Well structure except cleaning or small tough up repairing.
2. For budgetary purpose the cost for minor repair is estimated to be $10,000.00

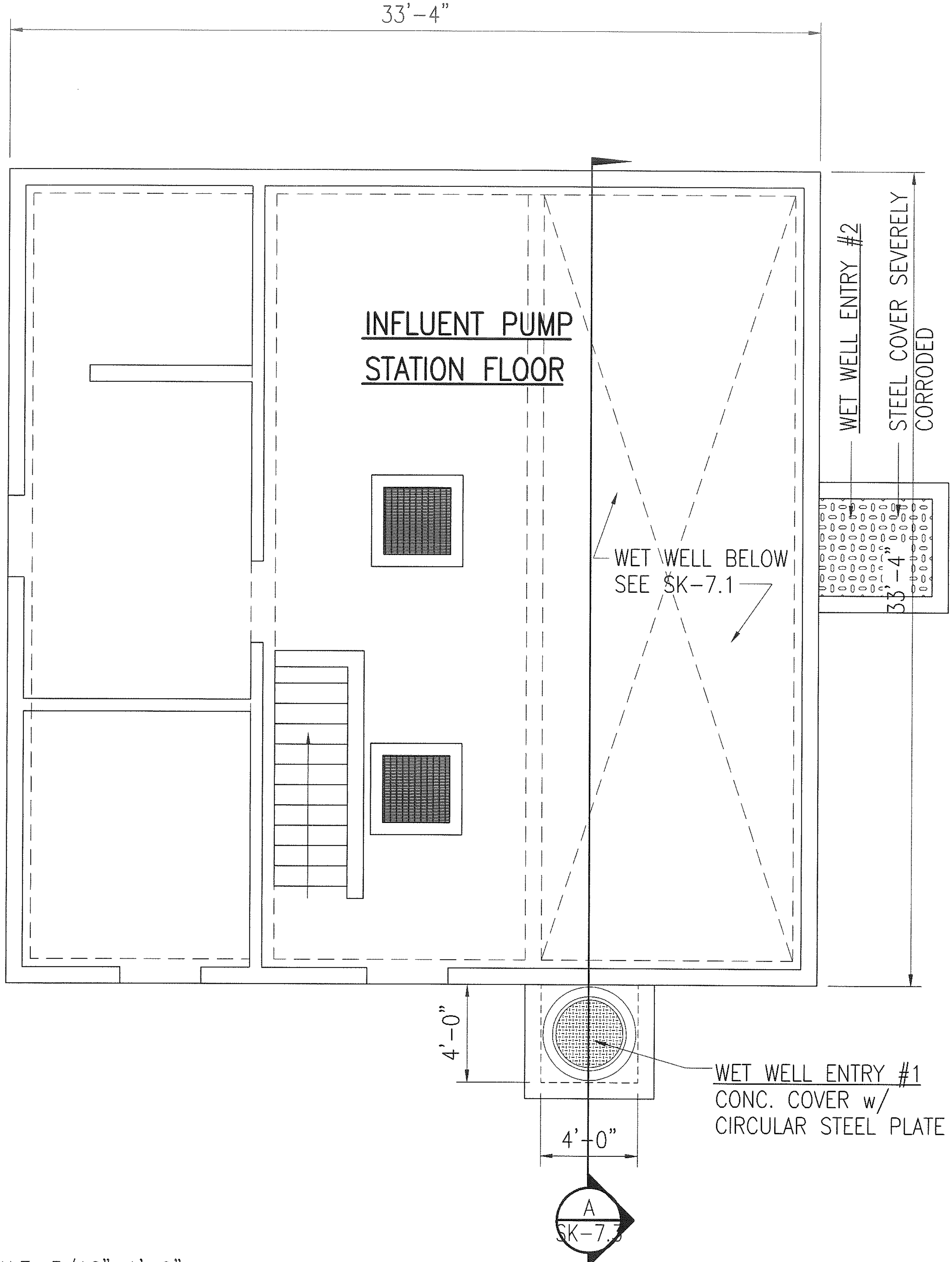
PHOTO 7.1 – WET WELL ENTRY NO. 1

PHOTO 7.2 – WETWELL ENTRY NO. 2



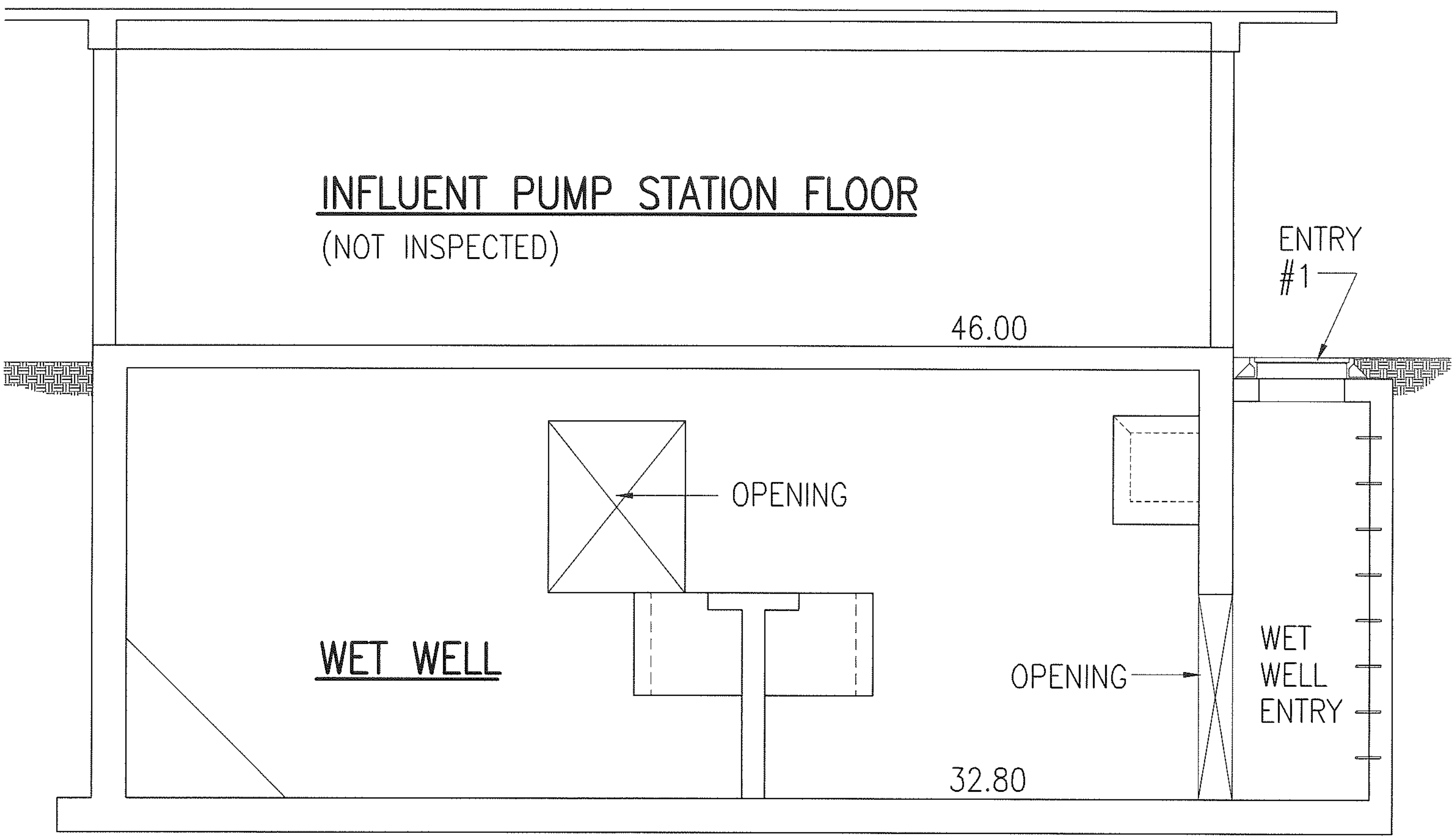
SCALE: 3/16"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	INFLUENT PUMP STATION/ WET WELL BOTTOM PLAN	SK-7.1



SCALE: 3/16"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	INFLUENT PUMP STATION/WET WELL GROUND FLOOR PLAN	SK-7.2



A LONGITUDINAL SECTION
SK-7.3
SCALE: 3/16"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	INFLUENT PUMP STATION/WET WELL LONGITUDINAL SECTION	SK-7.3

Section 8– Electrical Room

2.1 Description of structure

The existing Electrical Room was a small building constructed of concrete floor, concrete roof and CMU perimeter walls. The building will be completely demolished according to the development plan of the project. This section is prepared to provide general information of the structure. See SK-1.

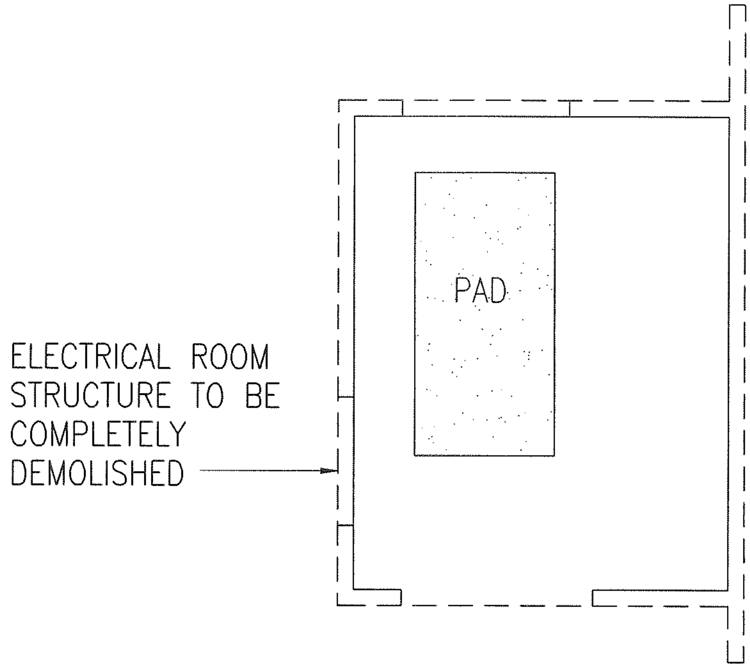
2.2 Existing conditions as observed

1. The CMU walls had sign of settlement. Cracks and spalls were observed in the walls. The floor concrete looked good with minor shrinkage cracks.

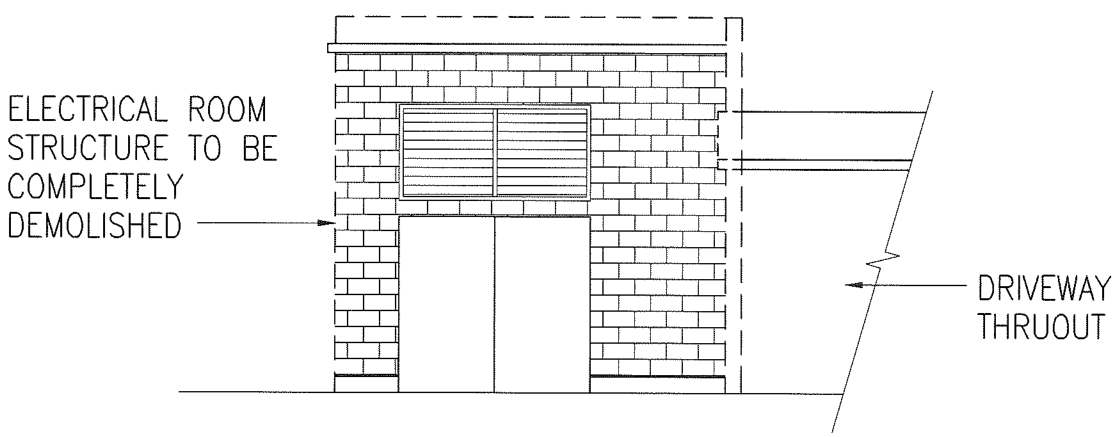
2.3 Evaluation, recommendations, and estimated cost to refurbish.

1. There is no requirement to perform evaluation of the structure since it is not currently in use and will be demolished completely.
2. For budgetary purpose the cost for demolition is estimated to be $5,000.00

PHOTO 8.1 – FRONT ELEVATION OF ELECTRICAL ROOM



PLAN



FRONT ELEVATION

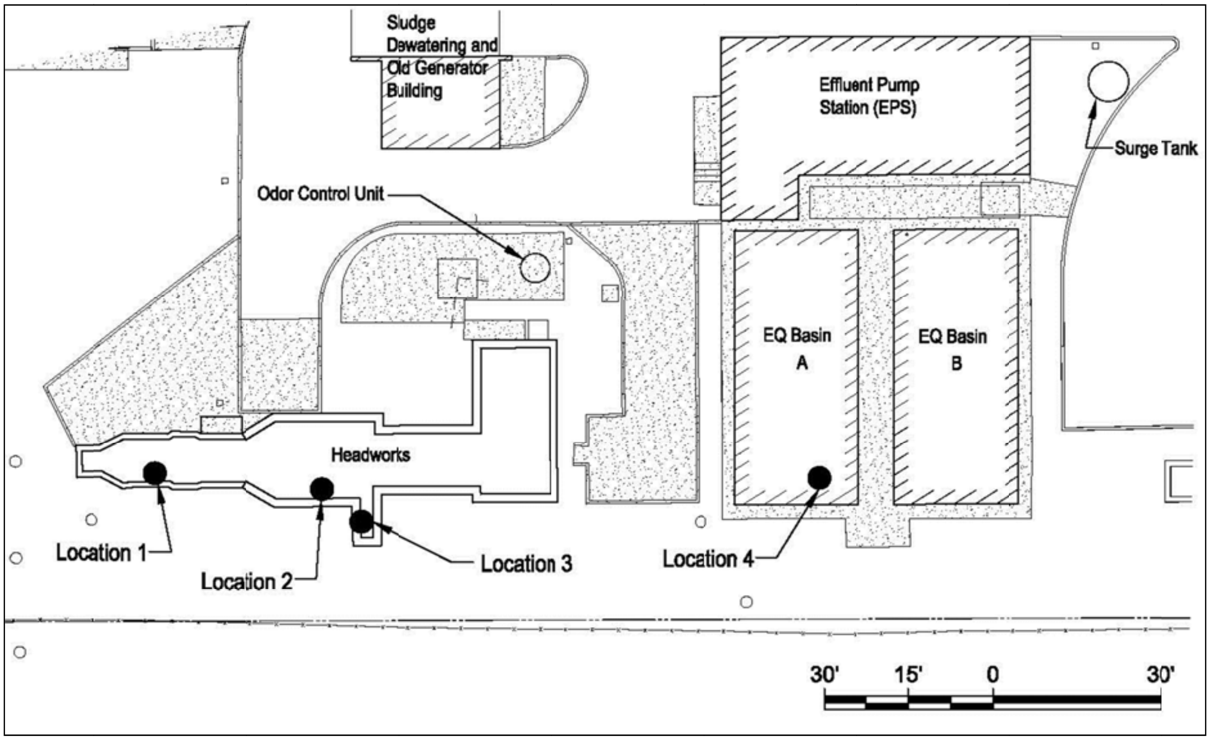
SCALE: 1/8"=1'-0"

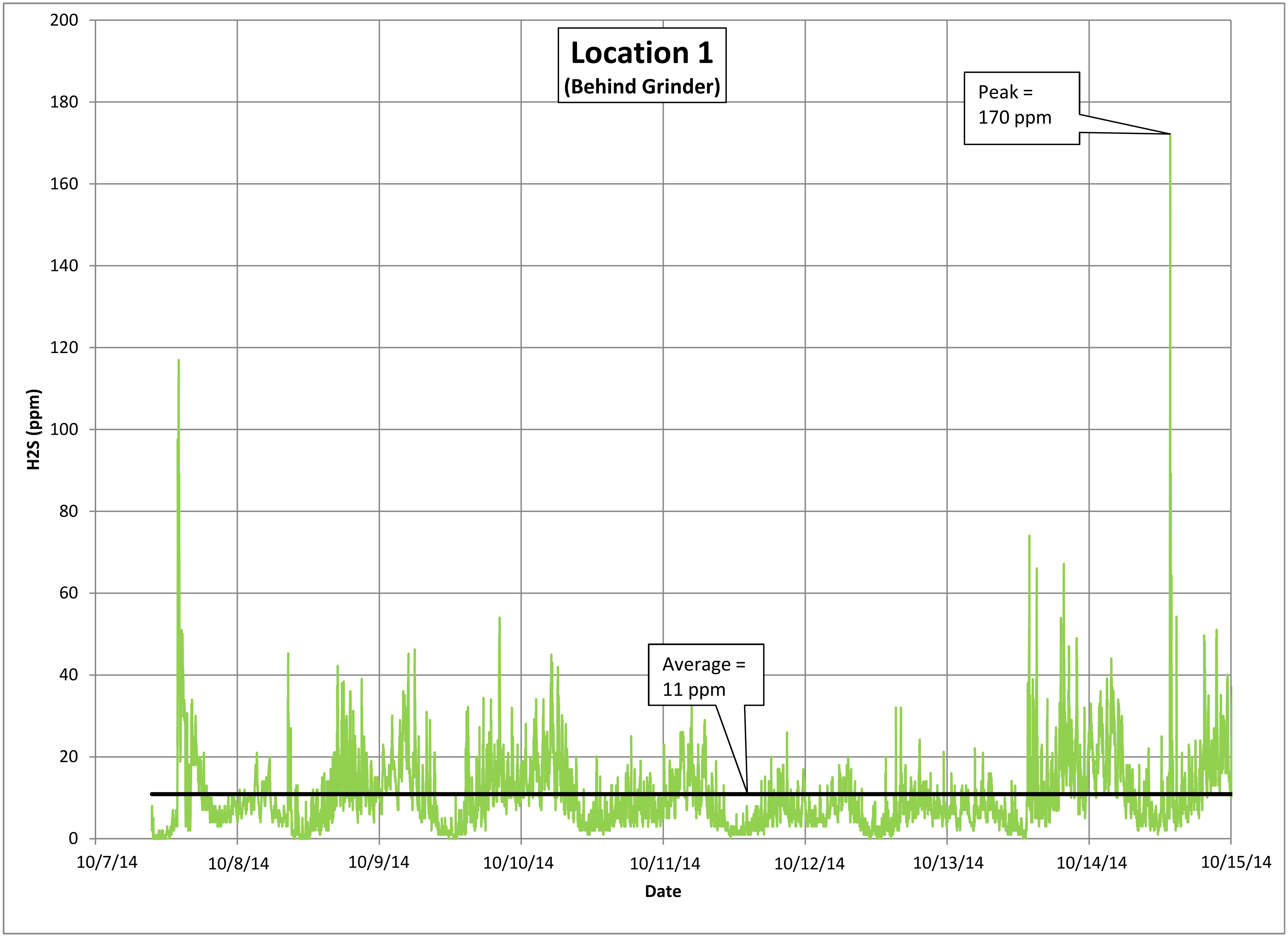
AHUIMANU WWPTF IMPROVEMENTS	ELECTRICAL RM FLOOR PLAN, FRONT EXTERIOR ELEVATION	SK-8.1

APPENDIX C

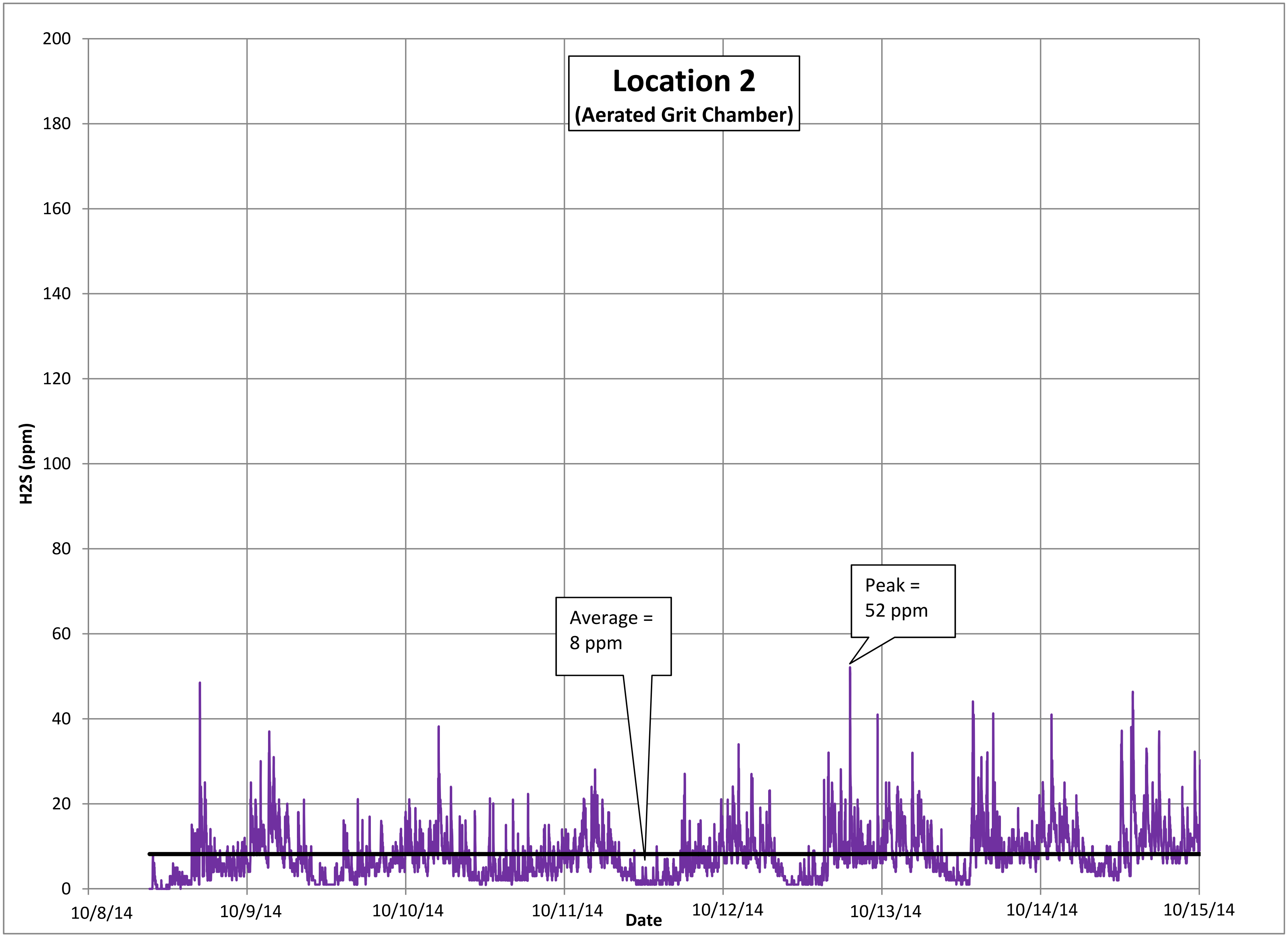
OdaLog Raw Data

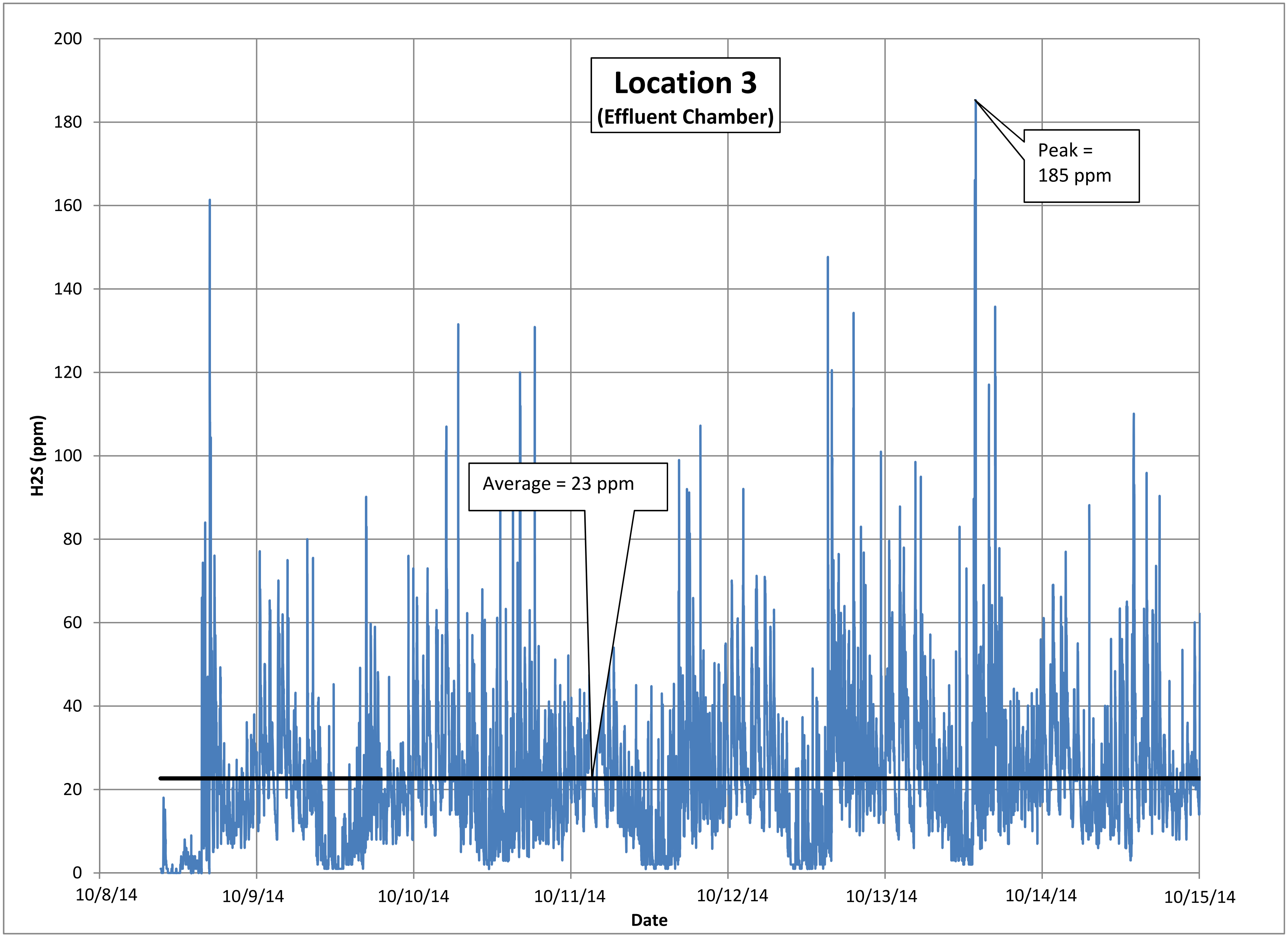
Figure 1. OdaLog Testing Locations

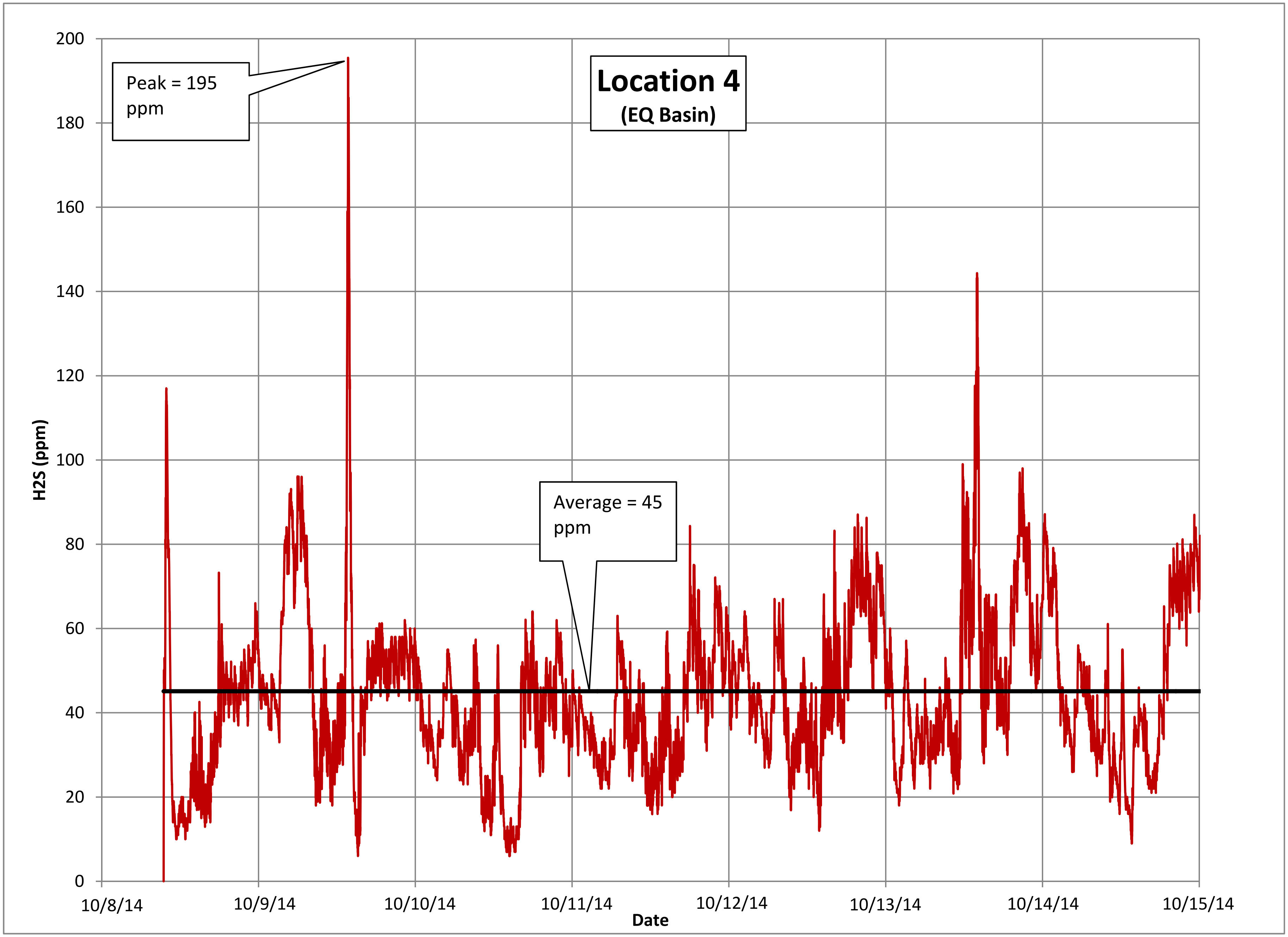




Location 1
(Behind Grinder)
Peak =
170 ppm
Average =
11 ppm
H2S (ppm)
200
180
160
140
120
100
80
60
40
20
0
10/7/14
10/8/14
10/9/14
10/10/14
10/11/14
10/12/14
10/13/14
10/14/14
10/15/14
Date


Location 2
(Aerated Grit Chamber)
Average =
8 ppm
Peak =
52 ppm
H2S (ppm)
200
180
160
140
120
100
80
60
40
20
0
10/8/14
10/9/14
10/10/14
10/11/14
10/12/14
10/13/14
10/14/14
10/15/14
Date


Location 3
(Effluent Chamber)
Peak =
185 ppm
Average = 23 ppm
H2S (ppm)
200
180
160
140
120
100
80
60
40
20
0
10/8/14
10/9/14
10/10/14
10/11/14
10/12/14
10/13/14
10/14/14
10/15/14
Date



Location 4
(EQ Basin)
Peak = 195 ppm
Average = 45 ppm
H2S (ppm)
200
180
160
140
120
100
80
60
40
20
0
10/8/14
10/9/14
10/10/14
10/11/14
10/12/14
10/13/14
10/14/14
10/15/14
Date

APPENDIX D

Influent Grit Characterization Report

B L A C K D O G A N A L Y T I C A L , L L C

INFLUENT GRIT CHARACTERIZATION

AHUIMANU PTF

STUDY PREPARED FOR
R.M. TOWILL CORPORATION
2024 NORTH KING STREET
SUITE 200
HONOLULU, HI 96819

2 4 0 2 E . 2 6 5 9^T H R D .
M A R S E I L L E S , I L 6 1 3 4 1

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2. Ahuimanu PTF Grit Evaluation Sampling Period
3. Fractional Concentrations of Grit at the Ahuimanu PTF
4. Predicted Removal Efficiencies (%) of a System Designed to Remove Grit of a Specific SES at the Ahuimanu PTF

Definitions/Abbreviations

gpm - gallons per minute.

Grit – A settleable inorganic kernel with attached organics larger than 50 microns and characterized by physical size and settling velocity.

Grit Concentration – the amount of grit present in the wastestream based on the fixed solids measurements

Grit Fixed Solids (FS) – also expressed as "**fixed solids**" - the inorganic portion of sample remaining after organics are removed by ashing in a muffle furnace at 550^{o}C.

lbs./MG – Pounds per Million Gallons

MG - Million Gallons

MGD – Million Gallons per Day

NR1 – the Reynolds number for the trial SES

NR2 – the Revised Reynolds number

PTF - Pollution Treatment Facility

SAA – Surface Active Agents – material affixed to the grit particle, such as organics, fats, oils, and greases that may affect the settling velocity of municipal grit.

Sample – All material accumulated in the bottom of the grit settler which includes settleable organics.

Sand Equivalent Size (SES) - The sand particle size, measured in microns, having the same settling velocity as the selected grit particle.

Sed h, cm – The height of water in the Imhoff cone through which the sediment passed to reach the surface of accumulated material during SES determination

Sed Time, sec – The time required for sediment to reach the recorded volume during SES determination

Sed vel, cm/s – the settling velocity (v) of the sediment reaching a particular settled volume

Sed. Vol., cc – Sedimentation Volume (cc or ml) – The amount of material that settles in the Imhoff Cone during SES determinations

SES, d1, u – Trial Sand Equivalent Size, in microns

Definitions/Abbreviations Continued

SES, d2, u – Revised Reynolds Number based on NR2 and d1

VIS – Vertically Integrated Sampler

Vol Frac, % - the cumulative sedimentation percentage occurring during SES determination

Study Objectives

The purpose of this study is to determine the quantities and characteristics of grit entering the Ahuimanu PTF.

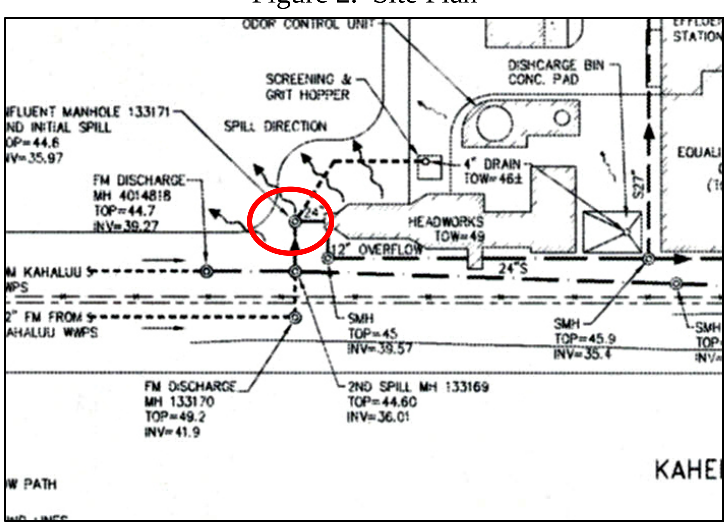
Methods/Materials

Obtaining Representative Grit Fixed Solids (FS) Sample

The volume and characteristics of grit received at wastewater treatment facilities can vary widely depending on the characteristics of the collection system, weather conditions, septic waste haulers, and industrial activities. The analytical procedures used in compiling these data take into account and compensate for the non-homogeneity of the grit. The influent sample was collected from the influent sewer supplying the facility. A Vertically Integrated Sampler (VIS) was secured in the manhole and positioned to face the flow (Figure 1). The VIS is designed to collect a homogenous sample from the entire height of the water column, however the slot for this study was only the height of the pipe (Figure 2). A suction hose plumbed to a trash pump was attached to the sampler.

Figure 1. Influent Sampler/Sampling Site

Figure 2. Site Plan



A segment of the influent sample collected by the trash pump was diverted to a grit settler (Figure 3). The settler was constructed from a 55-gallon drum with an influent port and a discharge weir. Flow enters the tank and is diverted to the side with a 90^{o} elbow to reduce the velocity and turbulence. Grit settles to the bottom of the tank, and wastewater exits through the discharge fitting at the top of the tank. In order to settle 50-micron grit with a specific gravity of 2.65, the overflow rate must be less than 3 gpm/ft^2 of surface area. The settler has a diameter of 24-inches, or a surface area of 3.14 ft^2. At 10 gpm, the overflow rate is 3.18 gpm/ft^2. The settler feed rate is adjusted to less than eight gpm to insure settling of fine grit and this is checked by timing the overflow rate of the settler. This is repeated every 30 minutes to insure stability. The excess flow provided by the pump is bypassed back into the waste stream.

Figure 3. Grit Settlers

A PVC wye was used to split the flow (Figure 4), and a valve following the wye is used to increase flow to the settler if necessary.

Figure 4. PVC Splitter and Valve

At the end of the sampling period, the settler contents are allowed to stand for 10 minutes. The supernatant is discarded and grit that has accumulated in the bottom of the settler is rinsed into buckets. The liquid portions of the grit samples are gradually poured off until the remaining grit/sludge samples are thick enough to obtain a homogenous mixture without grit settling out of the slurry. The entire volume of each sample is recorded before being split, if necessary, for analysis.

Determination of Grit Particle Distribution

A maximum 200-gram portion of the sample collected by the Grit Settler is immediately classified through a series of sieves. If the total sample size exceeds 200-grams, the sample is split and the fraction is recorded on the field bench sheet. Sieve sizes used are listed below in Table 1.

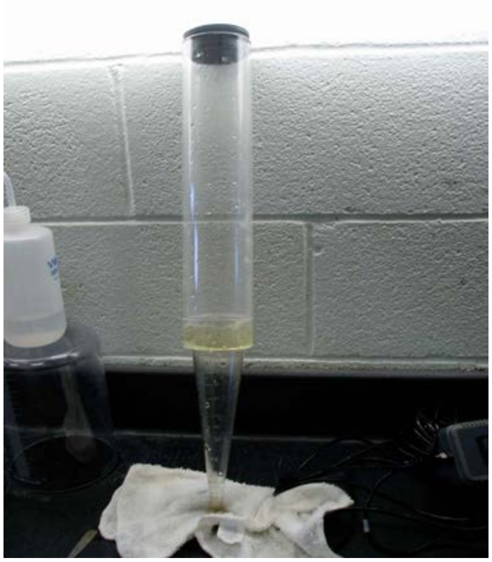
Table 1. Sieve Size Equivalents

		Opening	
U.S. Sieve Size	Tyler Equivalent	microns	inches
1/4	3.25 mesh	6300	0.2500
1/8	6.5 mesh	3180	0.1250
#12	10 mesh	1680	0.0661
#20	20 mesh	841	0.0331
#50	48 mesh	297	0.0117
#70	65 mesh	210	0.0083
#100	100 mesh	149	0.0059
#140	150 mesh	105	0.0041
#200	200 mesh	74	0.0029
#270	270 mesh	53	0.0021
Pan			

Determination of Sand Equivalent Size (SES) distribution

Settling tests were conducted immediately on solids passing the 1/8" sieve and sequentially retained on the #12, #20, #50, #70, #100, #150, #200, and #270 sieves. A portion of the retained material is placed into a modified Imhoff cone filled with water (See Figure 5). The column is inverted and as the grit settles in the cone corresponding time and volume measurements are recorded. The objective of these measurements is to determine the size of a sand sphere having the same settling velocity as the collected grit fraction.

Figure 5. Modified Imhoff Cone for SES Measurements

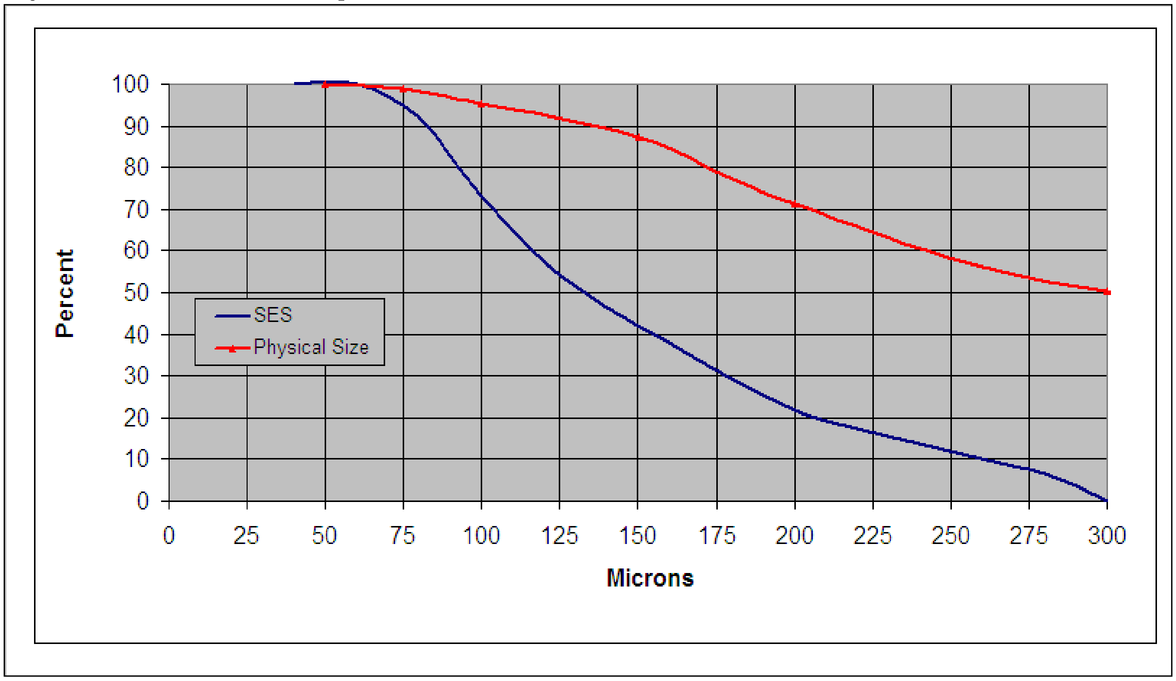


Sand Equivalent Size Description

The settling velocity of a grit particle depends on several factors that may include surface active agents affixed to the grit particle, attached fibrous organics, the composition, and the shape of the grit particle. Particles with slow settling velocities are said to be "light" and may have low specific gravity or be angular in shape. Conversely, fast settling particles are said to be "heavy" and may have high specific gravities and a rounder shape. Clean, round silica sand is known to have a Specific Gravity of 2.65. However, because grit is seldom clean or round, and may not be made of silica, settling velocities are often much slower. Like Specific Gravity, Sand Equivalent Size is a way of describing the settling characteristics of municipal grit. By definition, Sand Equivalent Size (SES) is "the clean sand particle size, measured in microns, having the same settling velocity of the collected grit particle". For example, a 300-micron **silica sand** particle with a specific gravity of 2.65 will settle at a known velocity. A 300-micron **grit particle** composed of a different material (i.e., limestone), or a silica sand particle (2.65 SG) with a shape that is not round, will settle slower, perhaps with a settling velocity similar to that of a 150-micron sand particle. Therefore, we say that the 300-micron grit particle has a **Sand Equivalent Size** of 150-microns. Additionally, sieve analyses are a "two-dimensional" test, and ignore the thickness of the grit particle. Therefore, a visually "coarse" distribution may in fact behave like a much finer one.

By comparing the physical size and the SES of the grit, the effects of shape and composition can be demonstrated. The following is an example of a "companion plot" that charts physical size and SES of municipal grit.

Physical Size versus Sand Equivalent Size: Cumulative Distributions



The preceding chart compares cumulative distributions. For example, from the chart, 87% of the influent grit has a physical size of 150-microns and larger, while only 43% of the grit has a Sand Equivalent Size of 150-microns and larger. This difference is a result of the composition and shape previously discussed, and this grit is "light". As particles become smaller, they attain a more rounded shape, resulting from larger, flat particles breaking up into smaller pieces. Grit chamber design must consider the settling velocity of the grit, as specific gravity and physical size distributions alone fail to provide enough information on grit behavior.

Solids Analysis

The weight measurements of the grit particles retained on each of the ten sieves were determined according to methods SM2540B and SM2540E as outlined in Standard Methods for the Examination of Water and Wastewater, 1998 APHA, AWWA, WEF, 20th edition. Fixed solids fractions were arranged into fractional and cumulative distributions. From this data a cumulative curve factoring physical size and weight of fixed solids is generated. All solids data are listed in Appendix A-1 "Fractional Solids Analysis"

Discussion of Results

The trial was conducted on September 10 and 11, 2014 and samples were collected during stable flow conditions. Sampling conditions are presented below in Table 2.

Table 2. Ahuimanu PTF Grit Evaluation Sampling Period					
Sampling Date	Average Flow During Study (MGD)	Start Time	Finish Time	Hours	Settler Feed Rate (gpm)
September 10, 2014	0.722	7:10	13:10	6.0	8.14
September 11, 2014	0.722	7:06	13:06	6.0	8.21

Influent Grit Characteristics

Figures 6 and 7 plot the fractional and cumulative distributions of influent grit collected over the study period, and concentrations of grit are plotted in Figure 8. From Figures 6 and 7, between 58.4 and 70.2% of grit entering the facility was larger than 297-microns physical size, and between 29.8 and 41.6% of grit was smaller than 297-microns. Influent concentrations were extremely low, totaling 1.6 lbs/MG on September 10 and 2.0 lbs/MG on September 11. Table 3 lists fractional concentrations.

Figure 6. Fractional Distribution of Grit at the Ahuimanu PTF

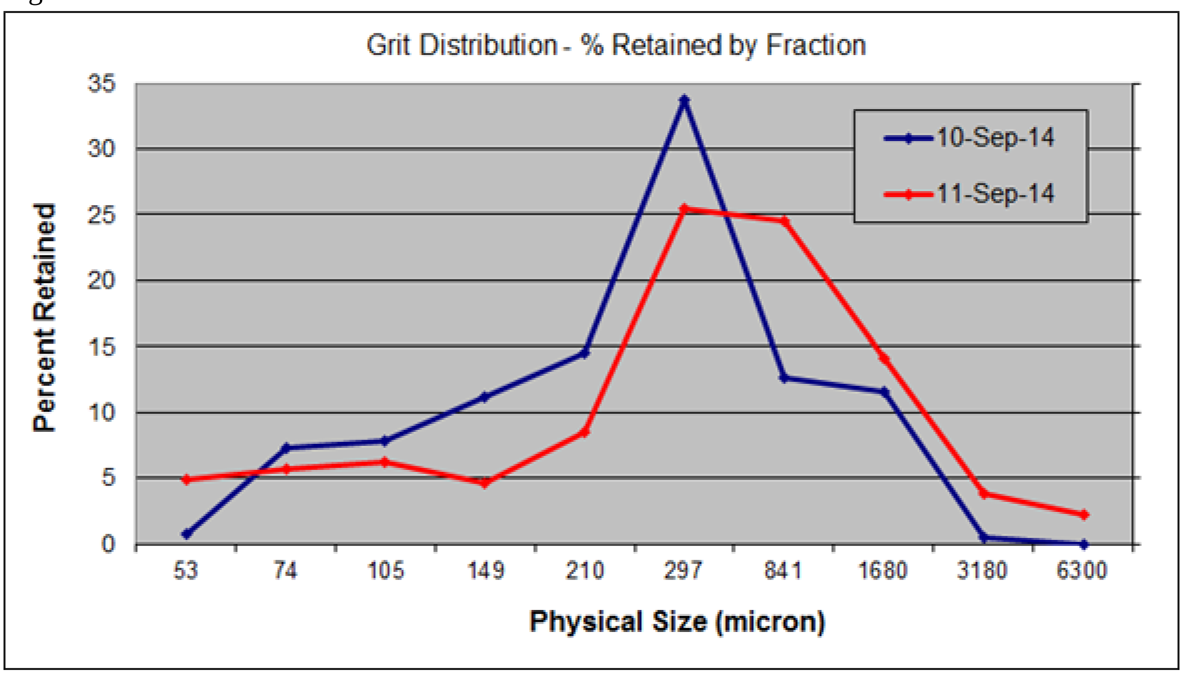


Figure 7. Cumulative Distribution of Grit at the Ahuimanu PTF

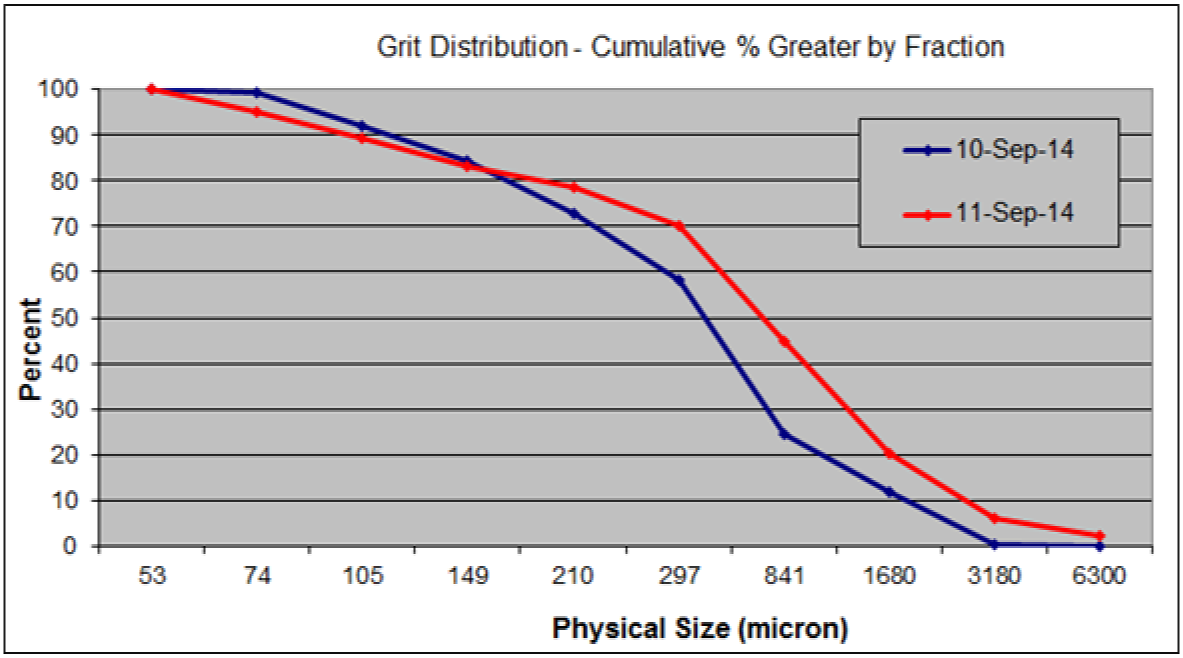


Figure 8. Concentrations of Grit Present at the Ahuimanu PTF

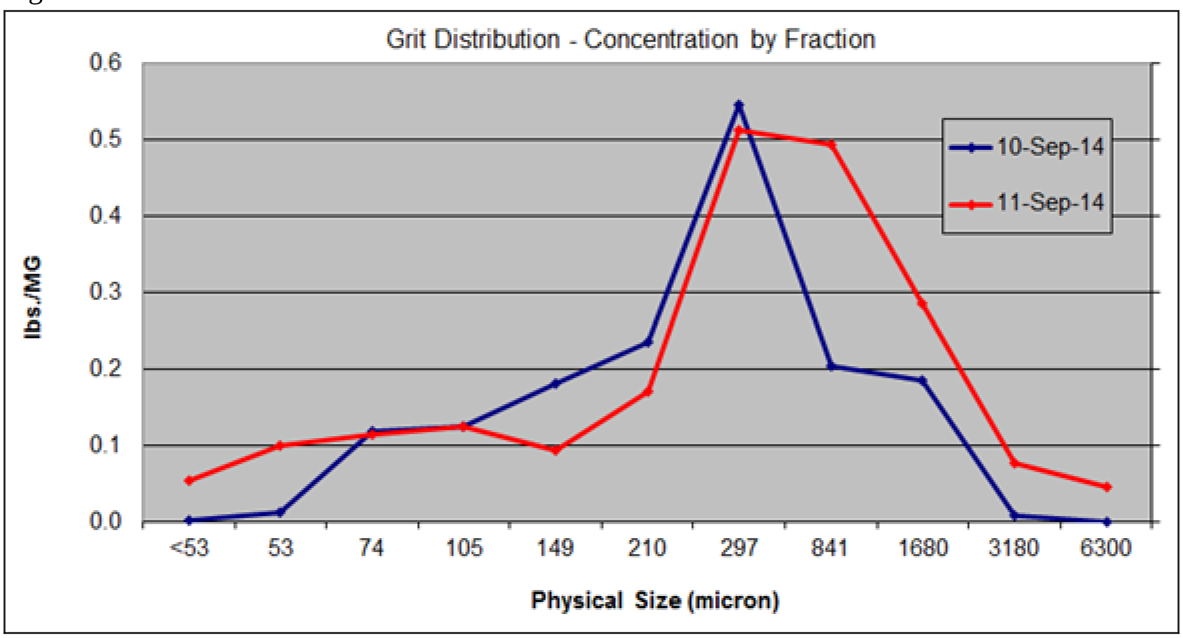


Table 3. Fractional Concentrations of Grit at the Ahuimanu PTF		
Size Fraction	September 10, 2014 (lbs/MG)	September 11, 2014 (lbs/MG)
>6300	0.000	0.045
<6300-microns >3180-microns	0.008	0.077
<3180-microns >1681-microns	0.186	0.285
<1681-microns >841-microns	0.204	0.495
<841-microns >297-microns	0.546	0.513
<297-microns >210-microns	0.235	0.170
<210-microns >149-microns	0.181	0.093
<149-microns >105-microns	0.126	0.125
<105-microns >74-microns	0.117	0.114
<74-microns >53-microns	0.013	0.099
<53-microns	0.001	0.054
Total	**1.617**	**2.016**

<u>Sand Equivalent Size</u>

Sand Equivalent Size (SES) vs. Physical Size plots can be used to determine grit removal system design parameters. The following table lists theoretical removal efficiencies for a system designed to remove grit based on the SES data collected from the influent sampling site. Different "cut-points" are given to demonstrate various levels of protection that can be achieved based on a facility's needs. Depending on the concentration of grit entering the facility, the cost/benefit can be determined to select an appropriate design. The presence of certain downstream processes may require a higher level of protection from deposition, thus a smaller cut-point particle will need to be considered for design.

Table 4. Predicted Removal Efficiencies (%) of a System Designed to Remove Grit of a Specific SES at the Ahuimanu PTF				
Sample Date	300-micron SES Design	150-micron SES Design	100-micron SES Design	75-micron SES Design
September 10, 2014	10.8	56.6	85.2	99.0
September 11, 2014	15.1	66.4	90.8	99.7

Efficiencies listed in Tables 4 are shown graphically in Figures 9 and 10, which compares the Sand Equivalent Size and physical size of influent grit. Figure 11compares the physical and SES distributions of collected grit with a clean sand distribution. Values found in Figure 11are determined from the median SES of material on each sieve, and fractional data is not applied as is the previous companion charts.

Figure 9. Comparison of the Ahuimanu PTF Grit Physical Size and Sand Equivalent Size: September 10, 2014

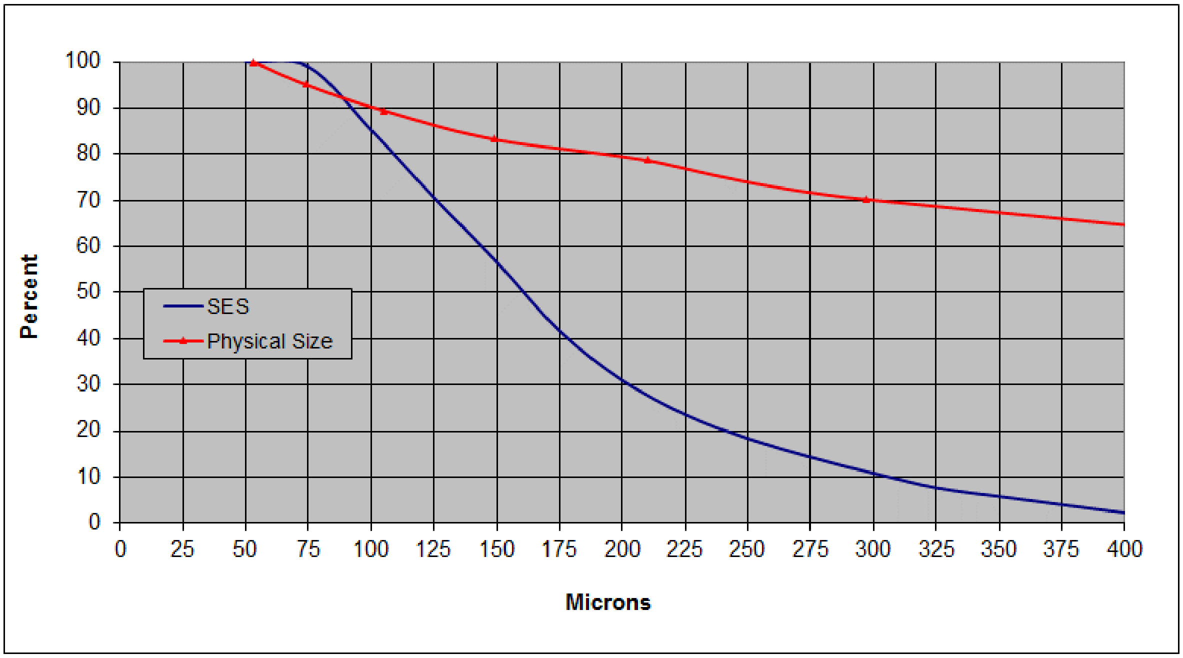


Figure 10. Comparison of the Ahuimanu PTF Grit Physical Size and Sand Equivalent Size: September 11, 2014

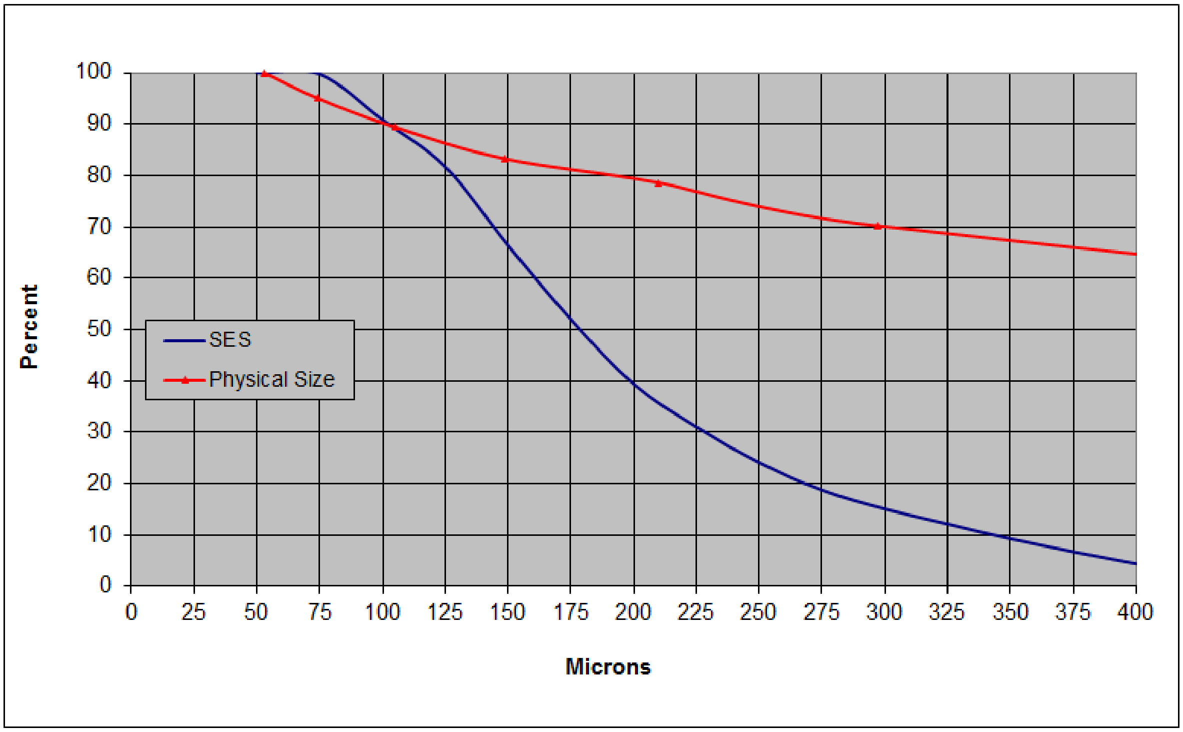
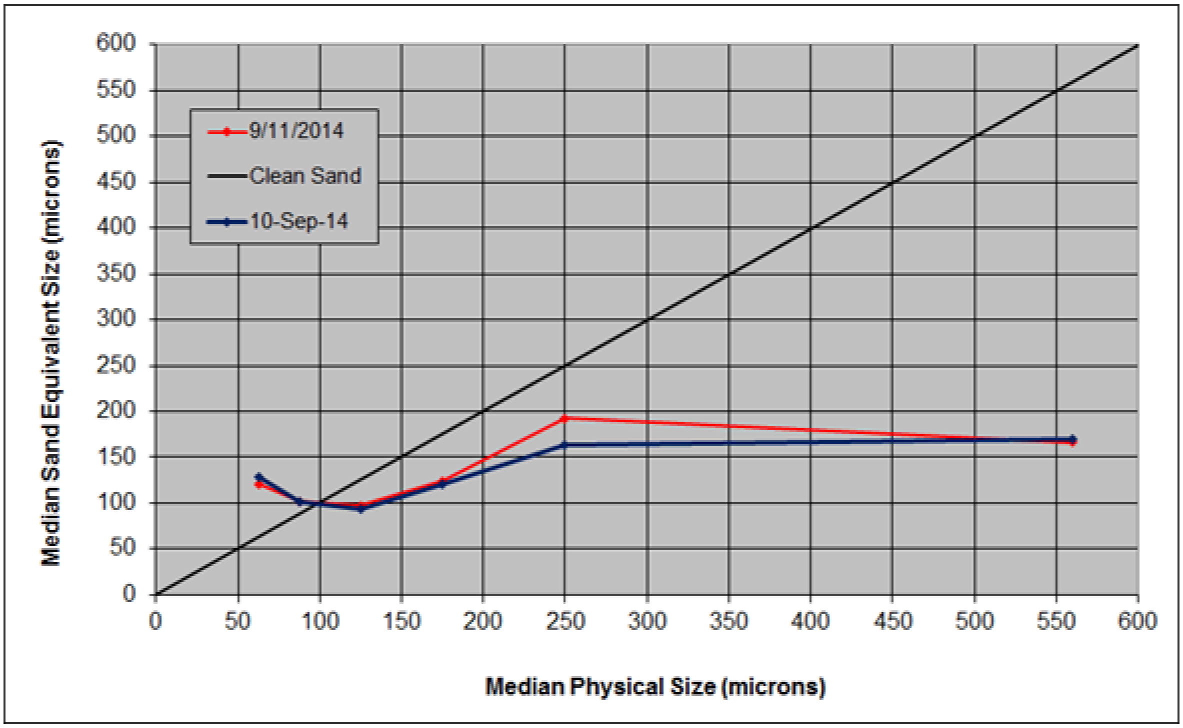


Figure 11. Median Size Distribution of Grit at the Ahuimanu PTF vs. a Clean Sand Distribution



<u>Conclusions</u>

1. At the Ahuimanu PTF, between 58.4 and 70.2% of grit entering the facility was larger than 297-microns physical size, and between 29.8 and 41.6% of grit was smaller than 297-microns (Figures 6 and 7)

2. The total influent grit concentrations were 1.6 lbs/MG on September 10 and 2.0 lbs/MG on September 11. This is extremely low compared to the national average of 55 lbs/MG. (Figure 8, Table 3)

3. Based on settling velocity data collected from the influent material, a grit removal system design based on 150-micron Sand Equivalent Size would collect between 56.6 and 66.4% of influent grit while a 100-micron SES system would improve to between 85.2 and 90.8% efficiency. (See Table 4)

4. Influent grit was light, with 560-micron material having an SES value of only 170-microns. (Figure 11).

5. It is likely that a majority of grit enters the facility during high flow events. Additional sampling is required to confirm the amounts and characteristics of this grit. It is also possible that the daily maximum concentration was missed due to the peak flow ramp-up occurring prior to sampling, between 4:00 and 7:00 am.

Bibliography

Clesceri, L., Greenberg, A. and Eaton, A., “Standard Methods for the Examination of Water and Wastewater”, 20th Edition, 1998, American Public Health Association, Washington, DC

Tchobanoglous, G., Burton, F.L. and Stensel, H.D., “Wastewater Engineering: Treatment and Reuse”, 4^{th} Edition, 2003. TATA McGraw-Hill

Appendix A – Raw Data

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A-1 Concentration Calculation Spreadsheet

Concentration Calculation Spreadsheet - Ahuimanu WWTP Influent

Sample Site	Start Time	End Time	Sampling Time (hrs.)	Settler Feed Rate (gpm)	Plant Flow (MGD)	Amount of Flow During Sampling Period (MG)	Gallons Sampled	Total Grit FS Collected (grams)
September 10, 2014	7:10	13:10	6.00	8.14	0.640	0.160	2,931	2.15
September 11, 2014	7:06	13:06	6.00	8.21	0.640	0.160	2,955	2.70

Sample Site	Sample Dilution/mls of sample	Total Sample Volume (gal)	Sample Dilution/volume analyzed (mls)	Weight of Sample Put in Wet Sieve (gm)	Total FS Weight (gm)	Total Grit FS Collected (pounds)	Total Grit FS Entering Channel During Sampling (pounds)	Concentration (lbs/MG)
September 10, 2014	1	0.0003	1	1	2.15	0.00	0.3	1.6
September 11, 2014	1	0.0003	1	1	2.70	0.01	0.3	2.0

A-2 Solids Analysis Bench Sheets

Fixed Solids Weight

Fixed Solids Sample Weight (grams)

		Sample Site	Influent		
Micron	US Sieve	10-Sep-14	11-Sep-14		
6300	1/4	0.000	0.059		
3180	1/8	0.011	0.101		
1680	#12	0.247	0.372		
841	#20	0.271	0.646		
297	#50	0.726	0.669		
210	#70	0.312	0.222		
149	#100	0.241	0.121		
105	#140	0.167	0.163		
74	#200	0.156	0.149		
53	#270	0.017	0.129		
<53	pan	0.001	0.070		
Total FS Weight		2.15	2.70	0.00	##

Fixed Solids Sample Percent Retained

		Sample Site	Influent	
Micron	US Sieve	10-Sep-14	11-Sep-14	
6300	1/4	0.00	2.24	
3180	1/8	0.51	3.84	
1680	#12	11.50	14.14	
841	#20	12.62	24.55	
297	#50	33.80	25.43	
210	#70	14.53	8.44	
149	#100	11.22	4.60	
105	#140	7.77	6.20	
74	#200	7.26	5.66	
53	#270	0.79	4.90	
<53	pan	0.05	2.66	
Total (%) minus pan		100.00	100.00	0.00

Fixed Solids Sample Cumulative %>

		Sample Site	Influent	
Micron	US Sieve	10-Sep-14	11-Sep-14	
53	#270	100	100	100
74	#200	99.21	95.10	0.00
105	#140	91.95	89.43	0.00
149	#100	84.17	83.24	0.00
210	#70	72.95	78.64	0.00
297	#50	58.43	70.20	0.00
841	#20	24.63	44.77	0.00
1680	#12	12.01	20.22	0.00
3180	1/8	0.51	6.08	0.00
6300	1/4	0.00	2.24	0.00

A-3 Fractional Grit Concentration Calculation Bench Sheet

Fractional Concentrations
Influent

Micron	US Sieve	10-Sep-14 %	lbs/MG	11-Sep-14 %	lbs/MG
6300	0.25	0.000	0.000	2.242	0.045
3180	0.125	0.512	0.008	3.839	0.077
1680	#12	11.499	0.186	14.139	0.285
841	#20	12.616	0.204	24.553	0.495
297	#50	33.799	0.546	25.428	0.513
210	#70	14.525	0.235	8.438	0.170
149	#100	11.220	0.181	4.599	0.093
105	#140	7.775	0.126	6.195	0.125
74	#200	7.263	0.117	5.663	0.114
53	#270	0.791	0.013	4.903	0.099
<53	pan	0.047	0.001	2.661	0.054
	Total (lbs)	1.617	1.617	2.016	2.016

A-4 SES Data Analysis

SES Data Analysis

Ahuimanu, HI - September 10, 2014 - Influent

sed vol, cc	fractional volume, %	sed time, sec	sed h, cm	sed vel, cm/s	SES, d1 µ	NR1	NR2	SES, d2 µ		SES, µ	vol frac, %≥
20M - 50M, 300µ - 820µ											
0.2	11	9.84	53.4	5.43E+00	327.8	17.8	17.8	327.8		327.8	11
0.4	22	14.61	52.7	3.61E+00	245.0	8.8	8.8	245.0		245.0	22
0.6	34	19.33	52.2	2.70E+00	202.8	5.5	5.5	202.8		202.8	34
0.8	45	23.76	51.8	2.18E+00	177.5	3.9	3.9	177.5		177.5	45
1.0	56	27.81	51.4	1.85E+00	160.8	3.0	3.0	160.8		160.8	56
1.3	70	32.32	51.1	1.58E+00	146.6	2.3	2.3	146.6		146.6	70
1.5	84	38.96	50.7	1.30E+00	131.1	1.7	1.7	131.1		131.1	84
1.8	98	52.02	50.4	9.70E-01	111.1	1.1	1.1	111.1		111.1	98
1.8	100	71.01	50.4	7.10E-01	93.7	0.7	0.7	93.7		93.7	100
50M - 70M, 200µ - 300µ											
0.20	33	17.98	53.4	2.97E+00	215.7	6.4	6.4	215.7		215.7	33
0.3	50	27.86	53.0	1.90E+00	163.6	3.1	3.1	163.6		163.6	50
0.4	67	43.50	52.7	1.21E+00	125.9	1.5	1.5	125.9		125.9	67
0.5	83	67.19	52.4	7.80E-01	98.6	0.8	0.8	98.6		98.6	83
0.6	100	89.12	52.2	5.86E-01	84.4	0.5	0.5	84.4		84.4	100
70M - 100M, 150µ - 200µ											
0.10	25	33.05	54.0	1.63E+00	149.5	2.4	2.4	149.5		149.5	25
0.2	50	47.44	53.4	1.13E+00	120.8	1.4	1.4	120.8		120.8	50
0.3	75	75.05	53.0	7.07E-01	93.4	0.7	0.7	93.4		93.4	75
0.4	100	115.06	52.7	4.58E-01	74.1	0.3	0.3	74.1		74.1	100
100M - 140M, 100µ - 150µ											
0.05	25	56.42	54.5	9.66E-01	110.9	1.1	1.1	110.9		110.9	25
0.1	50	75.36	54.0	7.17E-01	94.2	0.7	0.7	94.2		94.2	50
0.2	100	125.91	53.4	4.24E-01	71.2	0.3	0.3	71.2		71.2	100
140M - 200M, 75µ - 100µ											
0.05	50	67.16	54.5	8.11E-01	100.7	0.8	0.8	100.7		100.7	50
0.1	100	123.14	54.0	4.39E-01	72.4	0.3	0.3	72.4		72.4	100
200M - 270M, 50µ - 75µ											
0.01	20	33.11	55.2	1.67E+00	151.3	2.5	2.5	151.3		151.3	20
0.05	100	75.56	54.5	7.21E-01	94.5	0.7	0.7	94.5		94.5	100

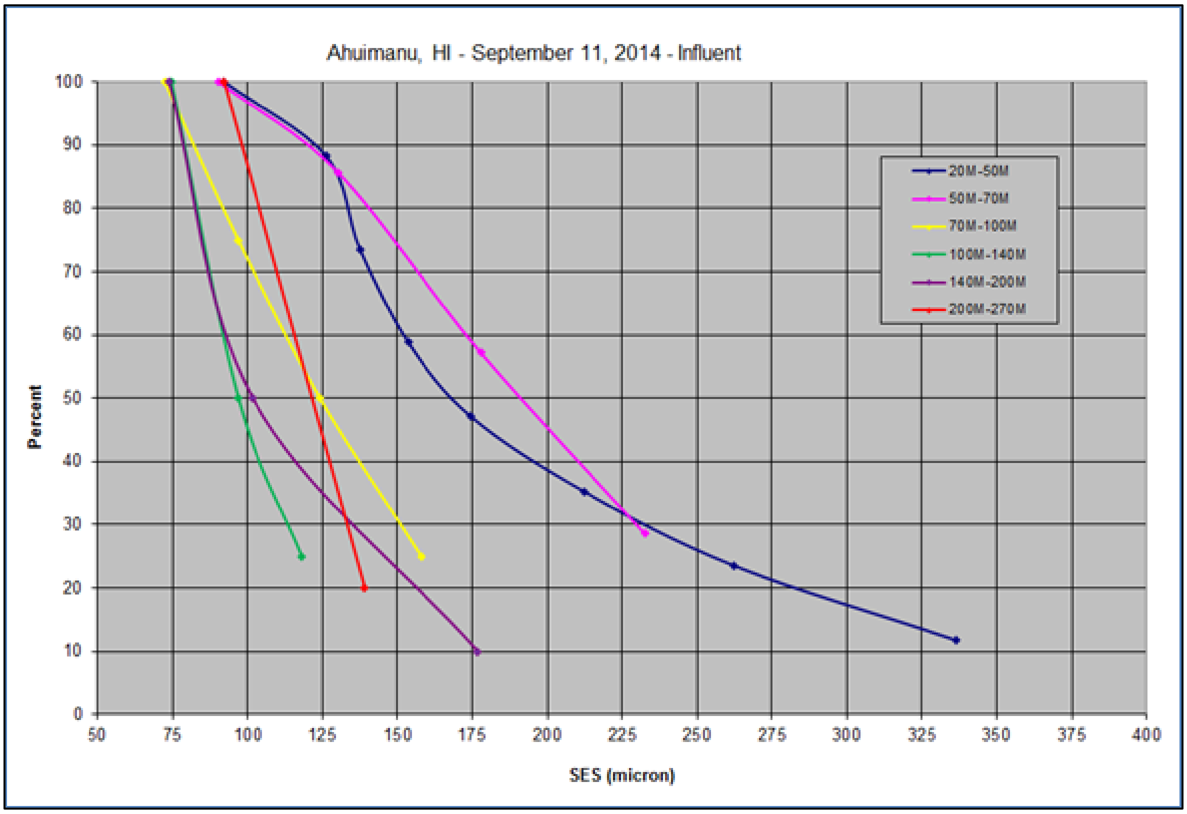
A-4 SES Data Analysis

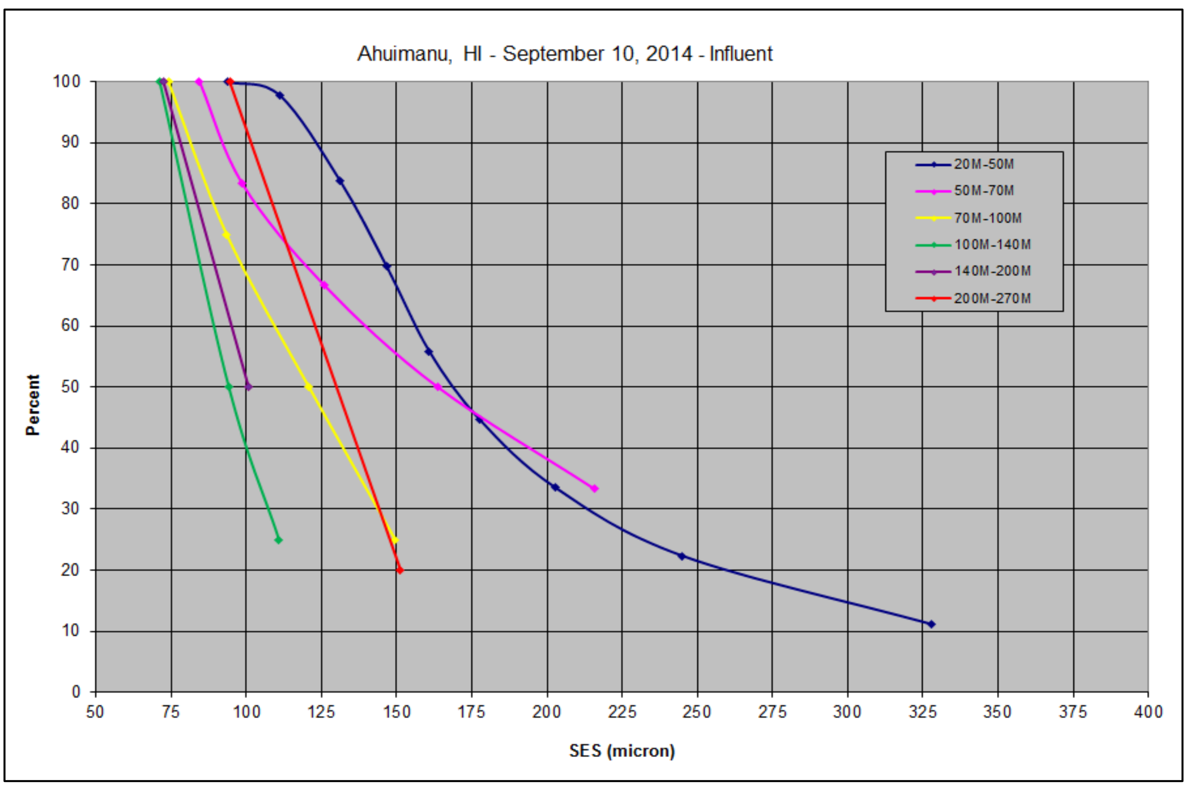
SES Data Analysis

Ahuimanu, HI - September 11, 2014 - Influent

sed vol, cc	fractional volume, %	sed time, sec	sed h, cm	sed vel, cm/s	SES, d1 µ	NR1	NR2	SES, d2 µ		SES, µ	vol frac, %≥
20M - 50M, 300µ - 820µ											
0.2	12	9.51	53.4	5.62E+00	336.4	18.9	18.9	336.4		336.4	12
0.4	24	13.23	52.7	3.98E+00	262.2	10.4	10.4	262.2		262.2	24
0.6	35	18.01	52.2	2.90E+00	212.2	6.1	6.1	212.2		212.2	35
0.8	47	24.41	51.8	2.12E+00	174.7	3.7	3.7	174.7		174.7	47
1.0	59	30.06	51.4	1.71E+00	153.6	2.6	2.6	153.6		153.6	59
1.3	74	36.10	51.1	1.41E+00	137.5	1.9	1.9	137.5		137.5	74
1.5	88	41.64	50.7	1.22E+00	126.3	1.5	1.5	126.3		126.3	88
1.7	100	73.34	50.5	6.89E-01	92.1	0.6	0.6	92.1		92.1	100
50M - 70M, 200µ - 300µ											
0.20	29	16.02	53.4	3.34E+00	232.6	7.8	7.8	232.6		232.6	29
0.4	57	24.11	52.7	2.19E+00	177.9	3.9	3.9	177.9		177.9	57
0.6	86	40.64	52.2	1.28E+00	130.1	1.7	1.7	130.1		130.1	86
0.7	100	78.51	52.0	6.62E-01	90.2	0.6	0.6	90.2		90.2	100
70M - 100M, 150µ - 200µ											
0.10	25	30.11	54.0	1.79E+00	157.9	2.8	2.8	157.9		157.9	25
0.2	50	45.18	53.4	1.18E+00	124.2	1.5	1.5	124.2		124.2	50
0.3	75	70.22	53.0	7.55E-01	96.9	0.7	0.7	96.9		96.9	75
0.4	100	120.36	52.7	4.38E-01	72.3	0.3	0.3	72.3		72.3	100
100M - 140M, 100µ - 150µ											
0.05	25	50.32	54.5	1.08E+00	118.1	1.3	1.3	118.1		118.1	25
0.1	50	71.44	54.0	7.56E-01	96.9	0.7	0.7	96.9		96.9	50
0.2	100	115.06	53.4	4.64E-01	74.6	0.3	0.3	74.6		74.6	100
140M - 200M, 75µ - 100µ											
0.01	10	25.48	55.2	2.17E+00	176.9	3.8	3.8	176.9		176.9	10
0.1	50	65.97	54.5	8.26E-01	101.7	0.8	0.8	101.7		101.7	50
0.1	100	118.61	54.0	4.55E-01	73.9	0.3	0.3	73.9		73.9	100
200M - 270M, 50µ - 75µ											
0.01	20	38.23	55.2	1.44E+00	139.2	2.0	2.0	139.2		139.2	20
0.1	100	78.99	54.5	6.90E-01	92.2	0.6	0.6	92.2		92.2	100

A-5 SES Charts





A-6 SES Chart Analysis

Ahuimanu, HI - September 10, 2014 - Influent

Sieve Size >	1/4	1/8	#12	#20	#50	#70	#100	#140	#200	#270	% Total in SES Range			
fxd solids fraction	0.00	0.51	11.50	12.62	33.80	14.53	11.22	7.77	7.26	0.79				
											SES (micron)	% Percent Retained	Cumulative % Retained	% >
SES Interval											50			100
50-75							1.0	8.0	4.0		75	1.02	1.02	98.98
75-100					1.0	18.0	31.0	52.0	44.0	8.0	100	13.73	14.76	85.24
100-125				1.0	11.0	15.0	22.0	35.0	44.0	35.0	125	14.68	29.44	70.56
125-150			1.0	11.0	21.0	12.0	21.0	5.0	8.0	35.0	150	13.95	43.39	56.61
150-175		1.0	11.0	21.0	21.0	9.0	22.0			22.0	175	14.97	58.36	41.64
175-200	1.0	11.0	21.0	21.0	12.0	8.0	3.0				200	10.68	69.03	30.97
200-225	11.0	21.0	21.0	12.0	7.0	7.0					225	7.42	76.45	23.55
225-250	21.0	21.0	12.0	7.0	5.0	8.0					250	5.22	81.67	18.33
250-275	21.0	12.0	7.0	5.0	4.0	8.0					275	4.01	85.68	14.32
275-300	12.0	7.0	5.0	4.0	4.0	7.0					300	3.48	89.17	10.83
300-325	7.0	5.0	4.0	4.0	3.0	8.0					325	3.17	92.33	7.67
325-350	5.0	4.0	4.0	3.0	3.0						350	1.87	94.21	5.79
350-375	4.0	4.0	3.0	3.0	3.0						375	1.76	95.96	4.04
375-400	4.0	3.0	3.0	3.0	3.0						400	1.75	97.72	2.28
400-425	3.0	3.0	3.0	3.0	2.0						425	1.41	99.13	0.87
>425	11.0	8.0	5.0	2.0							>425	0.87	100.00	0.00
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0		100.00		

Ahuimanu, HI - September 10, 2014 - Influent

Sieve Size >	1/4	1/8	#12	#20	#50	#70	#100	#140	#200	#270	% Total in SES Range			
fxd solids fraction	0.00	0.51	11.50	12.62	33.80	14.53	11.22	7.77	7.26	0.79				
											SES (micron)	% Percent Retained	Cumulative % Retained	% >
SES Interval											50			100
50-75							1.0	8.0	4.0		75	1.02	1.02	98.98
75-100					1.0	18.0	31.0	52.0	44.0	8.0	100	13.73	14.76	85.24
100-125				1.0	11.0	15.0	22.0	35.0	44.0	35.0	125	14.68	29.44	70.56
125-150			1.0	11.0	21.0	12.0	21.0	5.0	8.0	35.0	150	13.95	43.39	56.61
150-175		1.0	11.0	21.0	21.0	9.0	22.0			22.0	175	14.97	58.36	41.64
175-200	1.0	11.0	21.0	21.0	12.0	8.0	3.0				200	10.68	69.03	30.97
200-225	11.0	21.0	21.0	12.0	7.0	7.0					225	7.42	76.45	23.55
225-250	21.0	21.0	12.0	7.0	5.0	8.0					250	5.22	81.67	18.33
250-275	21.0	12.0	7.0	5.0	4.0	8.0					275	4.01	85.68	14.32
275-300	12.0	7.0	5.0	4.0	4.0	7.0					300	3.48	89.17	10.83
300-325	7.0	5.0	4.0	4.0	3.0	8.0					325	3.17	92.33	7.67
325-350	5.0	4.0	4.0	3.0	3.0						350	1.87	94.21	5.79
350-375	4.0	4.0	3.0	3.0	3.0						375	1.76	95.96	4.04
375-400	4.0	3.0	3.0	3.0	3.0						400	1.75	97.72	2.28
400-425	3.0	3.0	3.0	3.0	2.0						425	1.41	99.13	0.87
>425	11.0	8.0	5.0	2.0							>425	0.87	100.00	0.00
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0		100.00		

A-7 Median SES versus Median Physical Size

Median Size (microns)	Size Range (microns)		10-Sep-14	9/11/2014
62.5	50	75	129	121
87.5	75	100	101	102
125	100	150	94	97
175	150	200	121	124
250	200	300	164	192
560	300	820	170	166

Appendix B – Calculations

<u>Drag Coefficient (C_d)</u>

$24/N_R + 3/\text{sqrt } N_R + 0.34$

<u>Reynolds number (N_R)</u>

(settling velocity of particle)(diameter of particle)/kinematic viscosity

<u>Stoke's Law</u>

Settling velocity (m/s) = $g(sg_p - 1)d^2{}_p/18v$

Where g = acceleration due to gravity (9.81 m/s^2)
sg_p = specific gravity of particle
d_p = diameter of particle
v = kinematic viscosity (m^2/s)

<u>% Total Solids</u>

(grams dry weight/grams wet weight)*100

<u>% Total Volatile Solids</u>

[(grams dry weight - grams ash weight)/ grams dry weight]*100

APPENDIX E

Structural Analysis Report

STRUCTURAL ENGINEERING
PROJECT MANAGEMENT
NTW ASSOCIATES, INC.

STRUCTURAL ANALYSIS REPORT

For

AHUIMANU WWPTF FOUNDATION ANALYSIS OF EQUALIZATION BASIN ALTERN ALTERNATIVES

Kahaluu, Oahu, Hawaii

EXPIRATION 04/30/2018

THIS PROJECT WAS PREPARED BY ME
UNDER MY SUPERVISION

JEFFREY Y.C. WONG
LICENSED PROFESSIONAL ENGINEER
No. 3207-S
HAWAII, U.S.A.

1542 Young Street, Suite 300, Honolulu, Hawaii 96826 Phone: (808) 942-8880 Fax: (808) 943-7137

AHUIMANU WWPTF IMPROVEMENTS AND EQUALIZARION FACILITY

FOUNDATION ANALYSIS OF EQUALIZATION BASIN ALTERNATIVES

SECTION 1 - GENERAL PROJECT DESCRIPTION

SECTION 2 – ENGINEERING CONSIDERATIONS AND APPROACHES

SECTION 3 – VARIOUS OPTIONS OF EQ BASIN STRUCTURES

FIGURES – S1.1 TO S3.2

Section 1 – General Project Description

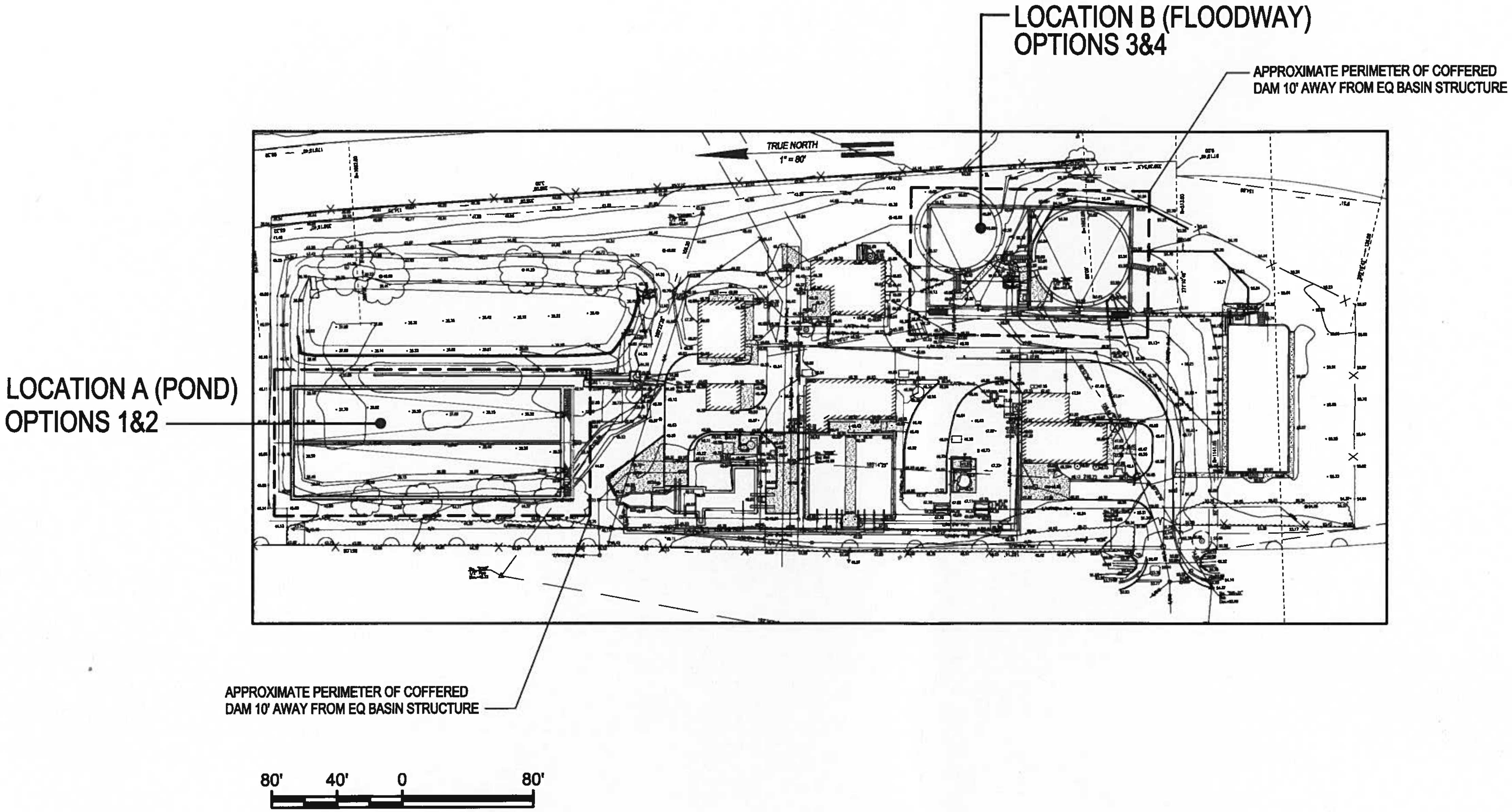
1.1 Description of Project site

Located at 47-305 Kahekili Highway the construction of Ahuimanu Wastewater Pre-Treatment Facility (AWWPTF) could be traced as back in 1963. Since then the facility had been undergoing numerous renovation and expansion. Situated between the Kahikili Highway on the West Side and the Ahuimanu Stream on the East Side the facility mainly served to store sewage from the Ahuimanu and Kahalu'u area. In this project City requests that alternative design options shall be provided for the Equlization (EQ) basins at two locations. Location A is at the holding pond and location B is at the floodway, where there are an existing Primary Clarifier tank and a Digester tank. See Figure S1.1. Two alternative options will be suggested at each location.

1.2 Scope of Work

As part of the improvement plan for AWWPTF the structural engineer performed the following tasks in this project:

1. Review the draft of Geotechnical exploration and Evaluation Report prepared by the project geotechnical engineer.
2. Based on the proposed locations and sizes of the EQ basins discuss with the project engineer and the geotechnical engineer and provide the structural input on the design and construction of the EQ basins.
3. Discuss with the project engineer to develop alternative structural framing systems that are suitable for the site and the soils condition.
4. Perform preliminary analysis for each option (total of 4) and develop schematic structural layout and framing.
5. Prepare an investigation report for "Foundation Analysis of Equalization Basin Aternatives", which will contain sketches to demonstrate our proposed structural foundation systems and basic structural approaches.



PROJECT SITE PLAN

Ahuimanu WWPTF Improvements and Equalization Facility	
FOUNDATION ANALYSIS OF EQUALIZATION BASIN ALTERNATIVES	Figure S1.1

Section 2 – Engineering Considerations and Approaches

2.1 Key geotechnical features of the site

The Geotechnical report reveals a full spectrum of soils and other geotechnical information, among which we list the following key information that we used for the foundation analysis and selection of the foundation system.

1. Counting from the ground surface down the soil profile shows Fill, Alluvium, and Residual layers. At the elevation of approximate 15 MSL or 22'to 23' below ground surface the Residual soil was encountered. This type of soil is considered as primarily fine-grained low-permeability elastic silts which are anticipated to provide an adequate bottom plug during the dewatering process.
2. The underground water table will be considered as the ground surface level during construction since the existing ground will be completely soaked and saturated with water during raining season.
3. Maximum ground water level shall follow FEMA's Flood Insurance Rate Map for the site. In our project, the maximum design water levels are 48 feet MSL for Location A and 51feet MSL for Location B respectively
4. The report provides pile uplift resistance capacities for various types of piles.
5. The report provides Unit weights of soil partial in dry condition and submerged condition.
6. The report provides Values of active soil pressure and passive soil pressure to assist the design of retaining walls.

2.2 Structural Engineering Approaches in the design of EQ Basin structures.

1. A total of four (4) optional alternatives have been analyzed. Options 1 and 2 of EQ Basins are located in the holding pond while options 3 and 4 of EQ basins are located in the floodway. Basic design requirements for each option are summarized in table 1.1 at the end of this section.
2. The main concern in the design is the uplift buoyancy force. The structure needs to comply with FEMA's Insurance requirement, which results in the option 1 basin submerged below water table by as 22 feet (measured to the bottom of base slab). The submerged depth for option 3 basin is 30 feet. How to resist such high uplift buoyancy force is a key issue in the design of the foundation and the tank structure. Instead of using piles to resist uplift force we tried to employ a more economical approach that is to expand the base slab beyond the structure foot print to key-in to the surrounding soil; utilize the weight of backfill material and the water above the Key-in section of the base slab to help counterbalance the uplift buoyancy.

3. After discussing with the project engineer we suggested raising the EQ basin structure to reduce the uplift force. Options 2 and 4 reflect this suggestion. This approach results in considerable cost saving on the construction of the coffered dam during construction of the project.
4. The EQ Basin structure including all walls shall be designed for both empty tanks condition and full storage condition.
5. To brace the walls and strengthen the Key-In slab we introduce the use of buttress walls that are perpendicular to the perimeter walls.
6. As a construction mean for dewatering and protect the open excavation for the basin a metal coffered dam is considered. Although the coffered dam is considered as "means and methods" provided and designed by the contractor we anticipate there will be two types of sheet piling systems to handle different options. In options 1 and 3 the sheet piling will extend 19' to 27' above the bottom of the open excavation area. Therefore, some kind of heavy wale and braces will be required at the top of the coffered dam to maintain the stability of the soil and brace the sheet piling. In options 2 and 4 the sheet pile can be designed as cantilevered without or only with a very light bracing. The tip of sheet piling will be driven into the residual soil to create a soil plug during dewatering. Since the coffered dam is a very expensive item in the construction, the use of cantilevered type of sheet piling will considerably reduce the construction cost.
7. There may be other engineering solutions to construct the EQ Basins. For the purpose of comparison and consistence we chose the "Coffered dam / Key – in slab" approach in the conceptual design for all options. Once an engineering scheme of the EQ Basin is chosen by the City a more in depth investigations for the foundation design and dewatering should be performed.

Table 1.1. Basic information of EQ Basin alternative

Option	1	2	3	4
Location	Holding Pond	Holding Pond	Flood way	Flood way
Tank capacity	0.84 MG	1.0 MG	0.84 MG	1.0 MG
Top of wall elevation *	50	50	55	58
Sewer level *	38	46	39	56
Top of base slab elevation *	25	33	24	37
Base slab thickness	3'- 0"	3'- 0"	3'- 0"	3'- 0"
Existing ground level *	38	38	45/53	45/53
Water level during * construction	38	38	45/53	45/53
Water level to be* designed	48	48	51	51
Sheet piling tip elevation *,**	-2	10	-5	10
Type of Sheet Piling **	Type 1	Type 2	Type 1	Type 2

Notes:
* Measured in MSL
** Contractor to verify and confirm suitability for site condition.
Type 1: Sheet pile with top bracing
Type 2: Cantilevered sheet pile with no top bracing

Section 3 – Various Options of EQ Basin Structures

3.1 Option 1

Located at the existing Holding Pond site (referenced as Location A) the structural design of the EQ basin consists of the following main features:

1. An overall uplift buoyancy force is 19,400 kips.
2. 10'-0" wide Key-In slabs surrounding the basin structure are provided as seats to hold the backfill soil above. This is a key engineering consideration to provide additional resistance to the uplift buoyancy force.
3. A 12" thick apron slab is provided on top of the finished ground surface to brace the exterior walls and tie the buttress walls together as part of the buoyancy resisting system.
4. Buttress walls are provided to strengthen the exterior walls and the Key-In slabs
5. The middle partition wall is used as a wall beam to resist uplift force acting underneath of the base slab. This wall is braced by a 5'-0"X1'-6" slab beam on the top.
6. Uplift buoyancy force is resisted by the total dead weight of the structure plus the backfill and water above the Key-In slabs. The base slab within the basin is designed to resist the upward buoyancy and transfer the unbalanced upward force to the surrounding Key-In slab. The base slab is reinforced by 6'X6' grade beams.
7. Coffered dam sheet piling will be heavy and should be braced by wale beams and other horizontal beams at top.
8. A factor of safety of resisting the uplift buoyancy force is between 1.35 and 1.45 by this system.
9. For detail information of this Option see attached Figure S2.1.

3.2 Option 2

This is an alternative of Option 1 at the same location. Compared to Option 1 this Option has the following features:

1. The base slab is raised to 33 MSL. (Base slab at Option 1 is at 25 MSL).The higher base slab reduces the total uplift buoyancy to approximate 13,000 kips
2. Key-In slabs and the middle partition wall are the same as Option 1.
3. The design of base slab, grade beams, buttress walls, and Key-In slabs will be lighter due to smaller uplift buoyancy force.
4. Omit the 12" apron slab on top of the ground surface.
5. The coffered dam sheet piling will be much lighter. The sheet pile may be only a cantilevered type without a complicate top bracing system. This lighter coffered dam should reduce the construction cost considerably.

6. A factor of safety of resisting the uplift force is around 1.4

7. For detail information of Option 2 see attached Figure S2.2.

3.3 Option 3

1 The EQ Basin is chosen at the Floodway of the Plant (referenced as Location B). Between the existing Primary Clarifier and the Digester Tank, the EQ Basin is composed of two equal sized tanks. See Attached Figure S1.1. The South tank will be constructed first with the existing Primary clarifier demolished and the existing digester tank will remain operational until the North EQ tank is completed. However, our analysis will address the final product. That means we only analyze an EQ Basin composing of two tanks as shown on Figure 3.1
2 The existing ground is high on the East side of the basin and slopes down towards the West side.
3. The total uplift buoyancy force is 17,000 kips.
4. Similar to Option 1, a 10'-0" wide Key-In slab is provided along four (4) sides of the basin structure to help resisting the upward force.
5. A 12" thick apron slab is provided on top of the existing ground for soil protection and wall bracing.
6. Buttress wall are provided on top of the Key-In slabs to strengthen the slabs and the walls.
7. A middle partition walls separating the South and North tanks is designed as a wall beam with a 5'X1.5' slab beam at top for lateral bracing.
8. Two cross grade beams at each tank are used to divide and support the base slab and transfer the unbalanced uplift force to the Key-In slabs.
9. A square shape coffered dam will be constructed for the South tank. The sheet piling shall be braced on the top by wale and bracing beams.
10. When the North tank is constructed a well transitional connection between the South tank and the North tank shall be designed.
11. For the entire EQ Basin a factor of safety of resisting the uplift buoyancy is 1.5.

3.4 Option 4

1. This Option is a modification to Option 3 at the same location and will be constructed in two phases similar to Option 3. The differences in this Option from Option 3 are listed below.
2. The base slab elevation is raised to 37 MSL compared to 24 MSL as in Option 3.
3. Key-In slabs and the middle partition wall are provided as in Option 3, but the width of the Key-In slab is only 7'-0" due to smaller uplift force.

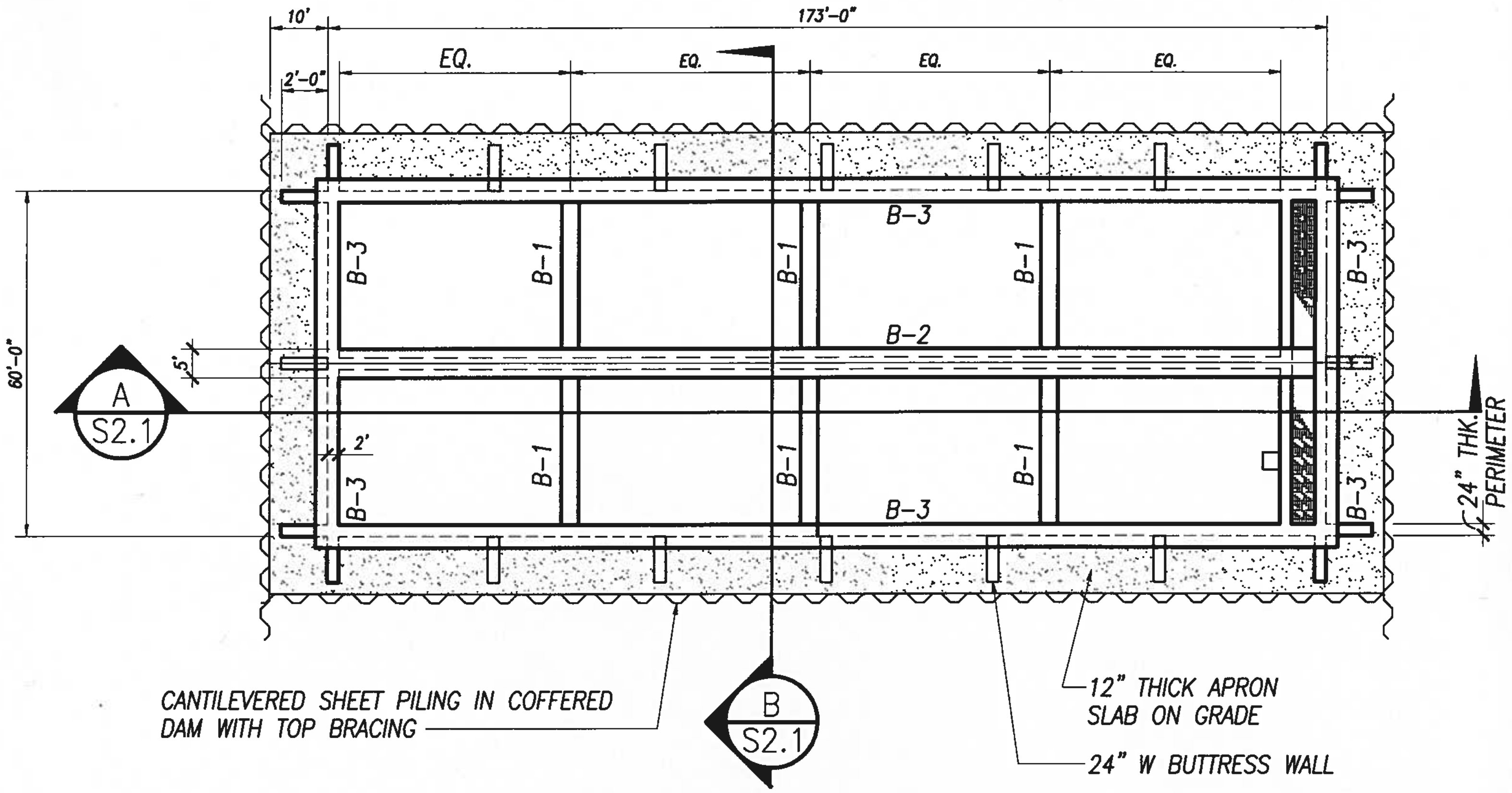
7. The coffered dam sheet piling will be much lighter and shallower. Cantilevered type of sheet piling would be used without a complicated bracing system, which will result in cheaper construction cost.
8. For detail information of Option 4 see attached figure 3.2.

3.5 Remarks

1. The four (4) options contained in this report reflect our understanding of the site condition and the requirement of the project. Modification on this report could be made once more accurate information is available.
2. Our investigation and study only provide a feasibility study for various options. It is our opinion that the EQ Basin can be constructed on the sites selected. It is feasible that it can be constructed without piles. Other alternative foundation systems as listed on the Geotechnical report were not analyzed as they seem more expansive than the foundation system presented in this report.
3. This report presents a conceptual structural solution for the construction of the proposed EQ basin. Information in this report shall not be used as design guidance during the actual design phase. More accurate analysis shall be needed.

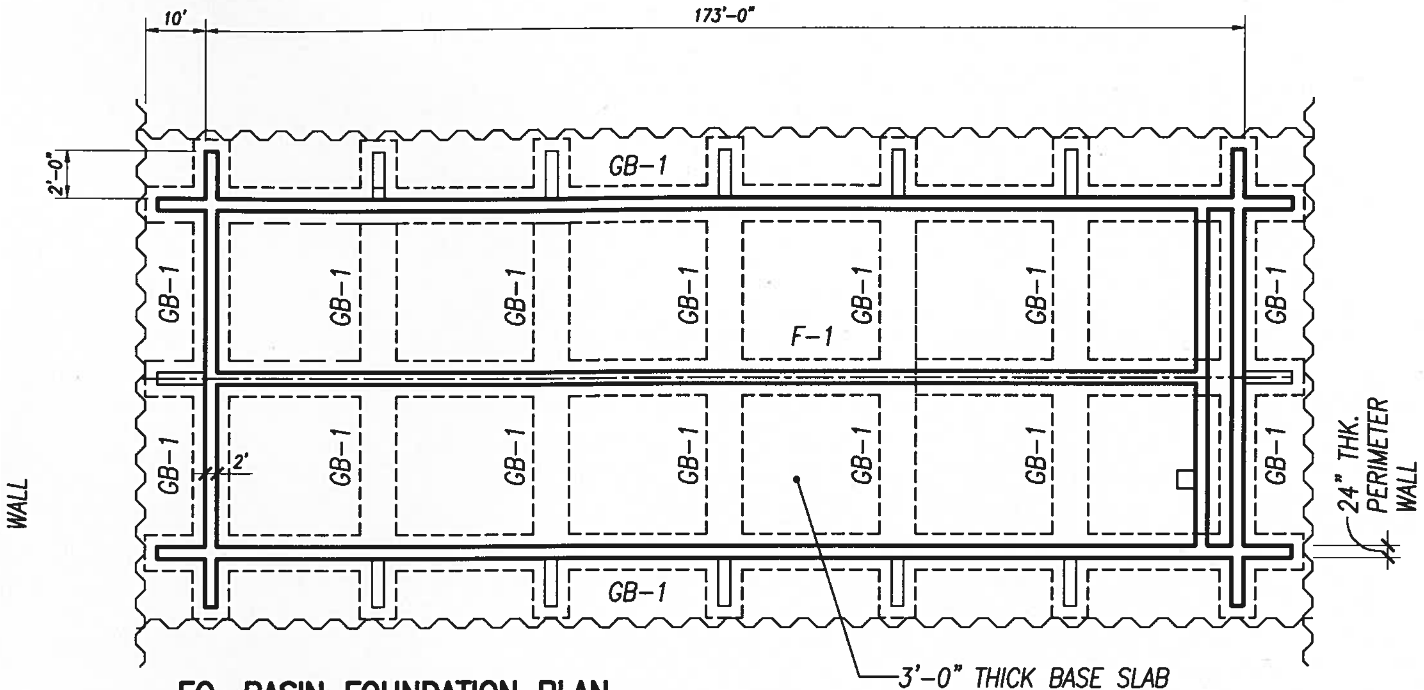
3.6 Opinion on design criteria and construction

1. The conceptual structural design as shown on the attached figures S2.1 thru S3.2 might look heavy and excessive, which is the results of designing the EQ Basins for the high flood water levels regulated by FEMA insurance. The design flood water levels at 48 MSL and 51 MSL will generate huge uplift buoyancy force to the open - tank shaped EQ Basin structures. This requires the structures to have enough dead weights together with other means to resist the buoyancy.
2. Reviewing the available construction documents for the existing structures in the AWWPTF site we did not see any evidence that the existing structures were designed for FEMA's regulated flood levels. Hypothetically, if the entire plant were flooded to 51 MSL the existing plant would not be effectively functional. From a practical point of view we might consider some sort of modification to the FEMA's requirement in the actual design, provided that it is acceptable to the government agency.
3. Dewatering is another concern during the construction. Sheet piling coffered dam is only one of several dewatering options suggested in this report. Other ways of dewatering can be investigated, particularly for option 2 and option 4.



EQ. BASIN TOP SLAB PLAN

SC: 1/32"=1'-0"

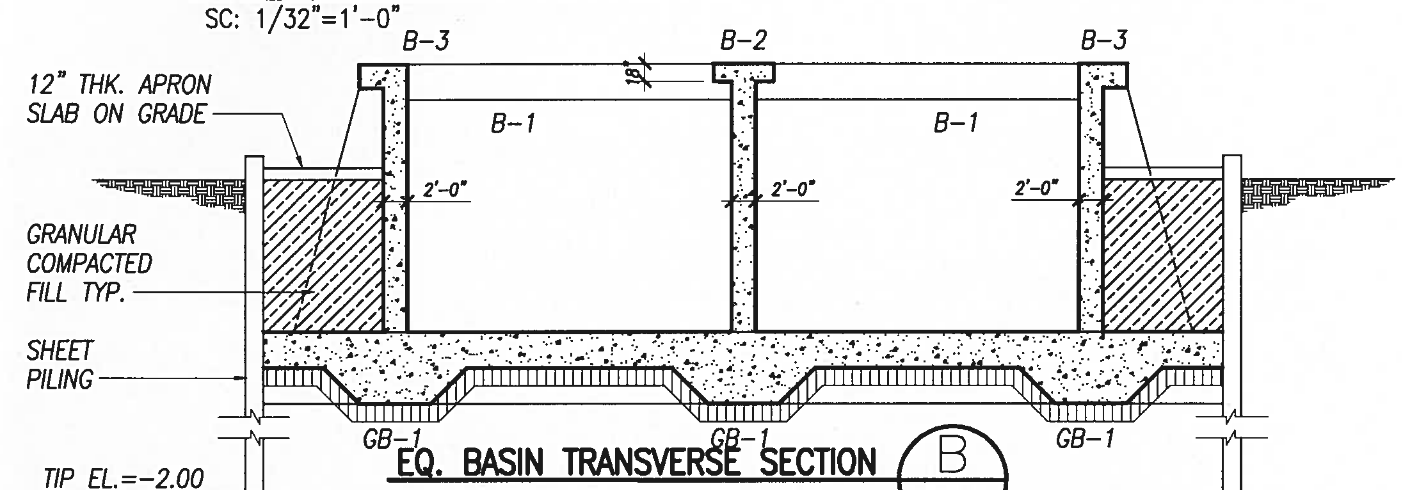


EQ. BASIN FOUNDATION PLAN

SC: 1/32"=1'-0"

LEGEND:

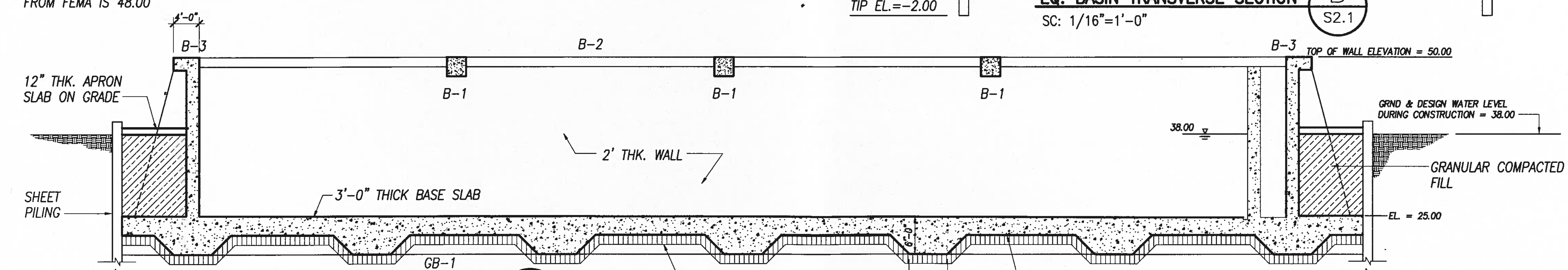
1. B-1 3'-0"x3'-0" BM
   B-2 5'-0"x1'-6" BM
   B-3 4'-0"x2'-0" W BM
   GB-1 6'-0"x6'-0" GRADE BM
2. ALL WALLS ARE 2'-0" THICK
3. DESIGN WATER LEVEL FROM FEMA IS 48.00



EQ. BASIN TRANSVERSE SECTION

B
S2.1

SC: 1/16"=1'-0"



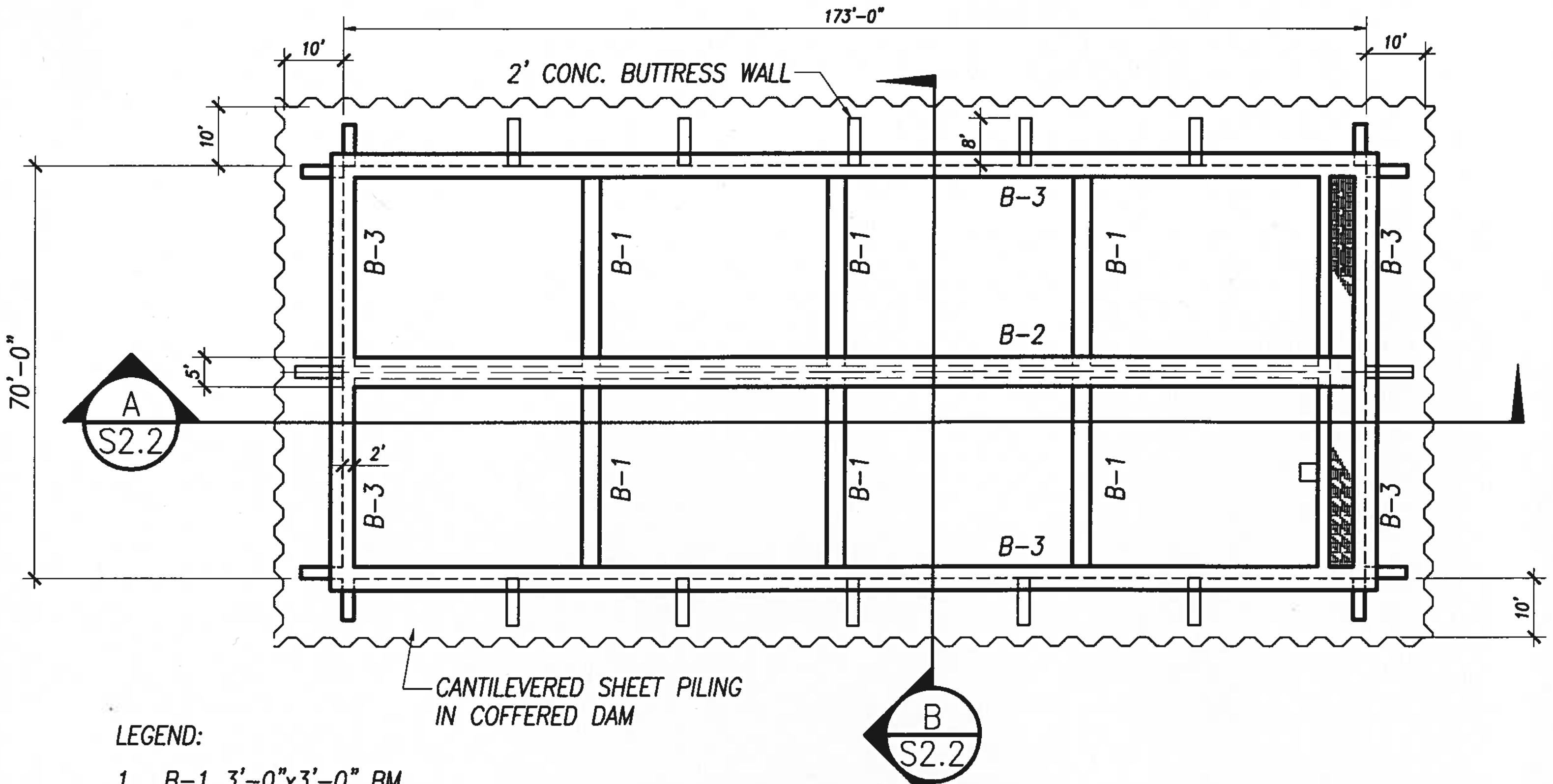
EQ. BASIN LONGITUDINAL SECTION

A
S2.1

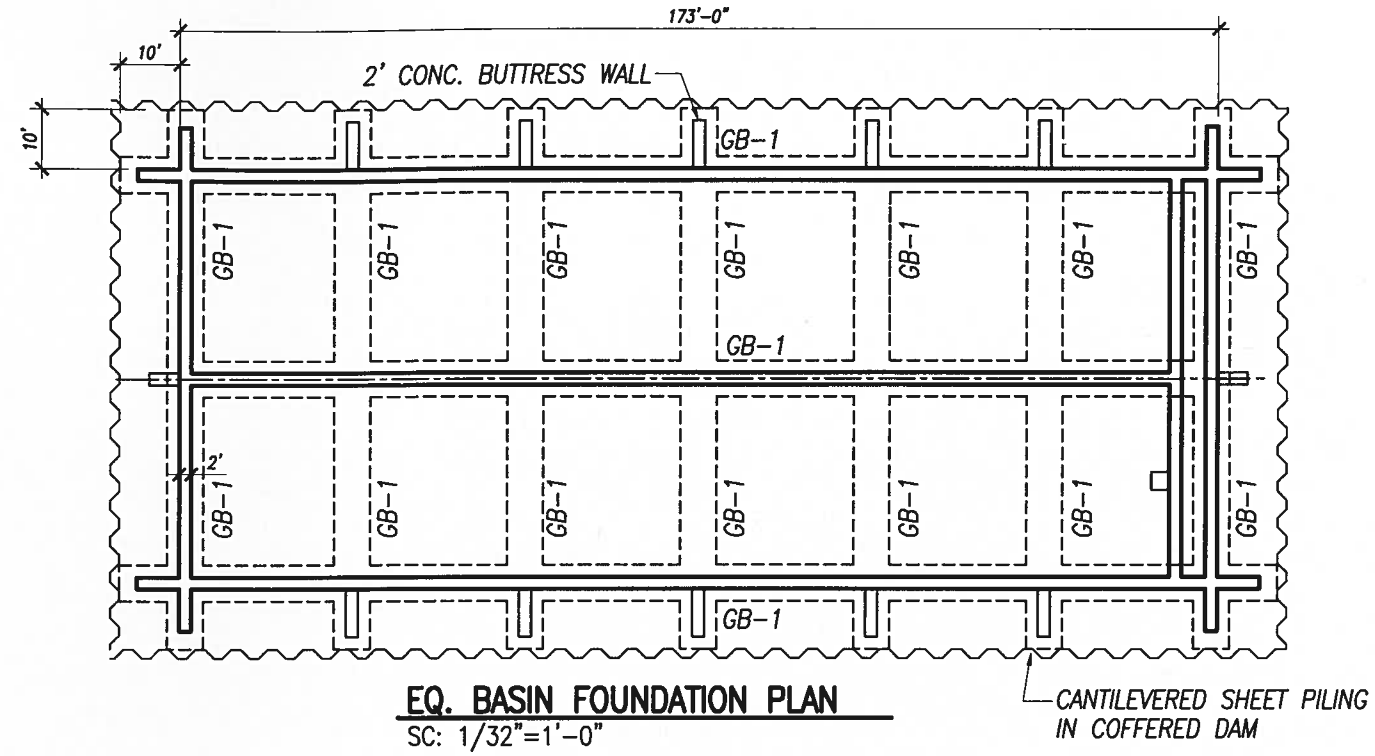
SC: 1/16"=1'-0"

EQ BASIN PLANS AND SECTIONS– OPTION 1

Ahuimanu WWPTF Improvements and Equalization Facility	
FOUNDATION ANALYSIS OF EQUALIZATION BASIN ALTERNATIVES	Figure S2.1



EQ. BASIN TOP SLAB PLAN
SC: 1/32"=1'-0"



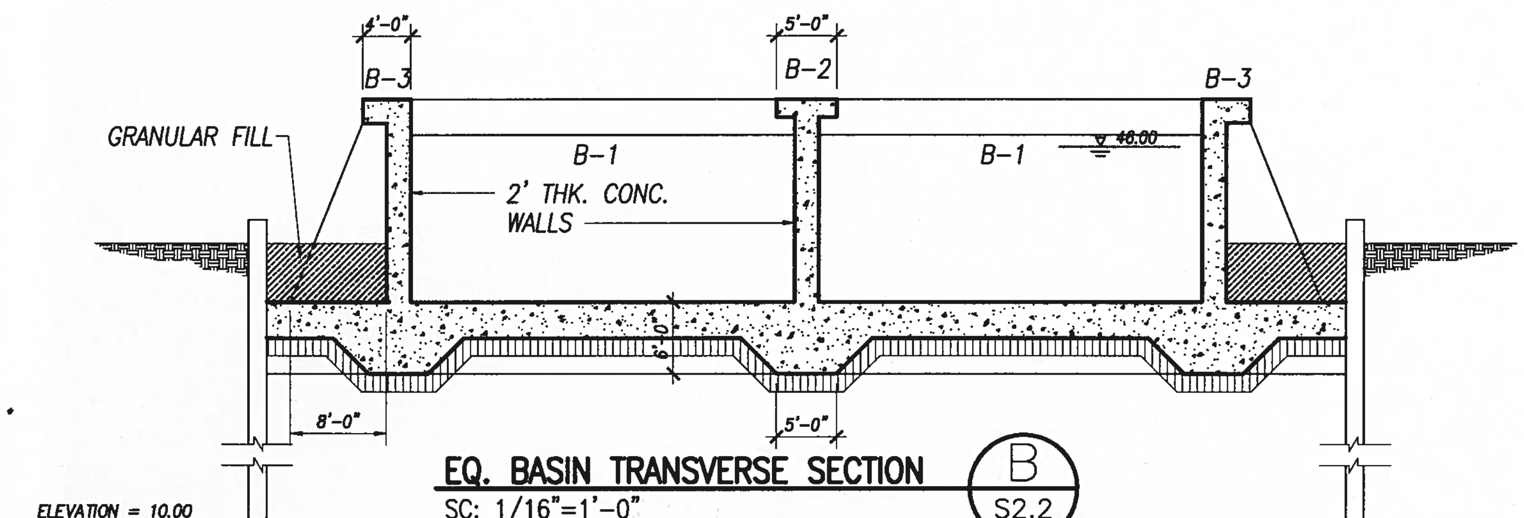
EQ. BASIN FOUNDATION PLAN
SC: 1/32"=1'-0"

LEGEND:

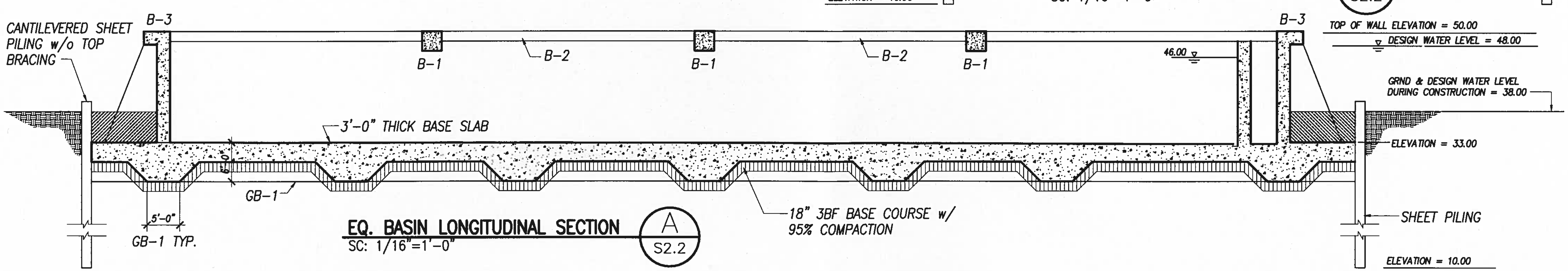
1. B-1 3'-0"x3'-0" BM
   B-2 5'-0"x1'-6" BM
   B-3 4'-0"x2'-0" BM
   GB-1 5'-0"x6'-0" GRADE BM

2. DESIGN WATER LEVEL FROM FEMA IS 48.00

3. ALL WALLS ARE 2'-0" THK



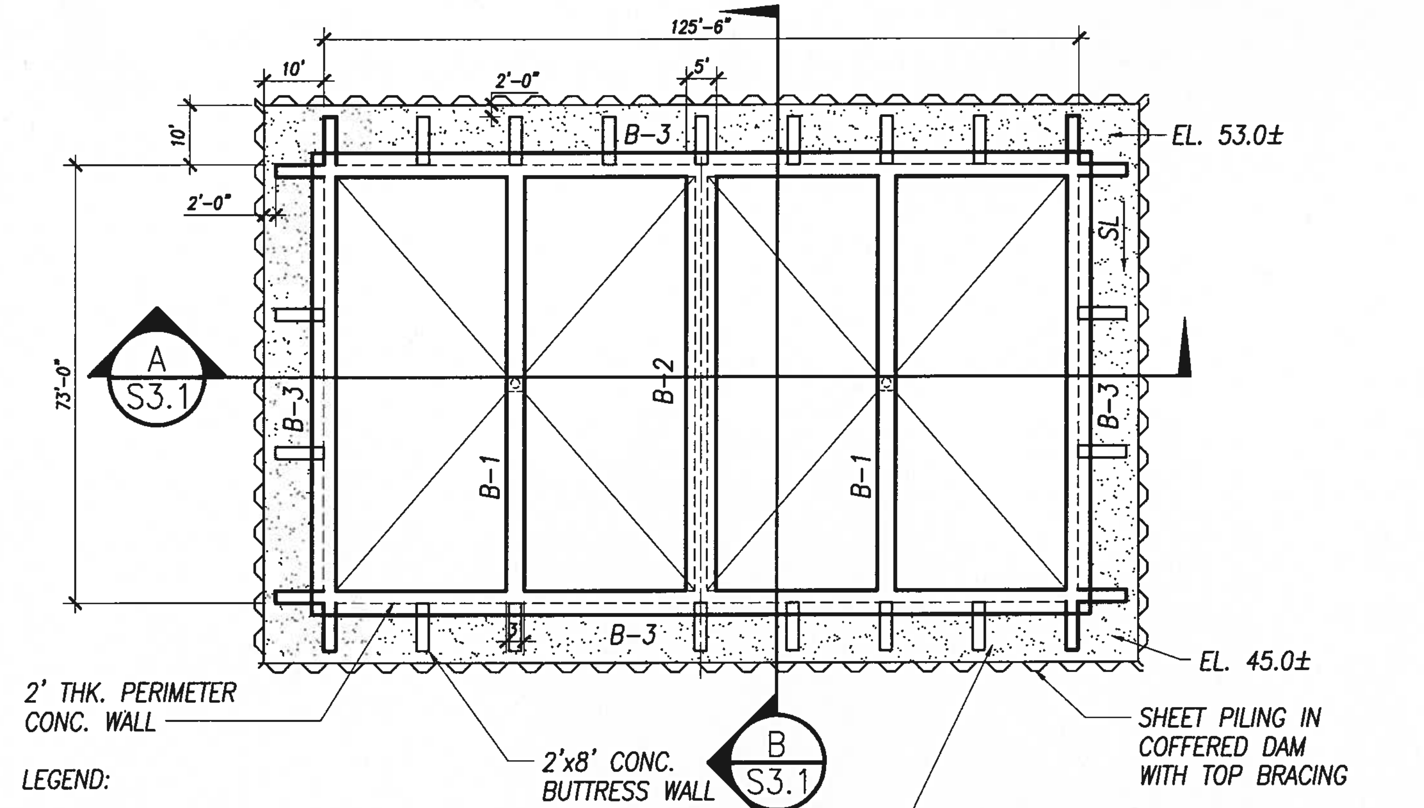
EQ. BASIN TRANSVERSE SECTION
SC: 1/16"=1'-0"



EQ. BASIN LONGITUDINAL SECTION
SC: 1/16"=1'-0"

EQ BASIN PLANS AND SECTIONS– OPTION 2

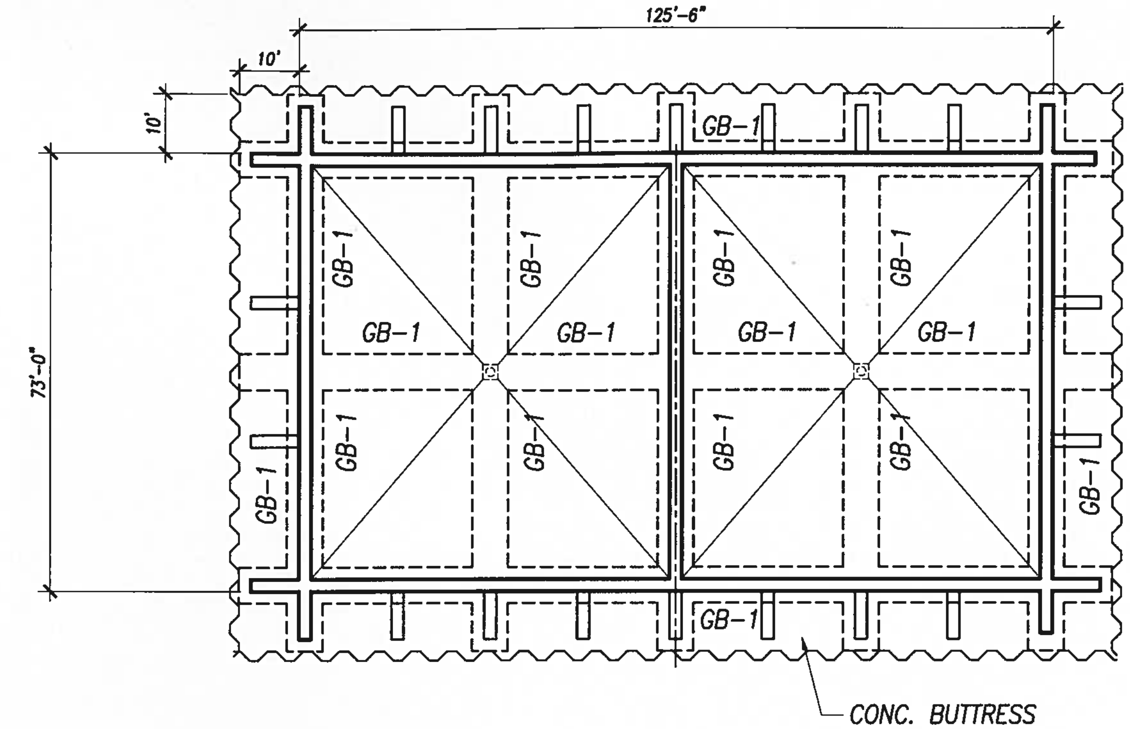
Ahuimanu WWPTF Improvements and Equalization Facility	
FOUNDATION ANALYSIS OF EQUALIZATION BASIN ALTERNATIVES	Figure S2.2



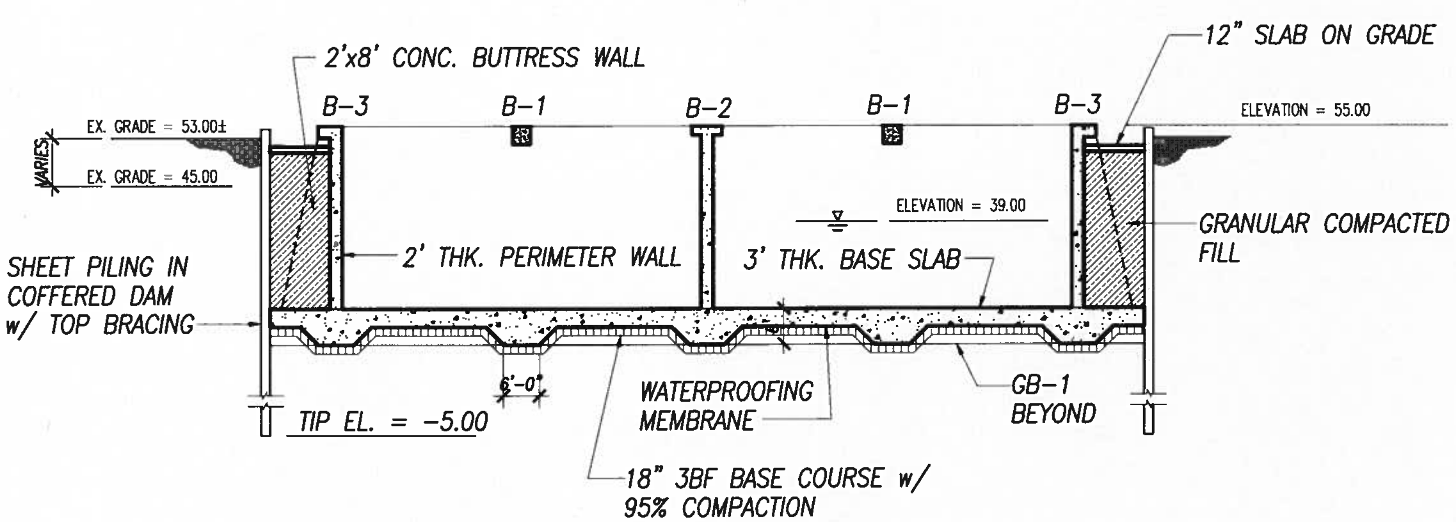
LEGEND:

1. B-1 3'x3' BM
   B-2 5'-0"x1'-6" BM
   B-3 4'-0"x2'-0" BM
   GB-1 6'-0"x6'-0" FTG
2. ALL WALLS ARE 2'-0" THICK
3. DESIGN WATER LEVEL FROM FEMA IS 51.00

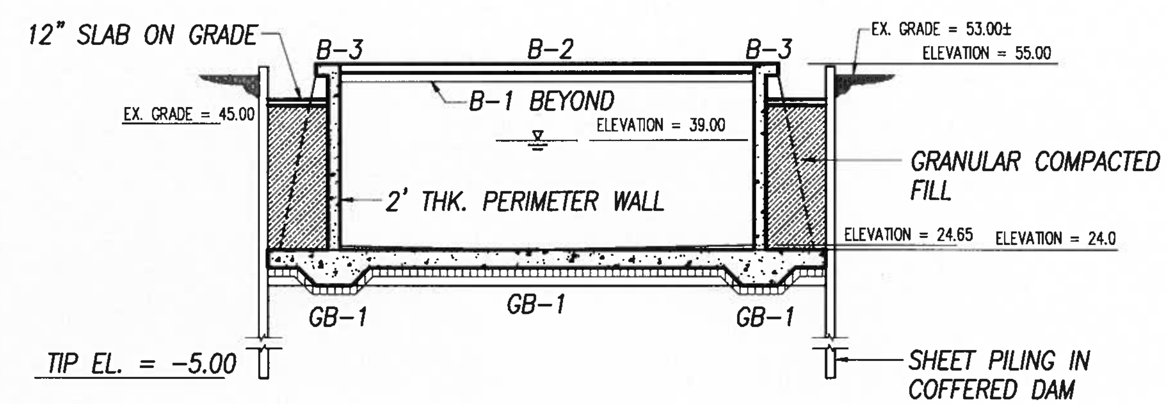
EQ. BASIN TOP SLAB PLAN
SC: 1/32"=1'-0"



EQ. BASIN FOUNDATION PLAN
SC: 1/32"=1'-0"



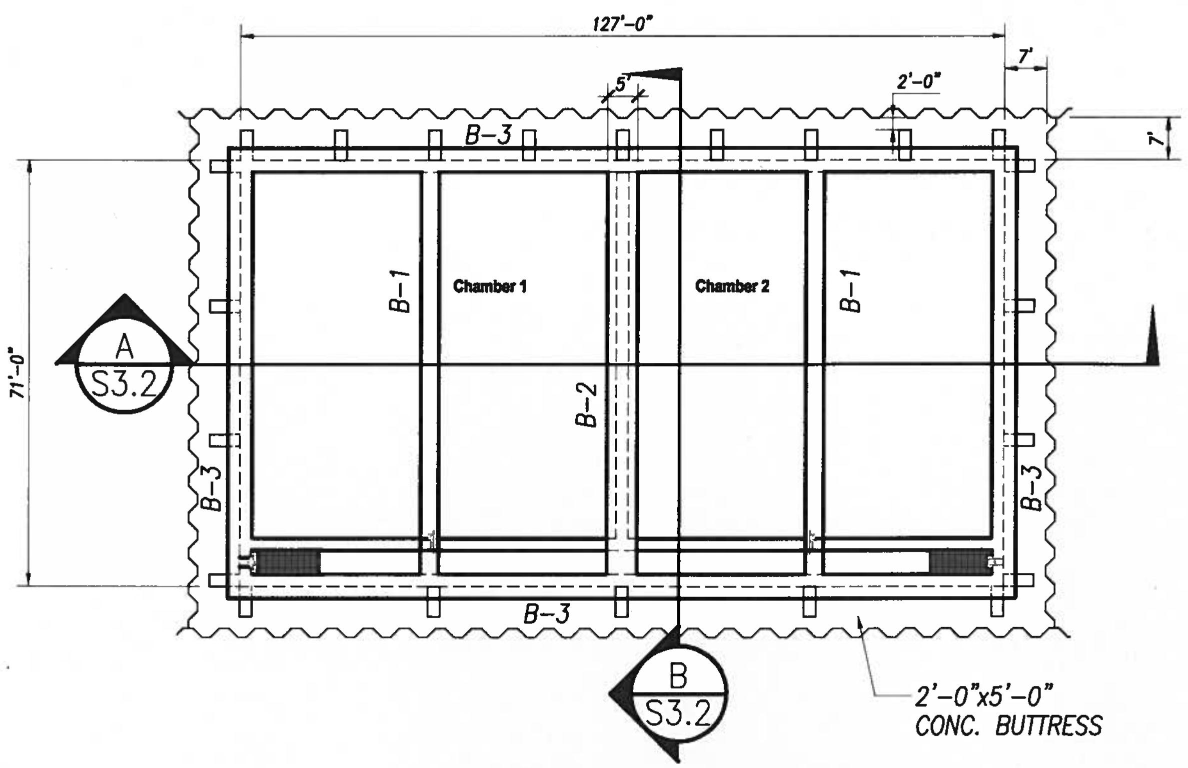
EQ. BASIN LONGITUDINAL SECTION (A / S3.1)
SC: 1/32"=1'-0"



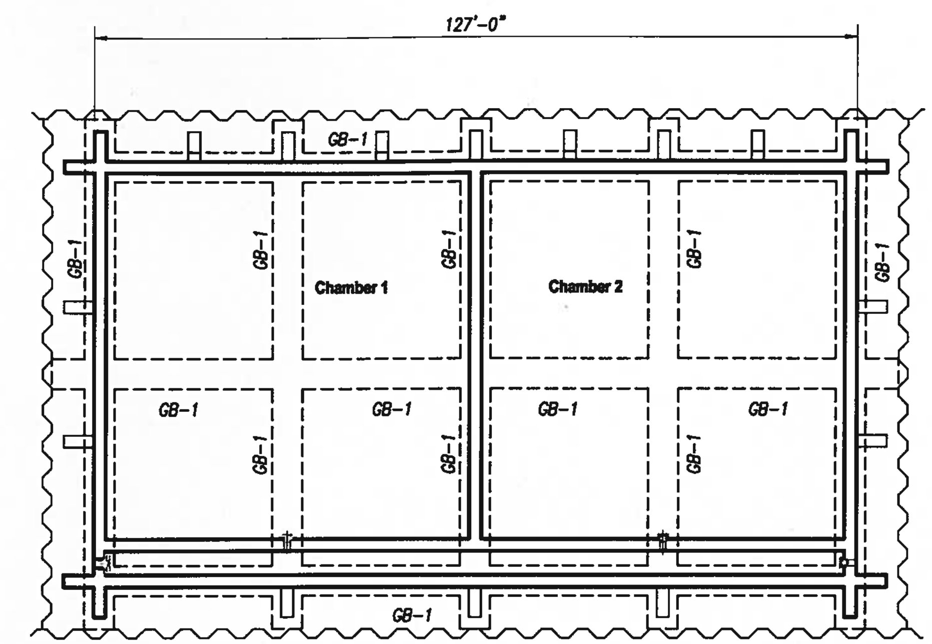
EQ. BASIN TRANSVERSE SECTION (B / S3.1)
SC: 1/32"=1'-0"

EQ BASIN PLANS AND SECTIONS- OPTION 3

Ahuimanu WWPTF Improvements and Equalization Facility	
FOUNDATION ANALYSIS OF EQUALIZATION BASIN ALTERNATIVES	Figure S3.1



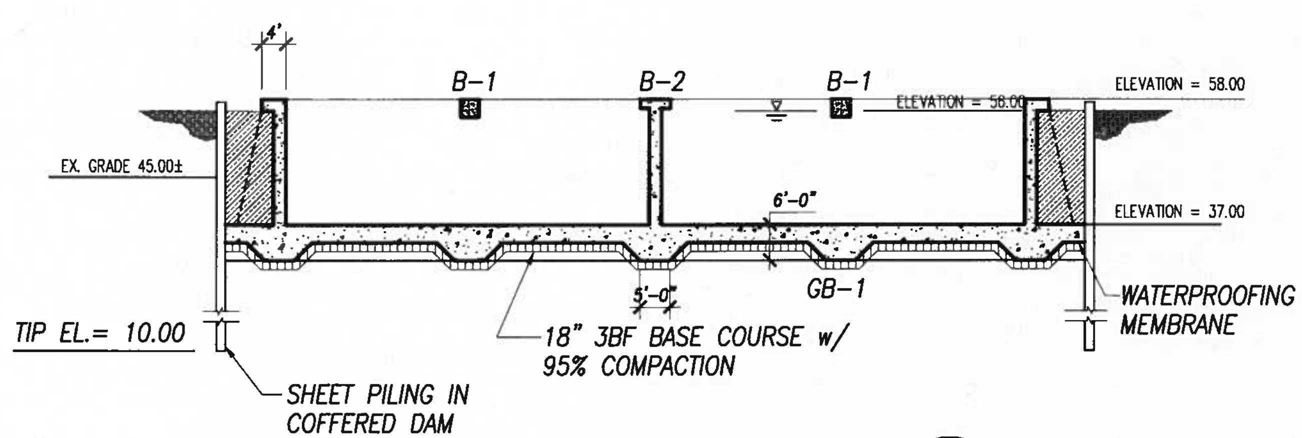
EQ. BASIN TOP SLAB PLAN
SC: 1/32"=1'-0"



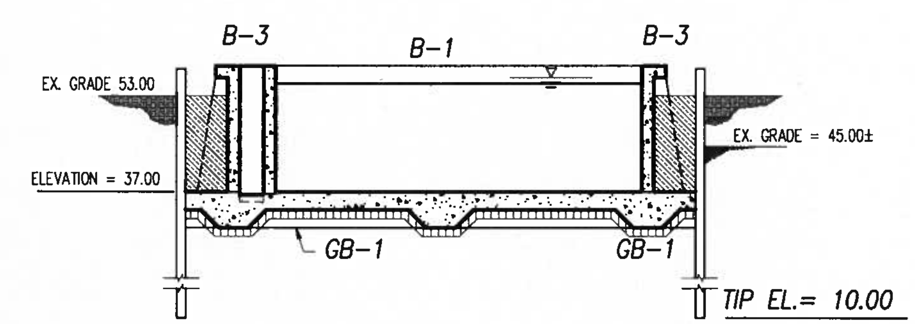
EQ. BASIN FOUNDATION PLAN
SC: 1/32"=1'-0"

LEGEND:

1. B-1 3'x3' BM
   B-2 18"x5'-0" W BM
   B-3 4'-0"x2'-0" W BM
   F-1 5'-0" Wx6'-0" D FTG
2. ALL WALLS ARE 2'-0" THK
3. DESIGN WATER LEVEL FROM FEMA IS 51.00



EQ. BASIN LONGITUDINAL SECTION (A / S3.2)
SC: 1/32"=1'-0"



EQ. BASIN TRANSVERSE SECTION (B / S3.2)
SC: 1/32"=1'-0"

EQ BASIN PLANS AND SECTIONS– OPTION 4

Ahuimanu WWPTF Improvements and Equalization Facility

FOUNDATION ANALYSIS OF EQUALIZATION BASIN ALTERNATIVES

Figure S3.2

APPENDIX F

Wetlands Survey

2024 North King Street
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Telephone 808 842 1133
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eMail rmtowill@hawaii.rr.com

R. M. TOWILL CORPORATION
SINCE 1930

Planning
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Environmental Services
Photogrammetry
Surveying
Project and Construction Management

December 15, 2015

Ms. Shelly Lynch
Branch Chief
Regulatory Branch (CEPOH-EC-R)
U.S. Army Engineer District Honolulu, Building 252
Fort Shafter, HI 96858-5440

Dear Ms. Lynch:

Request for a Permit Determination for
Proposed Improvements to the ʻĀhuimanu Wastewater Pre-Treatment Facility
Kāneʻohe, Island of Oʻahu, Tax Map Key (1) 4-7-004: 006

Introduction and Purpose

On behalf of the City and County of Honolulu (CCH) Department of Design and Construction (DDC), we are writing to request a Permit Determination from the U. S. Army Corp of Engineers (ACOE) for planned modifications to the existing ʻĀhuimanu Wastewater Pre-Treatment Facility (WWPTF). The ʻĀhuimanu WWPTF is located at 47-305 Kahekili Highway on approximately 4.5 acres of land identified as Oʻahu Tax Map Key (TMK): 4-7-004: 006 (property). See **Figures 1and 2.** R. M. Towill Corporation (RMTC) is assisting the DDC with planning and design for the project.

The DDC is evaluating possible construction of a new equalization (EQ) basin, drainage basin and appurtenant piping on the northern portion of the property in an area originally constructed as a wastewater effluent holding pond. The purpose of the new EQ basin would be to increase wastewater storage capacity and provide facility redundancy. The new drainage basin would continue to occupy a portion of the current basin area and be sized to retain on-site drainage.

Project Description

Contemplated improvements are illustrated on **Figure 3** and consist of the following:

- Demolition of the existing effluent holding pond and regrading the project site;
- Excavation to accommodate the new EQ basin and piping. The excavation will have dimensions of approximately 66 feet (ft.) in width, 170 ft. in length, 18 ft. in depth below existing grade (approximately 38 feet above mean sea level).;
- Construction of the EQ basin floor and walls by means of cast-in-place reinforced concrete. The completed EQ basin will be approximately 66 ft. wide; 170 ft. long, with a wall height of 33 ft. Approximately 18 ft. of the wall will be below grade while the remaining 15 ft. will be above grade;

- Installation of high density polyethylene (HDPE) piping, ranging in size from 18 to 24 inches in diameter, to connect the EQ basin to a new influent junction box; and,
- Construction of a new drainage basin by means of an earthen berm constructed six feet high above existing grade, enclosing a drainage detention area approximately 50 ft. wide and 175 ft. long.

Site Description

The existing basin originally served as a wastewater effluent holding pond as part of the original ʻĀhuimanu Wastewater Treatment Plant (WWTP) that began operating in 1964. The basin is approximately 150 ft. wide and long. The basin bottom elevation is approximately 38 ft. above mean sea level and is surrounded by an earthen berm approximately five feet high. See **Figure 4.**

Under the original WWTP operations, treated wastewater effluent entered the holding pond through a pipe running down the center of the basin. A discharge pipe, with a control valve, located in the northeast corner of the basin was used to discharge treated effluent into the adjacent ʻĀhuimanu Stream.

In 1986, the ʻĀhuimanu WWTP was converted into a wastewater pre-treatment facility (WWPTF). The effluent holding pond was abandoned in place. The influent pipe and discharge pipe remained in place, but unused. In 2010, the discharge pipe was plugged and capped.

The drainage basin is currently grassed with narrow-leaved carpet grass (*Axonopus fissifolius*) and Hilo grass (*Paspalum conjugatum*). Various trees, shrubs and palms grow along the tops and outer sides of the eastern and western berms. The grass and vegetation are routinely mowed and trimmed. See attached **Figures 5A** and **5B** for photographs taken on July 22, 2015.

A concrete-channelized unnamed tributary toʻĀhuimanu Stream borders the eastern side of the property. The confluence of this tributary with the main branch of ʻĀhuimanu Stream is located approximately 750 ft. downstream from the property, on the opposite side of Kahekili Highway. A distance of approximately 40 ft. separates the top of the drainage basin's eastern berm from the nearest edge of ʻĀhuimanu Stream.

Based on Federal Emergency Management Agency (FEMA), Flood Insurance Rate Map (FIRM) Number 15003C0280F, the basin is located in Flood Hazard Zone (Zone) AE with base flood elevations ranging from 46 to 48 ft. above msl, and Zone AEF. See **Figure 6**.

Analysis

On July 9, 2015, *AECOS*, Inc. conducted a wetlands survey following the *Corps of Engineers Wetland Delineation Manual and Regional Supplement (Manual).* The wetland survey report, including a U.S. Army Corp of Engineers Wetland Determination Data Form – Hawaiʻi and Pacific Islands, is attached.

One (1) wetland determination sampling point (SP) was established at a low point of the abandoned effluent holding pond. This location was chosen as it is the lowest point on the property and the place most likely to exhibit all three (3) wetland characteristics. The survey determined that the site has hydrophytic vegetation and hydric soils, but no wetland hydrology. The report concludes that because the site exhibits only two of the required indicators, the site is not a wetland.

Based upon the following documents, it appears that the property was historically located in an upland area, not in a stream, marsh or wetland.

- 1952 aerial photograph of the Kāneʻohe region showing the relationship of the Property to ʻĀhuimanu Stream. See **Figure 7**.
- 1954 United States Geological Survey (USGS) Map of Kāneʻohe showing the relationship of the Property to the surrounding region. ʻĀhuimanu Stream is shown, adjacent to the Property. No marsh or wetlands are shown adjacent to or near the Property. See **Figure 8**.
- United States Fish and Wildlife Service (USFWS) National Wetlands Inventory Mapper shows no wetlands, current or historic, on or adjacent to the Property. See **Figure 9**.

On behalf of DDC, we respectfully request written concurrence that the property is not a wetland subject to the regulatory requirements of the Clean Water Act, and ask for a written determination that a Department of Army Permit is not required for the planned improvements to the ʻĀhuimanu WWPTF.

Should you have any questions or require additional information, please contact the undersigned at (808) 842-1133.

Very truly yours,

Jim Niermann, AICP, LEED AP
Planning Project Coordinator

JAN/RLL
K:\ww\22366 Ahuimanu WWPTF\Document\ACOE Consultation\Letter to ACOE.docx

Attachments

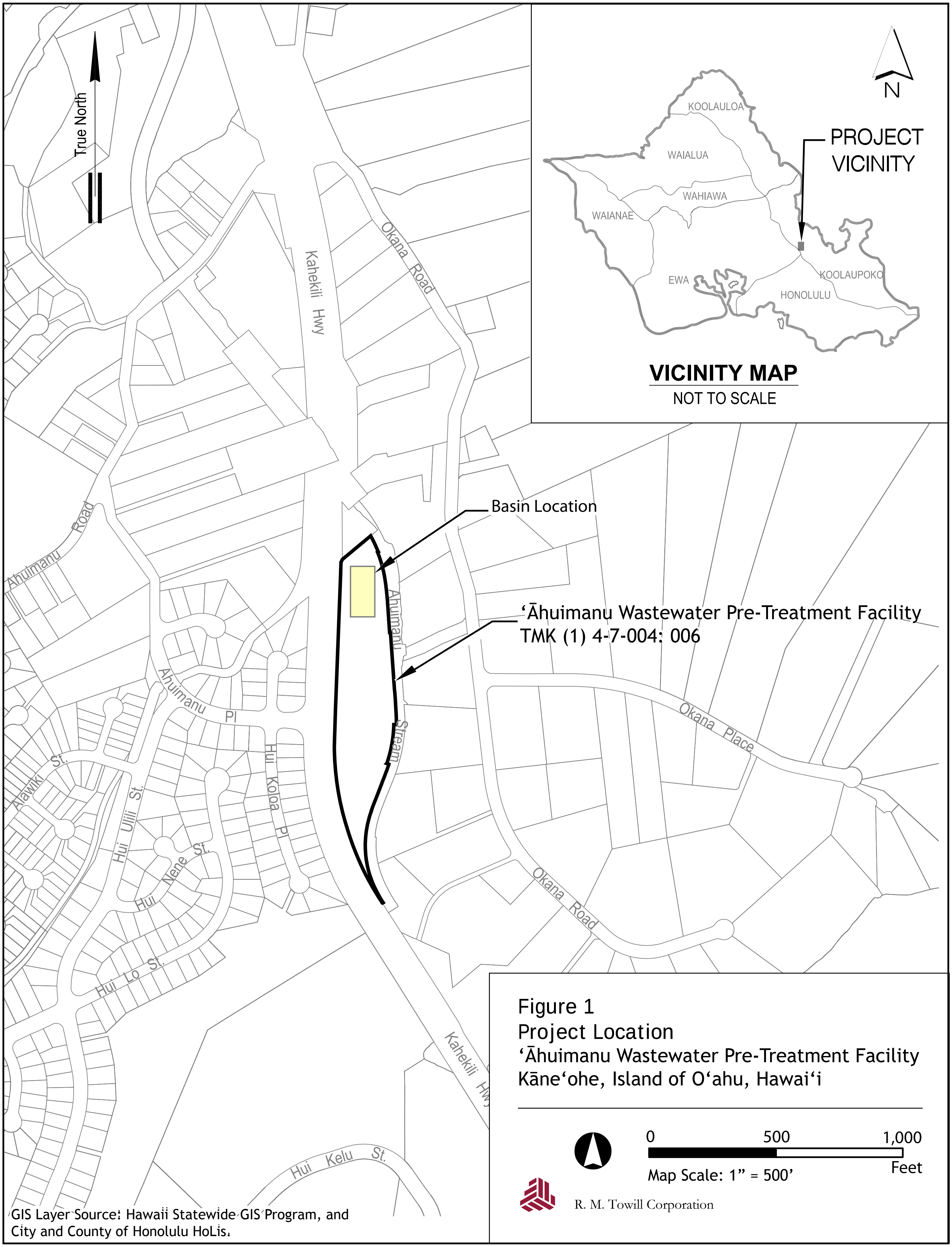


Figure 1
Project Location
ʻĀhuimanu Wastewater Pre-Treatment Facility
Kāneʻohe, Island of Oʻahu, Hawaiʻi

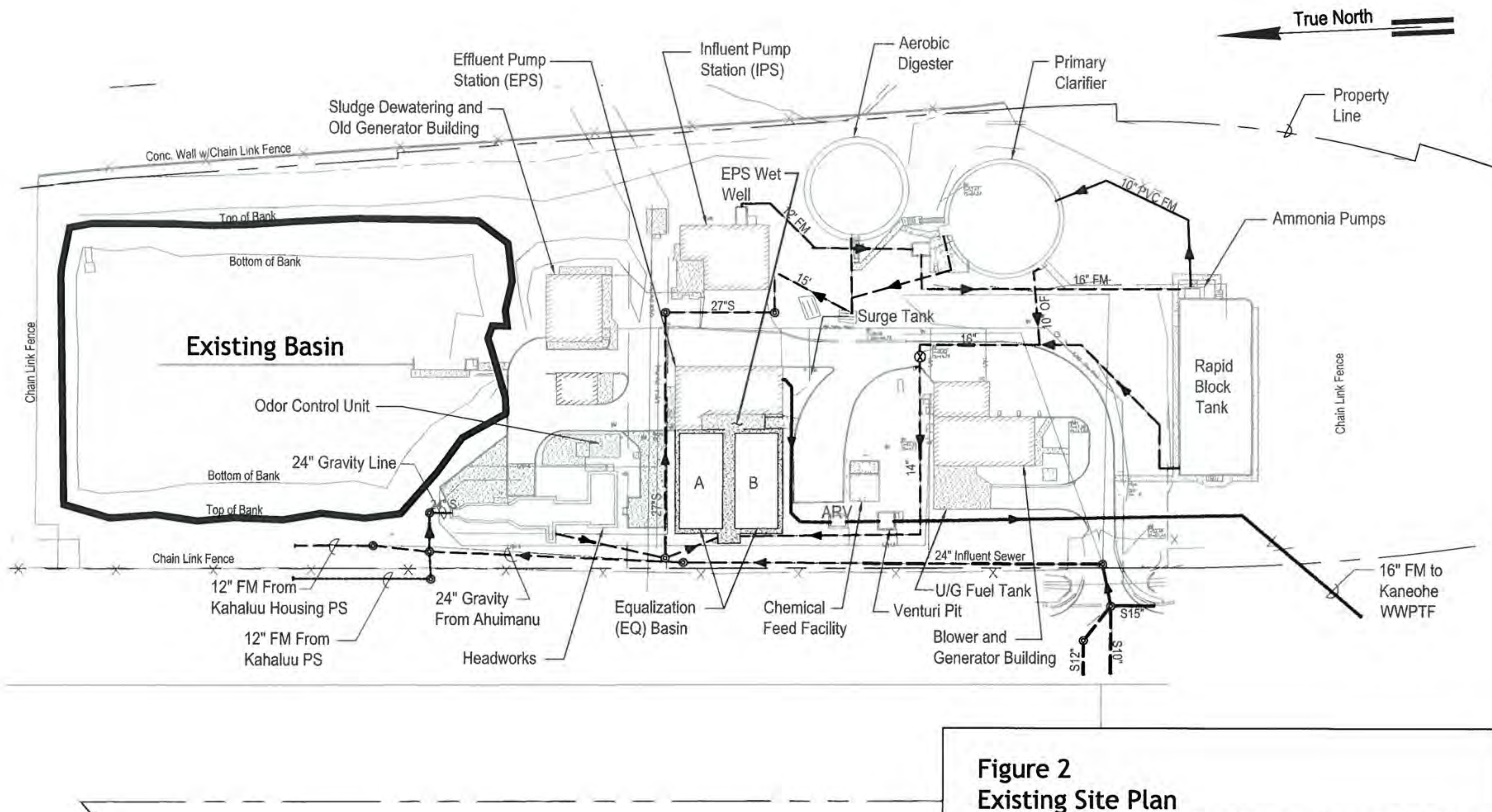


Figure 2
Existing Site Plan
ʻĀhuimanu Wastewater Pre-Treatment Facility
Kāneʻohe, Island of Oʻahu, Hawaiʻi

0 80 160
Feet
Map Scale: 1" = 80'

R. M. Towill Corporation

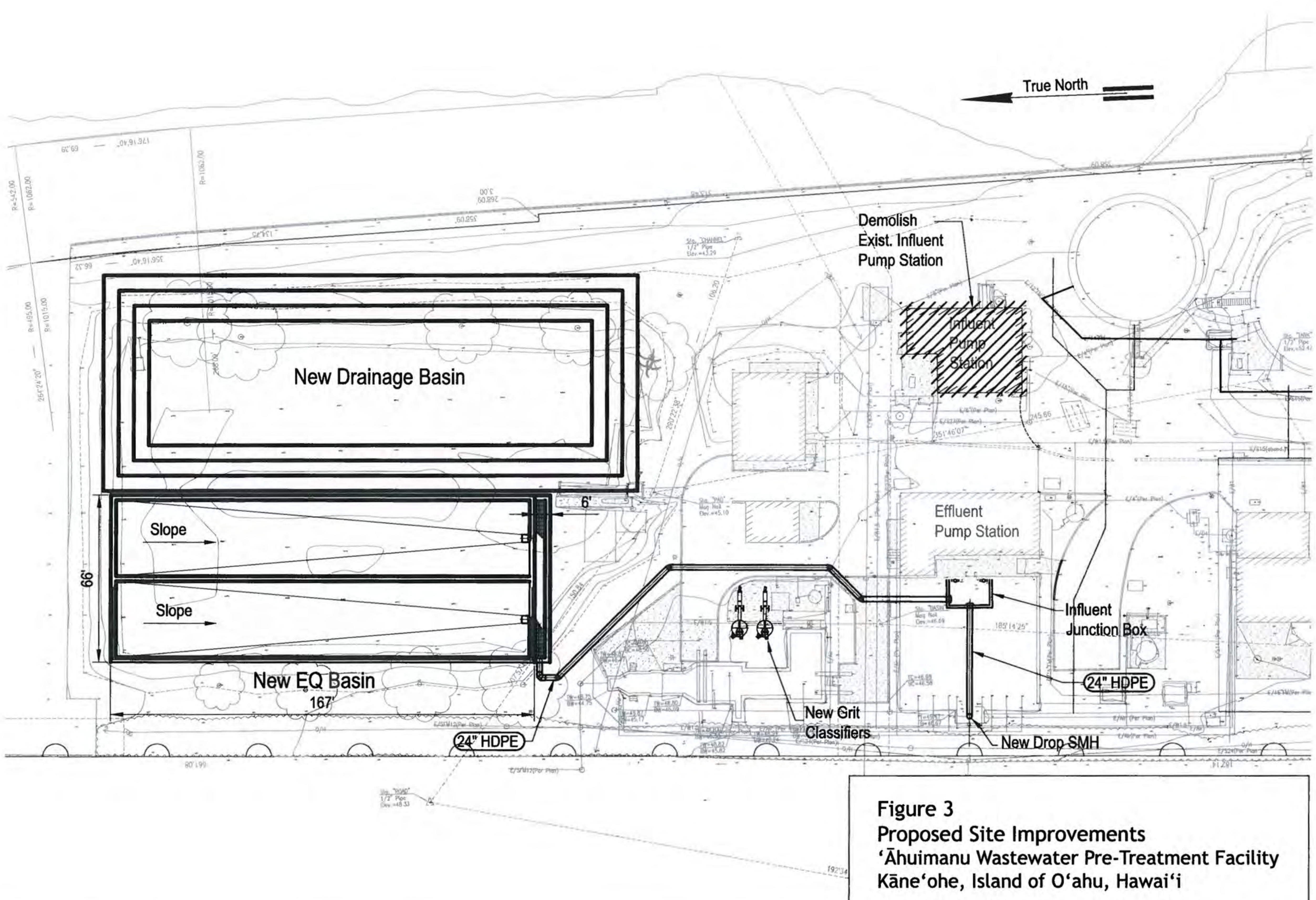


Figure 3
Proposed Site Improvements
ʻĀhuimanu Wastewater Pre-Treatment Facility
Kāneʻohe, Island of Oʻahu, Hawaiʻi

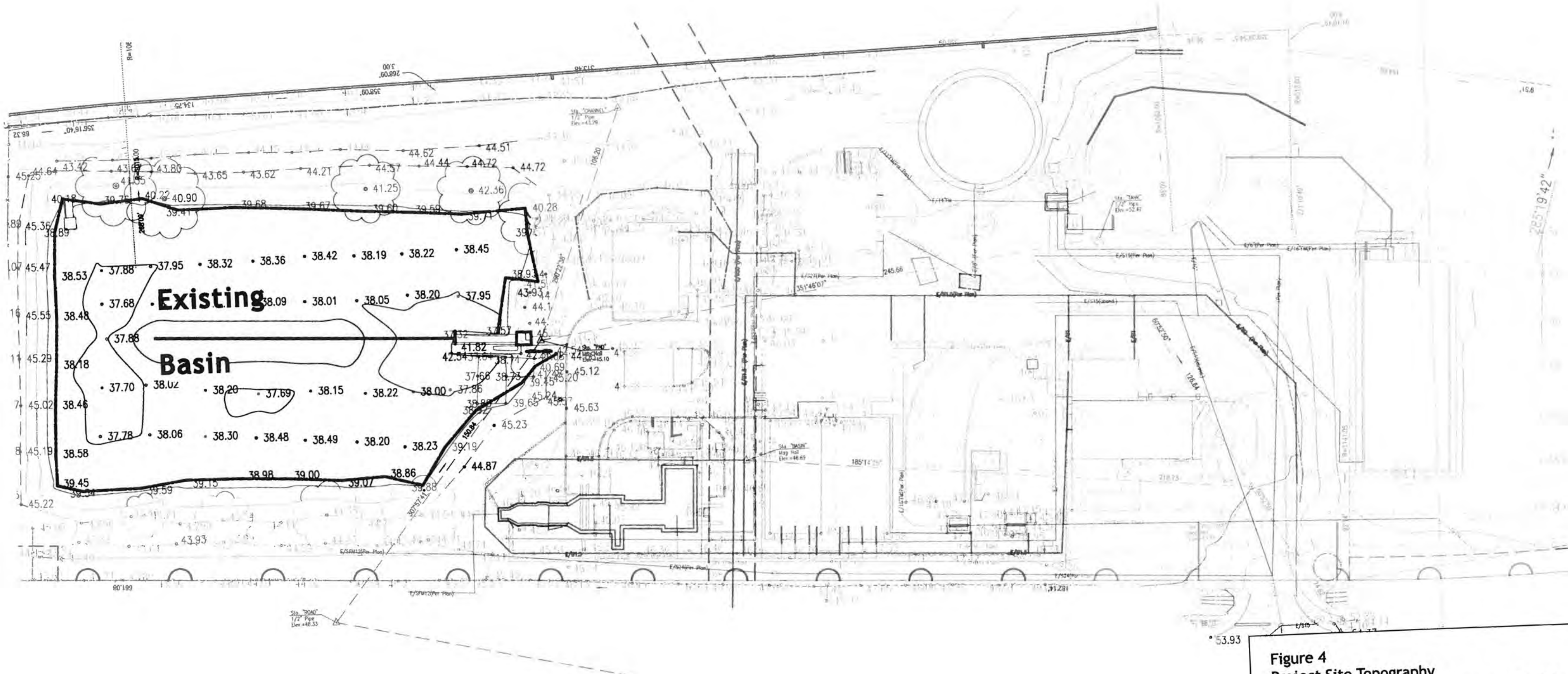


Figure 4
Project Site Topography
ʻĀhuimanu Wastewater Pre-Treatment Facility
Kāneʻohe, Island of Oʻahu, Hawaiʻi

NOT TO SCALE

R. M. Towill Corporation

Source: R. M. Towill Corporation

Figure 5A
Photographs of Project Site
'Āhuimanu Wastewater Pre-Treatment Facility
Kāne'ohe, Island of O'ahu, Hawai'i

R. M. Towill Corporation

Source: R. M. Towill Corporation

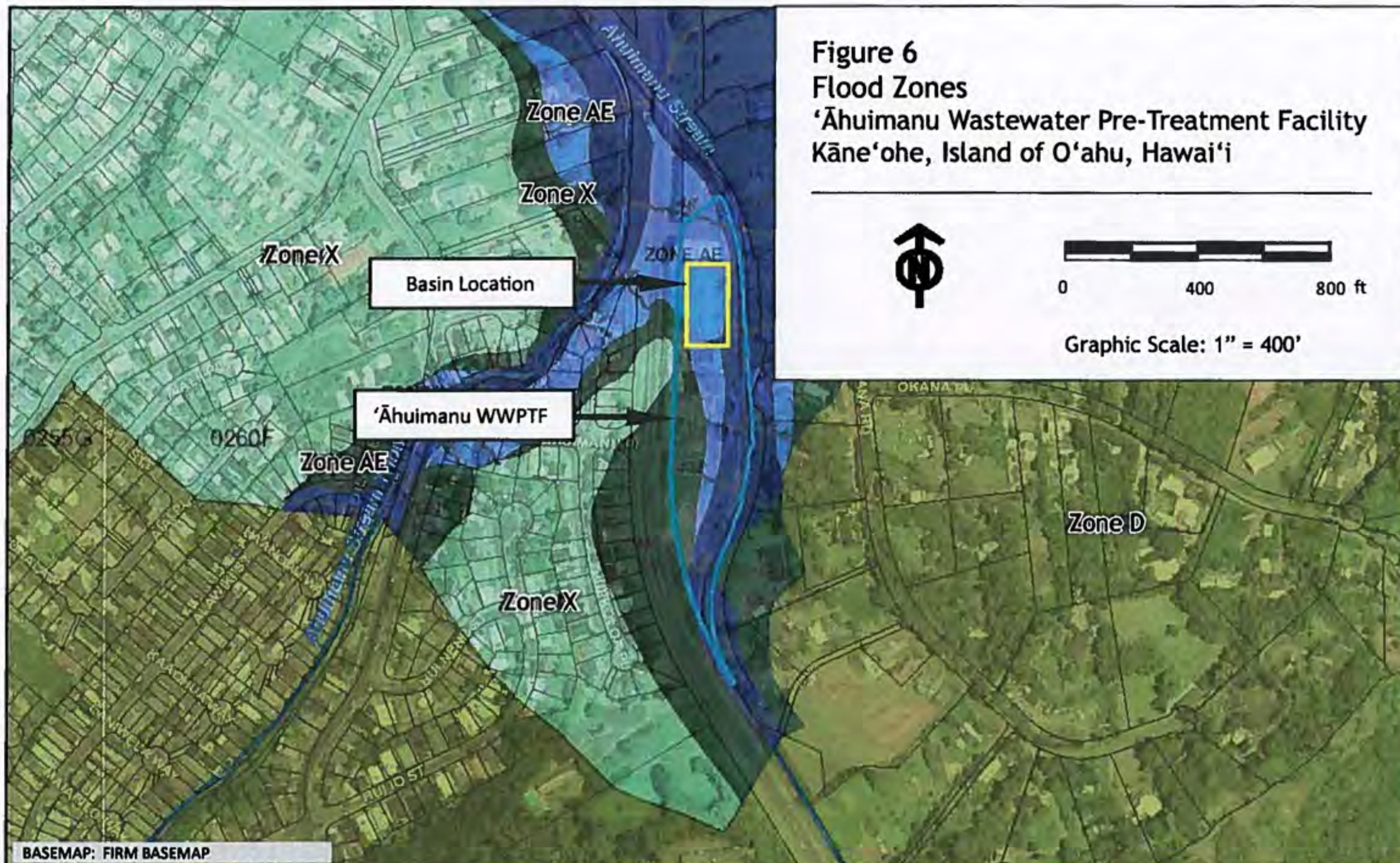
Figure 5B
Photographs of Project Site
ʻĀhuimanu Wastewater Pre-Treatment Facility
Kāneʻohe, Island of Oʻahu, Hawaiʻi

R. M. Towill Corporation

Figure 6
Flood Zones
'Āhuimanu Wastewater Pre-Treatment Facility
Kāne'ohe, Island of O'ahu, Hawai'i

0 400 800 ft

Graphic Scale: 1" = 400'



Flood Hazard Assessment Report

www.hawaiinfip.org

Ahuimanu WWPTF

Property Information

COUNTY: HONOLULU
TMK NO: (1) 4-7-004:006
WATERSHED: AHUIMANU
PARCEL ADDRESS: 47-305 KAHEKILI HWY KANEOHE, HI 96744

Notes:

Flood Hazard Information

FIRM INDEX DATE:	JANUARY 19, 2011
LETTER OF MAP CHANGE(S):	NONE
FEMA FIRM PANEL:	15003C0260F
PANEL EFFECTIVE DATE:	SEPTEMBER 30, 2004

THIS PROPERTY IS WITHIN A TSUNAMI EVACUTION ZONE: NO
FOR MORE INFO, VISIT: http://www.scd.hawaii.gov/

THIS PROPERTY IS WITHIN A DAM EVACUATION ZONE: NO
FOR MORE INFO, VISIT: http://dlnreng.hawaii.gov/dam/

FLOOD HAZARD ASSESSMENT TOOL LAYER LEGEND
(Note: legend does not correspond with NFHL)

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD - The 1% annual chance flood (100-year), also know as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. SFHAs 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 apply, but coverage is available in participating communities.

Figure 7
1952 Aerial Photograph
‘Āhuimanu Wastewater Pre-Treatment Facility
Kāne‘ohe, Island of O‘ahu, Hawai‘i

SCALE UNKNOWN

R. M. Towill Corporation

Source: R. M. Towill Corporation

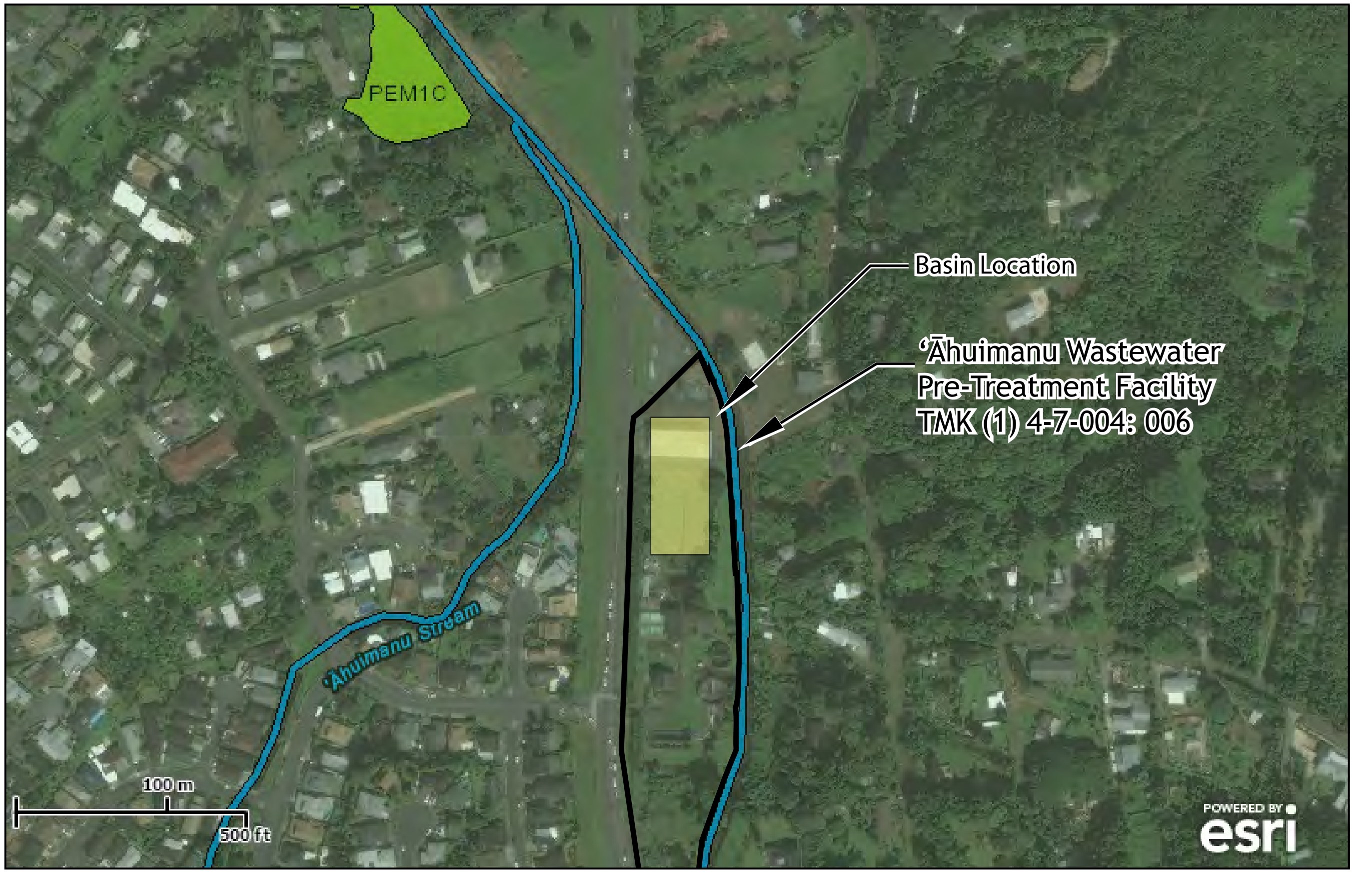
Figure 8
1954 USGS Map
ʻĀhuimanu Wastewater Pre-Treatment Facility
Kāneʻohe, Island of Oʻahu, Hawaiʻi

SCALE UNKNOWN

R. M. Towill Corporation

U.S. Fish and Wildlife Service

National Wetlands Inventory



Key

Wetlands

- Freshwater Emergent
- Freshwater Forested/Shrub
- Estuarine and Marine Deepwater
- Estuarine and Marine
- Freshwater Pond
- Lake
- Riverine
- Other

Riparian

- Freshwater Forested/Shrub
- Forested/Shrub

Riparian Status

- Digital Data

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

Figure 9
Wetlands Map
ʻĀhuimanu Wastewater Pre-Treatment Facility
Kāneʻohe, Island of Oʻahu, Hawaiʻi

Map Scale: 1” = 500’

R. M. Towill Corporation

Wetlands survey at
ʻĀhuimanu Wastewater Pretreatment Facility
ʻĀhuimanu, Oʻahu

July 24, 2015 **DRAFT** *AECOS* No. 1445

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Introduction

AECOS, Inc. was contracted by R. M. Towill to conduct a wetlands survey at the ʻĀhuimanu Wastewater Pretreatment Facility (WPF) located on a site identified as Tax Map Key (TMK): 4-7-004:006 in ʻĀhuimanu, windward Oʻahu. On July 9, 2015, *AECOS* scientists conducted the survey. Wetland data sheets and geospatial information for the delineation process are presented in this report.

Project Area Description

ʻĀhuimanu WPF is on a relatively narrow parcel with Kahekili Highway to the west and a channelized unnamed tributary to ʻĀhuimanu Stream to the east (Figure 1). The confluence of this tributary with the main branch of ʻĀhuimanu Stream is just downstream from the parcel, on the opposite side of Kahekili Higway. ʻĀhuimanu and Kahuluʻu streams converge prior to discharge into Kahuluʻu Flood Control Lagoon and ultimately Kāneʻohe Bay.

The ʻĀhuimanu watershed was modified in the late 1960s and 1970s for housing developments, a small commercial development, and the construction of Kahekili Highway. ʻĀhuimanu Stream and tributaries were modified in the middle and lower reaches to reduce flooding. The adjacent floodplain was graded and filled for the construction of Kahekili Highway. Flooding in 1965 and again in 1969 led to development of the Kahuluʻu Flood Control Project, which confined ʻĀhuimanu and Kahuluʻu streams to concrete-lined open box culverts and created Kahuluʻu Flood Control Lagoon. The adjacent floodplains of these streams were graded and filled for the construction of Kahekili Highway.

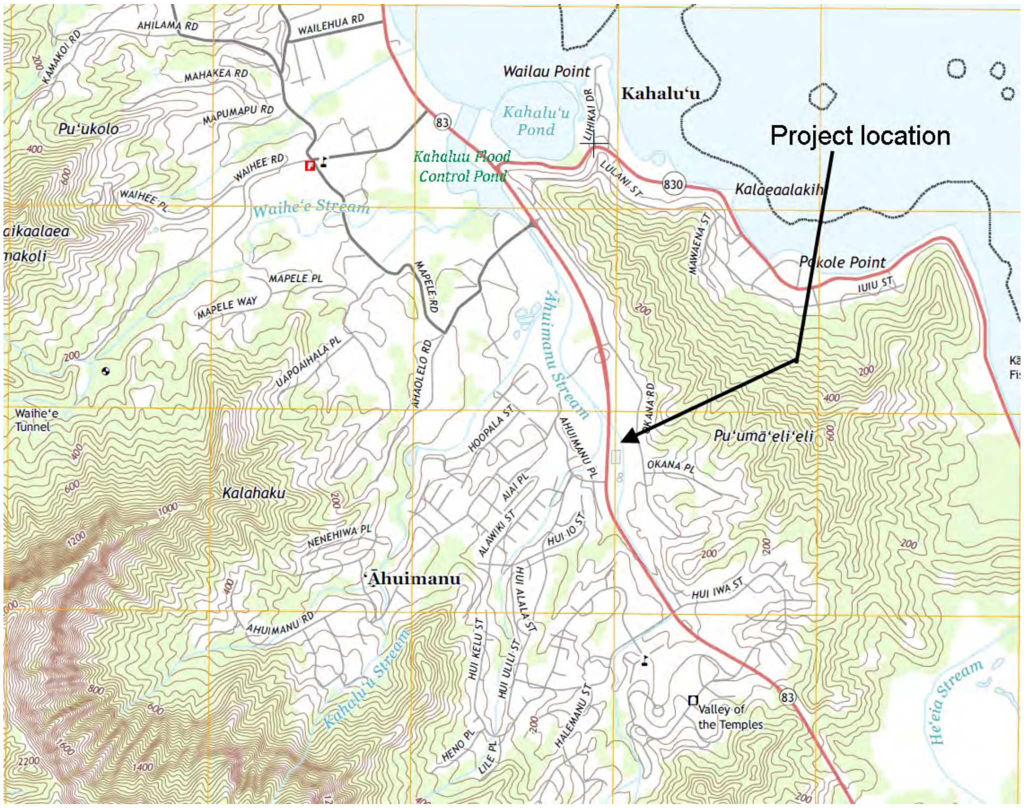

Figure 1. Project location in ʻĀhuimanu on windward Oʻahu.

Wetlands

Wetlands are typically found at the interface of aquatic and terrestrial ecosystems. Certain wetlands are regulated by the federal government under the auspices of the Clean Water Act (CWA) and are defined as (USACE, 1986; USEPA, 2004):

> …those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.

The U.S. Army Corps of Engineers (USACE) developed a manual ("Manual") for use in the CWA Section 404 regulatory program to identify and delineate wetlands[1] (USACE, 1987) and has updated this information with a regional supplement for Hawaiʻi and the Pacific Islands (USACE, 2012a). The approach required by the Manual and regional supplement requires positive evidence of hydrophytic vegetation, hydric soils, and wetland hydrology (all three must be present) for a jurisdictional wetland determination.

The National Wetlands Inventory (NWI; USFWS, 2009) is a mapping of all aquatic environments (not just wetlands) and is a helpful starting point to identify where wetlands might occur in an area. The NWI does not indicate aquatic features are present on or near the parcel.

Methods

AECOS scientists followed the methods of wetland delineation described in *Corps of Engineers Wetland Delineation Manual* ("Manual"; USACE, 1987) and *Regional Supplement* (USACE, 2012a). The wetland status of plant species follows the 2012 National Wetland Plant List (USACE, 2012b) and the 2014 update (Lichvar, et al., 2014).

We established a single wetland determination sampling point (SP) in a low point of a basin (Figure 2) that is reported to have been used as a settling basin for secondary-treated effluent prior to reconfiguration of the facility from a sewage treatment plant to a pretreatment facility (J. Niermann, pers. comm.). The basin is the lowest point on the parcel and the most likely place on the parcel to exhibit wetland characteristics.

Attachment A provides the wetland data sheet. *AECOS* scientists marked the location with a handheld, global navigation satellite system (GNSS) instrument (Trimble 6000 Series, Geo XT), providing submeter accuracy of the recorded position.

[1] The process of determining that line on the ground (and shown on maps) separating jurisdictional waters from upland is termed "delineation". Although *AECOS* can "delineate" wetlands, jurisdictional determination is the purview of USACE, and USACE must concur with our delineation for it to become official.

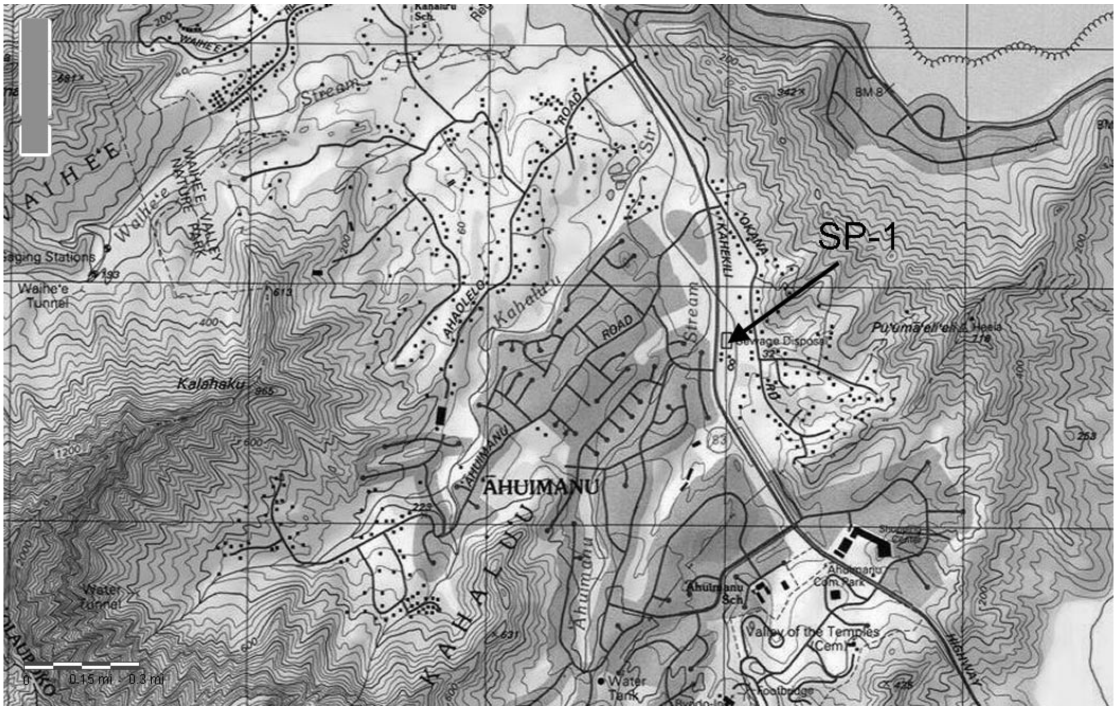

Figure 2. Location of SP-1 in former sewage treatment settling basin at ʻĀhuimanu WPF.

Results

Determination of jurisdictional status for a palustrine wetland begins with establishing that three characteristics—hydrology, soil, and vegetation—meet the wetland criteria established by the USACE (1987).

<u>Vegetation</u> - The National Wetland Plant List (NWPL), administered by the USACE, assigns a regional wetland indicator status to each species of plant (USACE, 2012b, Lichvar, et al., 2014). Table 1 provides descriptions of each status indicator. Only plant species that are designated obligate (OBL), facultative wetland (FACW), or facultative (FAC) are considered as indicators of wetlands. The basin has hydric vegetation, as the two dominant plants are facultative grasses (Figure 3): *Axonopus fissifolius* (narrow-leaved carpet grass) and *Paspalum conjugatum* (Hilo grass).

<u>Soils</u> – Hydric soils are soils that are sufficiently wet in the upper part to develop anaerobic conditions; that is, soils that could be associated with

Table 1. Wetland status indicators and their definitions
(from Lichvar and Gillrich, 2011).

Status indicator (abbreviation)	Description
Obligate (OBL)	Almost always is hydrophytic, rarely occurs in uplands.
Facultative wetland (FACW)	Usually is hydrophytic, but occasionally found in uplands.
Facultative (FAC)	Commonly occurs as either hydrophytic or non-hydrophytic.
Facultative upland (FACU)	Occasionally is hydrophytic, but usually occurs in wetlands.
Upland (UPL)	Rarely is hydrophytic, almost always found in uplands

Figure 3. Facultative plants are dominant in the basin.

wetlands. Soil saturation with water is what differentiates wetland soils from upland soils, as saturation greatly reduces the oxygen present between soil particles. In determining whether a soil is hydric, we look for evidence of this saturation (i.e., reducing conditions); the soil need not be saturated at the time of inspection.

The entire parcel is mapped as having Hanalei silty clay, 0 to 2 % slopes (NRCS, 2015), which is on the list of hydric soils for Oʻahu (NRCS, 2014). Because local conditions can deviate from a mapped soil type, inspection by soil pits is a necessary part of the wetlands determination process to confirm the mapped soil type. The soil profile we examined at SP-1 has a depleted matrix with prominent and distinct redox features—our soil profile confirms the mapped soil type and is a hydric soil.

Hydrology - Evidence of wetland hydrology (for example, shallow groundwater or saturated soil) was not present at SP-1.

Conclusions

We completed a wetland data determination form at a low point of a basin at ʻĀhuimanu WPF. We determined the site has hydrophytic vegetation and hydric soils, but no wetland hydrology. Because the site exhibits only two of the required indicators, the site is not a wetland.

References

Lichvar, R. W. and J. J. Gillrich. 2011. Final protocol for assigning wetland indicator status ratings during National Wetland Plant List Update. Prep. for: US Army Corps of Engineers. ERDC/CRREL TN-11-1. 19 pp.

_______, M. Butterwick, N. C. Melivin, and W. N. Kirchner. 2014. The National Wetland Plant List: 2014 Update of Wetland Ratings. *Phytoneuron* 2014-41: 1-42.

Natural Resource Conservation Service US Department of Agriculture (NRCS). 2014. National Hydric Soils List by State. Available online at URL: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/use/?cid=nrcs142p2_053957; last accessed on March 10, 2015.

_______. 2015. Web Soil Survey 3.1. Available online at URL: http://websoilsurvey.nrcs.usda.gov/; last accessed on March 10, 2015.

U.S. Army Corps of Engineers (USACE). 1986. Corps of Engineers, Department of the Army, Department of Defense, 33 CFR II, Parts 328 and 329. Navigation and Navigable Waters. *Federal Register*, 51 (41250 and 41251, November 13, 1986).

U.S. Army Corps of Engineers (USACE). 1987. *Corps of Engineers Wetlands Delineation Manual*. Tech. Rept. Y-87-1. Environmental Laboratory, Dept. of the Army, Waterways Experiment Station, Vicksberg.

______. 2012a. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Hawaiʻi and Pacific Islands Region Version 2.0,* ed. J. F. Berkowitz, J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-12-5. U.S. Army Engineer Research and Development Center. Vicksberg, MS. 130 pp incl. appendices.

U.S. Environmental Protection Agency (USEPA). 2004. Part II. 40 CFR §230.3. Definitions. *Federal Register*, 23 (xx; April 21, 2004): 250-251.

U.S. Fish and Wildlife Service (USFWS). 2009. National Wetlands Inventory maps, Hawaii: U.S. Fish and Wildlife Service. Available online at URL: http://www.fws.gov/wetlands/Data/Mapper.html; last accessed on July 24, 2015.

Attachment A

Wetland determination data forms

WETLAND DETERMINATION DATA FORM—Hawai‘i and Pacific Islands

Project/Site: ‘Āhuimanu Wastewater Pretreatment Facility City: Kāne‘ohe Sampling Date: 9 July 2015 Time: 0900

Applicant/Owner: City and County of Honolulu State/Terr./Comm.: HI Island: O‘ahu Sampling Point: **SP-1**

Investigator(s): Susan Burr and Chad Linebaugh TMK/Parcel: 4-7-004:006

Landform (hillslope, coastal plain, etc.): floodplain Local relief (concave, convex, none): concave

Lat: 21° 26.659" N Long: 157° 49.939"W Datum: NAD83 Slope (%): <1

Soil Map Unit Name: Hanalei silty clay, 0 to 2% slopes NWI classification: upland

Are climactic/hydrologic conditions on the site typical for this time of year: Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS—Attach a site map showing sampling point locations transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No	
Hydric Soil Present?	Yes X	No	**Is the Sampled Area**
Wetland Hydrology Present?	Yes	No X	**within a Wetland? Yes ____ No X**

Remarks: Area is a basin surrounded by berms. Kahekili Highway is to the west and a channelized (concrete bottom and banks) tributary to ‘Āhuimanu Stream is to the east. There is no surface connection between the stream and basin. Prior to 1994, basin served as a settling basin for secondary-treated effluent prior to discharge into the stream.

VEGETATION—Use scientific names of plants.

Tree Stratum (Plot size: 30 m x 40 m)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
	0 =Total Cover		
Sapling/Shrub Stratum (Plot size: 30 m x 40 m)			
1. None			
2.			
3.			
4.			
	0 =Total Cover		
Herb Stratum (Plot size: 30 m x 40 m)			
1. *Axonopus fissifolius*	45	Yes	FAC
2. *Paspalum conjugatum*	35	Yes	FAC
3. *Cyperus polystachyos*	7	No	FACW
4. *Paspalum fimbriatum*	3	No	FAC
5. Sorghum halepense	4	No	FACU
6. Ludwigia octovalvis	2	No	OBL
7. *Paederia foetida*	2	No	UPL
8. Fimbristylis dichotoma	2	No	FAC
9. *Chamaecrista nictitans*	1	No	FACU
10. *Kyllinga brevifolia*	1	No	FAC
5. *Macroptilium atropurpureum*	1	No	FAC
	103 =Total Cover		
Woody Vine Stratum (Plot size: 30 m x 40 m)			
1. None			
	0 =Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 **(B)**

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x1=
FACW species	x2=
FAC species	x3=
FACU species	x4=
UPL species	x5=
Column Totals: (A)	(B)

Prevalence Index = B/A=

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation [1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: Sampling plot encompasses entire basin. East side of basin has a greater cover of *Axonopus fissifolius* and west side of basin has a greater cover of *Paspalum conjugatum*, though hydrology appears similar on both sides

SOIL **Sampling Point: SP-1**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0 – 5	10YR 4/2	97	10YR 4/6	3	C	PL & M	silty clay loam	prominent redox features
5 – 16	10YR 4/2	84	5YR 5/8	1	C	PL	silty clay	prominent redox features
			10YR 5/4	2	C	M		distinct redox features
			7.5YR 4/4	8	C	M		distinct redox features
			10YR 4/1	5	D	M		faint redox features
16 – 18	10YR 3/1	93	7.5YR 5/6	2	C	M	silty clay loam	prominent redox features
			7.5 YR 4/2	5	D	M		faint redox features

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

___ Histisols (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Muck Presence (A8)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Dark-Surface (S7)
___ Loamy Gleyed Matrix (F2)
_X_ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ Stratified Layers (A5)
___ Sandy Mucky Mineral (S1)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:___

Depth (inches):___

Hydric Soil Present: **Yes** X **No** ___

Remarks:

Soil generally confirms mapped soil type—Hanalei silty clay, 0 to 2% slopes—which is on the 2014 Hydric soil list for Hawai‘i.

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required: check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Innundation Visible on Aerial Imagery (B7)
___ Water Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ Tilapia Nests (B17)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tiled Soils (C6)
___ Thin Muck Surface (C7)
___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Salt Deposits (C5)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes___ No X Depth (inches): none

Water Table Present? Yes___ No X Depth (inches): >18

Saturation Present? (includes capillary fringe) Yes___ No X Depth (inches): >18

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Sampling point location was established in lowest point of basin.
Soil is moist, but not saturated at 16 in.

DEPARTMENT OF THE ARMY
HONOLULU DISTRICT, U.S. ARMY CORPS OF ENGINEERS
FORT SHAFTER, HAWAII 96858-5440

January 15, 2016

SUBJECT: No Permit Required for Improvements to the Ahuimanu Wastewater Pre-Treatment Facility, Kaneohe, Oahu, Hawaii. DA File No. POH-2015-00263

City and County of Honolulu
Department of Design and Construction
c/o Ingrid Friedberg
R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819-3494

Dear Ms. Friedberg:

We have received your letter dated December 15, 2015 requesting a determination of permitting requirements for the proposed improvement and expansion of the Ahuimanu Wastewater Pre-Treatment Facility, located at Tax Map Key 4-7-004:006 at 47-305 Kahekili Highway, in Kaneohe, Island of Oahu, Hawaii. We have assigned your project Department of the Army (DA) file number POH-2015-00263. Please reference this number in all future correspondence concerning this project.

We have reviewed your submittal pursuant to Section 10 of the Rivers and Harbors Act of 1899 (Section 10) and Section 404 of the Clean Water Act (Section 404). Section 10 requires that a DA permit be obtained for certain structures or work in or affecting navigable waters of the United States, prior to conducting the work (33 U.S.C. 403). Section 404 requires that a DA permit be obtained for the discharge of dredged and/or fill material into waters of the U.S., including wetlands and navigable waters of the U.S, prior to conducting the work (33 U.S.C. 1344).

Based on our review of the information you furnished, and assuming your project is conducted only as set forth in the information provided, this office has determined that the proposed activity does not occur within the jurisdictional limits of a Navigable Water of the U.S. as defined by Section 10 of the Rivers and Harbors Act of 1899 or within the limits of a Waters of the U.S. as defined by Section 404 of the Clean Water Act. Therefore, a DA permit will not be required.

We have completed an approved jurisdictional determination (Enclosure 1) for your project area. This determination is valid for a period of five (5) years from the date of this letter, unless new information warrants revision of the determination before the expiration date. If you object to this determination, you may request an Administrative Appeal under 33 CFR 331. We have enclosed a Notification of Appeal Process and Request for Appeal (NAP/RFA) form. If you request to appeal this determination you must submit a completed RFA form, according to instructions in the RFA, to the Corps' Pacific Ocean Division office at the following address:

Appeals Review Officer
U.S. Army Corps of Engineers
Pacific Ocean Division, ATTN: CEPOD-PDC
Building 525
Fort Shafter, HI 96858-5440

Although a permit is not required from this office, we recommend use of Best Management Practices to avoid and minimize adverse impacts to the aquatic resource. It is your responsibility to ensure that your project complies with all other Federal, State, or local statutes, ordinances and regulations.

Thank you for your cooperation with the Honolulu District Regulatory Program. Should you have any questions related to this determination, please contact Ms. Vera Koskelo of my staff at 808-835-4310 or via e-mail at Vera.B.Koskelo@usace.army.mil. You are encouraged to provide comments on your experience with the Honolulu District Regulatory Office by accessing our web-based customer survey form at http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0.

Sincerely,

Michelle Lynch

Michelle R. Lynch
Chief, Regulatory Office

Enclosure(s)

cc:
State of Hawaii DBEDT Office of Planning (John Nakagawa)
State of Hawaii DOH-CWB (Darryl Lum)
IngridF@rmtowill.com

APPENDIX G

Cost Estimates

AHUIMANU WASTEWATER PRE-TREATMENT FACILITY
IMPROVEMENTS AND EQUALIZATION FACILITY
DESIGN ALTERNATIVES REPORT (FINAL SUBMITTAL)

Option 1 - Re-Use Ex. Storage Tanks

Description		QUANTITY	UNIT	LABOR	LABOR	MATERIAL	MATERIAL	TOTAL	TOTAL
				UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	COST
BASE BID									
Sitework	$ 1,769,682								
Site Preparation		1	LS	$0.00	$0	$57,035.00	$57,035	$57,035.00	$57,035
Kahekili Hwy Drainage		1	LS	$0.00	$0	$108,592.00	$108,592	$108,592.00	$108,592
Landscaping		1	LS	$0.00	$0	$199,500.00	$199,500	$199,500.00	$199,500
Electrical		1	LS	$0.00	$0	$1,034,555.00	$1,034,555	$1,034,555.00	$1,034,555
Allowance to Relocate Utility Poleline									$250,000
Allowance for HECO Service Charges									$120,000
Yard Piping	$ 584,175								
Demolition		1	LS	$0.00	$0	$15,000.00	$15,000	$15,000.00	$15,000
6" PVC		75	LF	$200.00	$15,000	$15.00	$1,125	$215.00	$16,125
8" PVC		525	LF	$200.00	$105,000	$17.00	$8,925	$217.00	$113,925
12" PVC		160	LF	$250.00	$40,000	$55.00	$8,800	$305.00	$48,800
14" PVC		90	LF	$250.00	$22,500	$65.00	$5,850	$315.00	$28,350
SMH		12	EA	$10,000.00	$120,000	$10,000.00	$120,000	$20,000.00	$240,000
4" DI Pipe		200	LF	$0.00	$0	$15.00	$3,000	$15.00	$3,000
4" Elbow		1	EA	$0.00	$0	$600.00	$600	$600.00	$600
Dewatering		1	LS	$50,000.00	$50,000	$50,000.00	$50,000	$100,000.00	$100,000
Washdown Hydrant		3	EA	$2,625.00	$7,875	$3,500.00	$10,500	$6,125.00	$18,375
Headworks	$ 4,271,300								
Structural Rehabilitation		1	LS	$800,000.00	$800,000	$1,600,000.00	$1,600,000	$2,400,000.00	$2,400,000
6mm Mechanical Screen		1	LS	$386,250.00	$386,250	$515,000.00	$515,000	$901,250.00	$901,250
Grit Removal System		1	EA	$359,250.00	$359,250	$479,000.00	$479,000	$838,250.00	$838,250
Slide Gates		2	EA	$8,400.00	$16,800	$12,000.00	$24,000	$20,400.00	$40,800
Wall Penetration		5	LS	$0.00	$0	$10,000.00	$50,000	$10,000.00	$50,000
24" HDPE (Bypass)		60	LF	$200.00	$12,000	$150.00	$9,000	$350.00	$21,000
SMH (Bypass)		1	EA	$10,000.00	$10,000	$10,000.00	$10,000	$20,000.00	$20,000
Existing EQ Basin	$ 2,655,250								
Basin Aluminum Covers		1	LS	$50,000.00	$50,000	$210,000.00	$210,000	$260,000.00	$260,000
Wall Penetration		3	EA	$0.00	$0	$10,000.00	$30,000	$10,000.00	$30,000
Slide Gates		5	EA	$13,500.00	$67,500	$18,000.00	$90,000	$31,500.00	$157,500
EQ Rehabilitation		1	LS	$0.00	$0.00	$1,800,000.00	$1,800,000	$1,800,000.00	$1,800,000
18" HDPE		80	LF	$200.00	$16,000	$100.00	$8,000	$300.00	$24,000
18" HDPE 1/4 Bend		1	EA	$750.00	$750	$1,000.00	$1,000	$1,750.00	$1,750
Drop Pipe		1	EA	$0.00	$0	$5,000.00	$5,000	$5,000.00	$5,000
Dry-Wet Weather Wall		1	LS	$51,500.00	$51,500	$73,500.00	$73,500	$125,000.00	$125,000
Bypass Rental Pump		12	MO	$9,000.00	$108,000	$12,000.00	$144,000	$21,000.00	$252,000
Aeration	$ 144,504								
Blower		1	LS	$43,500.00	$43,500.00	$58,000.00	$58,000.00	$101,500.00	$101,500.00
8" DI Pipe		275	LF	$0.00	$0	$17.00	$4,675	$17.00	$4,675
8" Elbow		6	EA	$0.00	$0	$650.00	$3,900	$650.00	$3,900
8" Butterfly		8	EA	$0.00	$0	$1,300.00	$10,400	$1,300.00	$10,400
8" Tee		6	EA	$0.00	$0	$671.55	$4,029	$671.55	$4,029
Wall Penetration		2	LS	$0.00	$0	$10,000.00	$20,000	$10,000.00	$20,000
Effluent Pump Station	$ 4,740,190								
Main Pump w/ AFD		1	EA	$202,500	$202,500	$270,000	$270,000	$472,500	$472,500
Jockey Pump		1	EA	$26,500	$26,500	$53,000	$53,000	$79,500	$79,500
EPS Wetwell Rehabilitation		1	LS	$0	$0	$50,000	$50,000	$50,000	$50,000
Misc Piping and Instrumentation		1	LS	$225,000	$225,000	$300,000	$300,000	$525,000	$525,000
Electrical		1	LS	$0	$0	$2,428,330	$2,428,330	$2,428,330	$2,428,330
Ventilation Demolition		1	LS	$8,400	$8,400	$2,000	$2,000	$10,400	$10,400
Exhaust Fans		1	EA	$4,200	$4,200	$8,000	$8,000	$12,200	$12,200
Duct w/o insulation		2,200	LB	$21	$46,200	$2	$3,300	$23	$49,500
Air Handling Unit		2	EA	$11,200	$22,400	$15,000	$30,000	$26,200	$52,400
Controls		1	LS	$8,400	$8,400	$2,200	$2,200	$10,600	$10,600
Test and Balanance		1	LS	$5,600	$5,600	$0	$0	$5,600	$5,600
Control Wiring		1	LS	$4,480	$4,480	$4,000	$4,000	$8,480	$8,480
Hoisting		1	LS	$2,240	$2,240	$6,000	$6,000	$8,240	$8,240
Maintenance Contract		1	LS	$10,640	$10,640	$1,800	$1,800	$12,440	$12,440
Odor Control System		1	LS	$435,000	$435,000	$580,000	$580,000	$1,015,000	$1,015,000
Aerobic Digester	$ 1,193,500								
Demolition of Equipment/Piping		1	LS	$0.00	$0	$15,000.00	$15,000	$15,000.00	$15,000

AHUIMANU WASTEWATER PRE-TREATMENT FACILITY
IMPROVEMENTS AND EQUALIZATION FACILITY
DESIGN ALTERNATIVES REPORT (FINAL SUBMITTAL)

Option 1 - Re-Use Ex. Storage Tanks

Description		QUANTITY	UNIT	LABOR	LABOR	MATERIAL	MATERIAL	TOTAL	TOTAL
				UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	COST
Structural Rehab Aerobic Digester		1	LS	$0.00	$0	$950,000.00	$950,000	$950,000.00	$950,000
Connection to Aerobic Digester		1	EA	$7,500.00	$7,500	$2,500.00	$2,500	$10,000.00	$10,000
8" Motor Operated Gate Valve		3	EA	$22,500.00	$67,500	$30,000.00	$90,000	$52,500.00	$157,500
Valve Box		3	EA	$10,000.00	$30,000	$10,000.00	$30,000	$20,000.00	$60,000
8"x14" Tee		1	EA	$500.00	$500	$500.00	$500	$1,000.00	$1,000
Primary Clarifier	$ 1,450,000								
Demolition of Equipment/Piping		1	LS	$0.00	$0	$15,000.00	$15,000	$15,000.00	$15,000
Structural Rehab Primary Clarifier		1	LS	$0.00	$0	$1,080,000.00	$1,080,000	$1,080,000.00	$1,080,000
Connection to Primary Clarifier		1	LS	$20,000.00	$20,000	$10,000.00	$10,000	$30,000.00	$30,000
8" Motor Operated Gate Valve		2	EA	$22,500.00	$45,000	$30,000.00	$60,000	$52,500.00	$105,000
12" Motor Operated Gate Valve		2	EA	$30,000.00	$60,000	$40,000.00	$80,000	$70,000.00	$140,000
Valve Box		4	EA	$10,000.00	$40,000	$10,000.00	$40,000	$20,000.00	$80,000
Rapid Block Tank	$ 1,236,250								
Demolition of Equipment/Piping		1	LS	$0.00	$0	$30,000.00	$30,000	$30,000.00	$30,000
Structural Rehab Rapid Block Unit		1	LS	$0.00	$0	$650,000.00	$650,000	$650,000.00	$650,000
Connection to AB Compartment		3	EA	$7,500.00	$22,500	$2,500.00	$7,500	$10,000.00	$30,000
Connection to ST Compartment		3	EA	$7,500.00	$22,500	$2,500.00	$7,500	$10,000.00	$30,000
6" Motor Operated Gate Valve		6	EA	$18,750.00	$112,500	$25,000.00	$150,000	$43,750.00	$262,500
Valve Box		6	EA	$10,000.00	$60,000	$10,000.00	$60,000	$20,000.00	$120,000
16" Motor Operated Gate Valve		1	EA	$48,750.00	$48,750	$65,000.00	$65,000	$113,750.00	$113,750
Force Main	$ 94,100								
Connection to Exist.		3	EA	$1,500	$4,500	$1,500	$4,500	$3,000	$9,000
12" HDPE		50	LF	$250	$12,500	$55	$2,750	$305	$15,250
14" HDPE		210	LF	$250	$52,500	$65	$13,650	$315	$66,150
12"x14" TEE		1	EA	$500	$500	$500	$500	$1,000	$1,000
12"x12" TEE		1	EA	$500	$500	$500	$500	$1,000	$1,000
12" 1/4 BEND		1	EA	$375	$375	$450	$450	$825	$825
14" 1/4 BEND		1	EA	$375	$375	$500	$500	$875	$875
Influent Pump Station	$ 1,179,195								
Demolition of Equipment/Piping		1	LS	$0	$0	$30,000	$30,000	$30,000	$30,000
Larger Pump		2	EA	$15,880	$31,760	$21,173	$42,346	$37,053	$74,106
Smaller Pump		2	EA	$8,591	$17,181	$11,454	$22,908	$20,045	$40,089
Wall Penetration		3	EA	$0	$0	$10,000	$30,000	$10,000	$30,000
14" Gate Valve		1	EA	$5,513	$5,513	$7,350	$7,350	$12,863	$12,863
12" Gate Valve		2	EA	$1,913	$3,825	$2,550	$5,100	$4,463	$8,925
10" Gate Valve		2	EA	$1,500	$3,000	$2,000	$4,000	$3,500	$7,000
10" Check Valve		2	EA	$2,250	$4,500	$3,000	$6,000	$5,250	$10,500
8" Gate Valve		2	EA	$975	$1,950	$1,300	$2,600	$2,275	$4,550
6" Gate Valve		2	EA	$645	$1,290	$860	$1,720	$1,505	$3,010
6" Check Valve		2	EA	$900	$1,800	$1,200	$2,400	$2,100	$4,200
14" DI Pipe		45	LF	$200	$9,000	$250	$11,250	$450	$20,250
12" Elbow		2	EA	$713	$1,425	$950	$1,900	$1,663	$3,325
8" Elbow		6	EA	$488	$2,925	$650	$3,900	$1,138	$6,825
6" Elbow		4	EA	$375	$1,500	$500	$2,000	$875	$3,500
14" Wye		4	EA	$938	$3,750	$1,250	$5,000	$2,188	$8,750
Flow Meter		1	EA	$8,400	$8,400	$11,200	$11,200	$19,600	$19,600
IPS Wetwell Rehabilitation		1	LS	$0	$0	$100,000	$100,000	$100,000	$100,000
1 ft Spool		3	EA	$638	$1,913	$850	$2,550	$1,488	$4,463
Misc		1	LS	$18,750	$18,750	$25,000	$25,000	$43,750	$43,750
Electrical		1	LS	$0	$0	$698,710	$698,710	$698,710	$698,710
Ventilation Demolition		1	LS	$4,200	$4,200	$1,000	$1,000	$5,200	$5,200
Exhaust Fans		1	EA	$2,240	$2,240	$5,000	$5,000	$7,240	$7,240
Duct w/o insulation		800	LB	$21	$16,800	$2	$1,600	$23	$18,400
Controls		1	LS	$3,360	$3,360	$1,200	$1,200	$4,560	$4,560
Test and Balanance		1	LS	$1,680	$1,680	$0	$0	$1,680	$1,680
Control Wiring		1	LS	$2,240	$2,240	$1,500	$1,500	$3,740	$3,740
Maintenance Contract		1	LS	$3,360	$3,360	$600	$600	$3,960	$3,960
Generator and Blower Building	$ 2,702,400								
Wall Demolition		1	LS	$0	$0	$9,000	$9,000	$9,000	$9,000
New Wall		1	LS	$10,300	$10,300	$14,700	$14,700	$25,000	$25,000
Ventilation Demolition		1	LS	$14,000	$14,000	$3,000	$3,000	$17,000	$17,000
Exhaust Fans		1	EA	$4,200	$4,200	$8,000	$8,000	$12,200	$12,200
Duct w/ insulation		2000	LB	$21	$42,000	$2	$4,000	$23	$46,000
Duct silencers		1	EA	$70,000	$70,000	$35,000	$35,000	$105,000	$105,000
Engine silencers/piping		1	LS	$28,000	$28,000	$20,000	$20,000	$48,000	$48,000

AHUIMANU WASTEWATER PRE-TREATMENT FACILITY
IMPROVEMENTS AND EQUALIZATION FACILITY
DESIGN ALTERNATIVES REPORT (FINAL SUBMITTAL)

Option 1 - Re-Use Ex. Storage Tanks

Description		QUANTITY	UNIT	LABOR UNIT COST	LABOR TOTAL	MATERIAL UNIT COST	MATERIAL TOTAL	TOTAL UNIT COST	TOTAL COST
Controls		1	LS	$11,200	$11,200	$3,000	$3,000	$14,200	$14,200
Test and Balanance		1	LS	$2,800	$2,800	$0	$0	$2,800	$2,800
Control Wiring		1	LS	$5,600	$5,600	$5,000	$5,000	$10,600	$10,600
Hoisting		1	LS	$4,200	$4,200	$10,000	$10,000	$14,200	$14,200
Maintenance Contract		1	LS	$7,000	$7,000	$2,400	$2,400	$9,400	$9,400
Electrical		1	LS	$0	$0	$2,389,000	$2,389,000	$2,389,000	$2,389,000
Generator Building - Fuel Tank	$ 237,800								
Demolition (tank removal only)		1	LS	$22,400.00	$22,400.00	$15,000.00	$15,000.00	$37,400.00	$37,400.00
12000 gal aboveground fuel tank		1	EA	$28,000.00	$28,000.00	$75,000.00	$75,000.00	$103,000.00	$103,000.00
500 gal aboveground day tank		1	EA	$16,800.00	$16,800.00	$20,000.00	$20,000.00	$36,800.00	$36,800.00
Piping		200	LF	$70.00	$14,000.00	$30.00	$6,000.00	$100.00	$20,000.00
Hoisting		1	LS	$5,600.00	$5,600.00	$35,000.00	$35,000.00	$40,600.00	$40,600.00
	$ 22,258,346								
SCADA Improvements		1	LS	$244,635.00	$244,635	$213,100	$213,100	$457,735	$457,735
Testing, Commissioning, Training, Start-Ups and O&M Manuals		1	LS	$0.00	$0	$100,000	$100,000	$100,000	$100,000
Miscallaneous Demolition									
Dewatering and Old Generator Building		1	LS	$0.00	$0	$150,000	$150,000	$150,000	$150,000
Total - Direct Cost		1	LS		**$4,574,581**		**$18,021,500**		**$22,966,081**
Mobilization (not to exceed 6%)		1	LS	$0.00	$0	$1,377,965	$1,377,965	$1,377,965	$1,377,965
General Contractor's Overhead (10%)		1	LS	$457,458.05	$457,458	$1,802,150.03	$1,802,150	$2,296,608	$2,259,608
General Contractor's Profit (10%)		1	LS	$503,203.86	$503,204	$2,120,161.52	$2,120,162	$2,660,365	$2,623,365
Tax (4.7%)		1	LS	$260,156.39	$260,156	$1,096,123.50	$1,096,124	$1,373,670	$1,356,280
Bond and Insurance (1.5%)		1	LS	$86,930.98	$86,931	$366,268.50	$366,269	$458,749	$453,199
Total - General Contractor's Cost		1	LS		**$5,882,330**		**$24,784,169**		**$31,036,498**
Contengency (35%)		1	LS						$10,862,774
Total - Budgetary Cost		1	LS		**$5,882,330**		**$24,784,169**		**$41,899,273**

AHUIMANU WASTEWATER PRE-TREATMENT FACILITY
IMPROVEMENTS AND EQUALIZATION FACILITY
DESIGN ALTERNATIVES REPORT (FINAL SUBMITTAL)

Option 1 - Re-Use Ex. Storage Tanks

Description	QUANTITY	UNIT	LABOR	LABOR	MATERIAL	MATERIAL	TOTAL	TOTAL
			UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	COST
BASE BID								
Sitework								
Site Preparation	1	LS	$0.00	$0	$57,035.00	$57,035	$57,035.00	$57,035
Kahekili Hwy Drainage	1	LS	$0.00	$0	$108,592.00	$108,592	$108,592.00	$108,592
Landscaping	1	LS	$0.00	$0	$199,500.00	$199,500	$199,500.00	$199,500
Electrical	1	LS	$0.00	$0	$1,034,555.00	$1,034,555	$1,034,555.00	$1,034,555
Allowance to Relocate Utility Poleline								$250,000
Allowance for HECO Service Charges								$120,000
Yard Piping								
Demolition	1	LS	$0.00	$0	$15,000.00	$15,000	$15,000.00	$15,000
6" PVC	75	LF	$200.00	$15,000	$15.00	$1,125	$215.00	$16,125
8" PVC	525	LF	$200.00	$105,000	$17.00	$8,925	$217.00	$113,925
12" PVC	160	LF	$250.00	$40,000	$55.00	$8,800	$305.00	$48,800
14" PVC	90	LF	$250.00	$22,500	$65.00	$5,850	$315.00	$28,350
SMH	12	EA	$10,000.00	$120,000	$10,000.00	$120,000	$20,000.00	$240,000
4" DI Pipe	200	LF	$0.00	$0	$15.00	$3,000	$15.00	$3,000
4" Elbow	1	EA	$0.00	$0	$600.00	$600	$600.00	$600
Dewatering	1	LS	$50,000.00	$50,000	$50,000.00	$50,000	$100,000.00	$100,000
Washdown Hydrant	3	EA	$2,625.00	$7,875	$3,500.00	$10,500	$6,125.00	$18,375
Existing EQ Basin								
Basin Aluminum Covers	1	LS	$50,000.00	$50,000	$210,000.00	$210,000	$260,000.00	$260,000
Wall Penetration	3	EA	$0.00	$0	$10,000.00	$30,000	$10,000.00	$30,000
Slide Gates	5	EA	$13,500.00	$67,500	$18,000.00	$90,000	$31,500.00	$157,500
EQ Rehabilitation	1	LS	$0.00	$0.00	$1,800,000.00	$1,800,000	$1,800,000.00	$1,800,000
18" HDPE	80	LF	$200.00	$16,000	$100.00	$8,000	$300.00	$24,000
18" HDPE 1/4 Bend	1	EA	$750.00	$750	$1,000.00	$1,000	$1,750.00	$1,750
Drop Pipe	1	EA	$0.00	$0	$5,000.00	$5,000	$5,000.00	$5,000
Dry-Wet Weather Wall	1	LS	$51,500.00	$51,500	$73,500.00	$73,500	$125,000.00	$125,000
Bypass Rental Pump	12	MO	$9,000.00	$108,000	$12,000.00	$144,000	$21,000.00	$252,000
Aeration								
Blower	1	LS	$43,500.00	$43,500.00	$58,000.00	$58,000.00	$101,500.00	$101,500.00
8" DI Pipe	275	LF	$0.00	$0	$17.00	$4,675	$17.00	$4,675
8" Elbow	6	EA	$0.00	$0	$650.00	$3,900	$650.00	$3,900
8" Butterfly	8	EA	$0.00	$0	$1,300.00	$10,400	$1,300.00	$10,400
8" Tee	6	EA	$0.00	$0	$671.55	$4,029	$671.55	$4,029
Wall Penetration	2	LS	$0.00	$0	$10,000.00	$20,000	$10,000.00	$20,000
Aerobic Digester								
Demolition of Equipment/Piping	1	LS	$0.00	$0	$15,000.00	$15,000	$15,000.00	$15,000
Structural Rehab Aerobic Digester	1	LS	$0.00	$0	$950,000.00	$950,000	$950,000.00	$950,000
Connection to Aerobic Digester	1	EA	$7,500.00	$7,500	$2,500.00	$2,500	$10,000.00	$10,000
8" Motor Operated Gate Valve	3	EA	$22,500.00	$67,500	$30,000.00	$90,000	$52,500.00	$157,500
Valve Box	3	EA	$10,000.00	$30,000	$10,000.00	$30,000	$20,000.00	$60,000
8"x14" Tee	1	EA	$500.00	$500	$500.00	$500	$1,000.00	$1,000
Primary Clarifier								
Demolition of Equipment/Piping	1	LS	$0.00	$0	$15,000.00	$15,000	$15,000.00	$15,000
Structural Rehab Primary Clarifier	1	LS	$0.00	$0	$1,080,000.00	$1,080,000	$1,080,000.00	$1,080,000
Connection to Primary Clarifier	1	LS	$20,000.00	$20,000	$10,000.00	$10,000	$30,000.00	$30,000
8" Motor Operated Gate Valve	2	EA	$22,500.00	$45,000	$30,000.00	$60,000	$52,500.00	$105,000
12" Motor Operated Gate Valve	2	EA	$30,000.00	$60,000	$40,000.00	$80,000	$70,000.00	$140,000
Valve Box	4	EA	$10,000.00	$40,000	$10,000.00	$40,000	$20,000.00	$80,000
Rapid Block Tank								
Demolition of Equipment/Piping	1	LS	$0.00	$0	$30,000.00	$30,000	$30,000.00	$30,000
Structural Rehab Rapid Block Unit	1	LS	$0.00	$0	$650,000.00	$650,000	$650,000.00	$650,000
Connection to AB Compartment	3	EA	$7,500.00	$22,500	$2,500.00	$7,500	$10,000.00	$30,000
Connection to ST Compartment	3	EA	$7,500.00	$22,500	$2,500.00	$7,500	$10,000.00	$30,000
6" Motor Operated Gate Valve	6	EA	$18,750.00	$112,500	$25,000.00	$150,000	$43,750.00	$262,500

AHUIMANU WASTEWATER PRE-TREATMENT FACILITY
IMPROVEMENTS AND EQUALIZATION FACILITY
DESIGN ALTERNATIVES REPORT (FINAL SUBMITTAL)

Option 1 - Re-Use Ex. Storage Tanks

Description	QUANTITY	UNIT	LABOR UNIT COST	LABOR TOTAL	MATERIAL UNIT COST	MATERIAL TOTAL	TOTAL UNIT COST	TOTAL COST
Valve Box	6	EA	$10,000.00	$60,000	$10,000.00	$60,000	$20,000.00	$120,000
16" Motor Operated Gate Valve	1	EA	$48,750.00	$48,750	$65,000.00	$65,000	$113,750.00	$113,750
Force Main								
Connection to Exist.	3	EA	$1,500	$4,500	$1,500	$4,500	$3,000	$9,000
12" HDPE	50	LF	$250	$12,500	$55	$2,750	$305	$15,250
14" HDPE	210	LF	$250	$52,500	$65	$13,650	$315	$66,150
12"x14" TEE	1	EA	$500	$500	$500	$500	$1,000	$1,000
12"x12" TEE	1	EA	$500	$500	$500	$500	$1,000	$1,000
12" 1/4 BEND	1	EA	$375	$375	$450	$450	$825	$825
14" 1/4 BEND	1	EA	$375	$375	$500	$500	$875	$875
Influent Pump Station								
Demolition of Equipment/Piping	1	LS	$0	$0	$30,000	$30,000	$30,000	$30,000
Larger Pump	2	EA	$15,880	$31,760	$21,173	$42,346	$37,053	$74,106
Smaller Pump	2	EA	$8,591	$17,181	$11,454	$22,908	$20,045	$40,089
Wall Penetration	3	EA	$0	$0	$10,000	$30,000	$10,000	$30,000
14" Gate Valve	1	EA	$5,513	$5,513	$7,350	$7,350	$12,863	$12,863
12" Gate Valve	2	EA	$1,913	$3,825	$2,550	$5,100	$4,463	$8,925
10" Gate Valve	2	EA	$1,500	$3,000	$2,000	$4,000	$3,500	$7,000
10" Check Valve	2	EA	$2,250	$4,500	$3,000	$6,000	$5,250	$10,500
8" Gate Valve	2	EA	$975	$1,950	$1,300	$2,600	$2,275	$4,550
6" Gate Valve	2	EA	$645	$1,290	$860	$1,720	$1,505	$3,010
6" Check Valve	2	EA	$900	$1,800	$1,200	$2,400	$2,100	$4,200
14" DI Pipe	45	LF	$200	$9,000	$250	$11,250	$450	$20,250
12" Elbow	2	EA	$713	$1,425	$950	$1,900	$1,663	$3,325
8" Elbow	6	EA	$488	$2,925	$650	$3,900	$1,138	$6,825
6" Elbow	4	EA	$375	$1,500	$500	$2,000	$875	$3,500
14" Wye	4	EA	$938	$3,750	$1,250	$5,000	$2,188	$8,750
Flow Meter	1	EA	$8,400	$8,400	$11,200	$11,200	$19,600	$19,600
IPS Wetwell Rehabilitation	1	LS	$0	$0	$100,000	$100,000	$100,000	$100,000
1 ft Spool	3	EA	$638	$1,913	$850	$2,550	$1,488	$4,463
Misc	1	LS	$18,750	$18,750	$25,000	$25,000	$43,750	$43,750
Electrical	1	LS	$0	$0	$698,710	$698,710	$698,710	$698,710
Ventilation Demolition	1	LS	$4,200	$4,200	$1,000	$1,000	$5,200	$5,200
Exhaust Fans	1	EA	$2,240	$2,240	$5,000	$5,000	$7,240	$7,240
Duct w/o insulation	800	LB	$21	$16,800	$2	$1,600	$23	$18,400
Controls	1	LS	$3,360	$3,360	$1,200	$1,200	$4,560	$4,560
Test and Balanance	1	LS	$1,680	$1,680	$0	$0	$1,680	$1,680
Control Wiring	1	LS	$2,240	$2,240	$1,500	$1,500	$3,740	$3,740
Maintenance Contract	1	LS	$3,360	$3,360	$600	$600	$3,960	$3,960
SCADA Improvements	1	LS	$244,635.00	$244,635	$213,100	$213,100	$457,735	$457,735
Testing, Commissioning, Training, Start-Ups and O&M Manuals	1	LS	$0.00	$0	$100,000	$100,000	$100,000	$100,000
Miscallaneous Demolition								
Dewatering and Old Generator Building	1	LS	$0.00	$0	$150,000	$150,000	$150,000	$150,000
Total - Direct Cost	1	LS		**$1,702,621**		**$8,941,770**		**$11,014,391**
Mobilization (not to exceed 6%)	1	LS	$0.00	$0	$660,863	$660,863	$660,863	$660,863
General Contractor's Overhead (10%)	1	LS	$170,262	$170,262	$894,177	$894,177	$1,101,439	$1,064,439
General Contractor's Profit (10%)	1	LS	$187,288	$187,288	$1,049,681	$1,049,681	$1,273,969	$1,236,969
Tax (4.7%)	1	LS	$96,828	$96,828	$542,685	$542,685	$656,903	$639,513
Bond and Insurance (1.5%)	1	LS	$32,355	$32,355	$181,338	$181,338	$219,243	$213,693
Total - General Contractor's Cost	1	LS		**$2,189,354**		**$12,270,515**		**$14,829,868**
Contengency (35%)	1	LS						$5,190,454
Total - Budgetary Cost	1	LS		**$2,189,354**		**$12,270,515**		**$20,020,322**

AHUIMANU WASTEWATER PRE-TREATMENT FACILITY
IMPROVEMENTS AND EQUALIZATION FACILITY
DESIGN ALTERNATIVES REPORT (FINAL SUBMITTAL)

Option 2 - New Storage Tanks (Digester)

DESCRIPTION	QUANTITY	UNIT	LABOR	LABOR	MATERIAL	MATERIAL	TOTAL	TOTAL
			UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	COST
BASE BID								
Sitework								
Mobilization	1	LS	$0.00	$0	$1,115,848.90	$1,115,849	$1,115,848.90	$1,115,849
Field Office	24	MO	$0.00	$0	$2,500.00	$60,000	$2,500.00	$60,000
Electrical	1	LS	$0.00	$0	$602,805.00	$602,805	$602,805.00	$602,805
Temporary Erosion Control	500	LF	$0.00	$0	$20.00	$10,000	$20.00	$10,000
Landscaping	1	LS	$0.00	$0	$199,500.00	$199,500	$199,500.00	$199,500
Demolition								
Piping	1	LS	$0.00	$0	$15,000.00	$15,000	$15,000.00	$15,000
Primary Clarifier	1	LS	$0.00	$0	$187,844.48	$187,844	$187,844.48	$187,844
Digester	1	LS	$0.00	$0	$125,747.13	$125,747	$125,747.13	$125,747
Existing EQ Basins	1	LS	$0.00	$0	$571,004.50	$571,005	$571,004.50	$571,005
New Junction Box								
Wall Penetration	4	EA	$0.00	$0	$10,000.00	$40,000	$10,000.00	$40,000
Slide Gates	3	EA	$13,500.00	$40,500	$18,000.00	$54,000	$31,500.00	$94,500
18" HDPE	100	LF	$200.00	$20,000	$100.00	$10,000	$300.00	$30,000
18" HDPE 1/8 Bend	2	EA	$750.00	$1,500	$1,000.00	$2,000	$1,750.00	$3,500
SMH	2	EA	$10,000.00	$20,000	$10,000.00	$20,000	$20,000.00	$40,000
Drop Pipe	2	EA	$0.00	$0	$5,000.00	$10,000	$5,000.00	$10,000
New Junction Box	1	LS	$47,000.00	$47,000	$68,000.00	$68,000	$115,000.00	$115,000
Bypass Rental Pump	9	MO	$9,000.00	$81,000	$12,000.00	$108,000	$21,000.00	$189,000
New Tank								
1MG Basin	1	LS	$5,100,000.00	$5,100,000	$7,300,000.00	$7,300,000	$12,400,000.00	$12,400,000
Construction Phasing	1	LS	$1,690,680.15	$1,690,680	$0.00	$0	$1,690,680.15	$1,690,680
Excavation and Embankment Onsite Mat'l	5,100	CY	$25.00	$127,500	$0.00	$0	$25.00	$127,500
Disposal of Excess Material	5,100	CY	$40.00	$204,000	$0.00	$0	$40.00	$204,000
AC Pavement	322	SF	$0.00	$0	$100.00	$32,200	$100.00	$32,200
14" HDPE	240	LF	$200.00	$48,000	$50.00	$12,000	$250.00	$60,000
14" HDPE 1/4 Bend	2	EA	$375.00	$750	$500.00	$1,000	$875.00	$1,750
14" HDPE 1/8 Bend	2	EA	$375.00	$750	$500.00	$1,000	$875.00	$1,750
18" HDPE	80	LF	$200.00	$16,000	$100.00	$8,000	$300.00	$24,000
18" HDPE 1/4 Bend	3	EA	$750.00	$2,250	$1,000.00	$3,000	$1,750.00	$5,250
SMH	4	EA	$10,000.00	$40,000	$10,000.00	$40,000	$20,000.00	$80,000
4" DI Pipe	200	LF	$0.00	$0	$15.00	$3,000	$15.00	$3,000
4" Elbow	1	EA	$0.00	$0	$600.00	$600	$600.00	$600
Washdown Hydrant	2	EA	$2,625.00	$5,250	$3,500.00	$7,000	$6,125.00	$12,250
Gate (18"x18")	3	EA	$7,500.00	$22,500	$10,000.00	$30,000	$17,500.00	$52,500
Gate (36x36")	1	EA	$13,500.00	$13,500	$18,000.00	$18,000	$31,500.00	$31,500
Influent Pump Station								
Demolition of Equipment/Piping	1	LS	$0.00	$0	$30,000.00	$30,000	$30,000.00	$30,000
Larger Pump	2	EA	$15,879.75	$31,760	$21,173	$42,346	$37,052.75	$74,106
Smaller Pump	2	EA	$8,590.50	$17,181	$11,454	$22,908	$20,044.50	$40,089
Wall Penetration	3	EA	$0.00	$0	$10,000.00	$30,000	$10,000.00	$30,000
14" Gate Valve	1	EA	$5,512.50	$5,513	$7,350.00	$7,350	$12,862.50	$12,863
12" Gate Valve	2	EA	$1,912.50	$3,825	$2,550.00	$5,100	$4,462.50	$8,925
10" Gate Valve	2	EA	$1,500.00	$3,000	$2,000.00	$4,000	$3,500.00	$7,000
10" Check Valve	2	EA	$2,250.00	$4,500	$3,000.00	$6,000	$5,250.00	$10,500
8" Gate Valve	2	EA	$975.00	$1,950	$1,300.00	$2,600	$2,275.00	$4,550
6" Gate Valve	2	EA	$645.00	$1,290	$860.00	$1,720	$1,505.00	$3,010
6" Check Valve	2	EA	$900.00	$1,800	$1,200.00	$2,400	$2,100.00	$4,200
14" DI Pipe	45	LF	$200.00	$9,000	$250.00	$11,250	$450.00	$20,250
12" Elbow	2	EA	$712.50	$1,425	$950.00	$1,900	$1,662.50	$3,325
8" Elbow	6	EA	$487.50	$2,925	$650.00	$3,900	$1,137.50	$6,825
6" Elbow	4	EA	$375.00	$1,500	$500.00	$2,000	$875.00	$3,500
14" Wye	4	EA	$937.50	$3,750	$1,250.00	$5,000	$2,187.50	$8,750
Flow Meter	1	EA	$8,400.00	$8,400	$11,200.00	$11,200	$19,600.00	$19,600
IPS Wetwell Rehabilitation	1	LS	$0.00	$0	$10,000.00	$10,000	$10,000.00	$10,000
1 ft Spool	3	EA	$637.50	$1,913	$850.00	$2,550	$1,487.50	$4,463

AHUIMANU WASTEWATER PRE-TREATMENT FACILITY
IMPROVEMENTS AND EQUALIZATION FACILITY
DESIGN ALTERNATIVES REPORT (FINAL SUBMITTAL)

Option 2 - New Storage Tanks (Digester)

DESCRIPTION	QUANTITY	UNIT	LABOR UNIT COST	LABOR TOTAL	MATERIAL UNIT COST	MATERIAL TOTAL	TOTAL UNIT COST	TOTAL COST
Misc	1	LS	$0.00	$0	$25,000.00	$25,000	$25,000.00	$25,000
Electrical	1	LS	$0.00	$0	$698,710.00	$698,710	$698,710.00	$698,710
Ventilation Demolition	1	LS	$3,750.00	$3,750.00	$1,000.00	$1,000.00	$4,750.00	$4,750.00
Exhaust Fans	1	EA	$2,000.00	$2,000.00	$5,000.00	$5,000.00	$7,000.00	$7,000.00
Duct w/o insulation	800	LB	$16.25	$13,000.00	$0.50	$400.00	$16.75	$13,400.00
Controls	1	LS	$3,000.00	$3,000.00	$1,200.00	$1,200.00	$4,200.00	$4,200.00
Test and Balanance	1	LS	$3,000.00	$3,000.00	$0.00	$0.00	$3,000.00	$3,000.00
Control Wiring	1	LS	$2,000.00	$2,000.00	$1,500.00	$1,500.00	$3,500.00	$3,500.00
Maintenance Contract	1	LS	$3,000.00	$3,000.00	$600.00	$600.00	$3,600.00	$3,600.00
Testing, Commissioning, Training, Start-Ups and O&M Manuals	1	LS	$0.00	$0	$100,000.00	$100,000	$100,000.00	$100,000
Miscallaneous Demolition								
Rapid Block Tank	1	LS	$0.00	$0	$261,485.89	$261,486	$261,485.89	$261,486
Dewatering and Old Generator Building	1	LS	$0.00	$0	$150,000.00	$150,000	$150,000.00	$150,000
Total - Direct Cost	1	LS		**$7,610,661**		**$12,102,670**		**$19,713,331**
General Contractor's Overhead (10%)	1	LS	$761,066.07	$761,066	$1,210,266.99	$1,210,267	$1,971,333.06	$1,971,333
General Contractor's Profit (10%)	1	LS	$837,172.67	$837,173	$1,331,293.69	$1,331,294	$2,168,466.36	$2,168,466
Tax (4.7%)	1	LS	$432,818.27	$432,818	$688,278.84	$688,279	$1,121,097.11	$1,121,097
Bond and Insurance (1.5%)	1	LS	$144,625.76	$144,626	$229,987.64	$229,988	$374,613.41	$374,613
Total - General Contractor's Cost	1	LS		**$9,786,343**		**$15,562,497**		**$25,348,840**
Contengency (35%)	1	LS						$8,872,094
Total - Budgetary Cost	1	LS		**$9,786,343**		**$15,562,497**		**$34,220,935**

Option 2 - New Storage Tanks (Holding Pond)

DESCRIPTION	QUANTITY	UNIT	LABOR UNIT COST	LABOR TOTAL	MATERIAL UNIT COST	MATERIAL TOTAL	TOTAL UNIT COST	TOTAL COST
BASE BID								
Sitework								
Mobilization	1	LS	$0.00	$0	$1,109,023.77	$1,109,024	$1,109,023.77	$1,109,024
Field Office	24	MO	$0.00	$0	$2,500.00	$60,000	$2,500.00	$60,000
Electrical Site Work	1	LS	$0.00	$0	$602,805.00	$602,805	$602,805.00	$602,805
Landscaping	1	LS	$0.00	$0	$199,500.00	$199,500	$199,500.00	$199,500
Temporary Erosion Control	500	LF	$0.00	$0	$20.00	$10,000	$20.00	$10,000
Demolition								
Piping	1	LS	$0.00	$0	$15,000.00	$15,000	$15,000.00	$15,000
Existing EQ Basins	1	LS	$0.00	$0	$571,004.00	$571,004	$571,004.00	$571,004
New Junction Box								
Wall Penetration	4	EA	$0.00	$0	$10,000.00	$40,000	$10,000.00	$40,000
Slide Gates	3	EA	$13,500.00	$40,500	$18,000.00	$54,000	$31,500.00	$94,500
18" HDPE	80	LF	$200.00	$16,000	$100.00	$8,000	$300.00	$24,000
18" HDPE 1/8 Bend	2	EA	$375.00	$750	$500.00	$1,000	$875.00	$1,750
SMH	2	EA	$10,000.00	$20,000	$10,000.00	$20,000	$20,000.00	$40,000
Drop Pipe	2	EA	$0.00	$0	$5,000.00	$10,000	$5,000.00	$10,000
New Junction Box	1	LS	$47,000.00	$47,000	$68,000.00	$68,000	$115,000.00	$115,000
New Tank								
1MG Basin	1	LS	$5,850,000.00	$5,850,000	$8,400,000.00	$8,400,000	$14,250,000.00	$14,250,000
Clearing and Grubbing	0.4	AC	$18,000.00	$7,200	$0.00	$0	$18,000.00	$7,200
Excavation and Embankment Onsite Mat'l	3,100	CY	$25.00	$77,500	$0.00	$0	$25.00	$77,500
Disposal of Excess Material	3,100	CY	$40.00	$124,000	$0.00	$0	$40.00	$124,000
14" HDPE	270	LF	$200.00	$54,000	$50.00	$13,500	$250.00	$67,500
14" HDPE 1/8 Bend	4	EA	$375.00	$1,500	$500.00	$2,000	$875.00	$3,500
18" HDPE	195	LF	$200.00	$39,000	$100.00	$19,500	$300.00	$58,500
18" HDPE 1/4 Bend	4	EA	$750.00	$3,000	$1,000.00	$4,000	$1,750.00	$7,000
SMH	4	EA	$10,000.00	$40,000	$10,000.00	$40,000	$20,000.00	$80,000
4" DI Pipe	150	LF	$0.00	$0	$15.00	$2,250	$15.00	$2,250
Washdown Hydrant	2	EA	$2,625.00	$5,250	$3,500.00	$7,000	$6,125.00	$12,250
Gate (18"x18")	3	EA	$7,500.00	$22,500	$10,000.00	$30,000	$17,500.00	$52,500
Gate (36x36")	1	EA	$13,500.00	$13,500	$18,000.00	$18,000	$31,500.00	$31,500
Drainage Basin								
Clearing and Grubbing	0.4	AC	$18,000.00	$7,200	$0.00	$0	$18,000.00	$7,200
Disposal of Excess Material	727	CY	$40.00	$29,080	$0.00	$0	$40.00	$29,080
Influent Pump Station								
Demolition of Equipment/Piping	1	LS	$0.00	$0	$30,000.00	$30,000	$30,000.00	$30,000
Larger Pump	2	EA	$15,879.75	$31,760	$21,173	$42,346	$37,052.75	$74,106
Smaller Pump	2	EA	$8,590.50	$17,181	$11,454	$22,908	$20,044.50	$40,089
Wall Penetration	3	EA	$0.00	$0	$10,000.00	$30,000	$10,000.00	$30,000
14" Gate Valve	1	EA	$5,512.50	$5,513	$7,350.00	$7,350	$12,862.50	$12,863
12" Gate Valve	2	EA	$1,912.50	$3,825	$2,550.00	$5,100	$4,462.50	$8,925
10" Gate Valve	2	EA	$1,500.00	$3,000	$2,000.00	$4,000	$3,500.00	$7,000
10" Check Valve	2	EA	$2,250.00	$4,500	$3,000.00	$6,000	$5,250.00	$10,500
8" Gate Valve	2	EA	$975.00	$1,950	$1,300.00	$2,600	$2,275.00	$4,550
6" Gate Valve	2	EA	$645.00	$1,290	$860.00	$1,720	$1,505.00	$3,010
6" Check Valve	2	EA	$900.00	$1,800	$1,200.00	$2,400	$2,100.00	$4,200
14" DI Pipe	45	LF	$200.00	$9,000	$250.00	$11,250	$450.00	$20,250
12" Elbow	2	EA	$712.50	$1,425	$950.00	$1,900	$1,662.50	$3,325
8" Elbow	6	EA	$487.50	$2,925	$650.00	$3,900	$1,137.50	$6,825
6" Elbow	4	EA	$375.00	$1,500	$500.00	$2,000	$875.00	$3,500
14" Wye	4	EA	$937.50	$3,750	$1,250.00	$5,000	$2,187.50	$8,750
Flow Meter	1	EA	$8,400.00	$8,400	$11,200.00	$11,200	$19,600.00	$19,600
IPS Wetwell Rehabilitation	1	LS	$0.00	$0	$10,000.00	$10,000	$10,000.00	$10,000
1 ft Spool	3	EA	$637.50	$1,913	$850.00	$2,550	$1,487.50	$4,463
Misc	1	LS	$0.00	$0	$25,000.00	$25,000	$25,000.00	$25,000
Electrical	1	LS	$0.00	$0	$698,710.00	$698,710	$698,710.00	$698,710
Ventilation Demolition	1	LS	$3,750.00	$3,750.00	$1,000.00	$1,000.00	$4,750.00	$4,750.00

Option 2 - New Storage Tanks (Holding Pond)

DESCRIPTION	QUANTITY	UNIT	LABOR UNIT COST	LABOR TOTAL	MATERIAL UNIT COST	MATERIAL TOTAL	TOTAL UNIT COST	TOTAL COST
Exhaust Fans	1	EA	$2,000.00	$2,000.00	$5,000.00	$5,000.00	$7,000.00	$7,000.00
Duct w/o insulation	800	LB	$16.25	$13,000.00	$0.50	$400.00	$16.75	$13,400.00
Controls	1	LS	$3,000.00	$3,000.00	$1,200.00	$1,200.00	$4,200.00	$4,200.00
Test and Balanance	1	LS	$3,000.00	$3,000.00	$0.00	$0.00	$3,000.00	$3,000.00
Control Wiring	1	LS	$2,000.00	$2,000.00	$1,500.00	$1,500.00	$3,500.00	$3,500.00
Maintenance Contract	1	LS	$3,000.00	$3,000.00	$600.00	$600.00	$3,600.00	$3,600.00
Testing, Commissioning, Training, Start-Ups and O&M Manuals	1	LS	$0.00	$0	$100,000.00	$100,000	$100,000.00	$100,000
Miscallaneous Demolition								
Rapid Block Tank	1	LS	$0.00	$0	$261,485.00	$261,485	$261,485.00	$261,485
Primary Clarifier	1	LS	$0.00	$0	$187,844.00	$187,844	$187,844.00	$187,844
Digester	1	LS	$0.00	$0	$125,747.00	$125,747	$125,747.00	$125,747
Dewatering and Old Generator Building	1	LS	$0.00	$0	$150,000.00	$150,000	$150,000.00	$150,000
Total - Direct Cost	1	LS		**$6,527,461**		**$13,065,293**		**$19,592,753**
General Contractor's Overhead (10%)	1	LS	$652,746.05	$652,746	$1,306,529.28	$1,306,529	$1,959,275.33	$1,959,275
General Contractor's Profit (10%)	1	LS	$718,020.66	$718,021	$1,437,182.20	$1,437,182	$2,155,202.86	$2,155,203
Tax (4.7%)	1	LS	$371,216.68	$371,217	$743,023.20	$743,023	$1,114,239.88	$1,114,240
Bond and Insurance (1.5%)	1	LS	$124,041.66	$124,042	$248,280.41	$248,280	$372,322.07	$372,322
Total - General Contractor's Cost	1	LS		**$8,393,486**		**$16,800,308**		**$25,193,793**
Contengency (35%)	1	LS						$8,817,828
Total - Budgetary Cost	1	LS		**$8,393,486**		**$16,800,308**		**$34,011,621**

Option 3A - Ex. EQ Basin & New Tanks (Digester)

DESCRIPTION	QUANTITY	UNIT	LABOR UNIT COST	LABOR TOTAL	MATERIAL UNIT COST	MATERIAL TOTAL	TOTAL UNIT COST	TOTAL COST
BASE BID								
Sitework								
Mobilization	1	LS	$0.00	$0	$1,001,607.53	$1,001,608	$1,001,607.53	$1,001,608
Field Office	24	MO	$0.00	$0	$2,500.00	$60,000	$2,500.00	$60,000
Electrical	1	LS	$0.00	$0	$602,805.00	$602,805	$602,805.00	$602,805
Landscaping	1	LS	$0.00	$0	$199,500.00	$199,500	$199,500.00	$199,500
Temporary Erosion Control	500	LF	$0.00	$0	$20.00	$10,000	$20.00	$10,000
Demolition								
Piping	1	LS	$0.00	$0	$15,000.00	$15,000	$15,000.00	$15,000
Primary Clarifier	1	LS	$0.00	$0	$187,844.48	$187,844	$187,844.48	$187,844
Digester	1	LS	$0.00	$0	$125,747.13	$125,747	$125,747.13	$125,747
Existing EQ Basin								
Basin Aluminum Covers	1	LS	$25,000.00	$25,000	$185,000.00	$185,000	$210,000.00	$210,000
Wall Penetration	4	EA	$0.00	$0	$10,000.00	$40,000	$10,000.00	$40,000
Slide Gates	5	EA	$13,500.00	$67,500	$18,000.00	$90,000	$31,500.00	$157,500
EQ Rehabilitation	1	LS	$0.00	$0	$300,000.00	$300,000	$300,000.00	$300,000
18" HDPE	80	LF	$200.00	$16,000	$100.00	$8,000	$300.00	$24,000
18" HDPE 1/4 Bend	1	EA	$750.00	$750	$1,000.00	$1,000	$1,750.00	$1,750
Drop Pipe	2	EA	$0.00	$0	$5,000.00	$10,000	$5,000.00	$10,000
Dry-Wet Weather Wall	1	LS	$51,500.00	$51,500	$73,500.00	$73,500	$125,000.00	$125,000
Bypass Rental Pump	9	MO	$9,000.00	$81,000	$12,000.00	$108,000	$21,000.00	$189,000
Aeration								
Blower	3	EA	$18,750.00	$56,250.00	$25,000.00	$75,000.00	$43,750.00	$131,250.00
8" DI Pipe	30	LF	$0.00	$0	$17.00	$510	$17.00	$510
8" Elbow	1	EA	$0.00	$0	$650.00	$650	$650.00	$650
8" Gate Valve	8	EA	$0.00	$0	$1,300.00	$10,400	$1,300.00	$10,400
8" Tee	3	EA	$0.00	$0	$671.55	$2,015	$671.55	$2,015
Wall Penetration	2	LS	$0.00	$0	$10,000.00	$20,000	$10,000.00	$20,000
New Tank								
0.84MG Basin	1	LS	$4,340,000.00	$4,340,000	$6,200,000.00	$6,200,000	$10,540,000.00	$10,540,000
Construction Phasing	1	LS	$1,517,587.17	$1,517,587	$0.00	$0	$1,517,587.17	$1,517,587
Excavation and Embankment Onsite Mat'l	5,100	CY	$25.00	$127,500	$0.00	$0	$25.00	$127,500
Disposal of Excess Material	5,100	CY	$40.00	$204,000	$0.00	$0	$40.00	$204,000
AC Pavement	322	SF	$0.00	$0	$100.00	$32,200	$100.00	$32,200
14" HDPE	240	LF	$200.00	$48,000	$50.00	$12,000	$250.00	$60,000
14" HDPE 1/4 Bend	2	EA	$375.00	$750	$500.00	$1,000	$875.00	$1,750
14" HDPE 1/8 Bend	2	EA	$375.00	$750	$500.00	$1,000	$875.00	$1,750
18" HDPE	80	LF	$200.00	$16,000	$100.00	$8,000	$300.00	$24,000
18" HDPE 1/4 Bend	3	EA	$750.00	$2,250	$1,000.00	$3,000	$1,750.00	$5,250
SMH	4	EA	$10,000.00	$40,000	$10,000.00	$40,000	$20,000.00	$80,000
Gate (18"x18")	3	EA	$7,500.00	$22,500	$10,000.00	$30,000	$17,500.00	$52,500
Gate (36x36")	1	EA	$13,500.00	$13,500	$18,000.00	$18,000	$31,500.00	$31,500
4" DI Pipe	200	LF	$0.00	$0	$15.00	$3,000	$15.00	$3,000
4" Elbow	1	EA	$0.00	$0	$600.00	$600	$600.00	$600
Washdown Hydrant	2	EA	$2,625.00	$5,250	$3,500.00	$7,000	$6,125.00	$12,250
Influent Pump Station								
Demolition of Equipment/Piping	1	LS	$0.00	$0	$30,000.00	$30,000	$30,000.00	$30,000
Larger Pump	2	EA	$15,879.75	$31,760	$21,173	$42,346	$37,052.75	$74,106
Smaller Pump	2	EA	$8,590.50	$17,181	$11,454	$22,908	$20,044.50	$40,089
Wall Penetration	3	EA	$0.00	$0	$10,000.00	$30,000	$10,000.00	$30,000
14" Gate Valve	1	EA	$5,512.50	$5,513	$7,350.00	$7,350	$12,862.50	$12,863
12" Gate Valve	2	EA	$1,912.50	$3,825	$2,550.00	$5,100	$4,462.50	$8,925
10" Gate Valve	2	EA	$1,500.00	$3,000	$2,000.00	$4,000	$3,500.00	$7,000
10" Check Valve	2	EA	$2,250.00	$4,500	$3,000.00	$6,000	$5,250.00	$10,500
8" Gate Valve	2	EA	$975.00	$1,950	$1,300.00	$2,600	$2,275.00	$4,550
6" Gate Valve	2	EA	$645.00	$1,290	$860.00	$1,720	$1,505.00	$3,010
6" Check Valve	2	EA	$900.00	$1,800	$1,200.00	$2,400	$2,100.00	$4,200
14" DI Pipe	45	LF	$200.00	$9,000	$250.00	$11,250	$450.00	$20,250
12" Elbow	2	EA	$712.50	$1,425	$950.00	$1,900	$1,662.50	$3,325
8" Elbow	6	EA	$487.50	$2,925	$650.00	$3,900	$1,137.50	$6,825
6" Elbow	4	EA	$375.00	$1,500	$500.00	$2,000	$875.00	$3,500

AHUIMANU WASTEWATER PRE-TREATMENT FACILITY
IMPROVEMENTS AND EQUALIZATION FACILITY
DESIGN ALTERNATIVES REPORT (FINAL SUBMITTAL)

Option 3A - Ex. EQ Basin & New Tanks (Digester)

DESCRIPTION	QUANTITY	UNIT	LABOR UNIT COST	LABOR TOTAL	MATERIAL UNIT COST	MATERIAL TOTAL	TOTAL UNIT COST	TOTAL COST
14" Wye	4	EA	$937.50	$3,750	$1,250.00	$5,000	$2,187.50	$8,750
Flow Meter	1	EA	$8,400.00	$8,400	$11,200.00	$11,200	$19,600.00	$19,600
IPS Wetwell Rehabilitation	1	LS	$0.00	$0	$10,000.00	$10,000	$10,000.00	$10,000
1 ft Spool	3	EA	$637.50	$1,913	$850.00	$2,550	$1,487.50	$4,463
Misc	1	LS	$0.00	$0	$25,000.00	$25,000	$25,000.00	$25,000
Electrical	1	LS	$0.00	$0	$698,710.00	$698,710	$698,710.00	$698,710
Ventilation Demolition	1	LS	$3,750.00	$3,750.00	$1,000.00	$1,000.00	$4,750.00	$4,750.00
Exhaust Fans	1	EA	$2,000.00	$2,000.00	$5,000.00	$5,000.00	$7,000.00	$7,000.00
Duct w/o insulation	800	LB	$16.25	$13,000.00	$0.50	$400.00	$16.75	$13,400.00
Controls	1	LS	$3,000.00	$3,000.00	$1,200.00	$1,200.00	$4,200.00	$4,200.00
Test and Balanance	1	LS	$3,000.00	$3,000.00	$0.00	$0.00	$3,000.00	$3,000.00
Control Wiring	1	LS	$2,000.00	$2,000.00	$1,500.00	$1,500.00	$3,500.00	$3,500.00
Maintenance Contract	1	LS	$3,000.00	$3,000.00	$600.00	$600.00	$3,600.00	$3,600.00
Testing, Commissioning, Training, Start-Ups and O&M Manuals	1	LS	$0.00	$0	$100,000.00	$100,000	$100,000.00	$100,000
Miscallaneous Demolition								
Rapid Block Tank	1	LS	$0.00	$0	$261,485.89	$261,486	$261,485.89	$261,486
Dewatering and Old Generator Building	1	LS	$0.00	$0	$150,000.00	$150,000	$150,000.00	$150,000
Total - Direct Cost	1	LS		**$6,765,568**		**$10,929,499**		**$17,695,066**
General Contractor's Overhead (10%)	1	LS	$676,556.77	$676,557	$1,092,949.87	$1,092,950	$1,769,506.63	$1,769,507
General Contractor's Profit (10%)	1	LS	$744,212.44	$744,212	$1,202,244.86	$1,202,245	$1,946,457.30	$1,946,457
Tax (4.7%)	1	LS	$384,757.83	$384,758	$621,560.59	$621,561	$1,006,318.42	$1,006,318
Bond and Insurance (1.5%)	1	LS	$128,566.42	$128,566	$207,693.81	$207,694	$336,260.23	$336,260
Total - General Contractor's Cost	1	LS		**$8,699,661**		**$14,053,948**		**$22,753,609**
Contingency (35%)	1	LS						$7,963,763
Total - Budgetary Cost	1	LS		**$8,699,661**		**$14,053,948**		**$30,717,372**

AHUIMANU WASTEWATER PRE-TREATMENT FACILITY
IMPROVEMENTS AND EQUALIZATION FACILITY
DESIGN ALTERNATIVES REPORT (FINAL SUBMITTAL)

Option 3A - Ex. EQ Basin & New Tanks (Holding Pond)

DESCRIPTION	QUANTITY	UNIT	LABOR UNIT COST	LABOR TOTAL	MATERIAL UNIT COST	MATERIAL TOTAL	TOTAL UNIT COST	TOTAL COST
BASE BID								
Sitework								
Mobilization	1	LS	$0.00	$0	$990,183.10	$990,183	$990,183.10	$990,183
Field Office	24	MO	$0.00	$0	$2,500.00	$60,000	$2,500.00	$60,000
Electrical	1	LS	$0.00	$0	$602,805.00	$602,805	$602,805.00	$602,805
Landscaping	1	LS	$0.00	$0	$199,500.00	$199,500	$199,500.00	$199,500
Temporary Erosion Control	500	LF	$0.00	$0	$20.00	$10,000	$20.00	$10,000
Demolition								
Piping	1	LS	$0.00	$0	$15,000.00	$15,000	$15,000.00	$15,000
Existing EQ Basin								
Basin Aluminum Covers	1	LS	$25,000.00	$25,000	$185,000.00	$185,000	$210,000.00	$210,000
Wall Penetration	4	EA	$0.00	$0	$10,000.00	$40,000	$10,000.00	$40,000
Slide Gates	5	EA	$13,500.00	$67,500	$18,000.00	$90,000	$31,500.00	$157,500
EQ Rehabilitation	1	LS	$0.00	$0	$300,000.00	$300,000	$300,000.00	$300,000
18" HDPE	80	LF	$200.00	$16,000	$100.00	$8,000	$300.00	$24,000
18" HDPE 1/4 Bend	1	EA	$750.00	$750	$1,000.00	$1,000	$1,750.00	$1,750
SMH	1	EA	$10,000.00	$10,000	$10,000.00	$10,000	$20,000.00	$20,000
Drop Pipe	2	EA	$0.00	$0	$5,000.00	$10,000	$5,000.00	$10,000
Dry-Wet Weather Wall	1	LS	$51,500.00	$51,500	$73,500.00	$73,500	$125,000.00	$125,000
Aeration								
Blower	3	EA	$18,750.00	$56,250.00	$25,000.00	$75,000.00	$43,750.00	$131,250.00
8" DI Pipe	30	LF	$0.00	$0	$17.00	$510	$17.00	$510
8" Elbow	1	EA	$0.00	$0	$650.00	$650	$650.00	$650
8" Gate Valve	8	EA	$0.00	$0	$1,300.00	$10,400	$1,300.00	$10,400
8" Tee	3	EA	$0.00	$0	$671.55	$2,015	$671.55	$2,015
Wall Penetration	2	LS	$0.00	$0	$10,000.00	$20,000	$10,000.00	$20,000
New Tank								
0.84MG Basin	1	LS	$4,987,500.00	$4,987,500	$7,125,000.00	$7,125,000	$12,112,500.00	$12,112,500
Clearing and Grubbing	0.4	AC	$18,000.00	$7,200	$0.00	$0	$18,000.00	$7,200
Excavation and Embankment Onsite Mat'l	3,900	CY	$25.00	$97,500	$0.00	$0	$25.00	$97,500
Disposal of Excess Material	3,100	CY	$40.00	$124,000	$0.00	$0	$40.00	$124,000
14" HDPE	180	LF	$200.00	$36,000	$50.00	$9,000	$250.00	$45,000
14" HDPE 1/8 Bend	4	EA	$375.00	$1,500	$500.00	$2,000	$875.00	$3,500
18" HDPE	270	LF	$200.00	$54,000	$100.00	$27,000	$300.00	$81,000
18" HDPE 1/4 Bend	4	EA	$750.00	$3,000	$1,000.00	$4,000	$1,750.00	$7,000
SMH	3	EA	$10,000.00	$30,000	$10,000.00	$30,000	$20,000.00	$60,000
4" DI Pipe	150	LF	$0.00	$0	$15.00	$2,250	$15.00	$2,250
Washdown Hydrant	2	EA	$2,625.00	$5,250	$3,500.00	$7,000	$6,125.00	$12,250
Gate (18"x18")	3	EA	$7,500.00	$22,500	$10,000.00	$30,000	$17,500.00	$52,500
Gate (36x36")	1	EA	$13,500.00	$13,500	$18,000.00	$18,000	$31,500.00	$31,500
Drainage Basin								
Clearing and Grubbing	0.4	AC	$18,000.00	$7,200	$0.00	$0	$18,000.00	$7,200
Disposal of Excess Material	727	CY	$40.00	$29,080	$0.00	$0	$40.00	$29,080
Influent Pump Station								
Demolition of Equipment/Piping	1	LS	$0.00	$0	$30,000.00	$30,000	$30,000.00	$30,000
Larger Pump	2	EA	$15,879.75	$31,760	$21,173	$42,346	$37,052.75	$74,106
Smaller Pump	2	EA	$8,590.50	$17,181	$11,454	$22,908	$20,044.50	$40,089
Wall Penetration	3	EA	$0.00	$0	$10,000.00	$30,000	$10,000.00	$30,000
14" Gate Valve	1	EA	$5,512.50	$5,513	$7,350.00	$7,350	$12,862.50	$12,863
12" Gate Valve	2	EA	$1,912.50	$3,825	$2,550.00	$5,100	$4,462.50	$8,925
10" Gate Valve	2	EA	$1,500.00	$3,000	$2,000.00	$4,000	$3,500.00	$7,000
10" Check Valve	2	EA	$2,250.00	$4,500	$3,000.00	$6,000	$5,250.00	$10,500
8" Gate Valve	2	EA	$975.00	$1,950	$1,300.00	$2,600	$2,275.00	$4,550
6" Gate Valve	2	EA	$645.00	$1,290	$860.00	$1,720	$1,505.00	$3,010
6" Check Valve	2	EA	$900.00	$1,800	$1,200.00	$2,400	$2,100.00	$4,200
14" DI Pipe	45	LF	$200.00	$9,000	$250.00	$11,250	$450.00	$20,250
12" Elbow	2	EA	$712.50	$1,425	$950.00	$1,900	$1,662.50	$3,325
8" Elbow	6	EA	$487.50	$2,925	$650.00	$3,900	$1,137.50	$6,825
6" Elbow	4	EA	$375.00	$1,500	$500.00	$2,000	$875.00	$3,500
14" Wye	4	EA	$937.50	$3,750	$1,250.00	$5,000	$2,187.50	$8,750

AHUIMANU WASTEWATER PRE-TREATMENT FACILITY
IMPROVEMENTS AND EQUALIZATION FACILITY
DESIGN ALTERNATIVES REPORT (FINAL SUBMITTAL)

Option 3A - Ex. EQ Basin & New Tanks (Holding Pond)

DESCRIPTION	QUANTITY	UNIT	LABOR UNIT COST	LABOR TOTAL	MATERIAL UNIT COST	MATERIAL TOTAL	TOTAL UNIT COST	TOTAL COST
Flow Meter	1	EA	$8,400.00	$8,400	$11,200.00	$11,200	$19,600.00	$19,600
IPS Wetwell Rehabilitation	1	LS	$0.00	$0	$10,000.00	$10,000	$10,000.00	$10,000
1 ft Spool	3	EA	$637.50	$1,913	$850.00	$2,550	$1,487.50	$4,463
Misc	1	LS	$0.00	$0	$25,000.00	$25,000	$25,000.00	$25,000
Electrical	1	LS	$0.00	$0	$698,710.00	$698,710	$698,710.00	$698,710
Ventilation Demolition	1	LS	$3,750.00	$3,750.00	$1,000.00	$1,000.00	$4,750.00	$4,750.00
Exhaust Fans	1	EA	$2,000.00	$2,000.00	$5,000.00	$5,000.00	$7,000.00	$7,000.00
Duct w/o insulation	800	LB	$16.25	$13,000.00	$0.50	$400.00	$16.75	$13,400.00
Controls	1	LS	$3,000.00	$3,000.00	$1,200.00	$1,200.00	$4,200.00	$4,200.00
Test and Balanance	1	LS	$3,000.00	$3,000.00	$0.00	$0.00	$3,000.00	$3,000.00
Control Wiring	1	LS	$2,000.00	$2,000.00	$1,500.00	$1,500.00	$3,500.00	$3,500.00
Maintenance Contract	1	LS	$3,000.00	$3,000.00	$600.00	$600.00	$3,600.00	$3,600.00
Testing, Commissioning, Training, Start-Ups and O&M Manuals	1	LS	$0.00	$0	$100,000.00	$100,000	$100,000.00	$100,000
Miscallaneous Demolition								
Primary Clarifier	1	LS	$0.00	$0	$187,844.48	$187,844	$187,844.48	$187,844
Digester	1	LS	$0.00	$0	$125,747.13	$125,747	$125,747.13	$125,747
Rapid Block Tank	1	LS	$0.00	$0	$261,485.89	$261,486	$261,485.89	$261,486
Dewatering and Old Generator Building	1	LS	$0.00	$0	$150,000.00	$150,000	$150,000.00	$150,000
Total - Direct Cost	1	LS		**$5,774,711**		**$11,718,524**		**$17,493,235**
General Contractor's Overhead (10%)	1	LS	$577,471.05	$577,471	$1,171,852.43	$1,171,852	$1,749,323.48	$1,749,323
General Contractor's Profit (10%)	1	LS	$635,218.16	$635,218	$1,289,037.67	$1,289,038	$1,924,255.82	$1,924,256
Tax (4.7%)	1	LS	$328,407.79	$328,408	$666,432.47	$666,432	$994,840.26	$994,840
Bond and Insurance (1.5%)	1	LS	$109,737.11	$109,737	$222,687.70	$222,688	$332,424.81	$332,425
Total - General Contractor's Cost	1	LS		**$7,425,545**		**$15,068,535**		**$22,494,079**
Contengency (35%)	1	LS						$7,872,928
Total - Budgetary Cost	1	LS		**$7,425,545**		**$15,068,535**		**$30,367,007**

AHUIMANU WASTEWATER PRE-TREATMENT FACILITY
IMPROVEMENTS AND EQUALIZATION FACILITY
DESIGN ALTERNATIVES REPORT (FINAL SUBMITTAL)

Option 3B - Ex. EQ Basin & New Tanks (Digester)

DESCRIPTION	QUANTITY	UNIT	LABOR	LABOR	MATERIAL	MATERIAL	TOTAL	TOTAL
			UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	COST
BASE BID								
Sitework								
Mobilization	1	LS	$0.00	$0	$1,150,673.95	$1,150,674	$1,150,673.95	$1,150,674
Field Office	24	MO	$0.00	$0	$2,500.00	$60,000	$2,500.00	$60,000
Electrical Site Work	1	LS	$0.00	$0	$602,805.00	$602,805	$602,805.00	$602,805
Landscaping	1	LS	$0.00	$0	$199,500.00	$199,500	$199,500.00	$199,500
Temporary Erosion Control	500	LF	$0.00	$0	$20.00	$10,000	$20.00	$10,000
Demolition								
Piping	1	LS	$0.00	$0	$15,000.00	$15,000	$15,000.00	$15,000
Primary Clarifier	1	LS	$0.00	$0	$187,844.48	$187,844	$187,844.48	$187,844
Digester	1	LS	$0.00	$0	$125,747.13	$125,747	$125,747.13	$125,747
Existing EQ Basin								
Basin Aluminum Covers	1	LS	$25,000.00	$25,000	$185,000.00	$185,000	$210,000.00	$210,000
Wall Penetration	5	EA	$0.00	$0	$10,000.00	$50,000	$10,000.00	$50,000
Slide Gates	5	EA	$13,500.00	$67,500	$18,000.00	$90,000	$31,500.00	$157,500
EQ Rehabilitation	1	LS	$0.00	$0	$300,000.00	$300,000	$300,000.00	$300,000
18" HDPE	75	LF	$200.00	$15,000	$100.00	$7,500	$300.00	$22,500
18" HDPE 1/4 Bend	1	EA	$750.00	$750	$1,000.00	$1,000	$1,750.00	$1,750
Drop Pipe	1	EA	$0.00	$0	$5,000.00	$5,000	$5,000.00	$5,000
Dry-Wet Weather Wall	1	LS	$51,500.00	$51,500	$73,500.00	$73,500	$125,000.00	$125,000
Bypass Rental Pump	9	MO	$9,000.00	$81,000	$12,000.00	$108,000	$21,000.00	$189,000
Aeration								
Blower	3	EA	$18,750.00	$56,250.00	$25,000.00	$75,000.00	$43,750.00	$131,250.00
8" DI Pipe	30	LF	$0.00	$0	$17.00	$510	$17.00	$510
8" Elbow	1	EA	$0.00	$0	$650.00	$650	$650.00	$650
8" Gate Valve	8	EA	$0.00	$0	$1,300.00	$10,400	$1,300.00	$10,400
8" Tee	3	EA	$0.00	$0	$671.55	$2,015	$671.55	$2,015
Wall Penetration	2	LS	$0.00	$0	$10,000.00	$20,000	$10,000.00	$20,000
New Tank								
0.84MG Basin	1	LS	$5,500,000.00	$5,500,000	$7,800,000.00	$7,800,000	$13,300,000.00	$13,300,000
Construction Phasing	1	LS	$1,743,445.38	$1,743,445	$0.00	$0	$1,743,445.38	$1,743,445
Excavation and Embankment Onsite Mat'	9,100	CY	$25.00	$227,500	$0.00	$0	$25.00	$227,500
Disposal of Excess Material	9,100	CY	$40.00	$364,000	$0.00	$0	$40.00	$364,000
AC Pavement	322	SF	$0.00	$0	$100.00	$32,200	$100.00	$32,200
Railing	389	LF	$41.00	$15,949	$218.00	$84,802	$259.00	$100,751
16" HDPE	400	LF	$200.00	$80,000	$100.00	$40,000	$300.00	$120,000
16" HDPE 1/4 Bend	8	EA	$750.00	$6,000	$1,000.00	$8,000	$1,750.00	$14,000
SMH	6	EA	$10,000.00	$60,000	$10,000.00	$60,000	$20,000.00	$120,000
4" DI Pipe	200	LF	$0.00	$0	$15.00	$3,000	$15.00	$3,000
4" Elbow	1	EA	$0.00	$0	$600.00	$600	$600.00	$600
Washdown Hydrant	2	EA	$2,625.00	$5,250	$3,500.00	$7,000	$6,125.00	$12,250
Gate (18"x18")	2	EA	$7,500.00	$15,000	$10,000.00	$20,000	$17,500.00	$35,000
Testing, Commissioning, Training, Start-Ups and O&M Manuals	1	LS	$0.00	$0	$100,000.00	$100,000	$100,000.00	$100,000
Miscallaneous Demolition								
Rapid Block Tank	1	LS	$0.00	$0	$261,485.89	$261,486	$261,485.89	$261,486
Dewatering and Old Generator Building	1	LS	$0.00	$0	$150,000.00	$150,000	$150,000.00	$150,000
Influent Pump Station	1	LS	$0.00	$0	$167,195.60	$167,196	$167,195.60	$167,196
Total - Direct Cost	1	LS		**$8,314,144**		**$12,014,429**		**$20,328,573**
General Contractor's Overhead (10%)	1	LS	$831,414.44	$831,414	$1,201,442.87	$1,201,443	$2,032,857.31	$2,032,857
General Contractor's Profit (10%)	1	LS	$914,555.88	$914,556	$1,321,587.16	$1,321,587	$2,236,143.04	$2,236,143
Tax (4.7%)	1	LS	$472,825.39	$472,825	$683,260.56	$683,261	$1,156,085.95	$1,156,086
Bond and Insurance (1.5%)	1	LS	$157,994.10	$157,994	$228,310.79	$228,311	$386,304.89	$386,305
Total - General Contractor's Cost	1	LS		**$10,690,934**		**$15,449,030**		**$26,139,964**
Contengency (35%)	1	LS						$9,148,987
Total - Budgetary Cost	1	LS		**$10,690,934**		**$15,449,030**		**$35,288,952**

AHUIMANU WASTEWATER PRE-TREATMENT FACILITY
IMPROVEMENTS AND EQUALIZATION FACILITY
DESIGN ALTERNATIVES REPORT (FINAL SUBMITTAL)

Option 3B - Ex. EQ Basin & New Tanks (Holding Pond)

DESCRIPTION	QUANTITY	UNIT	LABOR	LABOR	MATERIAL	MATERIAL	TOTAL	TOTAL
			UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	COST
BASE BID								
Sitework								
Mobilization	1	LS	$0.00	$0	$1,141,403.03	$1,141,403	$1,141,403.03	$1,141,403
Field Office	24	MO	$0.00	$0	$2,500.00	$60,000	$2,500.00	$60,000
Electrical Site Work	1	LS	$0.00	$0	$602,805.00	$602,805	$602,805.00	$602,805
Landscaping	1	LS	$0.00	$0	$199,500.00	$199,500	$199,500.00	$199,500
Temporary Erosion Control	500	LF	$0.00	$0	$20.00	$10,000	$20.00	$10,000
Demolition								
Piping	1	LS	$0.00	$0	$15,000.00	$15,000	$15,000.00	$15,000
Existing EQ Basin								
Basin Aluminum Covers	1	LS	$25,000.00	$25,000	$185,000.00	$185,000	$210,000.00	$210,000
Wall Penetration	5	EA	$0.00	$0	$10,000.00	$50,000	$10,000.00	$50,000
Slide Gates	5	EA	$13,500.00	$67,500	$18,000.00	$90,000	$31,500.00	$157,500
EQ Rehabilitation	1	LS	$0.00	$0	$300,000.00	$300,000	$300,000.00	$300,000
18" HDPE	80	LF	$200.00	$16,000	$100.00	$8,000	$300.00	$24,000
18" HDPE 1/4 Bend	1	EA	$750.00	$750	$1,000.00	$1,000	$1,750.00	$1,750
Drop Pipe	1	EA	$0.00	$0	$5,000.00	$5,000	$5,000.00	$5,000
Dry-Wet Weather Wall	1	LS	$51,500.00	$51,500	$73,500.00	$73,500	$125,000.00	$125,000
Aeration								
Blower	3	EA	$18,750.00	$56,250.00	$25,000.00	$75,000.00	$43,750.00	$131,250.00
8" DI Pipe	30	LF	$0.00	$0	$17.00	$510	$17.00	$510
8" Elbow	1	EA	$0.00	$0	$650.00	$650	$650.00	$650
8" Gate Valve	8	EA	$0.00	$0	$1,300.00	$10,400	$1,300.00	$10,400
8" Tee	3	EA	$0.00	$0	$671.55	$2,015	$671.55	$2,015
Wall Penetration	2	LS	$0.00	$0	$10,000.00	$20,000	$10,000.00	$20,000
New Tank								
0.84MG Basin	1	LS	$6,400,000.00	$6,400,000	$9,000,000.00	$9,000,000	$15,400,000.00	$15,400,000
Clearing and Grubbing	0.4	AC	$18,000.00	$7,200	$0.00	$0	$18,000.00	$7,200
Excavation and Embankment Onsite Mat'l	5,800	CY	$25.00	$145,000	$0.00	$0	$25.00	$145,000
Disposal of Excess Material	5,800	CY	$40.00	$232,000	$0.00	$0	$40.00	$232,000
Railing	389	LF	$41.00	$15,949	$218.00	$84,802	$259.00	$100,751
18" HDPE	160	LF	$200.00	$32,000	$100.00	$16,000	$300.00	$48,000
18" HDPE 1/8 Bend	4	EA	$750.00	$3,000	$1,000.00	$4,000	$1,750.00	$7,000
SMH	4	EA	$10,000.00	$40,000	$10,000.00	$40,000	$20,000.00	$80,000
4" DI Pipe	150	LF	$0.00	$0	$15.00	$2,250	$15.00	$2,250
Washdown Hydrant	2	EA	$2,625.00	$5,250	$3,500.00	$7,000	$6,125.00	$12,250
Gate (18"x18")	2	EA	$7,500.00	$15,000	$10,000.00	$20,000	$17,500.00	$35,000
Drainage Basin								
Clearing and Grubbing	0.4	AC	$18,000.00	$7,200	$0.00	$0	$18,000.00	$7,200
Disposal of Excess Material	727	CY	$40.00	$29,080	$0.00	$0	$40.00	$29,080
Testing, Commissioning, Training, Start-Ups and O&M Manuals	1	LS	$0.00	$0	$100,000.00	$100,000	$100,000.00	$100,000
Miscallaneous Demolition								
Primary Clarifier	1	LS	$0.00	$0	$187,844.48	$187,844	$187,844.48	$187,844
Digester	1	LS	$0.00	$0	$125,747.13	$125,747	$125,747.13	$125,747
Rapid Block Tank	1	LS	$0.00	$0	$261,485.89	$261,486	$261,485.89	$261,486
Dewatering and Old Generator Building	1	LS	$0.00	$0	$150,000.00	$150,000	$150,000.00	$150,000
Influent Pump Station	1	LS	$0.00	$0	$167,195.60	$167,196	$167,195.60	$167,196
Total - Direct Cost	1	LS		**$7,148,679**		**$12,123,835**		**$19,272,514**
General Contractor's Overhead (10%)	1	LS	$714,867.90	$714,868	$1,212,383.47	$1,212,383	$1,927,251.37	$1,927,251
General Contractor's Profit (10%)	1	LS	$786,354.69	$786,355	$1,333,621.81	$1,333,622	$2,119,976.50	$2,119,977
Tax (4.7%)	1	LS	$406,545.37	$406,545	$689,482.48	$689,482	$1,096,027.85	$1,096,028
Bond and Insurance (1.5%)	1	LS	$135,846.70	$135,847	$230,389.84	$230,390	$366,236.54	$366,237
Total - General Contractor's Cost	1	LS		**$9,192,294**		**$15,589,712**		**$24,782,006**
Contengency (35%)	1	LS						$8,673,702
Total - Budgetary Cost	1	LS		**$9,192,294**		**$15,589,712**		**$33,455,708**

Effluent Pump Station Improvements

DESCRIPTION	QUANTITY	UNIT	LABOR	LABOR	MATERIAL	MATERIAL	TOTAL	TOTAL
			UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	COST
BASE BID								
7								
Main Pump w/ AFD	1	EA	$202,500	$202,500	$270,000	$270,000	$472,500	$472,500
Jockey Pump	1	EA	$26,500	$26,500	$53,000	$53,000	$79,500	$79,500
EPS Wetwell Rehabilitation	1	LS	$0	$0	$50,000	$50,000	$50,000	$50,000
Misc Piping and Instrumentation	1	LS	$225,000	$225,000	$300,000	$300,000	$525,000	$525,000
Electrical	1	LS	$0	$0	$2,428,330	$2,428,330	$2,428,330	$2,428,330
Ventilation Demolition	1	LS	$8,400	$8,400	$2,000	$2,000	$10,400	$10,400
Exhaust Fans	1	EA	$4,200	$4,200	$8,000	$8,000	$12,200	$12,200
Duct w/o insulation	2,200	LB	$21	$46,200	$2	$3,300	$23	$49,500
Air Handling Unit	2	EA	$11,200	$22,400	$15,000	$30,000	$26,200	$52,400
Controls	1	LS	$8,400	$8,400	$2,200	$2,200	$10,600	$10,600
Test and Balanance	1	LS	$5,600	$5,600	$0	$0	$5,600	$5,600
Control Wiring	1	LS	$4,480	$4,480	$4,000	$4,000	$8,480	$8,480
Hoisting	1	LS	$2,240	$2,240	$6,000	$6,000	$8,240	$8,240
Maintenance Contract	1	LS	$10,640	$10,640	$1,800	$1,800	$12,440	$12,440
Odor Control System	1	LS	$435,000	$435,000	$580,000	$580,000	$1,015,000	$1,015,000
Total - Direct Cost	1	LS		**$1,001,560**		**$3,738,630**		**$4,740,190**
Mobilization	1	LS	$0	$0	$284,411	$284,411	$284,411	$284,411
General Contractor's Overhead (10%)	1	LS	$100,156.00	$100,156	$373,863.00	$373,863	$474,019.00	$474,019
General Contractor's Profit (10%)	1	LS	$110,171.60	$110,172	$439,690.44	$439,690	$549,862.04	$549,862
Tax (4.7%)	1	LS	$56,958.72	$56,959	$227,319.96	$227,320	$284,278.67	$284,279
Bond and Insurance (1.5%)	1	LS	$19,032.69	$19,033	$75,958.72	$75,959	$94,991.42	$94,991
Total - General Contractor's Cost	1	LS		**$1,287,879**		**$5,139,874**		**$6,427,753**
Contengency (35%)	1	LS						$2,249,713
Total - Budgetary Cost	1	LS		**$1,287,879**		**$5,139,874**		**$8,677,466**

AHUIMANU WASTEWATER PRE-TREATMENT FACILITY
IMPROVEMENTS AND EQUALIZATION FACILITY
DESIGN ALTERNATIVES REPORT (FINAL SUBMITTAL)

Generator and Blower Room Improvements (Option 1)

DESCRIPTION	QUANTITY	UNIT	LABOR	LABOR	MATERIAL	MATERIAL	TOTAL	TOTAL
			UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	COST
BASE BID								
Generator and Blower Building								
Wall Demolition	1	LS	$0	$0	$9,000	$9,000	$9,000	$9,000
New Wall	1	LS	$10,300	$10,300	$14,700	$14,700	$25,000	$25,000
Ventilation Demolition	1	LS	$14,000	$14,000	$3,000	$3,000	$17,000	$17,000
Exhaust Fans	1	EA	$4,200	$4,200	$8,000	$8,000	$12,200	$12,200
Duct w/ insulation	2000	LB	$21	$42,000	$2	$4,000	$23	$46,000
Duct silencers	1	EA	$70,000	$70,000	$35,000	$35,000	$105,000	$105,000
Engine silencers/piping	1	LS	$28,000	$28,000	$20,000	$20,000	$48,000	$48,000
Controls	1	LS	$11,200	$11,200	$3,000	$3,000	$14,200	$14,200
Test and Balanance	1	LS	$2,800	$2,800	$0	$0	$2,800	$2,800
Control Wiring	1	LS	$5,600	$5,600	$5,000	$5,000	$10,600	$10,600
Hoisting	1	LS	$4,200	$4,200	$10,000	$10,000	$14,200	$14,200
Maintenance Contract	1	LS	$7,000	$7,000	$2,400	$2,400	$9,400	$9,400
Electrical	1	LS	$0	$0	$2,389,000	$2,389,000	$2,389,000	$2,389,000
Generator Building - Fuel Tank								
Demolition (tank removal only)	1	LS	$22,400.00	$22,400.00	$15,000.00	$15,000.00	$37,400.00	$37,400.00
12000 gal aboveground fuel tank	1	EA	$28,000.00	$28,000.00	$75,000.00	$75,000.00	$103,000.00	$103,000.00
500 gal aboveground day tank	1	EA	$16,800.00	$16,800.00	$20,000.00	$20,000.00	$36,800.00	$36,800.00
Piping	200	LF	$70.00	$14,000.00	$30.00	$6,000.00	$100.00	$20,000.00
Hoisting	1	LS	$5,600.00	$5,600.00	$35,000.00	$35,000.00	$40,600.00	$40,600.00
Total - Direct Cost	1	LS		**$286,100**		**$2,654,100**		**$2,940,200**
Mobilization	1	LS	$0	$0	$176,412	$176,412	$176,412	$176,412
General Contractor's Overhead (10%)	1	LS	$28,610.00	$28,610	$265,410.00	$265,410	$294,020.00	$294,020
General Contractor's Profit (10%)	1	LS	$31,471.00	$31,471	$309,592.20	$309,592	$341,063.20	$341,063
Tax (4.7%)	1	LS	$16,270.51	$16,271	$160,059.17	$160,059	$176,329.67	$176,330
Bond and Insurance (1.5%)	1	LS	$5,436.77	$5,437	$53,483.60	$53,484	$58,920.37	$58,920
Total - General Contractor's Cost	1	LS		**$367,888**		**$3,619,057**		**$3,986,945**
Contengency (35%)	1	LS						$1,395,431
Total - Budgetary Cost	1	LS		**$367,888**		**$3,619,057**		**$5,382,376**

AHUIMANU WASTEWATER PRE-TREATMENT FACILITY
IMPROVEMENTS AND EQUALIZATION FACILITY
DESIGN ALTERNATIVES REPORT (FINAL SUBMITTAL)

Headworks Improvements

DESCRIPTION	QUANTITY	UNIT	LABOR UNIT COST	LABOR TOTAL	MATERIAL UNIT COST	MATERIAL TOTAL	TOTAL UNIT COST	TOTAL COST
BASE BID								
Headworks								
Structural Rehabilitation	1	LS	$800,000.00	$800,000	$1,600,000.00	$1,600,000	$2,400,000.00	$2,400,000
6mm Mechanical Screen	1	LS	$386,250.00	$386,250	$515,000.00	$515,000	$901,250.00	$901,250
Grit Removal System	1	EA	$359,250.00	$359,250	$479,000.00	$479,000	$838,250.00	$838,250
Slide Gates	2	EA	$8,400.00	$16,800	$12,000.00	$24,000	$20,400.00	$40,800
Wall Penetration	5	LS	$0.00	$0	$10,000.00	$50,000	$10,000.00	$50,000
24" HDPE (Bypass)	60	LF	$200.00	$12,000	$150.00	$9,000	$350.00	$21,000
SMH (Bypass)	1	EA	$10,000.00	$10,000	$10,000.00	$10,000	$20,000.00	$20,000
Total - Direct Cost	1	LS		**$1,584,300**		**$2,687,000**		**$4,271,300**
Mobilization	1	LS	$0	$0	$256,278	$256,278	$256,278	$256,278
General Contractor's Overhead (10%)	1	LS	$158,430	$158,430	$268,700	$268,700	$427,130	$427,130
General Contractor's Profit (10%)	1	LS	$174,273	$174,273	$321,198	$321,198	$495,471	$495,471
Tax (4.7%)	1	LS	$90,099	$90,099	$166,059	$166,059	$256,158	$256,158
Bond and Insurance (1.5%)	1	LS	$30,107	$30,107	$55,489	$55,489	$85,595	$85,595
Total - General Contractor's Cost	1	LS		**$2,037,209**		**$3,754,724**		**$5,791,932**
Contengency (35%)	1	LS						$2,027,176
Total - Budgetary Cost	1	LS		**$2,037,209**		**$3,754,724**		**$7,819,109**

AHUIMANU WASTEWATER PRE-TREATMENT FACILITY
IMPROVEMENTS AND EQUALIZATION FACILITY
DESIGN ALTERNATIVES REPORT (FINAL SUBMITTAL)

Offsite Septage Receiving Facility

DESCRIPTION	QUANTITY	UNIT	LABOR	LABOR	MATERIAL	MATERIAL	TOTAL	TOTAL
			UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	COST
BASE BID								
Off-Site Driveway								
Mobilization	1	LS	$0.00	$0	$38,494.11	$38,494	$38,494.11	$38,494
Clearing and Grubbing	1.1	AC	$18,000.00	$19,800	$0.00	$0	$18,000.00	$19,800
Excavation and Embankment Onsite Mat'l	2,250	CY	$25.00	$56,250	$0.00	$0	$25.00	$56,250
Temporary Erosion Control	320	LF	$0.00	$0	$20.00	$6,400	$20.00	$6,400
AC Pavement	1,680	SY	$0.00	$0	$100.00	$168,000	$100.00	$168,000
Chain Link Fence	1,060	LF	$0.00	$0	$50.00	$53,000	$50.00	$53,000
Gates	1	EA	$0.00	$0	$20,000.00	$20,000	$20,000.00	$20,000
Septage - No Treatment								
Septage Receiving Facility - No treatment (inclusive of control panel, ball valve, magmeter and magnetic swipe cards)	2	EA	$20,000.00	$40,000	$40,000.00	$80,000	$60,000.00	$120,000
Roof (13'-2" x 17'-9")	1	LS	$18,500.00	$18,500	$26,500.00	$26,500	$45,000.00	$45,000
316 SST Enclosure	2	EA	$0.00	$0	$30,000.00	$60,000	$30,000.00	$60,000
Sampler	2	EA	$0.00	$0	$8,000.00	$16,000	$8,000.00	$16,000
pH Sensor Assembly	2	EA	$0.00	$0	$3,200.00	$6,400	$3,200.00	$6,400
6" Piping	191	LF	$200.00	$38,200	$15.00	$2,865	$215.00	$41,065
SMH Penetration	1	EA	$0.00	$0	$10,000.00	$10,000	$10,000.00	$10,000
6" Tee	1	EA	$335.78	$336	$671.55	$672	$1,007.33	$1,007
6" Elbow - 90 Deg.	1	EA	$382.06	$382	$764.12	$764	$1,146.17	$1,146
Standard SMH	1	EA	$7,000.00	$7,000	$10,500.00	$10,500	$17,500.00	$17,500
Total - Direct Cost	1	LS		**$180,468**		**$499,595**		**$680,063**
General Contractor's Overhead (10%)	1	LS	$18,046.78	$18,047	$49,959.48	$49,959	$68,006.26	$68,006
General Contractor's Profit (10%)	1	LS	$19,851.46	$19,851	$54,955.43	$54,955	$74,806.89	$74,807
Tax (4.7%)	1	LS	$10,263.21	$10,263	$28,411.95	$28,412	$38,675.16	$38,675
Bond and Insurance (1.5%)	1	LS	$3,429.44	$3,429	$9,493.82	$9,494	$12,923.26	$12,923
Total - General Contractor's Cost	1	LS		**$232,059**		**$642,415**		**$874,474**
Contengency (35%)	1	LS						$306,066
Total - Budgetary Cost	1	LS		**$232,059**		**$642,415**		**$1,180,540**

AHUIMANU WASTEWATER PRE-TREATMENT FACILITY
IMPROVEMENTS AND EQUALIZATION FACILITY
DESIGN ALTERNATIVES REPORT (FINAL SUBMITTAL)

Onsite Septage Receiving Facility

DESCRIPTION	QUANTITY	UNIT	LABOR UNIT COST	LABOR TOTAL	MATERIAL UNIT COST	MATERIAL TOTAL	TOTAL UNIT COST	TOTAL COST
BASE BID								
On-Site Driveway								
Mobilization	1	LS	$0.00	$0	$30,721.11	$30,721	$30,721.11	$30,721
Clearing and Grubbing	0.3	AC	$18,000.00	$5,400	$0.00	$0	$18,000.00	$5,400
Excavation and Embankment Onsite Mat'l	2,500	CY	$25.00	$62,500	$0.00	$0	$25.00	$62,500
Temporary Erosion Control	450	LF	$0.00	$0	$20.00	$9,000	$20.00	$9,000
AC Pavement	860	SY	$0.00	$0	$100.00	$86,000	$100.00	$86,000
Chain Link Fence	220	LF	$0.00	$0	$50.00	$11,000	$50.00	$11,000
Gates	2	EA	$0.00	$0	$10,000.00	$20,000	$10,000.00	$20,000
Septage - No Treatment								
Septage Receiving Facility - No treatment (inclusive of control panel, ball valve, magmeter and magnetic swipe cards)	2	EA	$20,000.00	$40,000	$40,000.00	$80,000	$60,000.00	$120,000
Roof (13'-2" x 17'-9")	1	LS	$18,500.00	$18,500	$26,500.00	$26,500	$45,000.00	$45,000
316 SST Enclosure	2	EA	$0.00	$0	$30,000.00	$60,000	$30,000.00	$60,000
Sampler	2	EA	$0.00	$0	$8,000.00	$16,000	$8,000.00	$16,000
pH Sensor Assembly	2	EA	$0.00	$0	$3,200.00	$6,400	$3,200.00	$6,400
6" Piping	191	LF	$200.00	$38,200	$15.00	$2,865	$215.00	$41,065
SMH Penetration	1	EA	$0.00	$0	$10,000.00	$10,000	$10,000.00	$10,000
6" Tee	1	EA	$335.78	$336	$671.55	$672	$1,007.33	$1,007
6" Elbow - 90 Deg.	1	EA	$382.06	$382	$764.12	$764	$1,146.17	$1,146
Standard SMH	1	EA	$7,000.00	$7,000	$10,500.00	$10,500	$17,500.00	$17,500
Total - Direct Cost	1	LS		**$172,318**		**$370,422**		**$542,740**
General Contractor's Overhead (10%)	1	LS	$17,231.78	$17,232	$37,042.18	$37,042	$54,273.96	$54,274
General Contractor's Profit (10%)	1	LS	$18,954.96	$18,955	$40,746.40	$40,746	$59,701.36	$59,701
Tax (4.7%)	1	LS	$9,799.72	$9,800	$21,065.89	$21,066	$30,865.60	$30,866
Bond and Insurance (1.5%)	1	LS	$3,274.56	$3,275	$7,039.14	$7,039	$10,313.71	$10,314
Total - General Contractor's Cost	1	LS		**$221,579**		**$476,315**		**$697,894**
Contengency (35%)	1	LS						$244,263
Total - Budgetary Cost	1	LS		**$221,579**		**$476,315**		**$942,157**

APPENDIX H

Technical Memorandum

TECHNICAL MEMORANDUM

CITY AND COUNTY OF HONOLULU
DRAFT HAIKU ROAD BYPASS SEWER AND AHUIMANU PRE-TREATMENT FACILITY DESKTOP ODOR EVALUATION

Prepared for: Jaime Nishikawa, P.E., RM Towill Corporation
Kyle Yukumoto, P.E., RM Towill Coporation

Prepared by: Brian Huang, E.I.T., V&A Consulting Engineers

Reviewed by: Chris Hunniford, P.E., V&A Consulting Engineers

V&A

Texas Board of Professional Engineers
Firm Registration No. 9154

August, 2016

V&A Project No.: 12-0404A

1.0 INTRODUCTION

This report is an update to a previous odor monitoring study conducted by V&A Consulting Engineers (V&A) in 2014 for the City and County of Honolulu's (the City) Ahuimanu Gravity Sewer. The study found the sewer to have extreme air pressure swings as well as high H_2S gas concentrations. The H_2S gas was being released along the alignment causing odor complaints. The cause of these pressurization swings is due to the sewer configuration in which the steep slopes and multiple changes in sewer slopes caused the sewer to be surcharged at different locations when the forcemain was activated.

The original study recommended to replace the constant speed pumps at the Ahuimanu Pre-Treatment Facility (APTF) to variable speed pumps so that the wastewater flow would be more constant, decreasing the magnitude of the pressure swings. However, the City has decided to abandon the Ahuimanu Gravity Sewer and redirect the sewer to the new Haiku Road Bypass Sewer (HRBS). The city is also planning to abandon the headworks at the APTF and convert the equalization basin to hold the dry and wet weather flows separately. This report is to update the recommendations of the previous technical memo based on these changes, including evaluating the odor impacts from the new HRBS and the operational changes at the APTF. V&A reviewed preliminary design drawings of the HRBS from RM Towill Corporation (RMTC) and provided feedback during the design phase as part of this study.

2.0 DISCUSSION

2.1 Ahuimanu Pre-Treatment Facility

The Ahuimanu Pre-Treatment Facility is undergoing rehabilitation. Specifically, there will be two major changes as part of the rehabilitation effort. The first change is to replace the constant speed pumps with variable speed pumps. The second change is to abandon the headworks and to redesign the equalization basin to separate the dry and wet weather flows. The replacement of the pumps to variable speed pumps was recommended based on the 2014 odor study of the Ahuimanu Gravity Sewer (AGS). However, the AGS will now be abandoned and replaced with the HRBS which has very different sewer ventilation dynamics than before. The HRBS does not have multiple slope changes or siphons that could impede airflow and cause extreme pressurization. Therefore, installing variable speed pumps will not dramatically improve the sewer ventilation as compared to constant speed pumps.

From an operational standpoint, there are concerns that the low flow velocity from the variable speed pumps could cause solids to settle in the forcemain, especially with the headworks removed, and that a constant speed pump would be preferable due to the higher pumping velocity. From an odor generation standpoint, the wastewater conveyed using the constant speed pump may have higher peak dissolved sulfide concentrations at the forcemain discharge compared to a variable speed pump, and have the potential to release higher peak concentrations of H_2S gas at downstream points of turbulence. However, due to the high dissolved sulfide concentration that is already present in the wastewater, the decreased peak concentration in dissolve sulfide from using variable speed pumps may not result in any significant impact on the release of H_2S gas.

The APTF currently doses a calcium nitrate solution to reduce the dissolved sulfide concentration in the Ahuimanu forcemain. This is a relatively high cost O&M item because of the continuous chemical use and the high cost of chemicals. Since calcium nitrate treats dissolved sulfide based on a stoichiometric relationship, the use of calcium nitrate in the forcemain can be costly if the incoming dissolve sulfide concentration is high. One possibility to reduce the cost of the calcium nitrate demand is to intentionally strip the dissolved sulfide from the incoming sewer in the equalization basin, and treat the released H_2S gas in a biotrickling filter located at the APTF. However, more information is required to determine if this option is feasible and/or if this option is more economical than calcium nitrate alone.

2.2 Haiku Road Bypass Sewer

The Haiku Road Bypass Sewer is replacing the Ahuimanu Gravity Sewer by rerouting the wastewater from the Ahuimanu forcemain to the Kam-Heeia Interceptor Sewer and eventually reaching the Kaneohe Pre-Treatment Plant. The following analysis evaluated the odor impact of this sewer during its design phase. The Haiku Road By-pass Sewer is an 18-inch PVC sewer that receives flow from the Ahuimanu forcemain. The Haiku Road sewer will discharge to the 27-inch Kam-Heeia Interceptor Sewer (KHIS) followed by the 27-inch and 36-inch Kaneohe Bay-East Interceptor Sewer (KBEIS) where the flow will terminate at the Kaneohe Pre-Treatment Plant (KPTP). The original HRBS design had multiple slope changes. These multiple changes in slope would have caused slight pressurization throughout the collection system when the slope decreases in the downstream direction. The two dropshafts also would have increased the pressurization due to dropshaft eduction. Dropshaft eduction is a natural phenomenon in which the falling wastewater forces additional air into the sewer causing the sewer to become even more pressurized. As the falling water breaks apart into water droplets, the surface area increases, causing more friction between the air and water, and thus increasing the amount of air that is dragged into the sewer. In some instances, the eduction airflow can be as high as several times of the incoming friction drag airflow and should be avoided whenever possible.

The original recommendation to mitigate these potential odor generating conditions was to install a vapor phase odor control facility. However, due to the lack of land available, it was recommended that the sewer be redesigned to limit the location where pressurization could occur by maintaining a constant slope and to minimize turbulence that would release H_2S gas. To maintain a constant slope along the alignment of the HBRS would have been cost prohibitive. Therefore, the new design starting at SMH 14 to the connection at KHIS only has one slope change, and two drop dropshafts. The first dropshaft is located near the Ahuimanu forcemain discharge at SMH 14 and the second dropshaft is located at SMH 5. These dropshafts will be fitted with a vortex inlet and plunge pool to reduce the eduction effects and to reduce turbulence.

Ideally, a sewer would be designed to have the slope and/or diameter increase in the downstream direction to prevent air pressurization due to a reduction in airflow capacity. However, due to the natural topography and hydraulics at the connection to the KHIS, this is not practical for the HRBS. In order to maintain a slope upstream of SMH 5 that is less than or equal to the downstream slope, the dropshaft at SMH 14 and the sewer segment between SMH 14 and 5 would both have to be constructed deeper, which would significantly increase construction costs.

While there is a potential for pressurization at SMH 5 where the sewer slope decreases, this area pressurization is more localized and will likely not cause pressurization in other areas of the collection system. In the absence of a vapor phase odor control facility, the only other option to mitigate sewer air pressurization would be to investigate the use of a smaller diameter sewer upstream of SMH 5 that results in a similar hydraulic capacity for both the upstream and downstream segments. This may result in a slightly higher construction cost if the pipe diameter is less readily available. Due to the high concentration of dissolved sulfide, H_2S gas could still be released if there are points of turbulence in the sewer.

At the downstream connection of the HRBS to the KHIS, there is also a potential for pressurization. This pressurization is unavoidable because the KHIS must accept the airflow from its own upstream 27-inch sewer in addition to the airflow from the 18-inch HRBS. This area of pressurization is also anticipated to be localized.

3.0 CONCLUSION

The current Haiku Road Bypass Sewer has been designed to minimize pressurization and odor generation to the extent that is practical given the lack of land availability for vapor phase odor control facilities. The sewer slope change has been kept to a minimum to limit the extent of the sewer pressurization. Turbulence control to prevent H_2S gas release and dropshaft eduction prevention were implemented with the installation of a plunge pool vortex dropshaft. It is recommended that the feasibility of using a smaller diameter pipe for the sewer segment upstream of SMH 5 be investigated to reduce the potential for pressurization.

From an odor generation standpoint, there will be no appreciable difference in dissolved sulfide concentration between variable speed pumps and constant speed pumps as the existing dissolved sulfide concentrations are already high. Therefore, the designer can choose which type of pump is best suited for the system. It is recommended that the feasibility of reducing the amount of chemical required to treat sulfide from the Ahuimanu forcemain through use of a biotrickling filter at the APTF be investigated.

APPENDIX I

Structural Evaluation Report

STRUCTURAL EVALUATION REPORT
UPDATED ON AUGUST 19, 2020

FOR

AHUIMANU WASTEWATER PUMP TREATMENT FACILITY

Kahaluu, Oahu, Hawaii

JEFFREY Y.C. WONG
LICENSED
PROFESSIONAL
ENGINEER
No. 3207-S
HAWAII, U.S.A.

EXPIRATION 04/30/2022

THIS PROJECT WAS PREPARED BY ME OR
UNDER MY SUPERVISION

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August 19, 2020

AHUIMANU WASTEWATER TREATMENT PLANT FACILITY

SECTION 1- GENERAL PROJECT DESCRIPTION

SECTION 2 - PRIMARY CLARIFIER

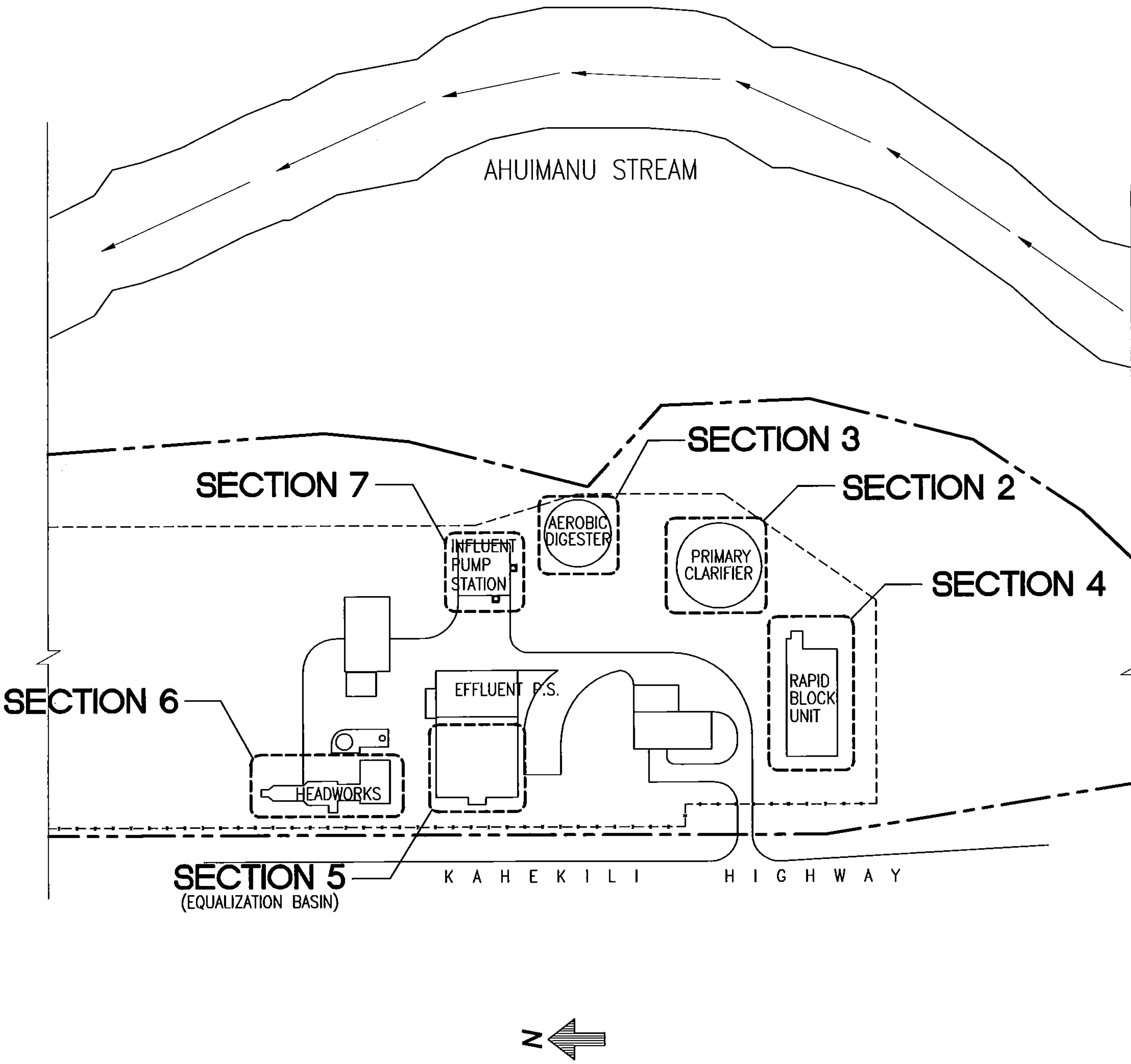
SECTION 3 - AEROBIC DIGESTER TANK

SECTION 4 - RAPID BLOCK UNIT

SECTION 5 - EQUALIZATION BASIN

SECTION 6 - HEADWORKS

SECTION 7 – INFLUENT PUMP STATION



AHUIMANU WWPTF IMPROVEMENTS	GENERAL SITE PLAN	SK-1.1

Section 1 – General Project Description

1.1 Description of Project site

Located at 47-305 Kahekili Highway the construction of Ahuimanu Wastewater Pre-Treatment Facility (AWWPTF), hereafter referenced as "the Facility", could be traced as back in 1963. Since then the facility had been undergoing numerous renovations and expansions. Situated between the Kahikili Highway on the West Side and the Ahuimanu Stream on the East Side the facility mainly served to store sewage from the Ahuimanu and Kahalu'u area. See SK-1.1. Majority of the structures were constructed of concrete with foundations bearing on compacted granular fill or base course.

1.2 Background

In 2014 a field observation was performed to evaluate the overall existing structural conditions of the major elements of the facility. During this observation seven structures were observed and assessed including Primary clarifier, Digester tank, Rapid block unit, Equalization basin, Effluent pump station, Wet well at influent pump station, and Electrical room, The results and evaluations were presented in a report entitled as "Structural Evaluation Report" dated December 24, 2014. The objective of the report was mainly to provide the City an overall view of the existing structures with our assessment on the conditions to assist the City in their development of a plan to improve the existing facility.

During the development stage of the improvement plan a Geotechnical consultant was retained by the City to perform Geotechnical investigation and evaluation of the site with a report entitled as "Geotechnical Exploration and Evaluation Report" dated June 2016. This report is to aid RMTC in their site selection and preliminary design of an EQ basin. In the report the Geotechnical engineer recommended that the FEMA's Flood Insurance Rate Map (FIRM) should be used as a guide, which indicated that a base "FIRM" flood elevation of 48 feet MSL and 51 feet MSL should be considered for location A (at holding pond) and location B (at flood way) respectively. The "FIRM" elevations are generally higher than the existing ground elevation surrounding the EQ basins to be considered. The FEMA's requirements would result in bigger uplift buoyancy created at the EQ structure. To minimize the effect of additional buoyancy it would be better to reduce the differential elevations between the "FIRM" flood elevation and the surrounding grade elevation of the EQ basin.

According to the most current RMTC's master plan the EQ basin will remain at its existing location. The Headworks, the EQ Basin, and a small portion of the Rapid Block Unit are Not in the 100 Year Zone. The Digester, PC, and IPS are in the flood zone. This effect of underground water level needs to be considered in the design and renovation of these structures.

As the City currently decided to proceed forward with the improvement plan of the Facility it will be prudent to update the information regarding the existing conditions of the Facility. NTW

Associates Inc. was retained to perform an "updated" field observation and structural assessment to four (4) major elements, which include the Primary clarification tank, Aerobic digester tank, Rapid block unit, and Equalization basin. NTW was also requested to provide structural assistance without field inspection to RMTC in the renovation of Headworks structure and Influent Pump Station structure.

1.2 Scope of Work

As part of the improvement plan for AWWPTF the structural engineer performed the following tasks in this project:

1. Performed site observation and investigation to four (4) major facility structures as previously mentioned. Due to a certain operational requirements and weather retrains this field observation did not include concrete coring and tests. The areas were only partially opened for observation due to time restraint.
2. This field observation was assisted by another sub-consultant, who provided laboring help, safety protection, some marking, and measurement/photo taking at unsafe accessible areas.
3. Evaluated the structural strength of each element in terms of resisting the original design loads or future loads within the designed useful life.
4. For Headworks and Influent Pump Station, where there were no field inspection conducted previously; provide structural assessment and recommendations based on information furnished by RMTC.
5. Provided recommendations for renovation of the existing structures with budgetary construction cost.
6. Prepared an evaluation and recommendation report which contains narrative, sketches, and photos.
7. Assisted the Civil/Mechanical engineers in the structural aspects.

Section 2 – Primary Clarifier (PC)

2.1 Description of Project site

The existing PC is a concrete circular tank with an inside diameter of 55 feet and a perimeter wall of 9'-2-1/2" high measured from the base to the top of launder channel. A 12" thick base slab with 2" thick grout topping was constructed at the bottom of the tank also serving as a mat footing, which bears on compacted granular soil. The interior surfaces of the wall and the slab were supposedly protected by elastomeric coating. Steel stairs were installed at the South end and North end of the tank to provide access from the grade to the top of the tank. A three (3) feet wide steel catwalk was constructed to serve as a bridge between the perimeter wall and the center effluent well. See SK-2.1

2.2 Existing conditions as observed

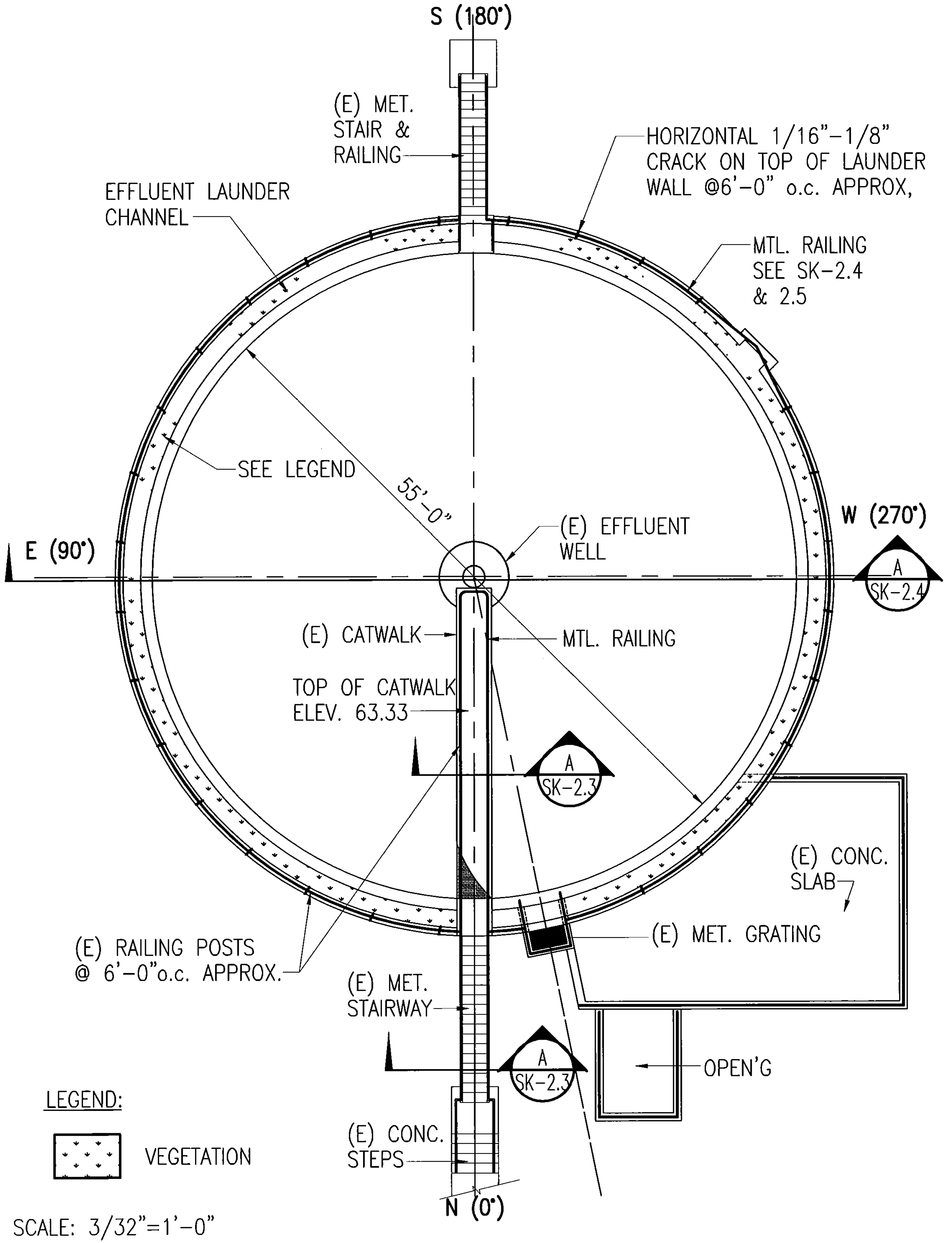
During the past 6 years the PC structural elements appeared undergoing minor repairs and cleaning. The following represents our current observation findings:

1. The entire PC tank structure appeared with moderate/severe deterioration. Defects noted are described in the following:
2. The residual coating observed in previous observation on the base slab and the interior wall surface was gone.
3. After the weeds and vegetation had been cleaned out, the base slab was exposed for observation. Large areas on the base slab were detected with hollow sound (SK-2.2), which indicated delamination or separation of base slab concrete from the supporting soil and the foundation was weakened.
4. The effluent launder channel walls and slab appeared in working condition. Very few defects were noted (SK-2.4). Horizontal cracks between 1/16" and 1/8" wide were noted constantly on top of the launder wall.(Sk-2.1,2.4, Photo 2.6))
5. Interior tank wall surface was noted to have random 1/16" vertical and horizontal cracks. No concrete spalls were noted. A certain areas on the interior wall surfaces appeared having minor delamination but should not affect the structural integrity of the wall. No protective coating on the concrete surface was noted. (SK-2.6 , Photo 2.1)
6. Exterior tank wall surfaces were noted to have vertical cracks of 1/32" to 1/16" wide. Pin holes and anchor bolt holes were randomly noted on the surfaces of the wall. (SK-2.5)
7. Along the base line of the West side exterior walls ground settlement of up to 5" was noted. We could not identify if this was the soil settlement or erosion of the ground, or the tank movement. We may need to consult the geotechnical engineer for verification. (SK-2.5)

8. The soffit surface of the launder channel slab was noted to have numerous surface cracks up1/16" wide and random spalls. (SK-2.3, Photo 2.7)
9. The steel stairs on both South and North sides of the tanks appeared in working conditions with minor rusts. (Photo 2.2 & 2.3)
10. The catwalk appeared severely rusted.

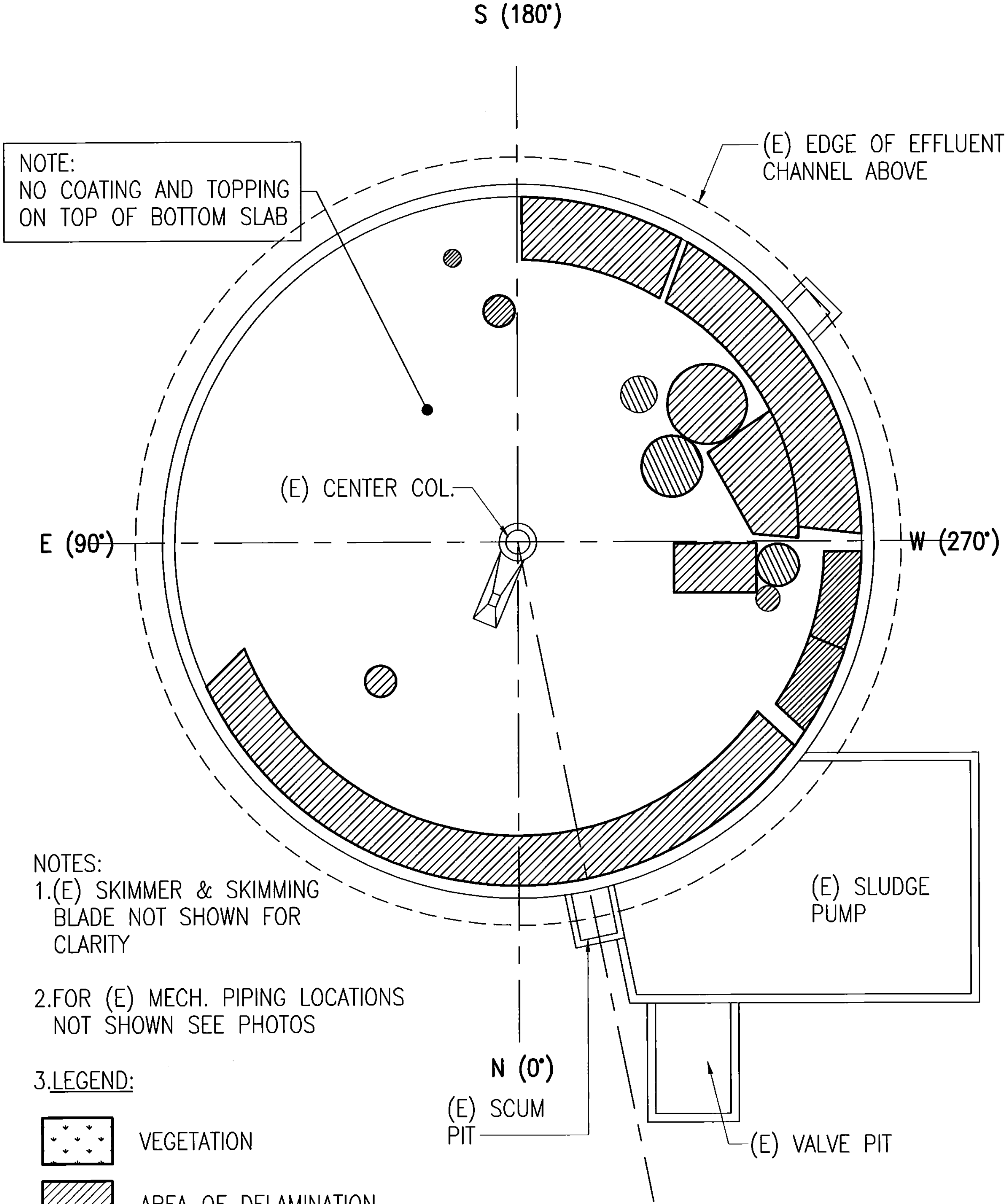
2.3 Evaluation, Recommendations, and estimated cost to refurbish.

1. After 6 years since the last field observation the tank walls appeared remaining in workable condition. The cracks and minor damages shall be repaired and new protective coating applied on the interior concrete surface.
   The cracks and spalls on the exterior wall surface and the soffit of the launder channel slab shall be repaired and the surfaces shall be repainted.
   However, during the repair of crack the condition of the wall reinforcement shall be verified and rust on the reinforcing bars shall be removed. Additional reinforcing bars might be needed to compensate for the lost of rebar areas due to rusting.
2. The Hollow spots on the base slab shall be solidly grouted to create firm contact between the slab and the substrate soil. A 2" thick gout topping shall be placed on top of the base slab and the top surface of the topping shall be protected with protective coating.
3. Rusted surfaces at the steel stairs and the metal railing shall be repaired.
4. The catwalk structure shall be removed and replaced. The end concrete seats/supports shall be reconstructed. The support column at center leg of the tank shall be reconstructed.
5. Consult a geotechnical engineer to verify the ground settlement or soil erosion do not affect the tank foundation and confirm there is no any foundation movement.
6. If the above mentioned recommendations are implemented with proper maintenance the PC structure shall remain in working conditions for another 15 year.
7. Estimated Structural refurbishing cost: $1,080,000.00



SCALE: 3/32"=1'–0"

AHUIMANU WWPTF IMPROVEMENTS	PRIMARY CLARIFIER TOP PLAN	SK–2.1



NOTES:

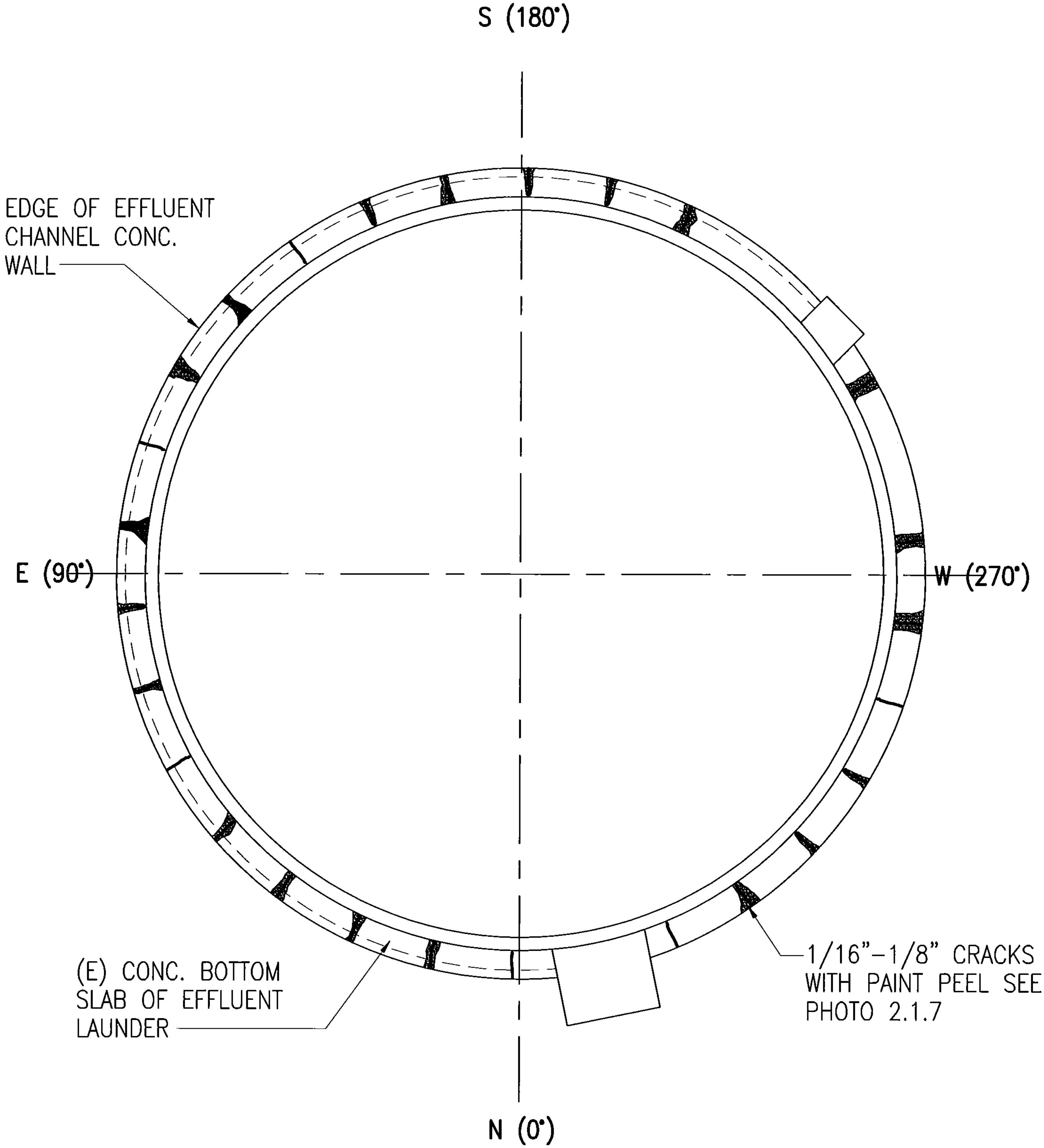
1. (E) SKIMMER & SKIMMING BLADE NOT SHOWN FOR CLARITY
2. FOR (E) MECH. PIPING LOCATIONS NOT SHOWN SEE PHOTOS
3. LEGEND:

VEGETATION

AREA OF DELAMINATION

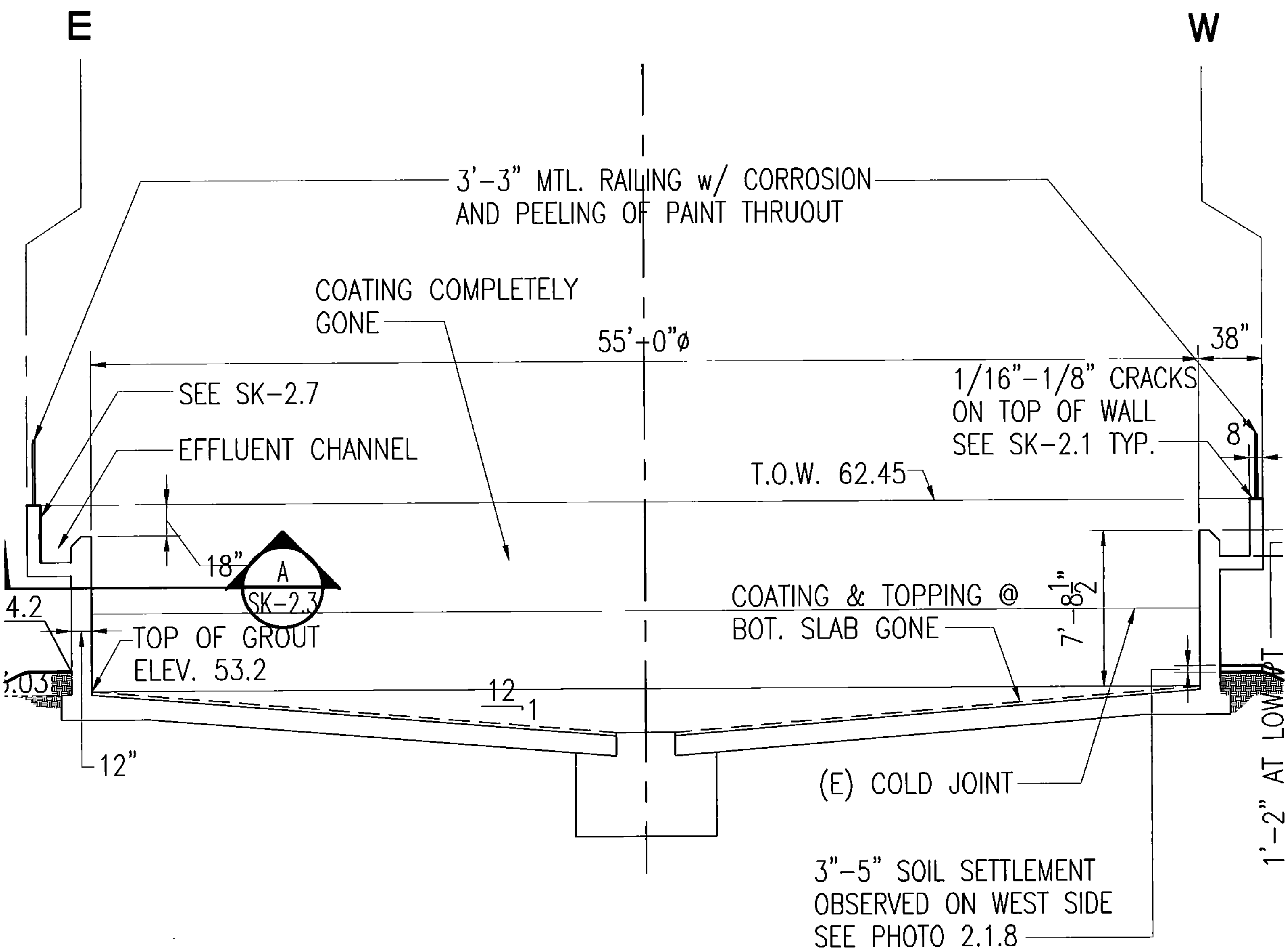
SCALE: 3/32"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	PRIMARY CLARIFIER BOTTOM SLAB PLAN	SK-2.2



SCALE: 3/32"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	PRIMARY CLARIFIER EFFLUENT LAUNDER REFLECTED CEILING PLAN	SK-2.3

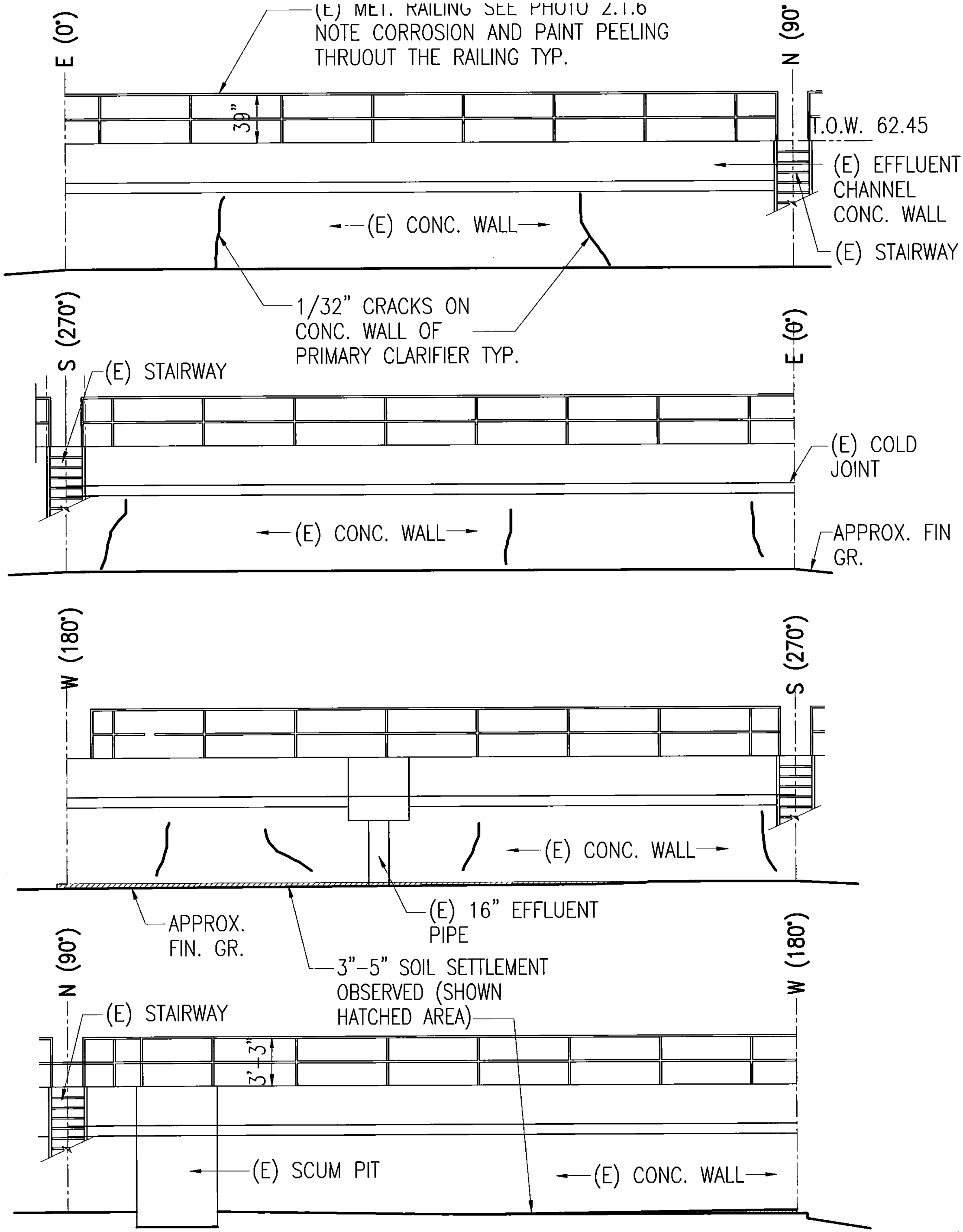


NOTE:
1. FOR DEFECTS ON EXTERIOR WALL SEE SK-2.5
2. FOR DEFECTS ON INTERIOR WALL SEE SK-2.6
3. FOR DEFECTS ON INTERIOR EFFLUENT LAUNDER WALL SEE SK-2.7
4. FOR DEFECTS ON EFFLUENT LAUNDER BOTTOM SLAB SEE REFLECTED CEILING PLAN SK-2.3

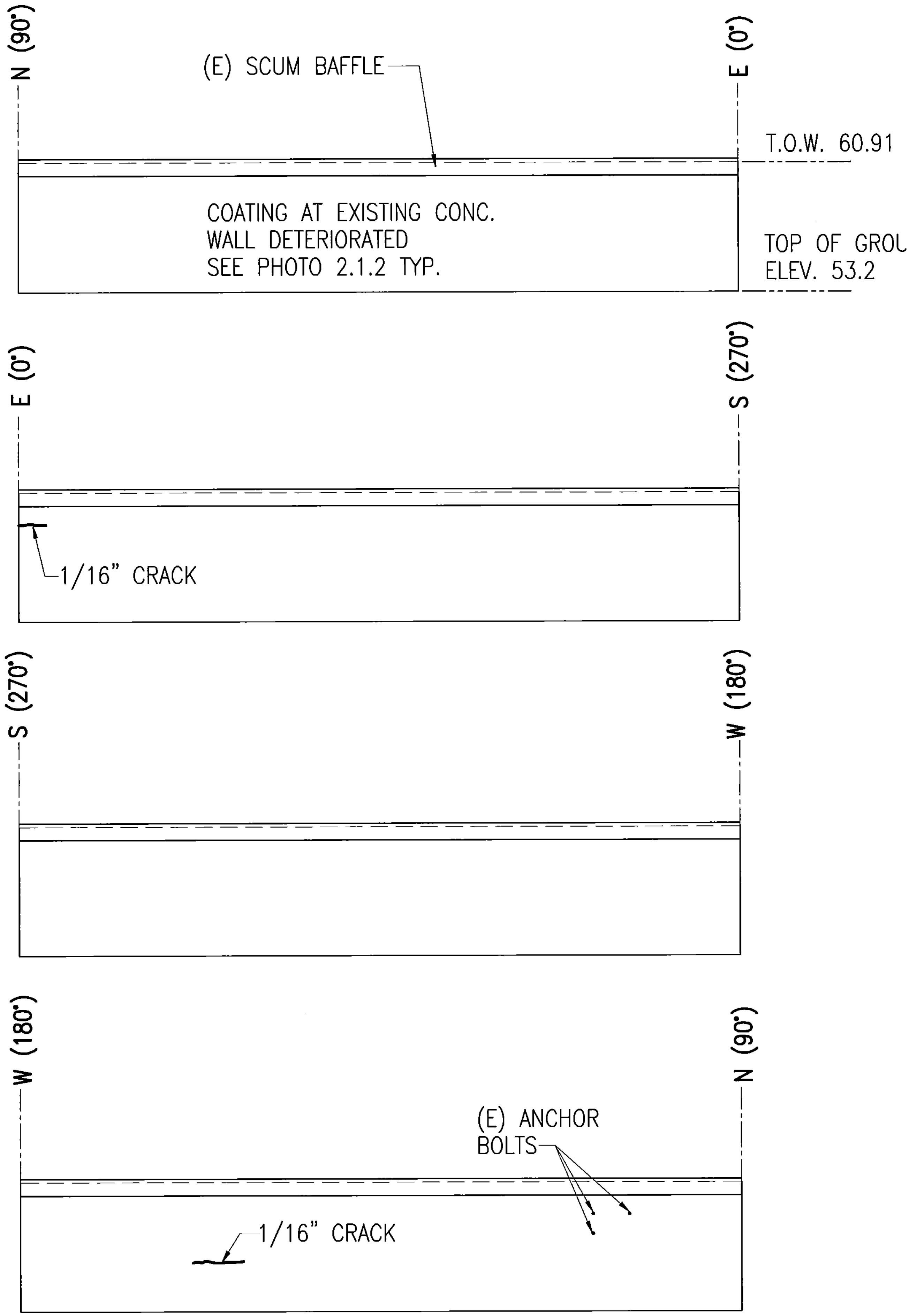
A / SK-2.4 TYPICAL CROSS SECTION

SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	PRIMARY CLARIFIER CROSS SECTION	SK-2.4

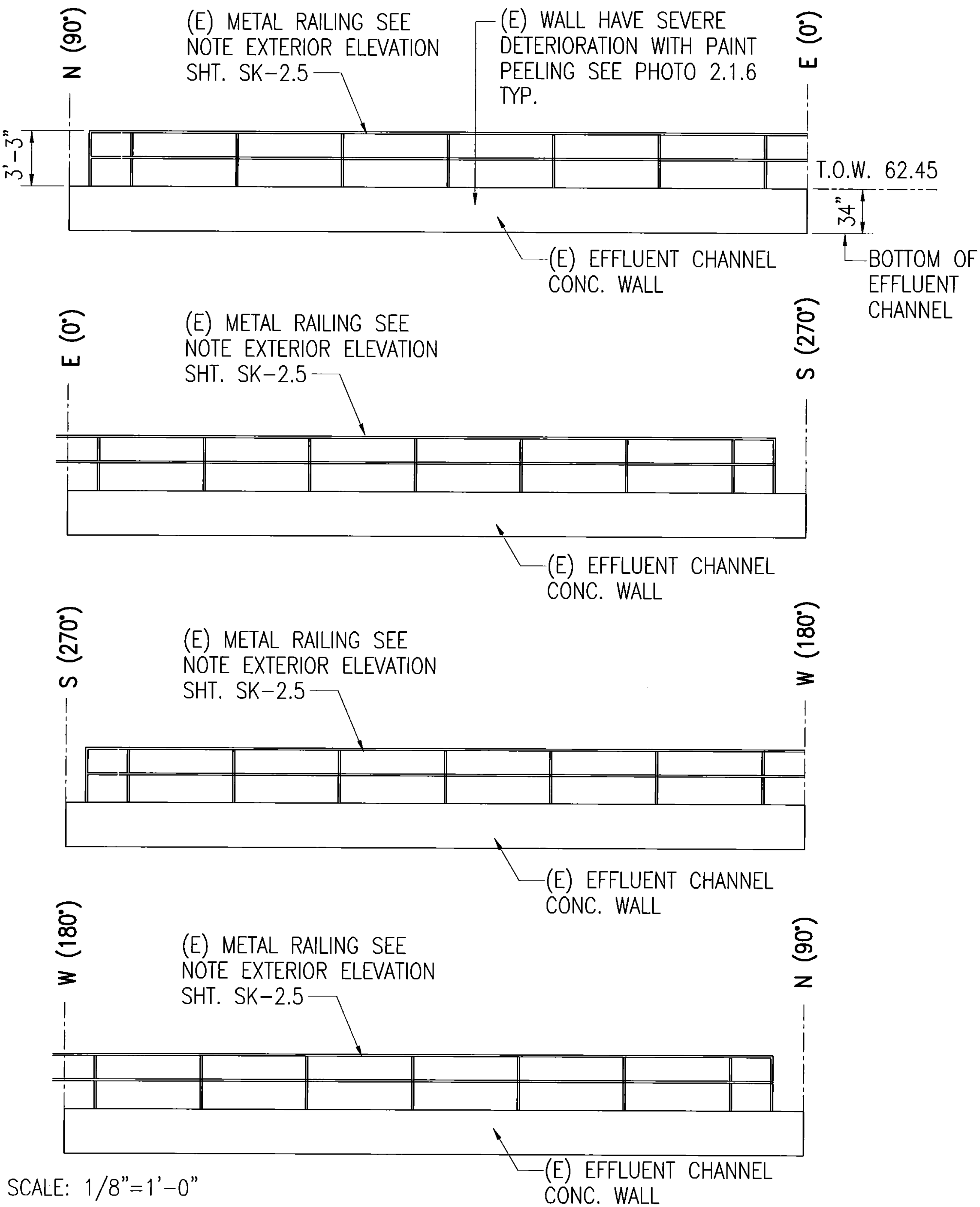


AHUIMANU WWPTF IMPROVEMENTS	P.C. EXTERIOR ELEVATION	SK-2.5



SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	P.C. INTERIOR ELEVATION	SK-2.6



SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	P.C. EFFLUENT CHANNEL INT. ELEV.	SK-2.7

PHOTO 2.1 - PRIMARY CLARIFIER BOTTOM SLAB

PHOTO 2.2 - PRIMARY CLARIFIER NORTH ELEVATION

PHOTO 2.3 - PRIMARY CLARIFIER SOUTH ELEVATION

PHOTO 2.4 - PRIMARY CLARIFIER PARTIAL EAST ELEVATION

PHOTO 2.5 - PRIMARY CLARIFIER WEST ELEVATION

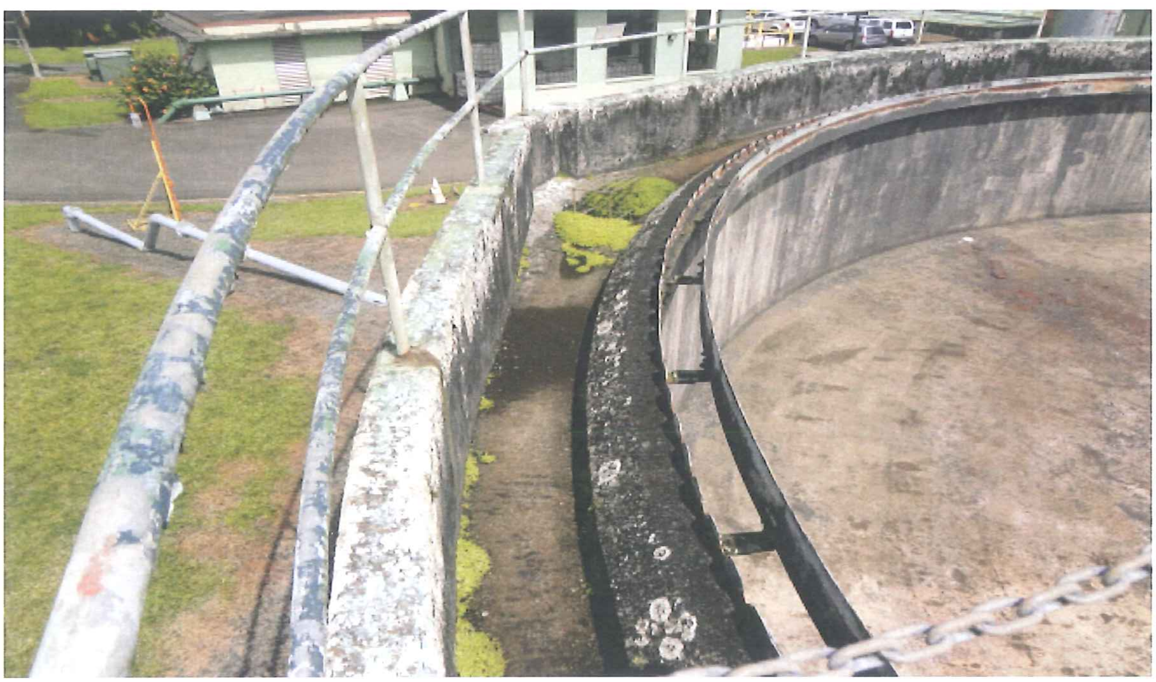


PHOTO 2.6 - EFFLUENT CHANNEL WITH VEGETATION GROWTH AND CONCRETE WALL SURFACE DETERIORATED. METAL RAILING ON CHANNEL HAVE PAINT PEELING AND CORROSION

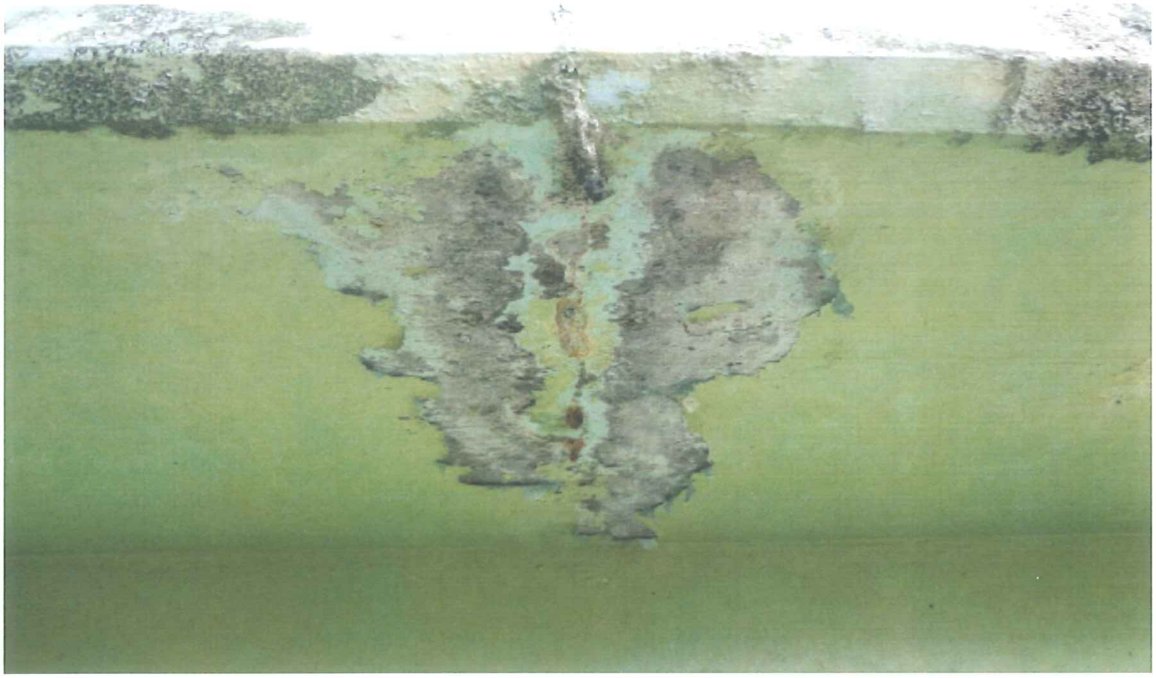


PHOTO 2.7 - PRIMARY CLARIFIER EFFLUENT CHANNEL BOTTOM SLAB WITH CRACK AND PAINT PEEL DUE TO WATER LEAKAGE

PHOTO 2.8 - PRIMARY CLARIFIER SOIL SETTLEMENT ON EXISTING GRADE MAINLY AROUND THE WEST SIDE OF THE CLARIFIER

PHOTO 2.9 - EXISTING STAIR AT THE NORTH SIDE OF CLARIFIER

Section 3 – Aerobic Digester Tank (DT)

3.1 Description of Project site

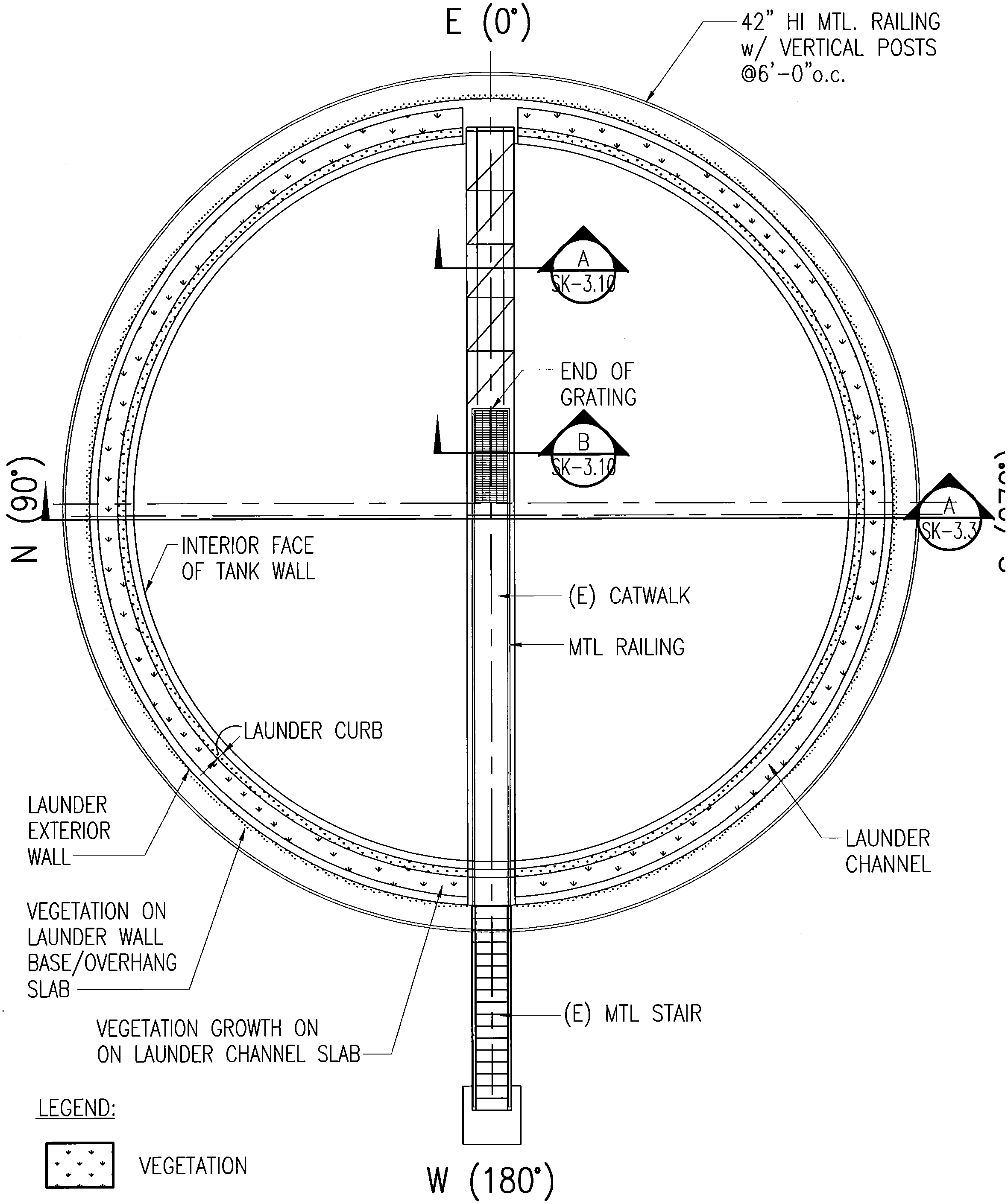
The existing DT is a concrete circular tank with an inside diameter of 45 feet and a perimeter wall of 19'-0" high measured from the base to the top of launder channel. A 12" thick base slab without topping was constructed at the bottom of the tank and it also served as a mat footing, which bears on compacted granular soil. The interior surface of the wall and the base slab was supposedly protected by elastomeric coating. One steel stair was installed at the West end of the tank to provide access from the grade to the top of the tank. A three (3) feet wide steel catwalk with partial grating was constructed to serve as a bridge across the tank spanning between and supported at West end and East end wall. See SK-3.1

3.2 Existing conditions as observed

1. The entire DT tank structure appeared moderately deteriorated. The deterioration appeared worse than last observation. Defects noted are described in the following:
2. The residual coating on the base slab and the interior wall surface, which was noted in the last field observation, was completely gone this time.
3. Weeds and vegetation growth was observed on most of the launder channel slab and the overhand eave slab. Random vegetation was noted on the base slab. (SK-3.1 3.2, Photo 3.2)
4. Large areas on the base slab were detected with hollow sound (SK-3.2), which indicated delamination or separation of base slab concrete from the supporting soil and the foundation was weakened.
5. The effluent launder channel walls and slab appeared in working condition. Very few defects were noted (SK-3.9).
6. Interior tank wall surfaces were noted to have continuous horizontal cracks with crack widths ranging from 1/32" to 1/8". There were no concrete spalls. A certain areas on the interior wall surfaces appeared having minor delamination but should not affect the structural integrity of the wall.(SK-3.7, 3.8, Photo 3.2))
7. Exterior tank wall surfaces were noted to have vertical cracks of 1/32" to 1/16" wide. Pin holes and anchor bolt holes were randomly noted on the surfaces of the wall. (SK 3.5, 3.6)
8. The soffit surface of the launder channel slab was noted to have numerous surface cracks up1/16" wide and random spalls. (SK-3.3, Photo 3.7)
9. The steel stairs on West side of the tank appeared in working conditions with minor rusts.
10. The catwalk was severely corroded. (photo 3.3, 3.4,3.5)
11. Rusting was noted on the surfaces of all metal railing. (Photo 3.3.6)

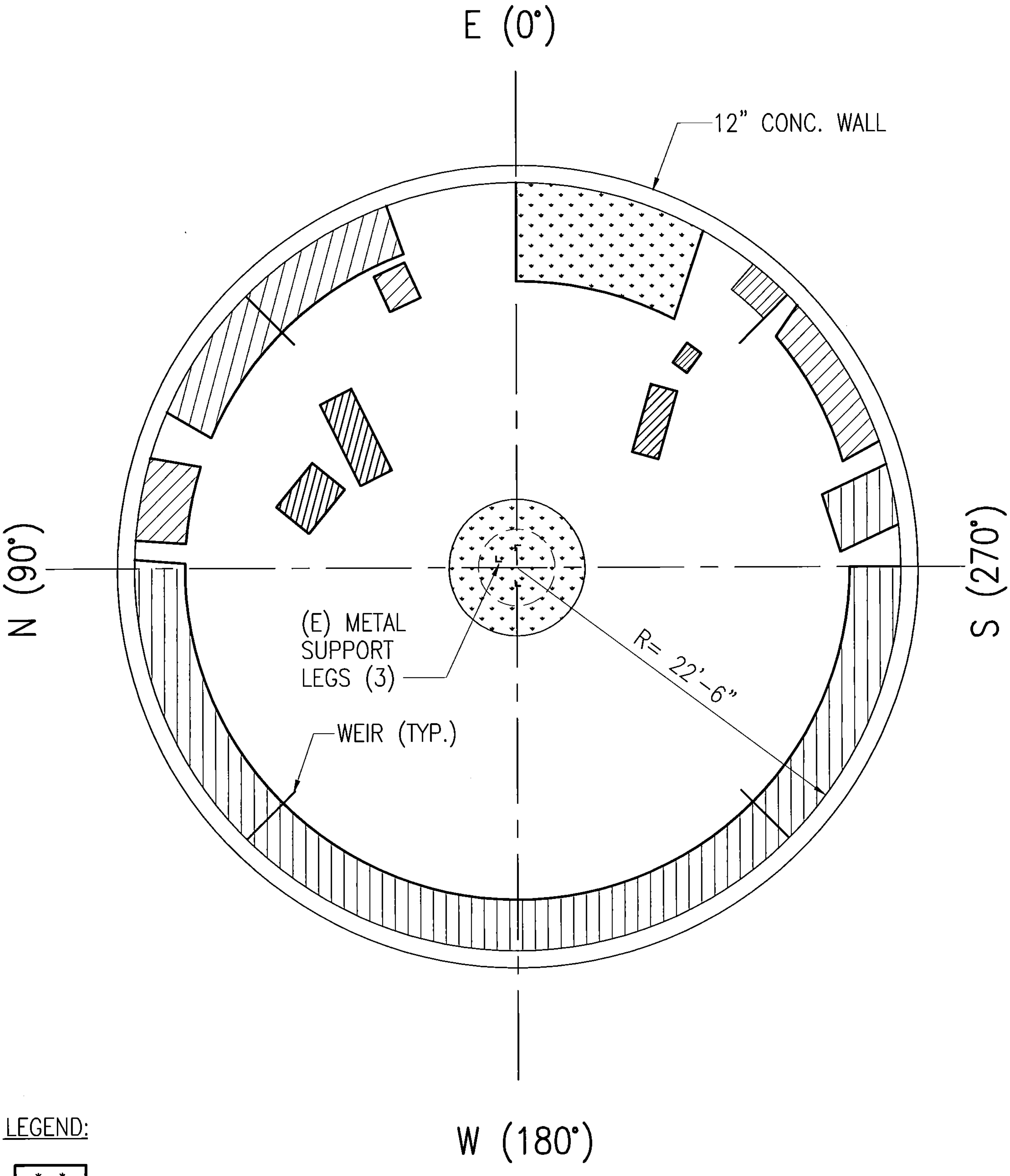
3.3 Evaluation, Recommendations, and estimated cost to refurbish.

1. After 6 years since the last field observation the tank walls appeared remaining in workable condition. The cracks and minor damages shall be repaired and new protective coating installed on the interior concrete surface.
   The cracks and spalls on the exterior wall surface and the soffit of the launder channel slab shall be repaired and the surfaces shall be repainted.
   However, during the repair of cracks the condition of the wall reinforcement shall be verified and evaluated. Rust on the reinforcing bars shall be removed. Additional reinforcing bars might be needed to compensate for the lost of rebar areas due to rusting.
2. All vegetation on the slabs shall be cleaned out. If the exposed concrete surfaces appeared to be defective with cracks, spalls or exposed aggregates they shall be repaired.
3. The Hollow spots on the base slab shall be solidly grouted to create firm contact between the slab and the substrate soil. A two (2)" thick gout topping shall be placed over the base slab and the top surface of the topping shall be protected with protective coating.
4. Remove corroded concrete surfaces to sound concrete.
4. Rusted surfaces at the steel stairs and the metal railing shall be repaired.
5. The catwalk structure shall be removed and replaced. End seats and mid support shall be reconstructed as required.
6. If the above mentioned recommendations are implemented with proper maintenance the PC structure shall remain in working conditions for another 15 year.
7. Estimated Structural refurbishing cost: $950,000.00



SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	AEROBIC DIGESTER TOP PLAN	SK-3.1



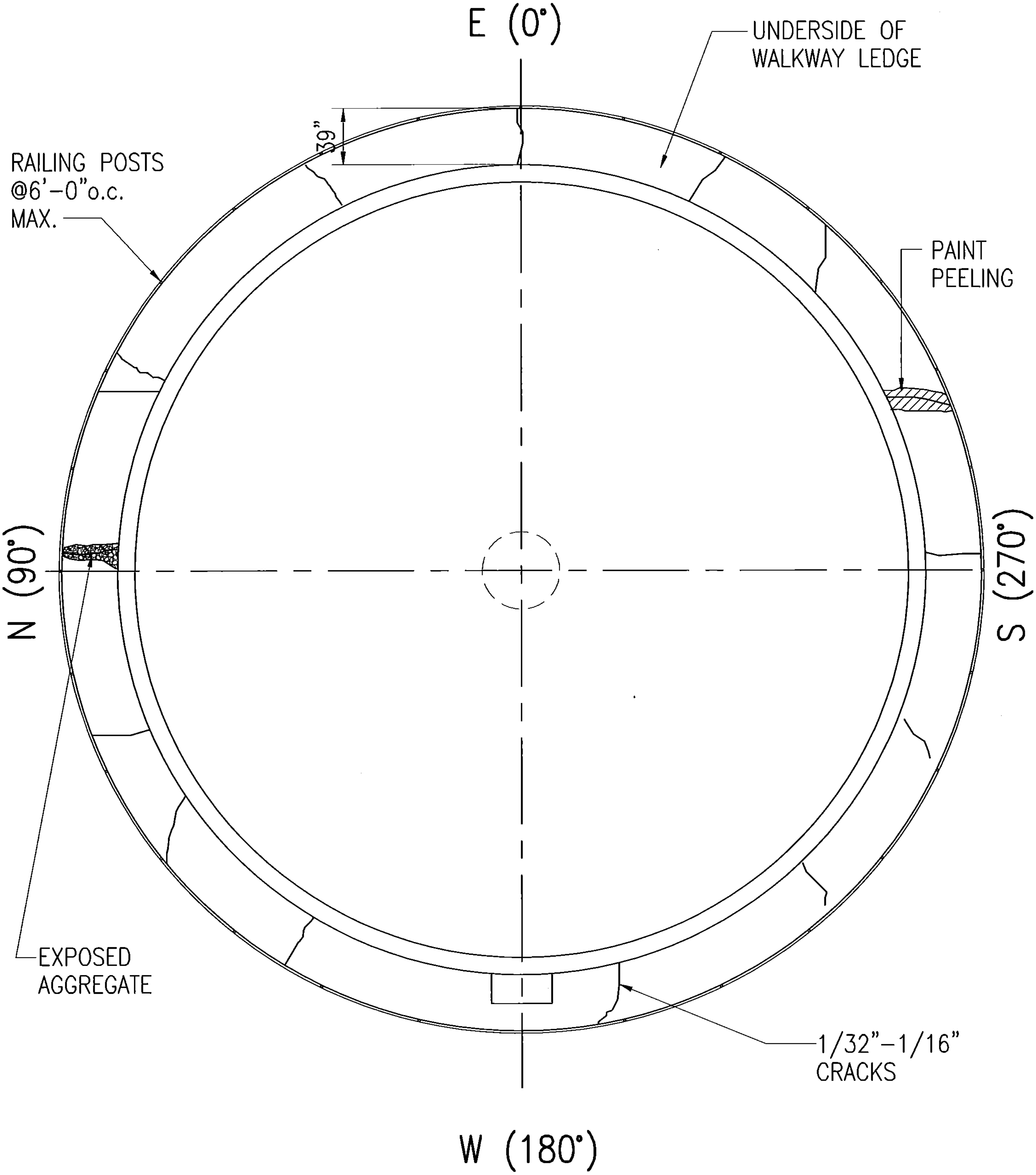
LEGEND:

VEGETATION

AREA OF DELAMINATION

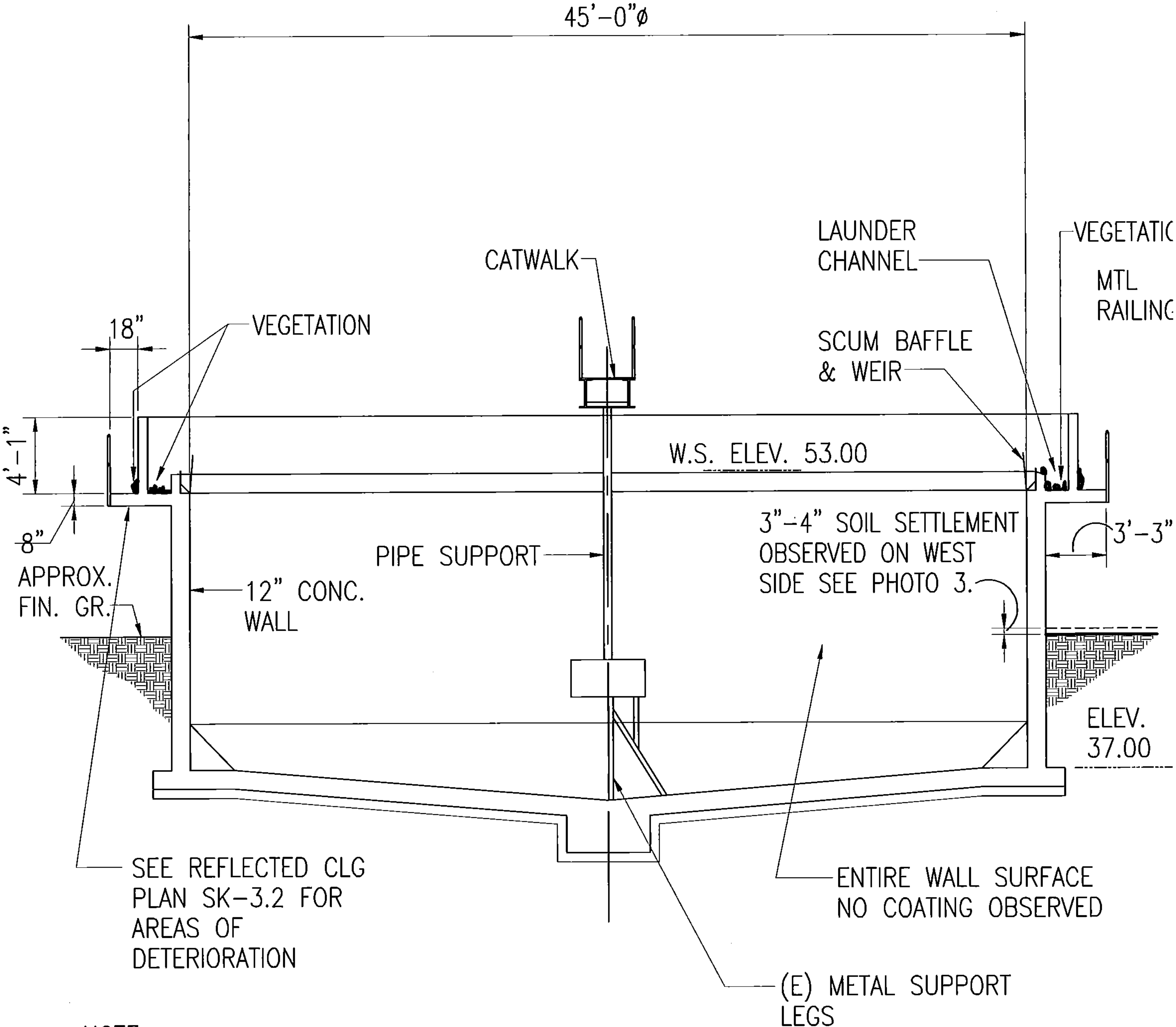
SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	AEROBIC DIGESTER BOTTOM SLAB PLAN	SK-3.2



SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	AEROBIC DIGESTER REFLECTED CLG PLAN	SK-3.3



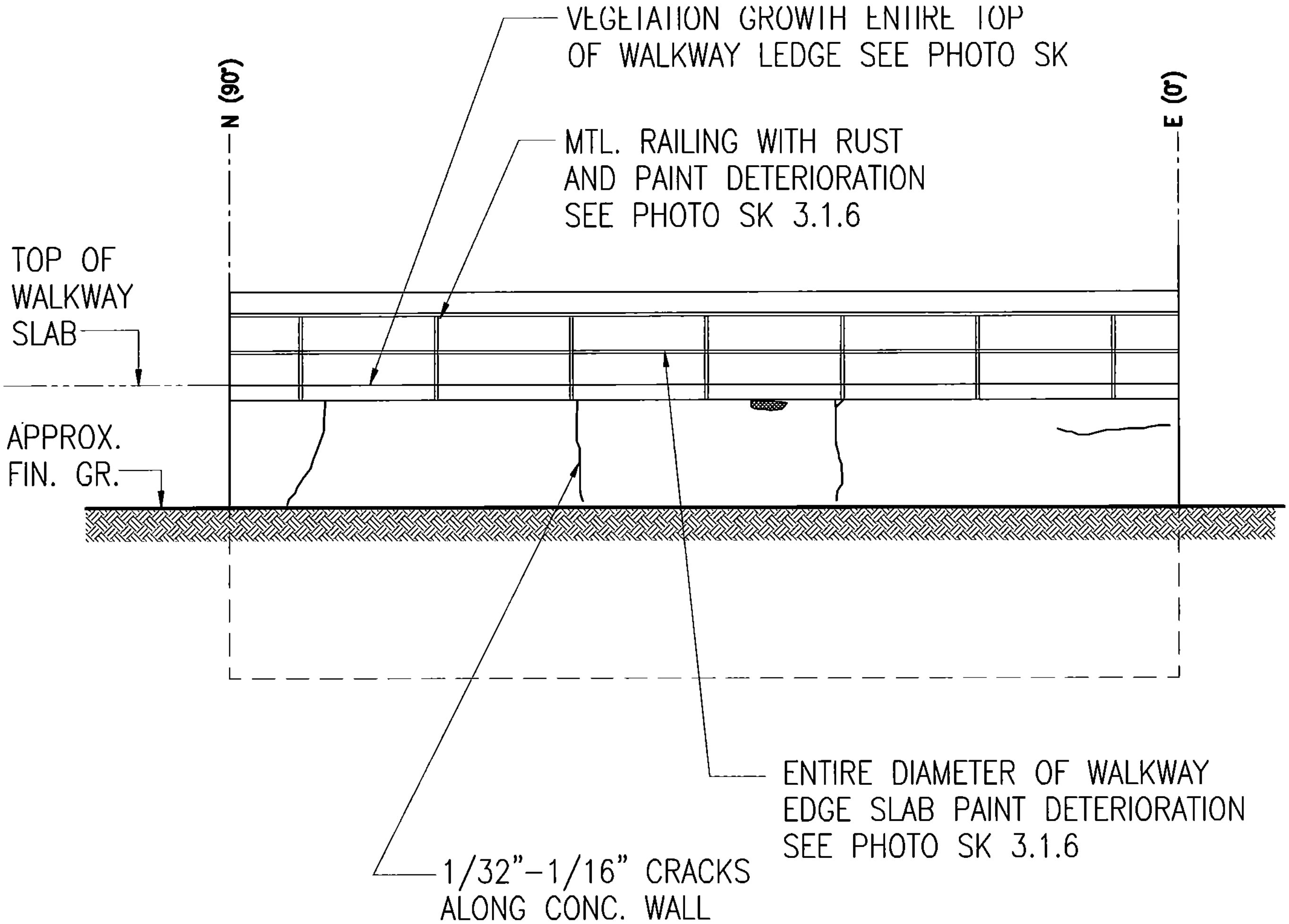
NOTE:

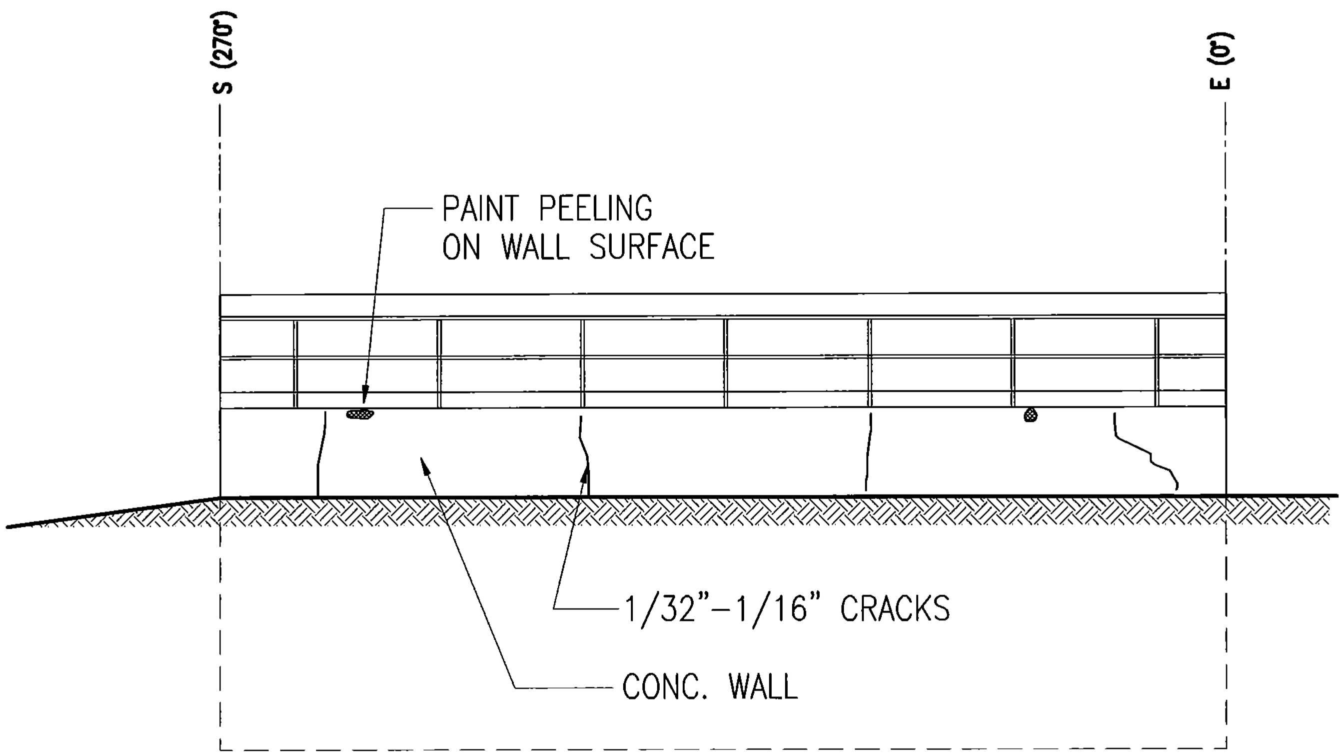
1. FOR DEFECTS ON EXTERIOR WALL SEE SK-3.5 & 3.6
2. FOR DEFECTS ON INTERIOR WALL SEE SK-3.7 & 3.8
3. FOR DEFECTS ON INTERIOR EFFLUENT LAUNDER SEE SK-3.9
4. FOR DEFECTS ON EFFLUENT LAUNDER BOTTOM SLAB SEE SK-3.2

A SK-3.4 TYPICAL CROSS SECTION

SCALE: 1/8"=1'-0"

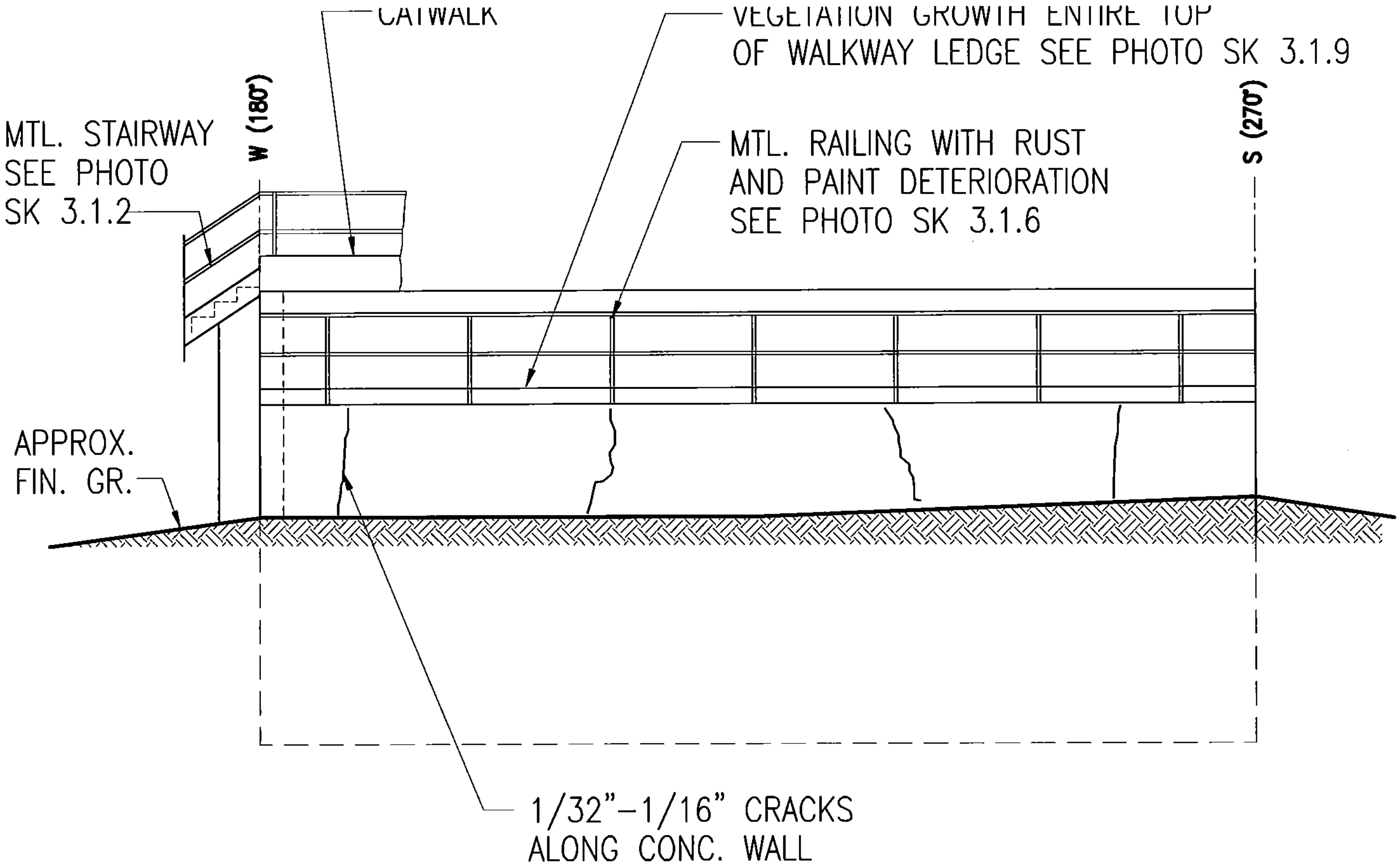
AHUIMANU WWPTF IMPROVEMENTS	AEROBIC DIGESTER CROSS SECTION	SK-3.4

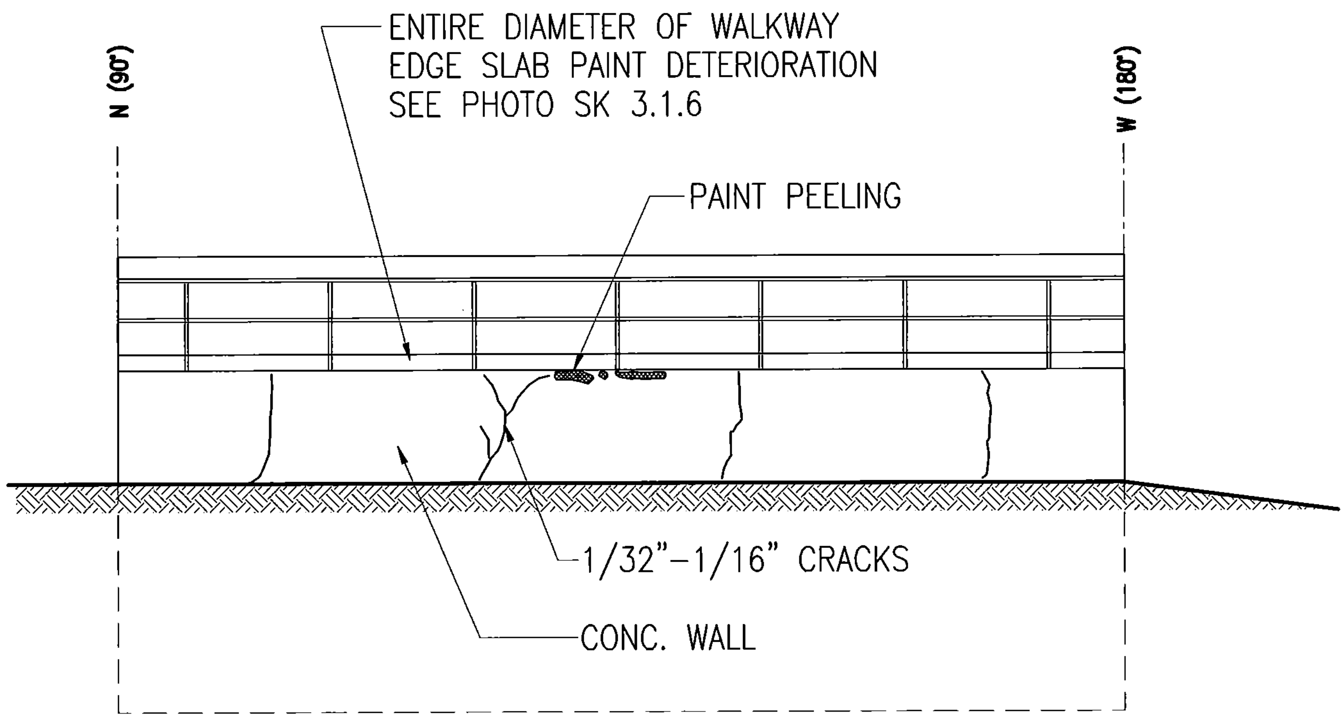




SCALE: 1/8"=1'–0"

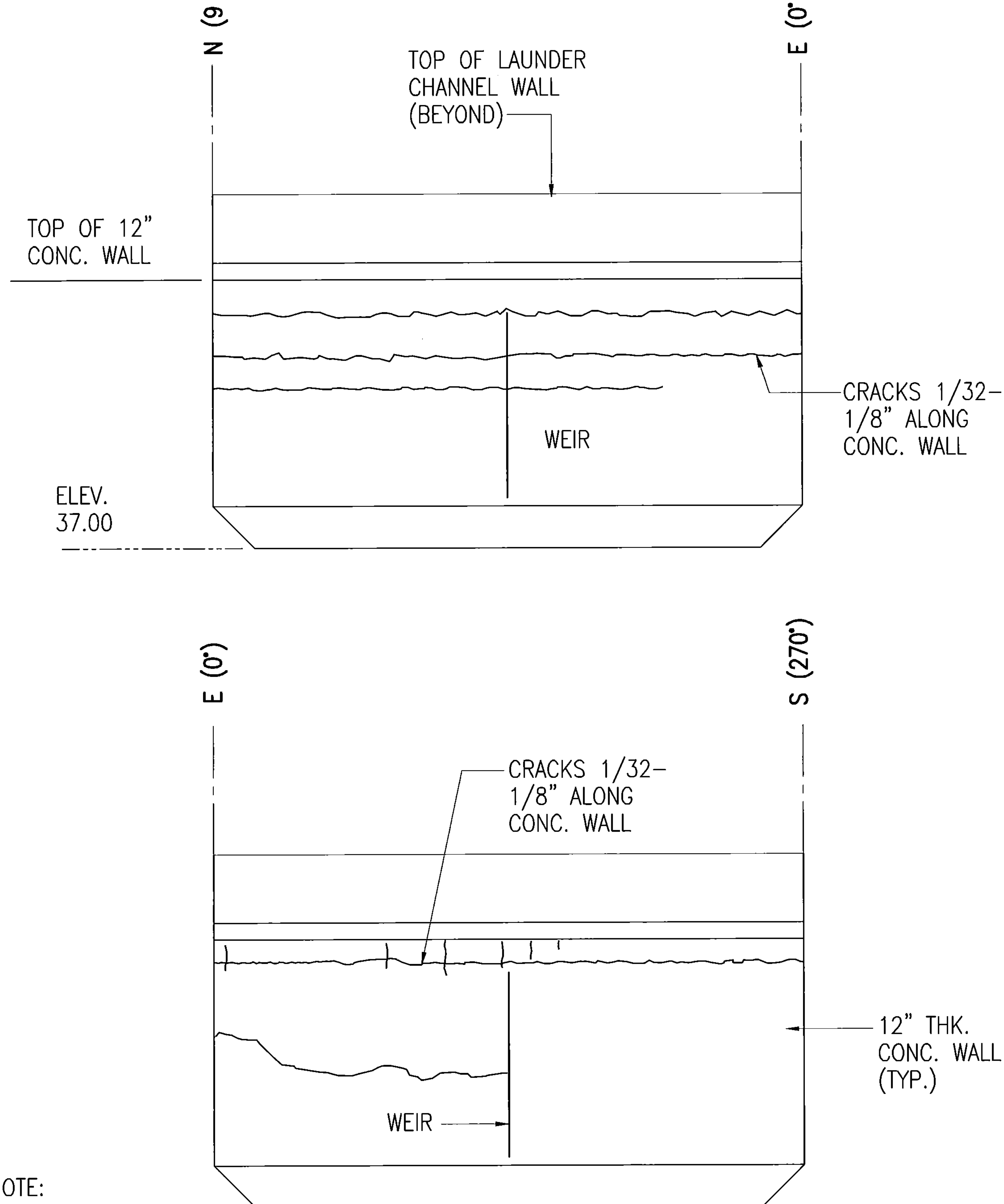
AHUIMANU WWPTF IMPROVEMENTS	AEROBIC DIGESTER EXTERIOR ELEV.	SK–3.5





SCALE: 1/8"=1'-0"

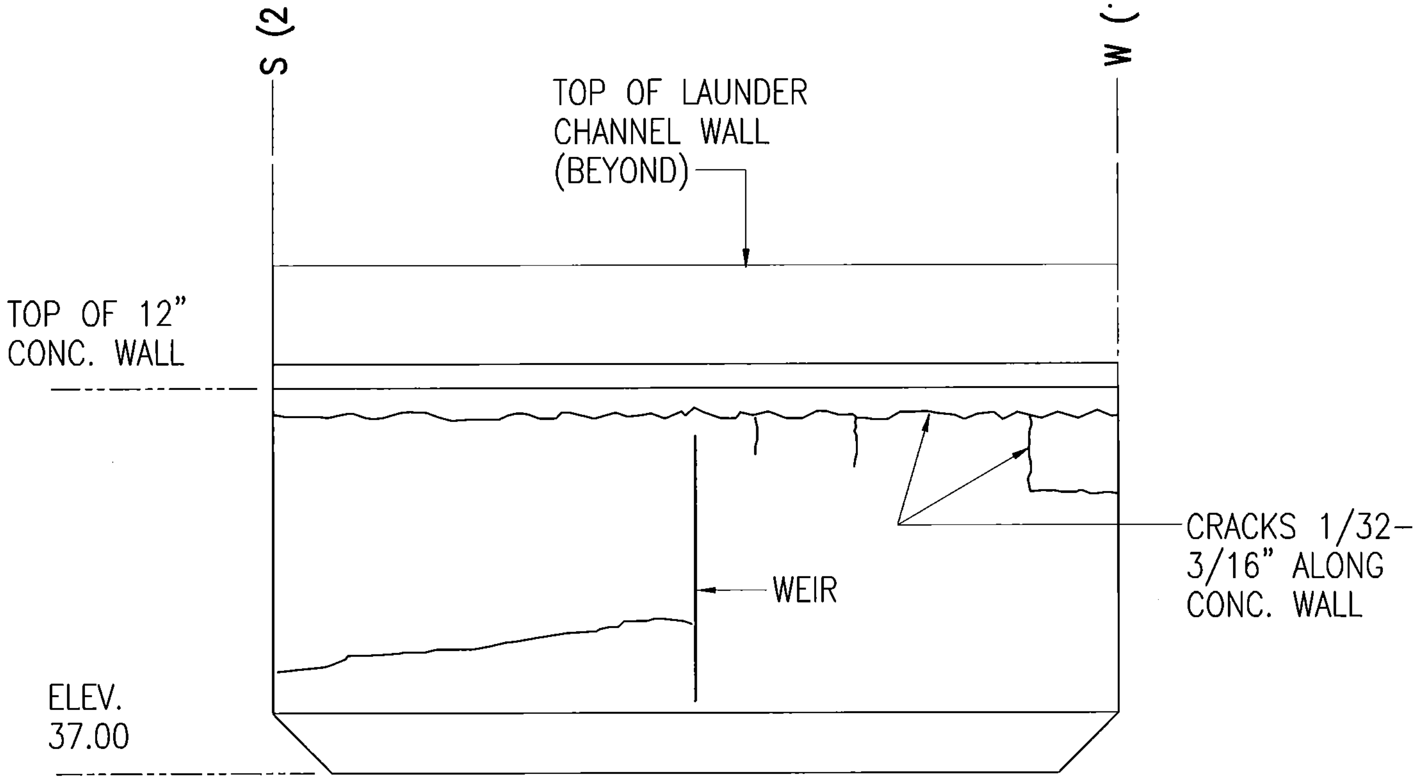
AHUIMANU WWPTF IMPROVEMENTS	AEROBIC DIGESTER EXTERIOR ELEV.	SK-3.6

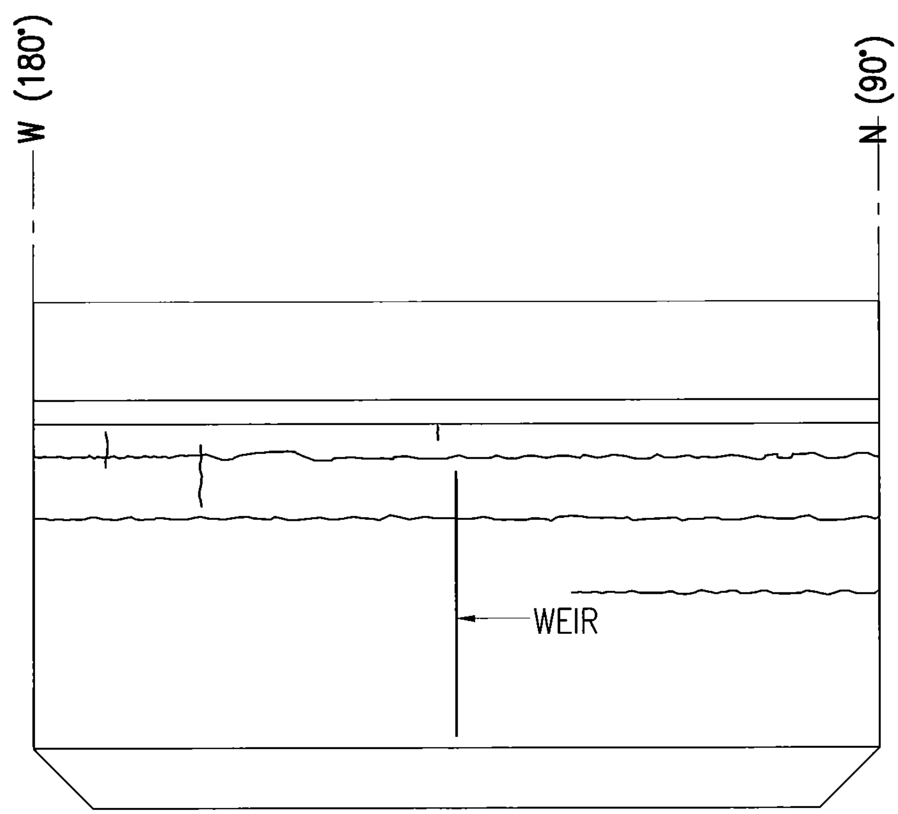


NOTE:
PROTECTIVE COATING
DETERIORATED THRUOUT
THE ENTIRE WALL SURFACE

SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	AEROBIC DIGESTER INT. WALL ELEVS.	SK-3.7

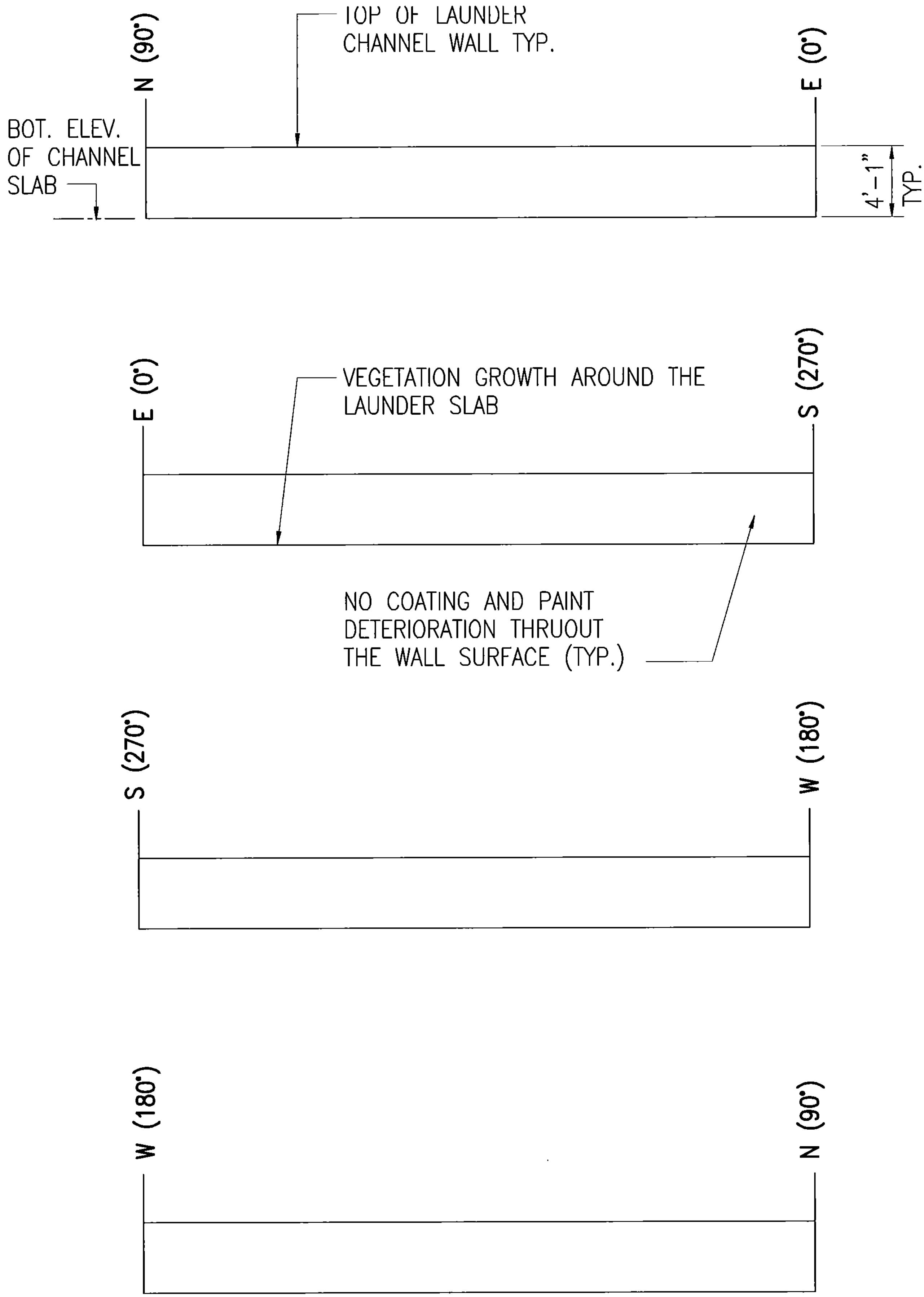




NOTE:
PROTECTIVE COATING
DETERIORATED THRUOUT
THE ENTIRE WALL SURFACE

SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	AEROBIC DIGESTER INT. WALL ELEVS.	SK-3.8



SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	A.D. EFFLUENT LAUNDER INT. ELEV.	SK-3.9

PHOTO 3.1 - AEROBIC DIGESTOR TANK PARTIAL NORTH ELEVATION; NEWLY CONSTRUCTED METAL STAIR

PHOTO 3.2 - AEROBIC DIGESTOR TANK BOTTOM SLAB. NOTE AREA OF VEGETATION GROWTH AND DELAMINATION OF SLAB

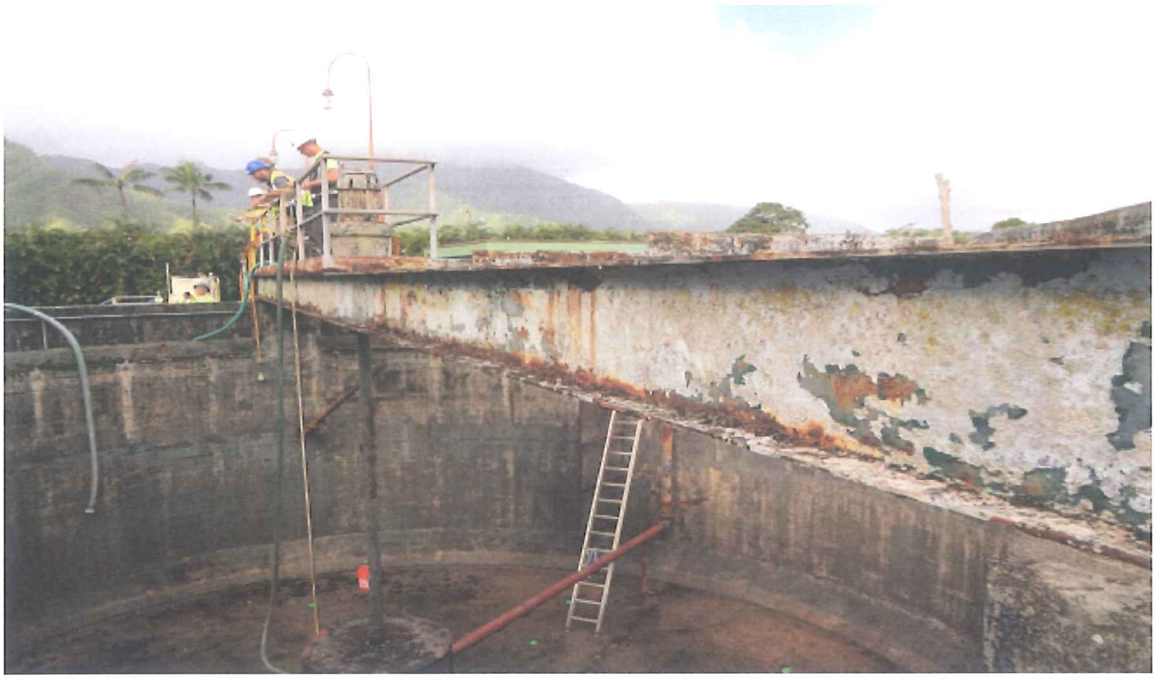


PHOTO 3.3 - EXISTING CATWALK, SEVERELY RUSTED AND PAINT PEELED OFF

PHOTO 3.4 – OVERVIEW OF AEROBIC DIGESTER CATWALK

PHOTO 3.5 - EAST END VIEW OF CATWALK

PHOTO 3.6 - AEROBIC DIGESTER EFFLUENT LAUNDER WALL AND METAL RAILING WITH CORROSION AND PAINT PEELING

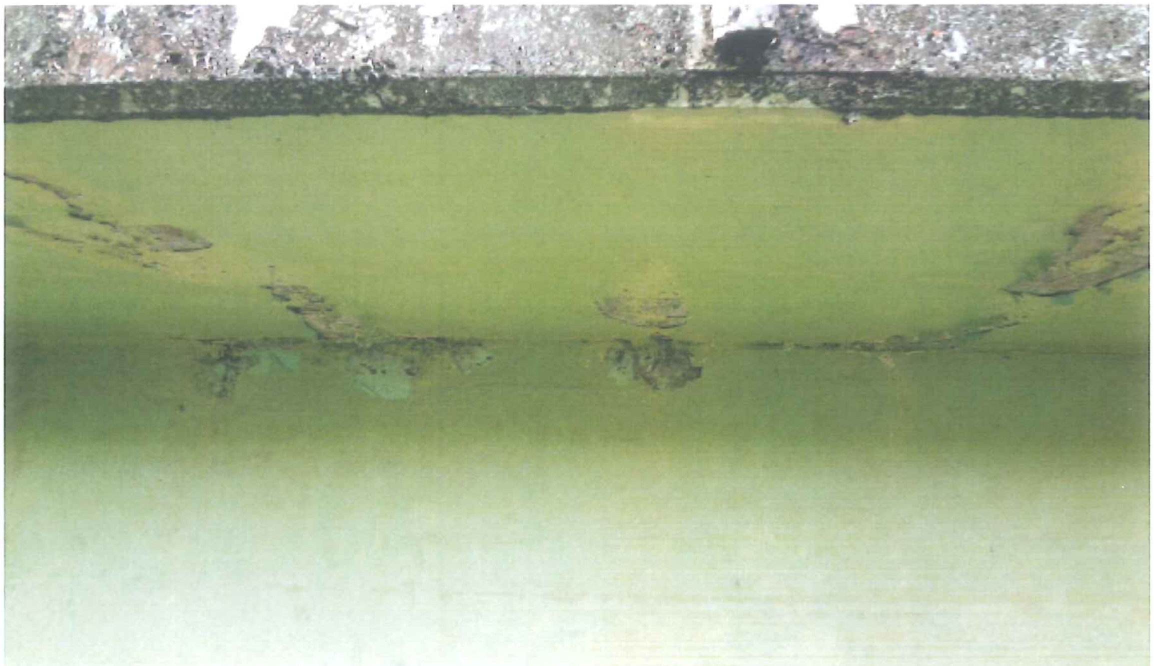


PHOTO 3.7 – SOFFIT OF OVERHANG SLAB OF EFFLUENT LAUNDER. NOTE CRACKS AND PAINT PEELLING

PHOTO 3.8 – DIGESTER INTERIOR CONC. WLL AND EFFLUENT CHANNEL WALL. NOTE DETERIORATOIN AND MISSING COATING. VEGETATION GROWTH AT BOTTOM SLAB OF LAUNDER CHANNEL, SCUM BAFFLE, AND WEIR

PHOTO 3.9 - DIGESTER EFFLUENT LAUNDER CHANNEL WALL AND OVERHANG SLAB WITH VEGETATION GROWTH

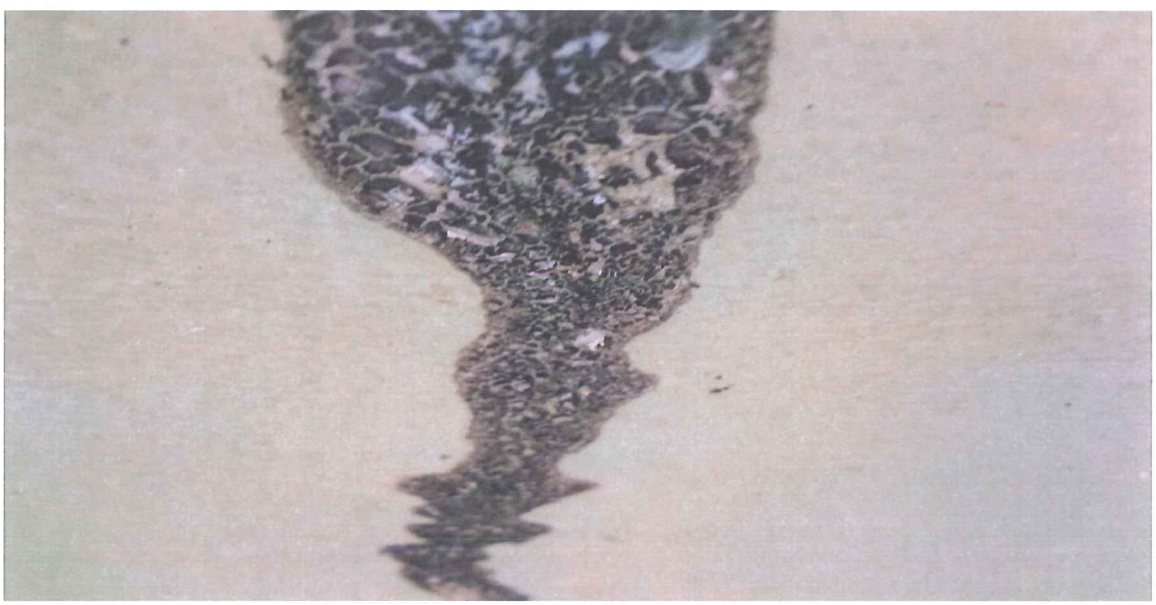


PHOTO 3.10 - SPALLING OF CONCRETE ON OVERHANG SLAB SOFFIT OF EFFLUENT CHANNEL

Section 4 – Rapid Block Unit (RBU)

4.1 Description of structure

The existing RBU is a concrete rectangular open tank with plan dimensions of 83'-4" X 37'-11". RBU mainly consists of three (3) settling tanks with outlet channel on the South side and three (3) aeration tanks with inlet channel on the North side. A four feet (4) wide concrete walkway slab was constructed between the settling tanks and the aeration tanks. (SK- 4.1, 4.2). There are 12" thick concrete partition walls between two adjacent settling tanks and two aeration tanks. The perimeter walls of the the RBU are 12" thick. A 14" thick horizontal base slab was constructed below the aerations tanks and a 12" thick sloping base slab was constructed below the settling tanks. All base slabs were bearing on compacted granular fills and serve as part of the mat foundation. The interior surfaces of the walls were protected by elastomeric coating.

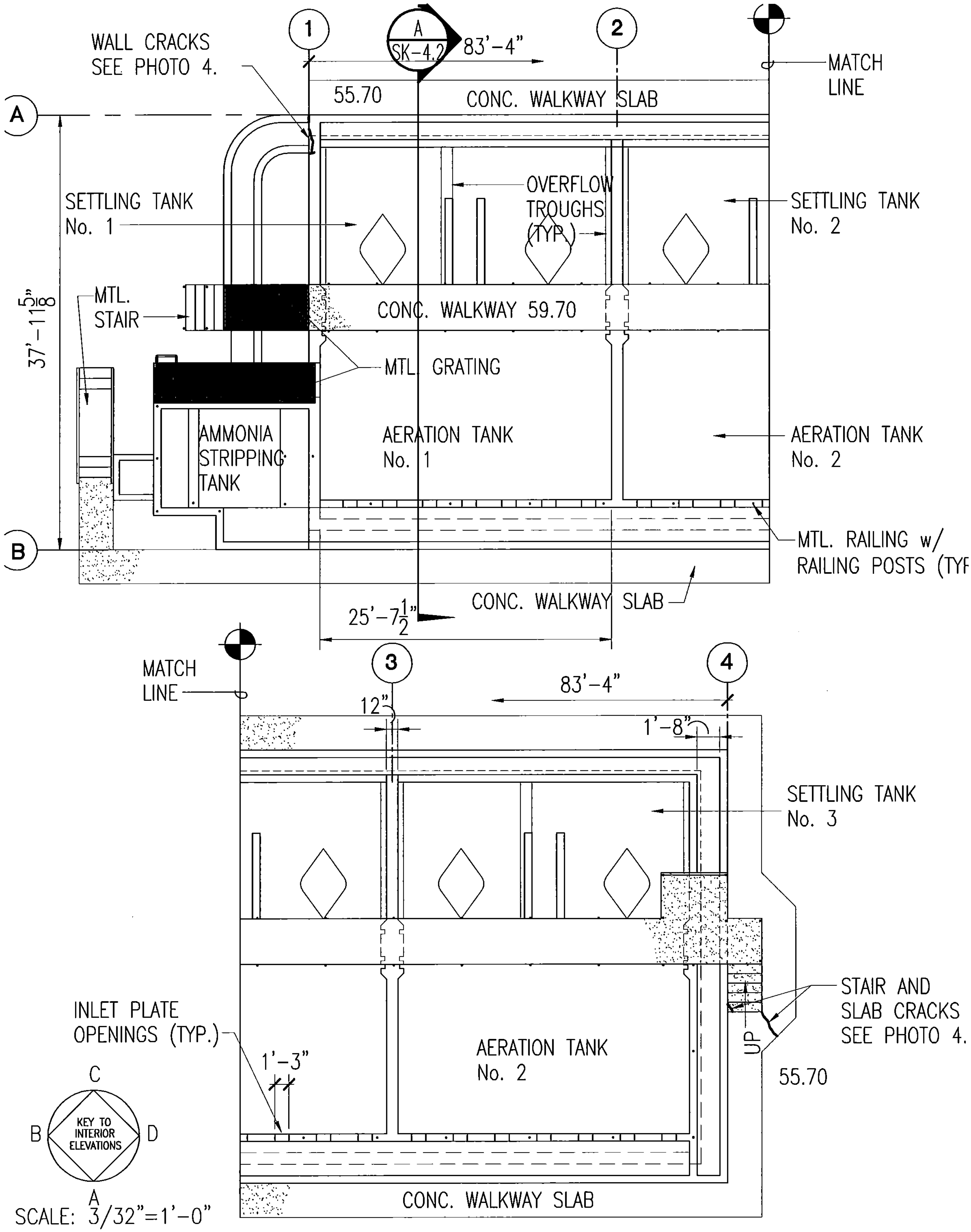
4.2 Existing conditions as observed

Due to the requirement of the operation and retrain of weather condition only Aeration Tank No.1 (SK-4.1, Photo 4.Photo 4.18) was cleaned out to open for observation of the base slab and surrounding walls. The existing conditions of all other tanks were presumed to be similar. The results of observation are summarized as follows.

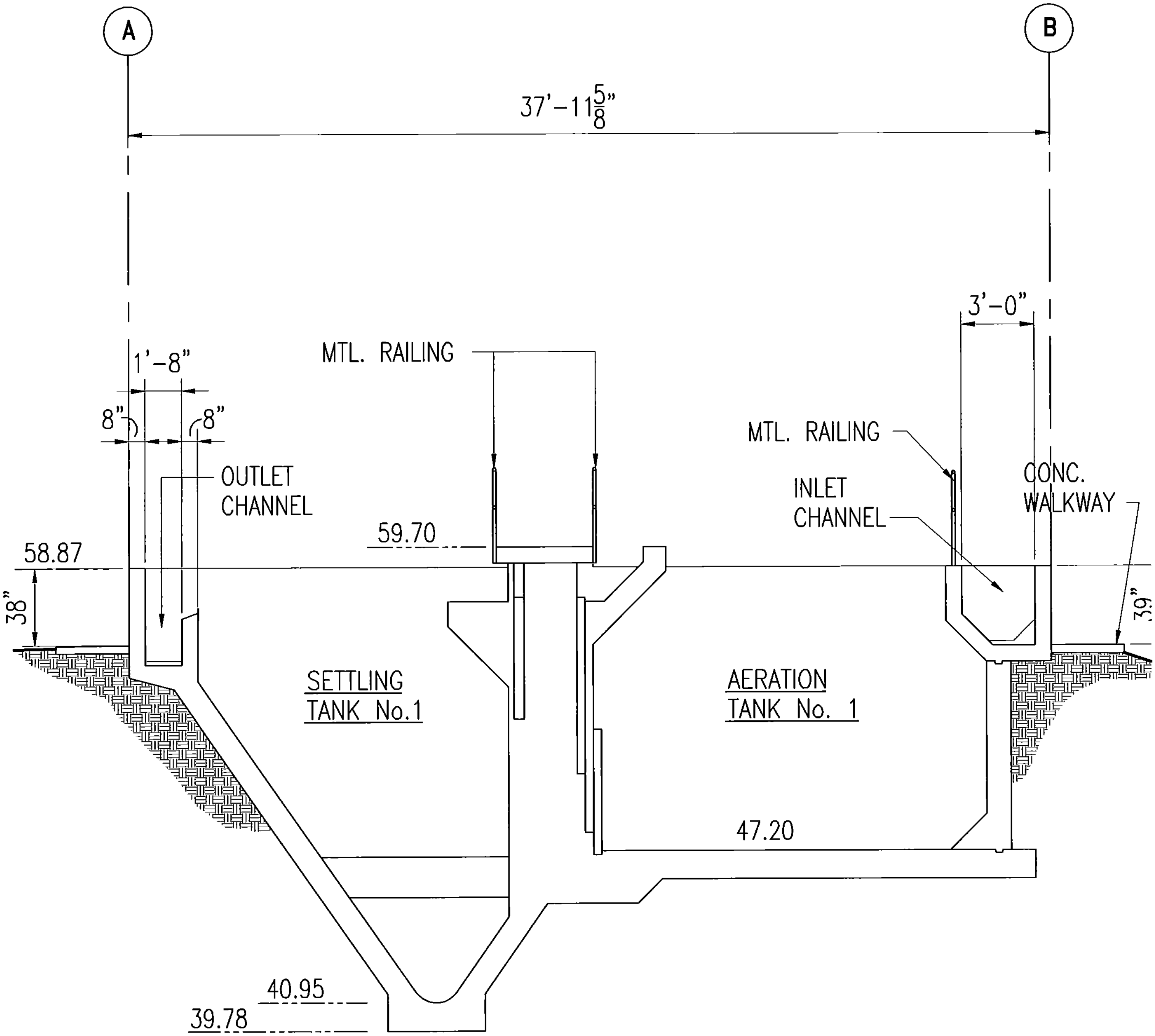
1. Basically, the concrete portion of the tank structure appeared in fairly good condition. Concrete appeared to be sound with only minor hairline cracks and spalls on the exterior surfaces unless otherwise noted. The hairline cracks will not be shown on the wall elevations as they will not significantly affect the structural integrity and can be covered and sealed with epoxy paint. Most of the interior wall coating had peeled off. The exposed interior wall concrete surface under coating appeared sound and in good condition. Numerous steel steps and grating were corroded (Photo 4.18). The base slabs appeared bearing on dense compacted granular fill as there was no hollow sport detected on the base slab.
2. The metal railing appeared severely rusted See SK-4.3 and Photo 4.19
3. All Exterior wall surfaces showed random vertical cracks ranging from 1/16" to 1/8" wide. Existing paint on walls peeled off. See Sk-4.4, 4.5. One (1) large vertical wall crack of 1/2" wide at South/East corner of Settling Tank No.1 was observed.
4. Surrounding soil settlement and erosion along North and West exterior walls were noted. A certain section of existing sidewalk slab cracked. See Sk-4.1, 4.3, and 4.4, and Photo 4.8, 4.9,4.10, 4.16
5. The inner channel slab was noted to have random hollow spots underneath the concrete (Photo 4.17)
6. Some weir inlet plates were rusted. One weir plate was broken. See Sk-4.6 and Photo 4.6.
7. Overflow troughs across settling tanks were corroded. (Photo 4.12)

4.3 Evaluation, recommendations, and estimated cost to refurbish.

1. The existing RBU structure is at workable condition. Comparing to the condition observed 6 years ago the structure exhibited more deterioration. More cracks were observed on the exterior wall surfaces. Paint peeled off. Railing and steel steps severely rusted. Surrounding soil eroded and settled.
2. To maintain a good and long useful life the above mentioned defects need to be fixed. The vertical cracks on the exterior wall appeared caused by rebar corrosion and soil settlement. Rust on the rebars shall be removed and applied rust inhibitor coating on the rusted surfaces, Additional reinforcing bars might be inserted as needed.
3. All interior wall surfaces shall be protected by protective coating.
4. Geotechnical engineer shall be consulted to verify the surrounding soil condition and to ensure the existing foundation is not moving or settling.
5. The rusted railing and steps shall be repaired or replaced.
6. After the above mentioned recommendation are implemented and the unit is under proper maintenance the RBU shall remain in good working condition for another 15 years and serve its original design load..
7. Estimated structural refurbishing cost is $ 650,000.

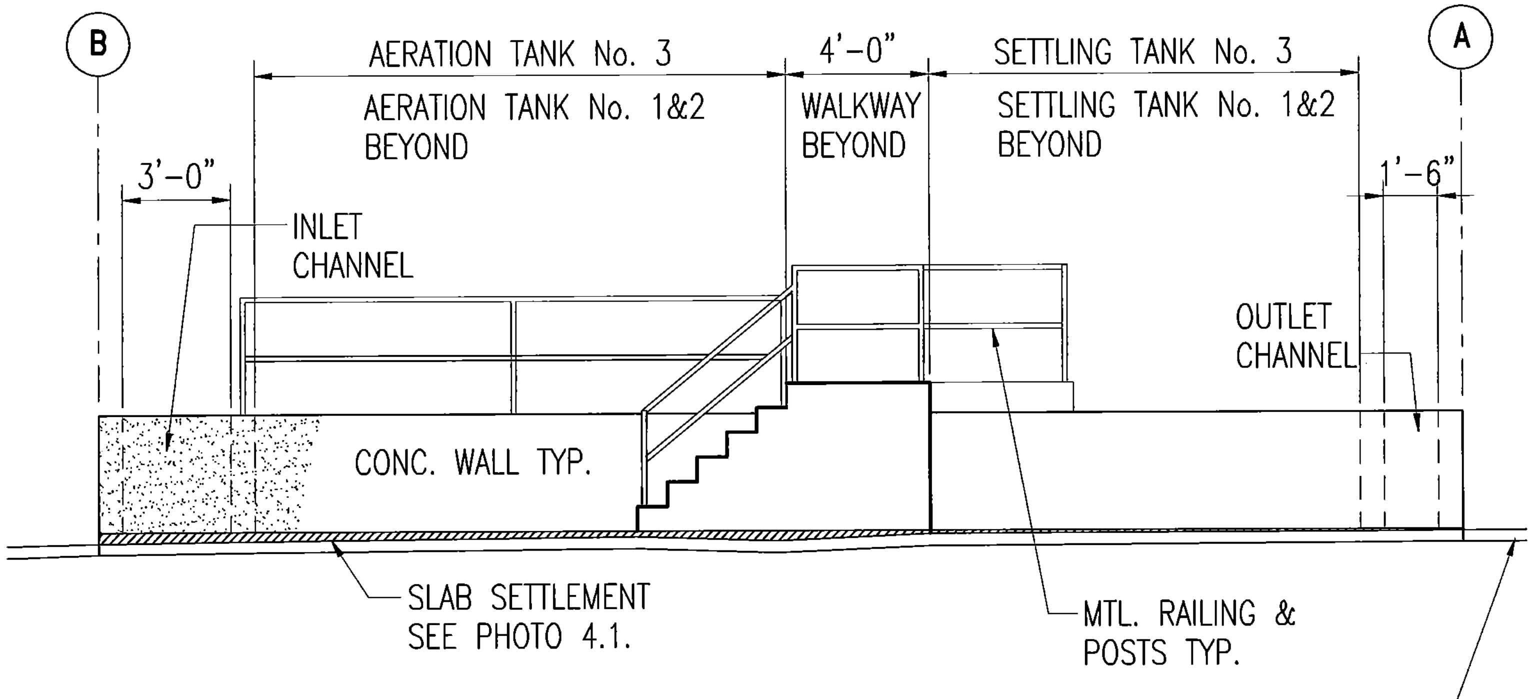


AHUIMANU WWPTF IMPROVEMENTS	RAPID BLOCK UNIT FLOOR PLAN	SK-4.1

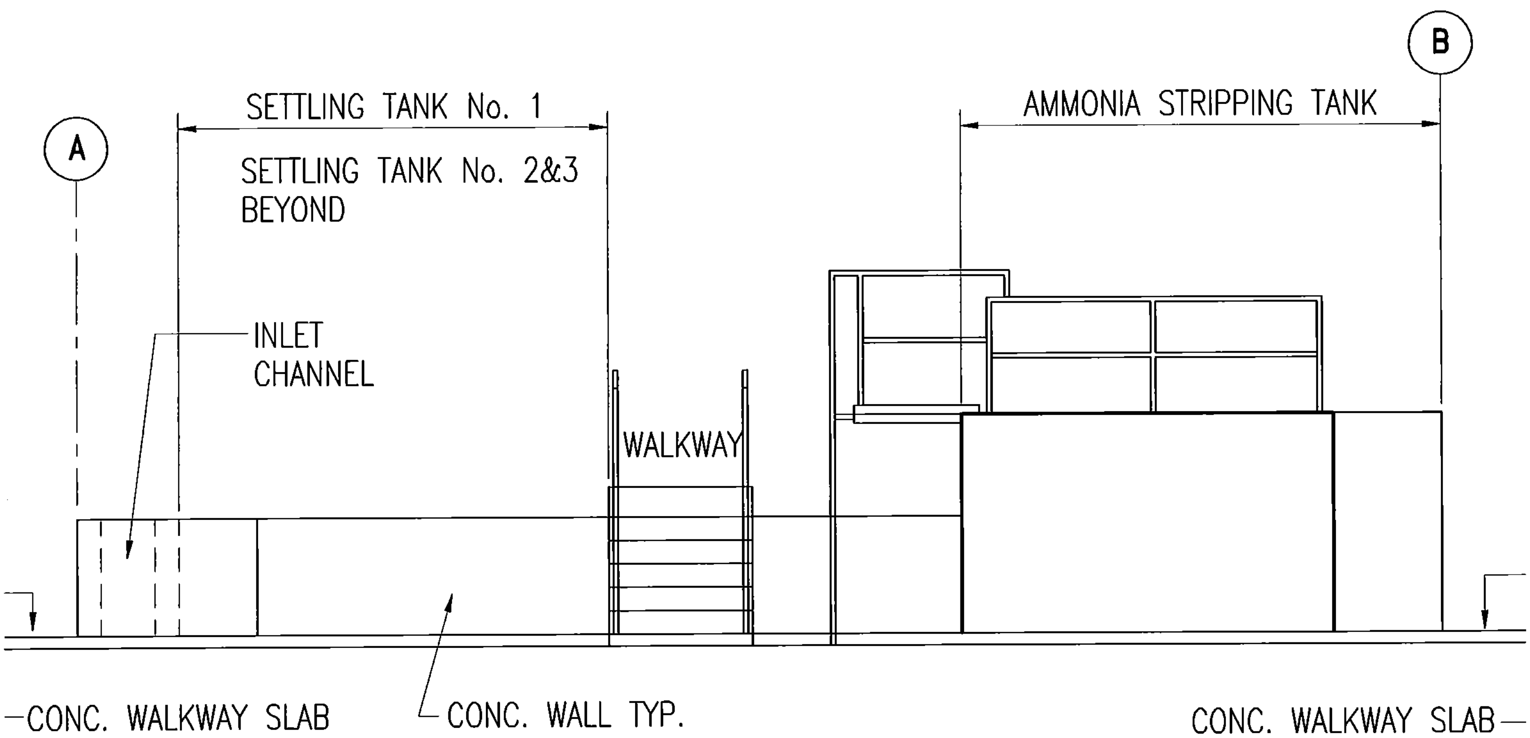


SCALE: 3/16"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	RAPID BLOCK UNIT CROSS SECTION	SK-4.2



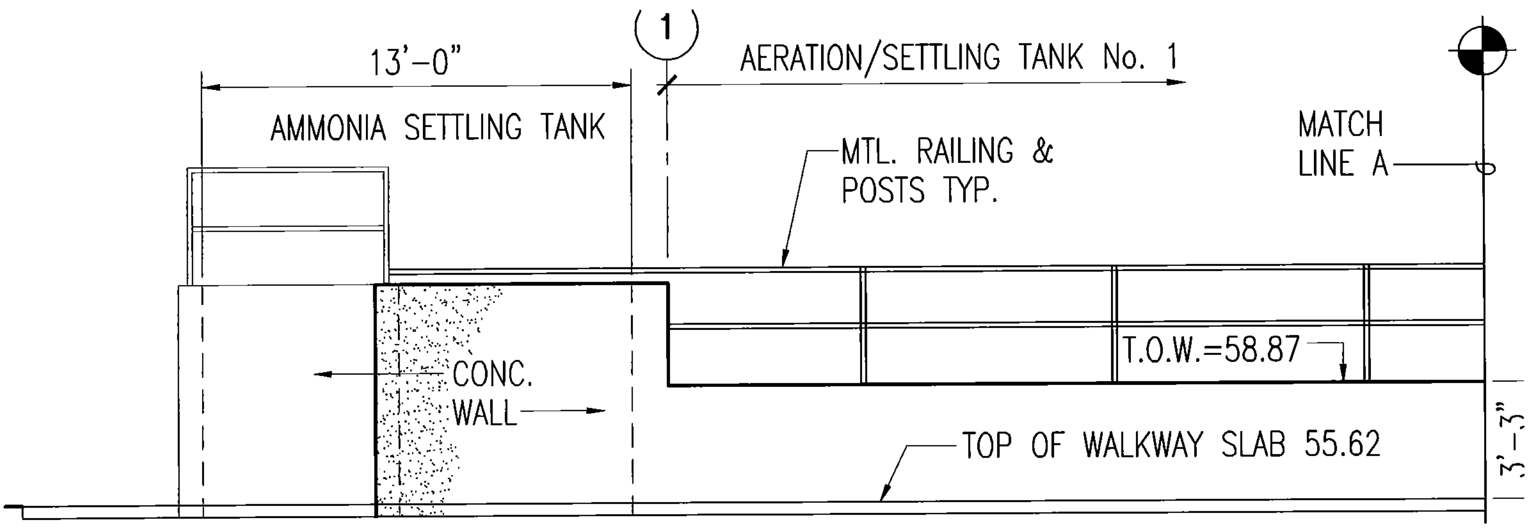
WEST ELEVATION

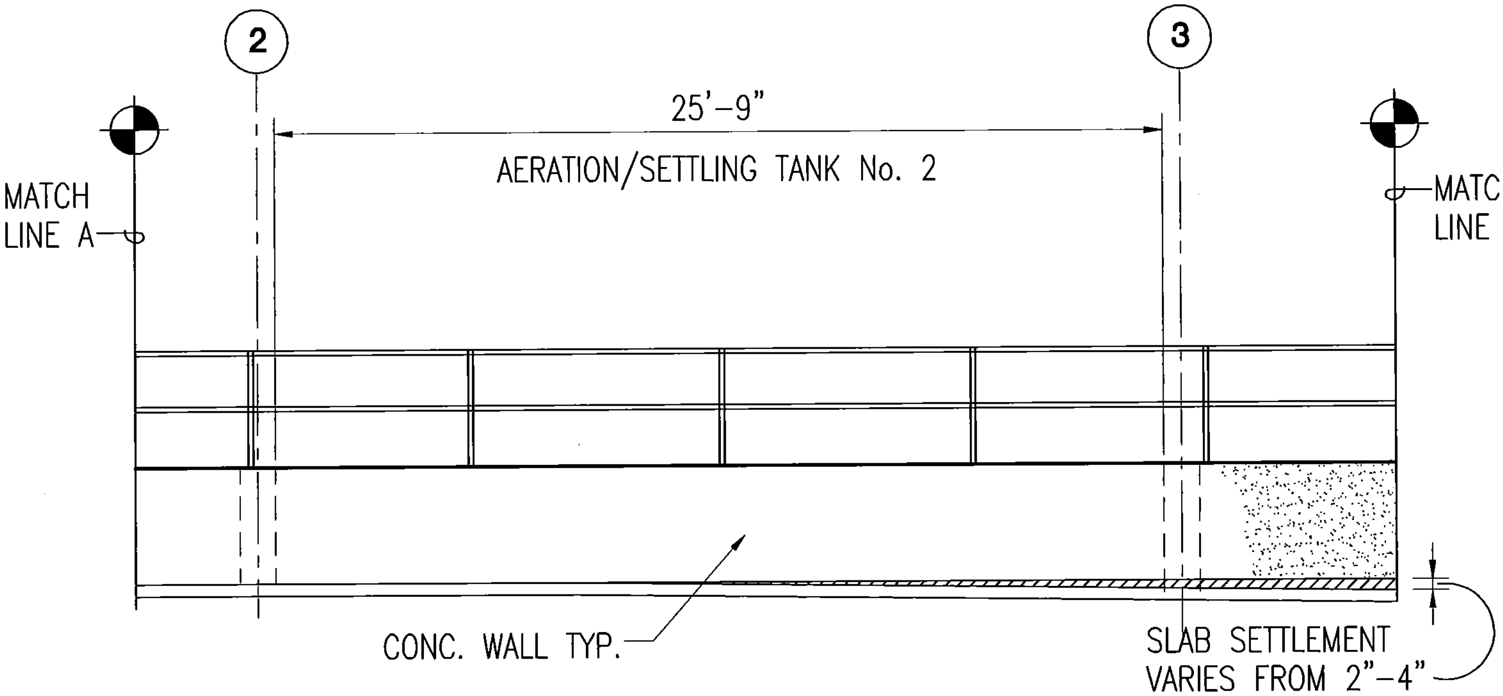


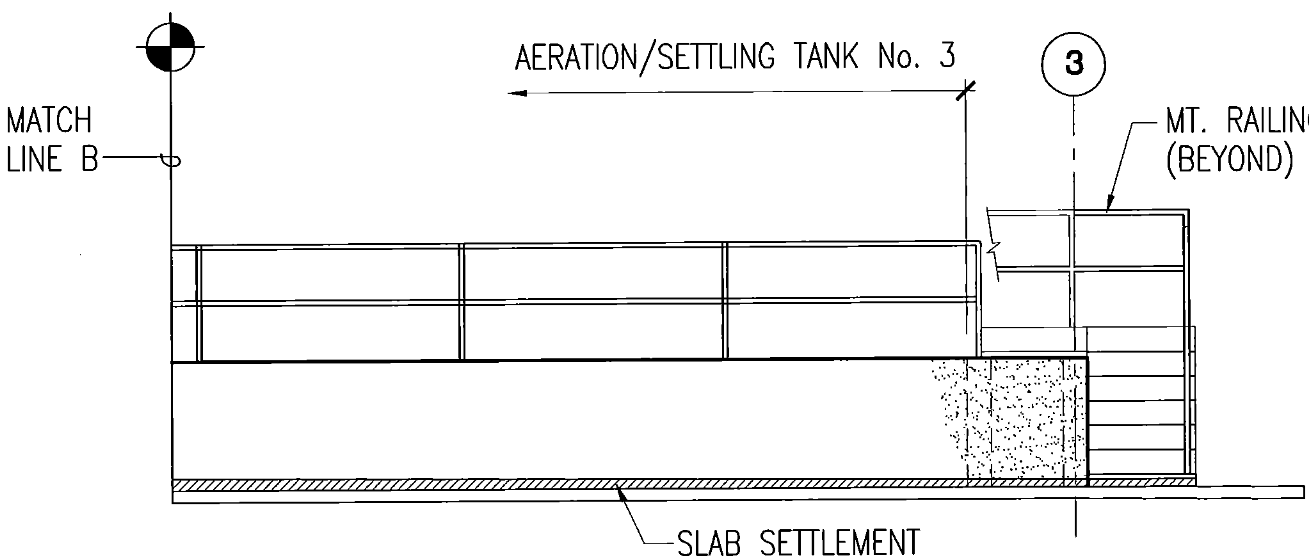
EAST ELEVATION

SCALE: 3/16"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	RAPID BLOCK UNIT EAST/WEST EXTERIOR ELEVATION	SK-4.4

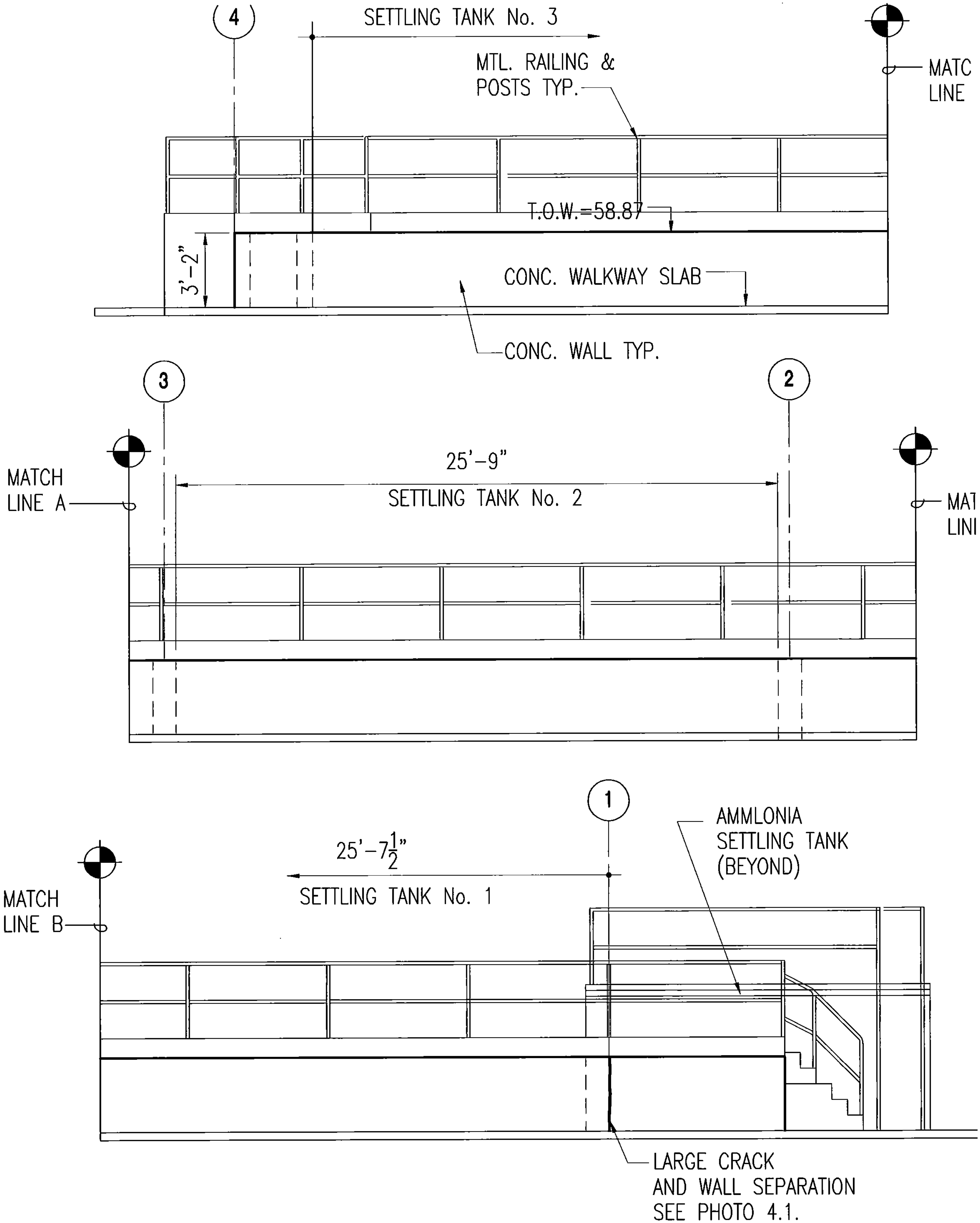






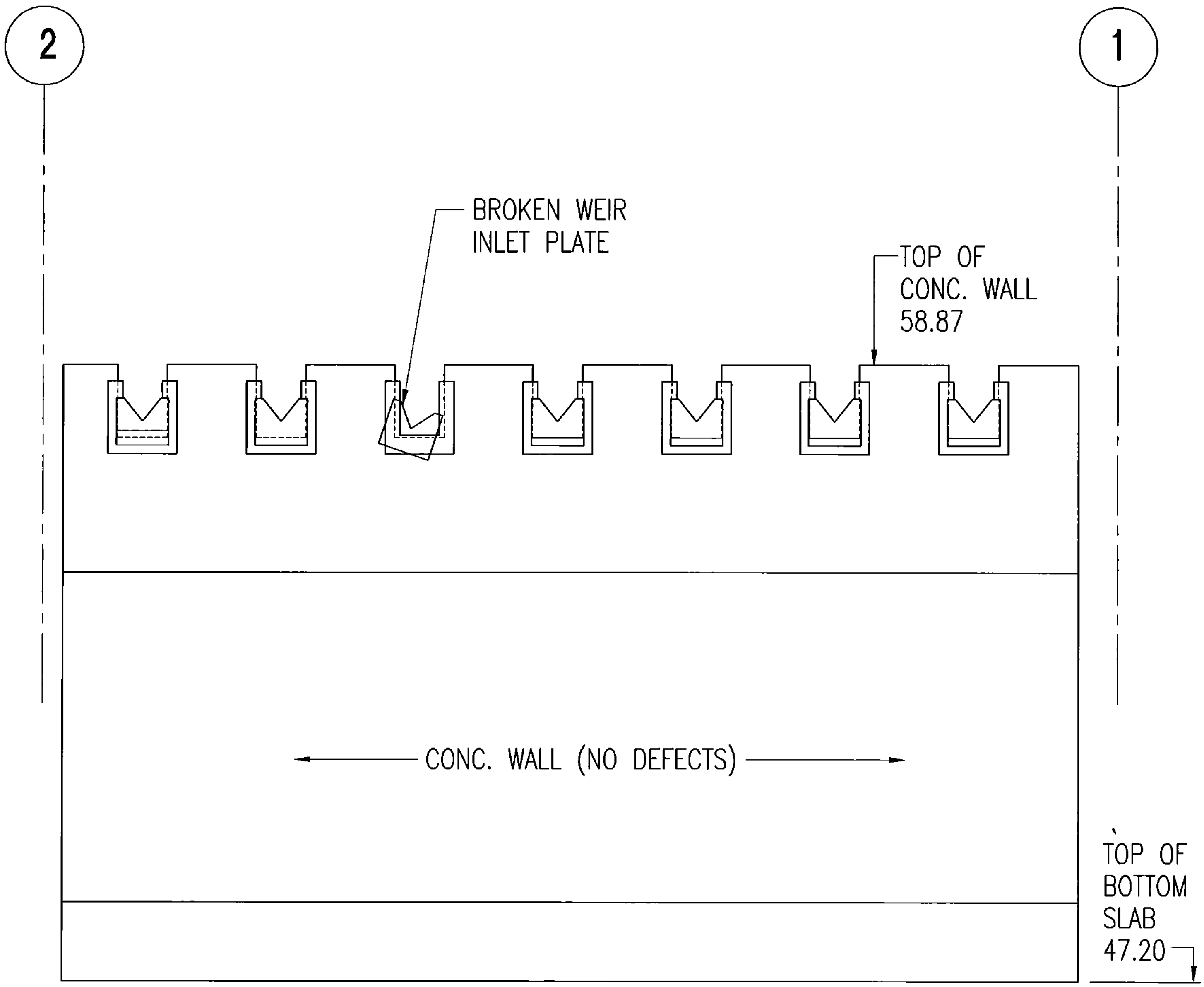
SCALE: 3/16"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	RAPID BLOCK UNIT NORTH EXTERIOR ELEVATION	SK-4.3



SCALE: 3/16"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	RAPID BLOCK UNIT SOUTH EXTERIOR ELEVATION	SK-4.5



SCALE: 1/4"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	RAPID BLK UNIT SETTLING TANK No. 1 INTERIOR ELEVATION A	SK-4.6

PHOTO 4.1 – EAST VIEW OF AMMONIA TANK

PHOTO 4.2 – EAST/SOUTH CORNER VIEW OF OUTLET CHANNEL

PHOTO 4.3 – CRACK ON OUTLET CHANNEL WALL SURFACE

PHOTO 4.4 – SOUTH/EAST CORNER OF OUTLET CHANNEL

PHOTO 4.5 – CATWALK AND AERATION TANK No. 3

PHOTO 4.6 - WEIR PLATES. NOTE DAMAGE ON ONE OF WEIR

PHOTO 4.7 – EAST VIEW. NOTE STEPS AND RAILING

PHOTO 4.8 – WEST/SOUTH CORNER. NOTE GROUND SETTLEMENT

PHOTO 4.9 – WEST VIEW IN FRONT OF CATWALK (BEYOND. NOTE GROUND SETTLEMENT

PHOTO 4.10 – SEVERE CRACK ON SIDEWALK

PHOTO 4.11 – NORTH VIEW OF STEPS & INLET CHANNEL NEXT TO AERATION TANK No. 3

PHOTO 4.12 – OVERFLOW TROUGH ON TOP OF SETTLING TANK

PHOTO 4.13 – SETTLING TANKS No. 2 & 3. NOTE PARTITION WALL

PHOTO 4.14 – CRACKS/PENETRATION TOP OF OUTLET CHANNEL WALL/SETTLING TANK No. 1 CRACK CONTINUES TO PHOTO 4.15

PHOTO 4.15 – WALL CRACKS

PHOTO 4.16 – NORTH VIEW OF INLET CHANNEL. NOTE GROUND SETTLEMENT/SEAPARATION AT BASE OF WALL

PHOTO 4.17 – MARK SHOWS HOLLOW SOUND DETECTED ON CHANNEL SLAB

PHOTO 4.18 – STANDING AT CATWALK TO VIEW AERATION TANK (LEFT) AND CORRODED GRATING ON AERATION TANK (RIGHT)


PHOTO 4.19 – CORRODED END OF RAILLING POST


PHOTO 4.20 – PIPE ON TOP OF SETTLING TANKS

Section 5 – Equalization Basin (EQ)

5.1 Description of structure

Based on the available drawings and other documents, the existing EQ is a concrete rectangular tank with plan dimensions of 55'-0" X54'-0". The EQ mainly consists of two (2) chambers. Chamber No.2 was inspected and evaluated in the year of 2014, while chamber No.1 was not available to be inspected due to operation conflict. See S5.1. The results of the previous inspection were contained in a report entitled as "Structural Evaluation Report" dated December 24, 2014. As of this date the final location of EQ was selected to remain on its existing location. The depth of the tanks is approximately 30'-3"meassurd from the top of footing at elevation 19.25 to top of EQ at 49.50. A 3'-0" thick bottom slab serving as a mat footing bears on 24" thick base course. With the surrounding grade at 46.5 the EQ structure is buried in 27' deep soil. The EQ structure was constructed with 3' thick perimeter walls, which are cantilevered from the base slab with the tops braced by precast concrete beams. Since over 90% of the EQ structure was buried in the soil it was unable to check on the condition of the exterior surfaces of the perimeter walls. The top of the tank was covered by removable FRP cover panels, which are supported by a series of precast concrete beams. PVC coating or T-lock lining was installed on all exposed interior concrete surfaces of walls, base slabs, and roof concrete beams. Epoxy coating was provided at the bottom of walls. See Sk-5.3, 5.4.

5.2 Existing conditions as observed

Due to the difficulty to access into the inside of EQ basin and time constrain we were not able to conduct field measurement and observation for the interior condition of the EQ basin in this project. The approach to repair and upgrade the structure as presented in this report are based on our experience and judgment on the results of the last time field observation. It is our opinion that the structural engineering approach as outlined in this report will not be much different for either treating the structure based on the condition revealed during in the last field observation or taking into a consideration that the current existing condition is worsening. To illustrate the existing interior condition of the basin a few text sections from the previous field observations report are reprinted below with verbiage slightly modified. Photos taken at previous field observation were also included at the end of this section.

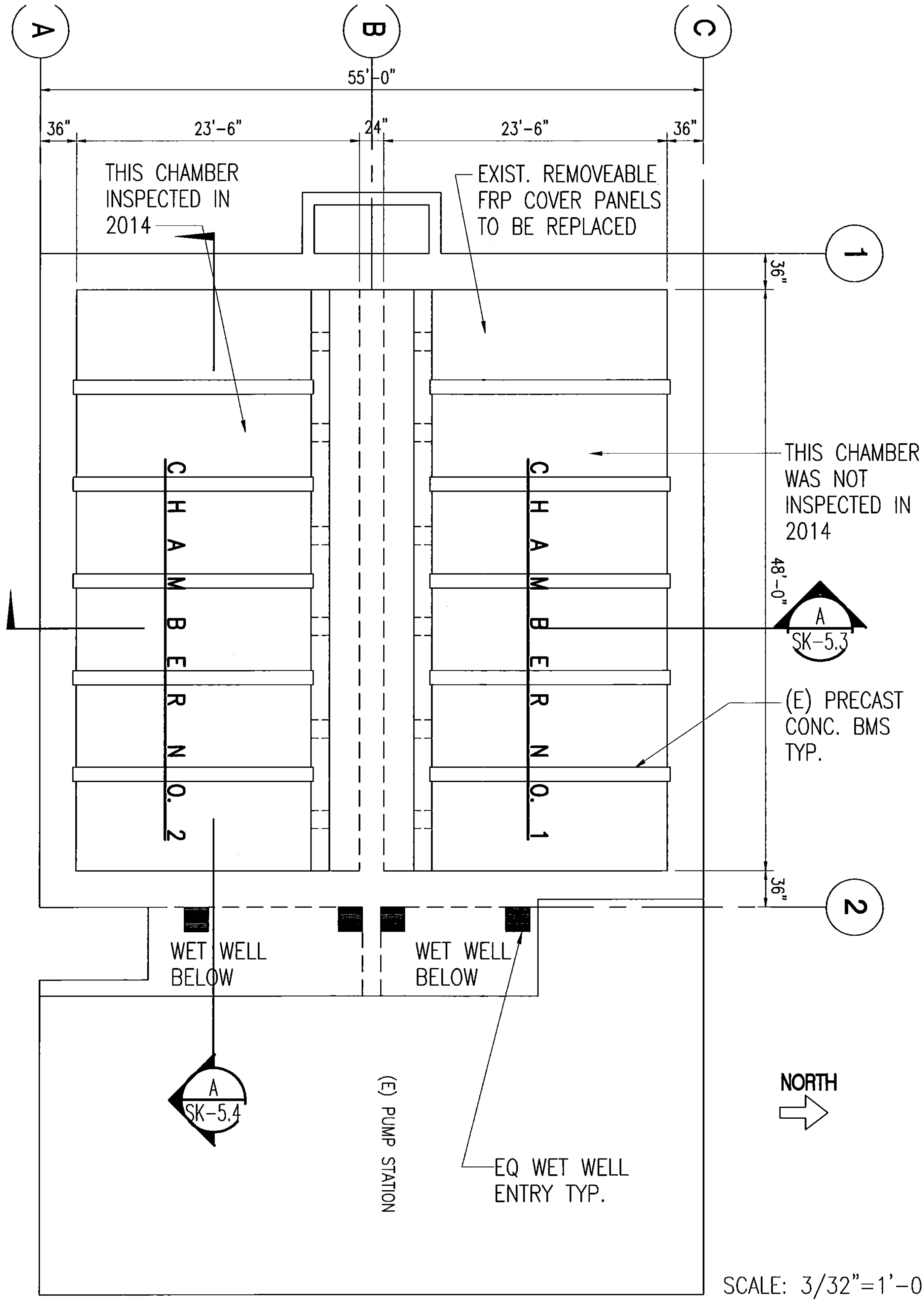
1. The tank structure appeared in fairly good condition. The thick walls and mat footing created an impression that the structure looked strong and sturdy. Concrete surfaces generally appeared sound. However, some damages were noted.
2. T-lock lining had bubbles, blistering, and was randomly delaminated from the concrete. Water existed between the T-lock and the concrete surface as dripping at the bottom of the lining was noted and water could be squeezed out from the T-lock joints. See photo 5.8,
3. Epoxy coating over the bottom portion of the T-lock was damaged and peeled off. Blistering was noted on the coating surfaces

4. Water infiltration was noted at a couple of spots on the floor slab and wall surfaces. See Photo 5.9, 5.10.
5. Corroded concrete and reinforcing bars were observed at gate opening.

5.3 Evaluation, recommendations, and estimated cost to refurbish.

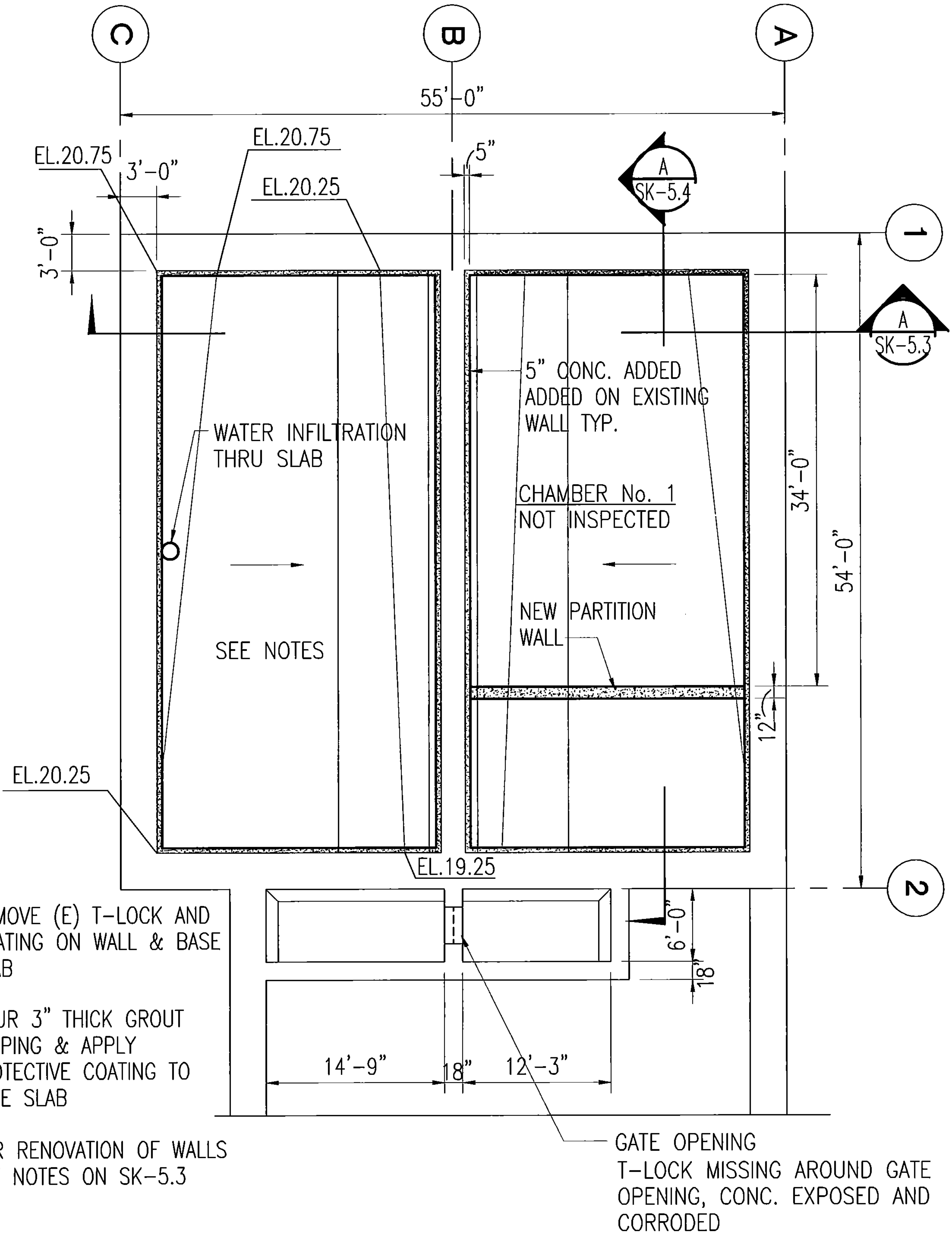
1. The existing EQ structure is at workable condition with reliable structural integrity. To maintain a good and long useful life and meet the design requirement for the future use the structure needs repairs and modified. We propose the following measures to be considered in the renovation and redesign of the EQ. These measures seem conservative compared to the recommendations presented in the previous report. They are proposed to minimize the unforeseen site conditions and aim to deliver a good quality structure that can last beyond 20 years of useful life with minimum maintenance cost.

   A. Remove the T-lock lining on the entire concrete surfaces including on the walls, the base slabs, and the precast concrete beams. Remove completely the epoxy coating on the walls. .
   B. Repair all corroded concrete surfaces and cracks after the coatings are removed.
   C. water infiltration on the walls and slab shall be sealed
   C. Rusted reinforcing bars shall be either repaired or replaced.
   D. Verify the condition of water stops at construction joints. Reconstruct the construction joints as needed.
   E. Add 5" thick of new concrete sections over all existing interior wall surfaces with proper reinforcement. The existing concrete surfaces that will receive new concrete shall be cleaned and sound. Hollow spots, if detected after the existing coating and T-lock are removed, shall be repaired.
   F. Construct new partition wall as required by other consultant.
   F. `Add a 3" thick reinforced grout topping on top of all base slabs. See SK-5.2.5.3.
   G. Apply new protective coating on the new concrete/grout topping surfaces.
   H. Verify the capacity of the EQ structure to resist the uplift buoyancy force to satisfy FEMA's requirement of flood elevation. (See section 1 of this report)
   I. Replace the entire removable roof panels on top of EQ basin structure.
2. Estimated structural construction cost to for above proposed items: $1,800,000.00 The applicability of the above proposed items should be verified with the City, and other consultants. The estimated cost is based on our best understating of "as it is" Condition of the existing structure.



SCALE: 3/32"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	PROPOSED RENOVATION OF EQ. BASIN/WET WELL TOP PLAN	SK-5.1



NOTES:

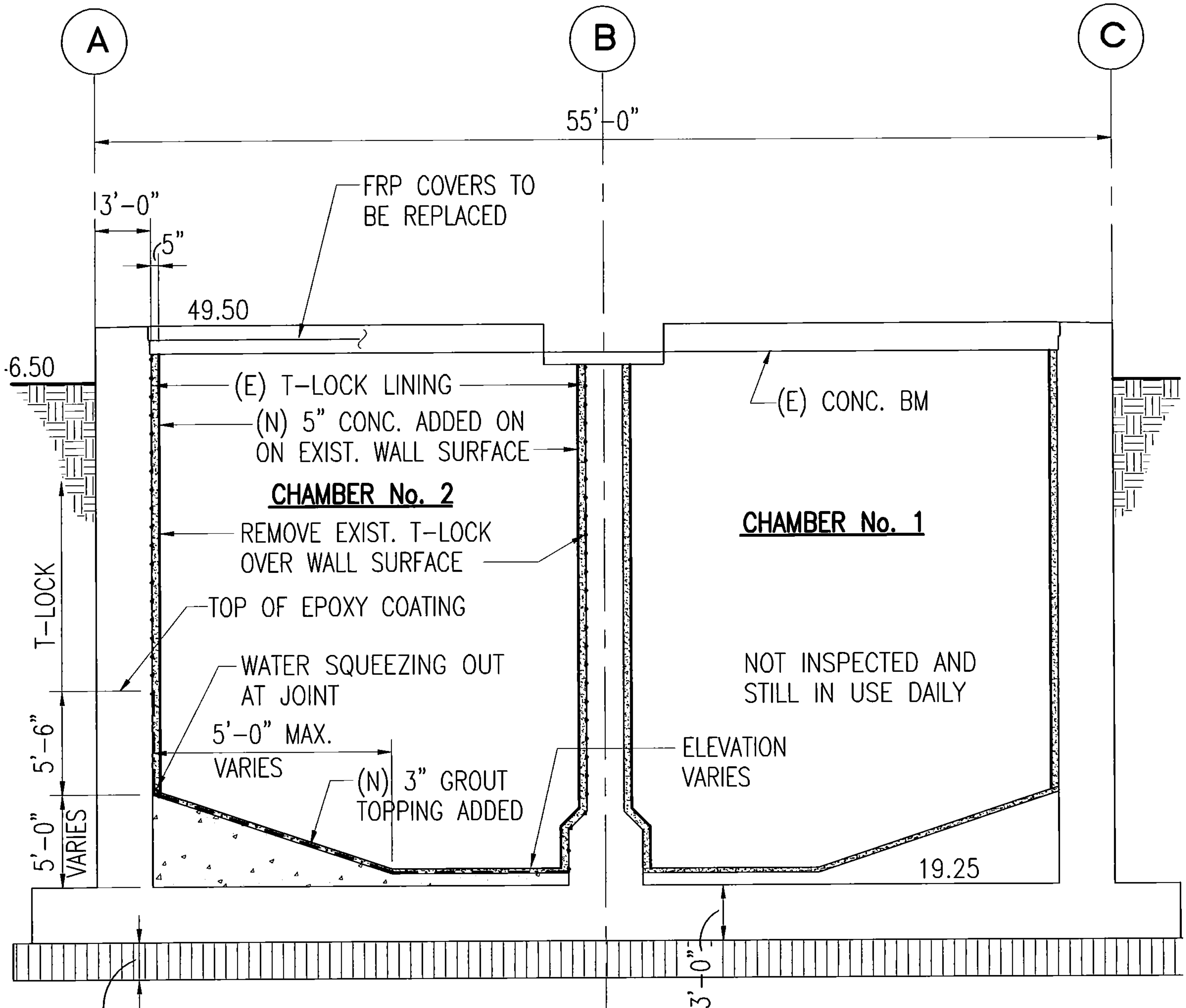
1. REMOVE (E) T-LOCK AND COATING ON WALL & BASE SLAB

2. POUR 3" THICK GROUT TOPPING & APPLY PROTECTIVE COATING TO BASE SLAB

3. FOR RENOVATION OF WALLS SEE NOTES ON SK-5.3

SCALE: 3/32"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	PROPOSED RENOVATION OF EQ. BASIN BOTTOM SLAB PLAN	SK-5.2

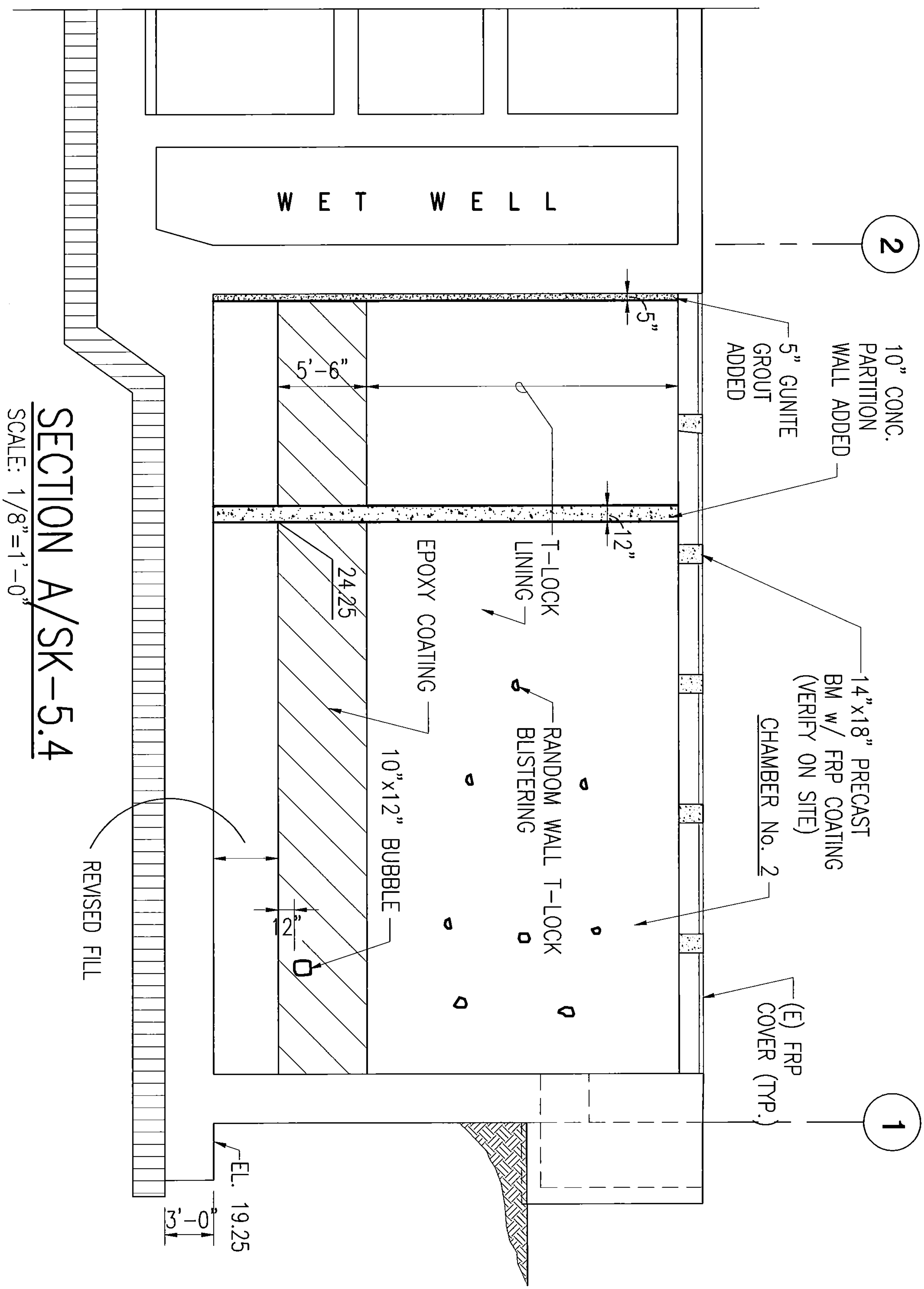


NOTES:

1. REMOVE (E) T-LOCK ON ALL WALL & BEAM SURFACE
2. ADD 5" THICK CONC. ON EXIST. WALL
3. APPLY PROTECTIVE COATING ON ALL EXPOSED WALL & BEAM SURFACES
4. SEE NOTES ON SK-5.2 FOR RENOVATION OF BASE SLAB

SECTION A/SK-5.3
SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	PROPOSED RENOVATION OF EQ. BASIN SECTION A	SK-5.3



AHUIMANU WWPTF IMPROVEMENTS	PROPOSED RENOVATION OF EQ. BASIN LONGITUDINAL SECTION A	SK-5.4

PHOTO 5.1 REMOVEABLE FRP COVERS ON TOP OF EQ

PHOTO 5.2 PIPE PENETRATION ON WALL

PHOTO 5.3 - BOTTOM OF WALL SHOWING T-LOCK & EPOXY COATING

PHOTO 5.4 – EXISTING T-LOCK. NOTE JOINT OF T-LOCK

PHOTO 5.5 – PIPE ON BOTTOM SLAB AND GATE. NOTE RUNGS DAMAGE AND BLISTERING/BUBBLES ON T-LOCK

PHOTO 5.6 – ENTRY OPENING FROM TOP OV COVER PANELS

PHOTO 5.7 – T-LOCK JOINTS/SPLICE

PHOTO 5.8 – BLISTERING AND BUBBLE ON T-LOCK AND BLISTERING FROM JOINT

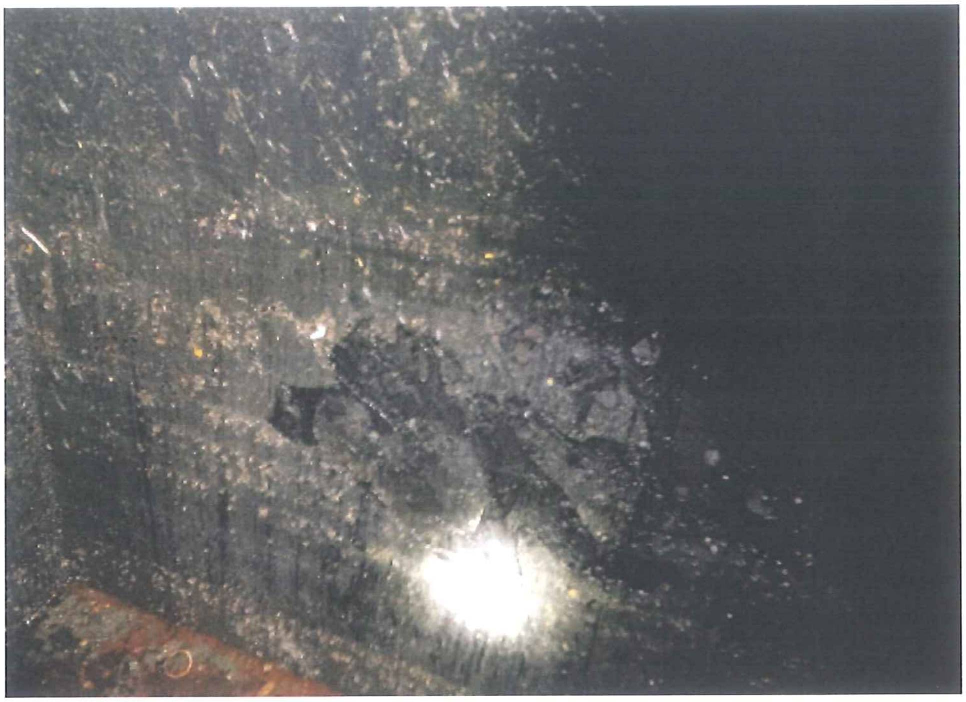


PHOTO 5.9 – WATER PENETRATION ON WALL

PHOTO 5.10 – WATER PENETRATION

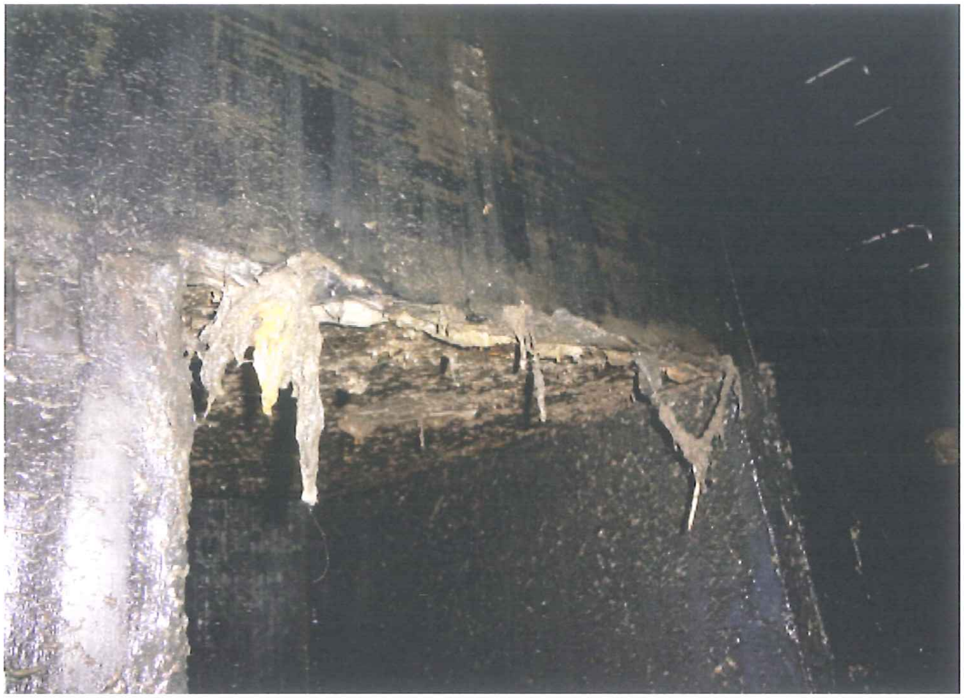


PHOTO 5.11 – CONCRETE DAMAGES AROUND GATE OPENING

Section 6 – Headworks

6.1 Description of Project site

Located at the Northern end of the Ahuimanu WWPTF, the existing Headworks is a single story, rectangular shape concrete structure with approximate dimensions of 86'-9" X 26'-0". Situated out of the 100 - year flood zone boundary the Headworks structure is not required to follow FEMA's requirement for higher ground water level. Cantilevered from the base slab, the perimeter walls retained about 12 feet deep of soil. The walls with thickness varying from 12" to 18" are sitting on 12" thick base slab, which serves as a foundation bearing on 24" thick base course. The construction of the Headworks structure could be traced back at around the early 60's. Being an aged facility the structure has exhibited deteriorations, which will be briefly described in the next sections. To meet current operational and functional requirements, the Headworks will be renovated and upgraded. See Sk-6.1 through SK-6.4.

6.2 Existing conditions

There was no structural field observation and investigation conducted for Headworks. Existing conditions outlined below were provided by RMTC.

1. The entire Headworks structure appeared operational and functional without severe damages. The foundation appeared sound with no significant movement.
2. The interior T-Lock protective vinyl sheets were delaminated and damaged. Random concrete surfaces were exposed and deteriorated with rebars rusted.
3. Several watermarks were noted to exhibit possible water infiltration through the walls.
4. The top cover panels were damaged and deteriorated.

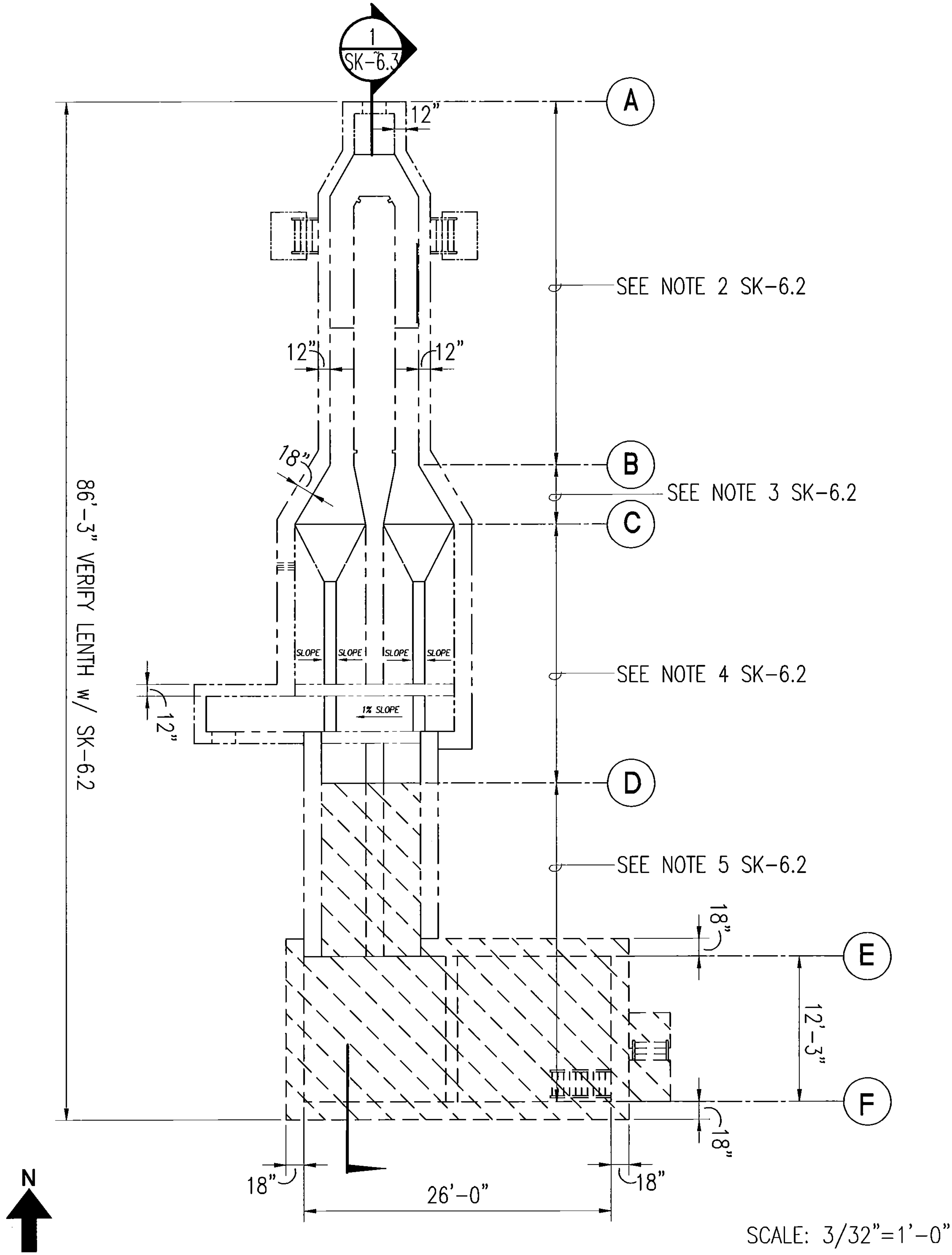
See photos 6.1 through 6.4.

6.3 Evaluation, Recommendations, and estimated structural cost

RMTC proposed a renovation plan to upgrade the existing Headworks. The following represents our opinions and recommendations from the structural engineer's point of view in this project:

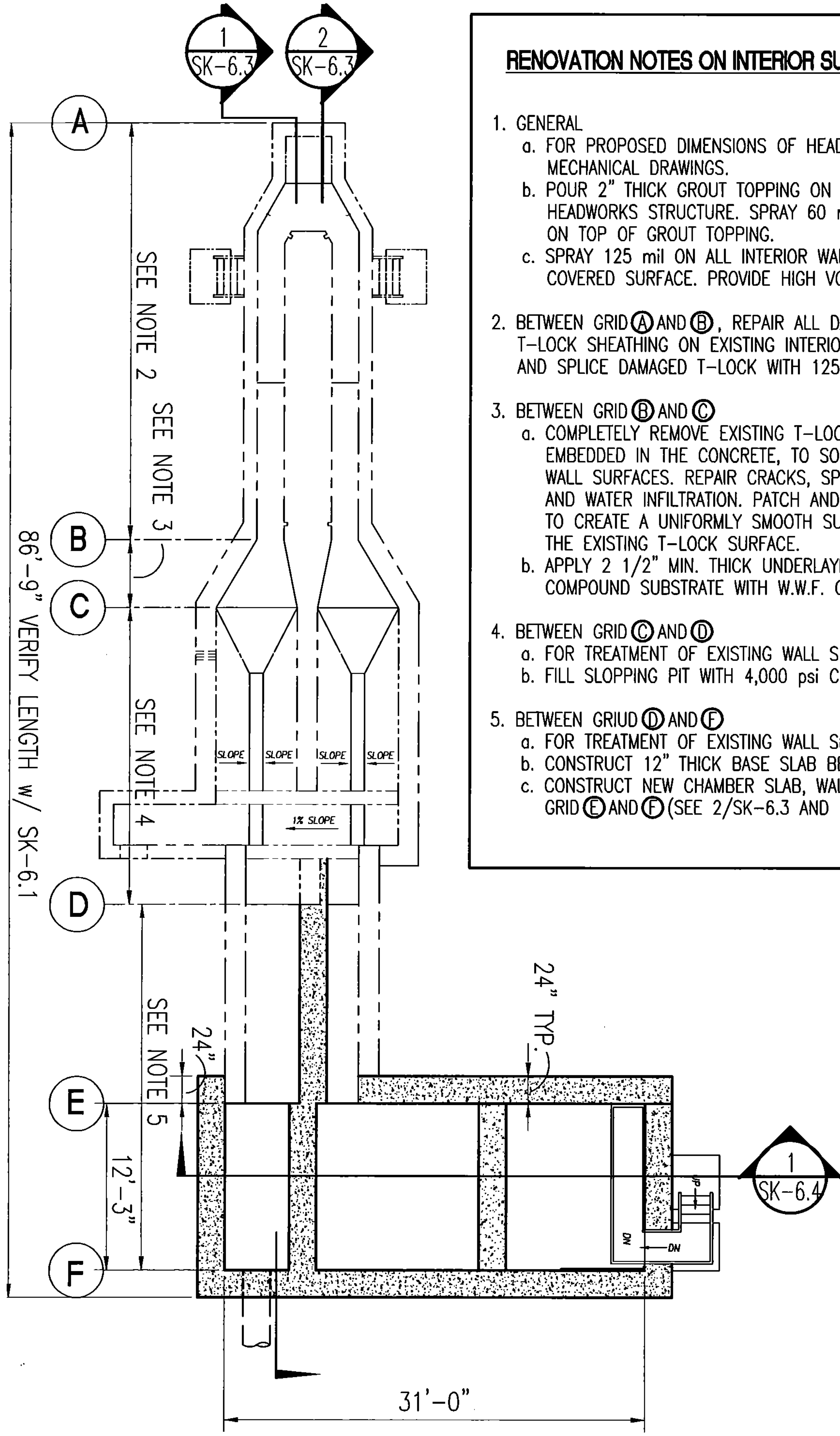
1. The existing structure is basically sound to sustain the renovation and upgrading. The Majority portion of the existing structure can be salvaged and remain workable.
2. See "Renovation Notes on Interior surfaces of Headworks" and related sketches on SK-6.2
3. At the South end of Headworks demolish and reconstruct the entire 12'-3" X26'-0" X approximately 8' deep Headcell chamber including all walls and foundation footing. See SK-6.1 through SK-6.4.

4. Repair all cracks, spalls, rusted rebars, and water infiltrations where occur on existing exterior walls and slabs.
5. Repair or re-construct all top panels.
6. Repair or reconstruct damaged/rusted metal railings, gratings, and steel stairs.
7. For the items of renovations and upgrading as aforementioned, the estimated structural cost is $1,600,000.
8. Prior to proceeding the final design an in-depth field observation to the Headworks structure shall be conducted to verify the updated conditions and the applicability of these recommendations.



SCALE: 3/32"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	HEADWORKS EXISTING FLOOR PLAN	SK-6.1



RENOVATION NOTES ON INTERIOR SURFACES OF HEADWORKS

1. GENERAL
   a. FOR PROPOSED DIMENSIONS OF HEADWORKS BLDG NOT SHOWN SEE MECHANICAL DRAWINGS.
   b. POUR 2" THICK GROUT TOPPING ON THE BOTTOM SLAB OF THE ENTIRE HEADWORKS STRUCTURE. SPRAY 60 mil MINIMUM PROTECTIVE COATING ON TOP OF GROUT TOPPING.
   c. SPRAY 125 mil ON ALL INTERIOR WALL SURFACES EXCEPT THE T-LOCK COVERED SURFACE. PROVIDE HIGH VOLTAGE SPARK TESTS AS REQUIRED.

2. BETWEEN GRID A AND B, REPAIR ALL DAMAGED EXISTING CONCRETE AND T-LOCK SHEATHING ON EXISTING INTERIOR WALL SURFACES. REPAIR, PATCH, AND SPLICE DAMAGED T-LOCK WITH 125 mil PROTECTIVE COATING.

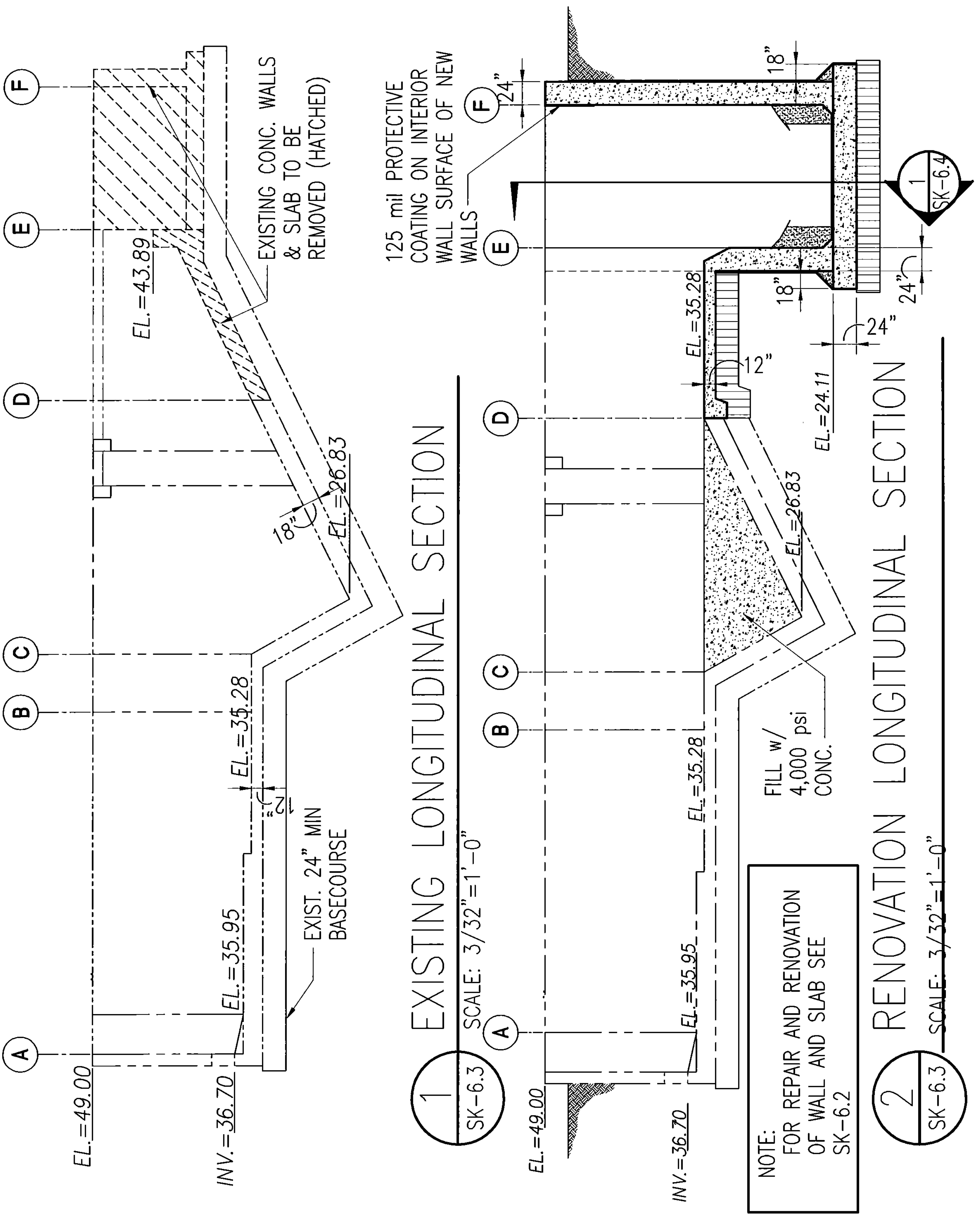
3. BETWEEN GRID B AND C
   a. COMPLETELY REMOVE EXISTING T-LOCK SHEATHING, INCLUDING KEYS EMBEDDED IN THE CONCRETE, TO SOUND CONCRETE ON THE INTERIOR WALL SURFACES. REPAIR CRACKS, SPALLS, RUSTED REBARS, WATER STOP, AND WATER INFILTRATION. PATCH AND FILL VOIDS WITH FILLER COMPOUND TO CREATE A UNIFORMLY SMOOTH SUBSTRATE SURFACE THAT MATCHES THE EXISTING T-LOCK SURFACE.
   b. APPLY 2 1/2" MIN. THICK UNDERLAYMENT MATERIAL ON THE FILLER COMPOUND SUBSTRATE WITH W.W.F. OR SMALLER SUZE REBARS.

4. BETWEEN GRID C AND D
   a. FOR TREATMENT OF EXISTING WALL SURFACES SEE NOTE 3.
   b. FILL SLOPPING PIT WITH 4,000 psi CONCRETE.

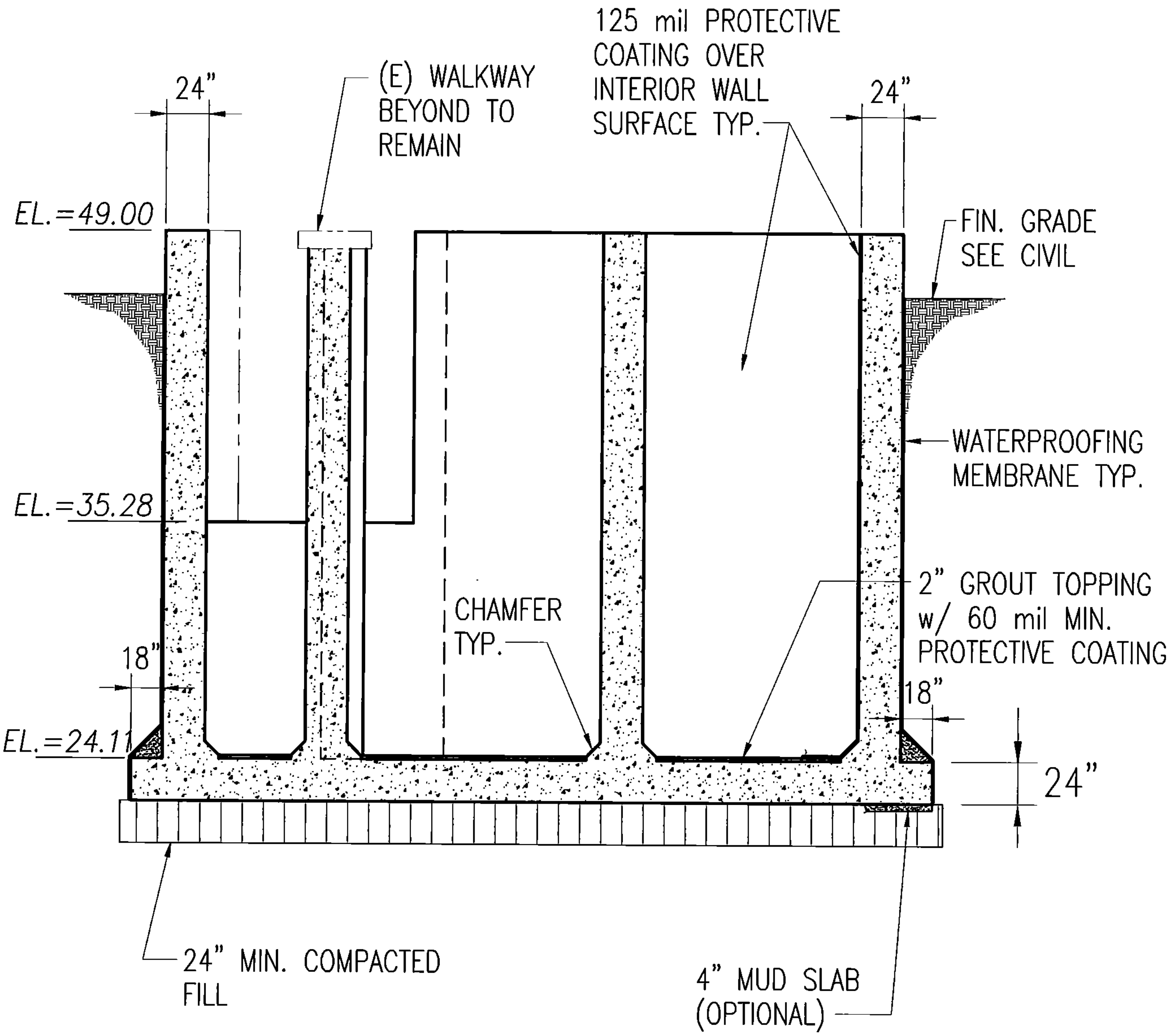
5. BETWEEN GRIUD D AND F
   a. FOR TREATMENT OF EXISTING WALL SEE NOTE 3.
   b. CONSTRUCT 12" THICK BASE SLAB BETWEEN D & E (SEE 2/SK-6.3)
   c. CONSTRUCT NEW CHAMBER SLAB, WALLS, AND FOUNDATION BETWEEN GRID E AND F (SEE 2/SK-6.3 AND 1/SK-6.4).

SCALE: 3/32"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	HEADWORKS RENOVATION FLOOR PLAN	SK-6.2



AHUIMANU WWPTF IMPROVEMENTS	HEADWORKS EXISTING & RENOVATED LONGITUDINAL SECTION	SK-6.3



1 SK-6.4 RENOVATION CROSS SECTION

SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	HEADWORKS RENOVATION CROSS SECTION	SK-6.4

PHOTO 6.1 – HEADWORKS SOUTH EXTERIOR ELEVATION

PHOTO 6.2 – HEADWORKS NORTH EXTERIOR ELEVATION

PHOTO 6.3 - HEADWORKS EAST EXTERIOR ELEVATION

PHOTO 6.4 – CONCRETE DAMAGED AND COATING PEELED OFF

Section 7 – Influent Pump Station (IPS)

7.1 Description of Project site

Located at the Eastern side of the Ahuimanu WWPTF, the existing IPS is a two story, square shape concrete structure, that consists a 33'-4"X 33'-4" pump station floor on the top and a 12'-6"X 33'-4" wet well below the South side of the pump station floor. The perimeter walls of the top floor were constructed of CMU while the wet well walls were concrete.
After the original IPS was constructed another single room and an open shed were added on to the North side of the pump floor, (SK-7,1)
Situated within the 100-year floor zone boundary, The IPS structure will encounter 51' MSL, which should be considered during the renovation and modification of the building.
A gently sloped flat roof was constructed above the pump station floor. Light gage or wood roofs were seen on top of the added portion. (SK7-2)

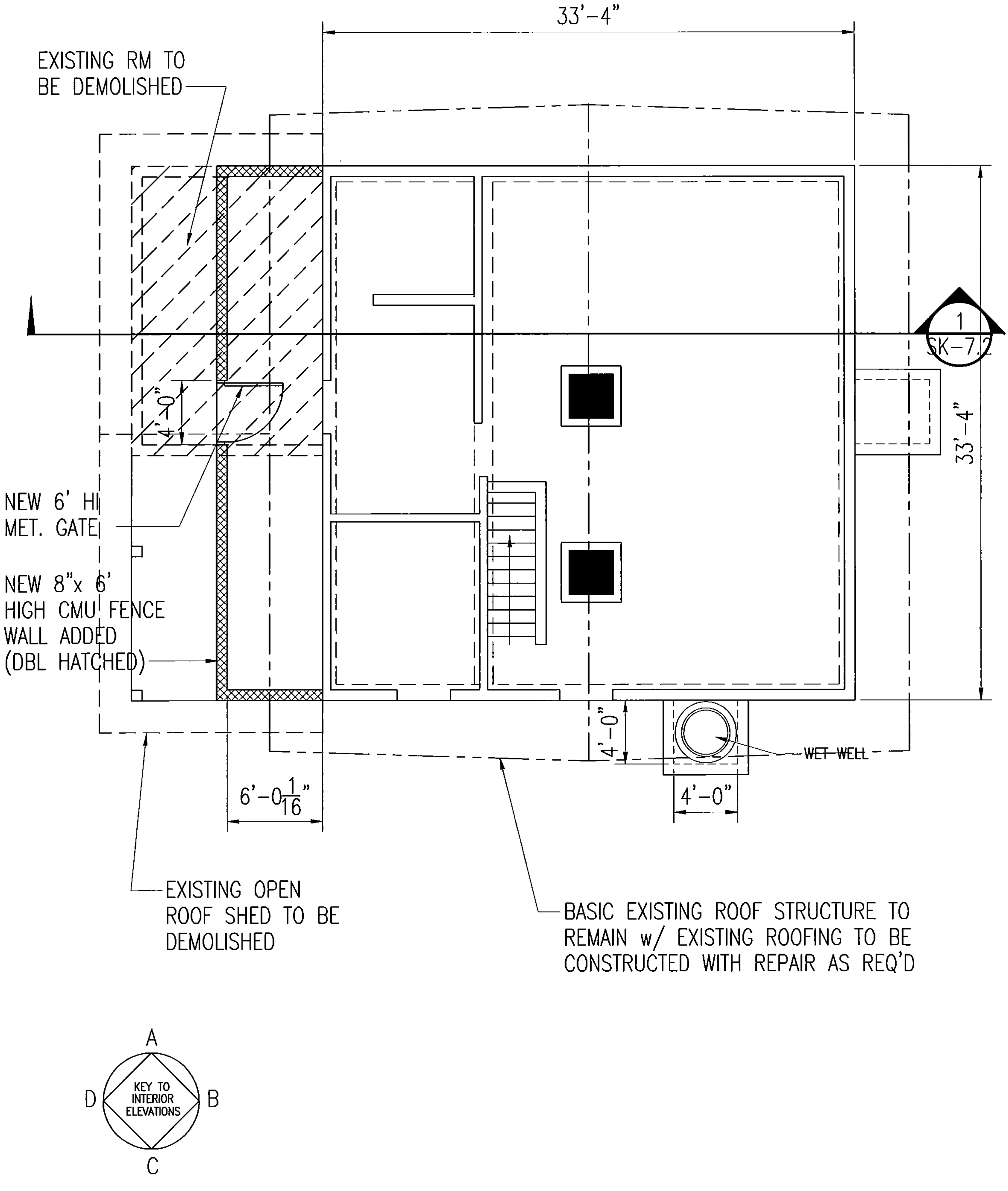
7.2 Existing conditions

There was no structural field observation and investigation conducted for IPS building. Existing condition of the IPS floor was observed by RMTC and briefly described below. However, the condition of Wet well was discussed in the previous field observation report. Photos 7.1 through photo 7.4.

1. The IPS floor was in workable condition. It did not require special repair
2. The main roof over the pump station floor was leaking and appeared aged.
3. The added room and open shed were deteriorated. RMTC feels that they can be abandoned.

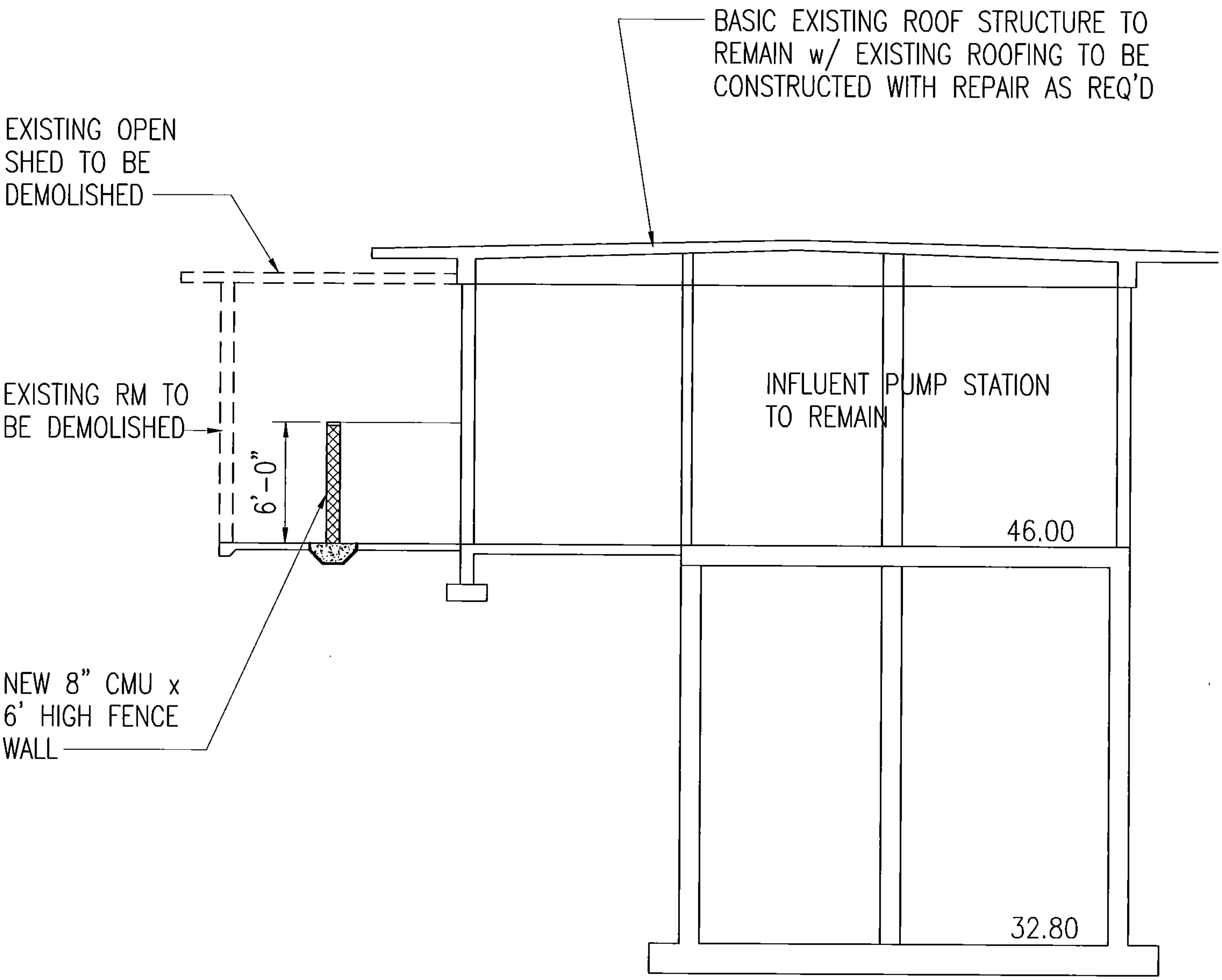
7.3 Evaluation, Recommendations, and estimated structural cost

1. The existing IPS floor is in operable condition without special repair.
2. The structure of existing roof over IPS station floor can be salvaged with some repair and paint, However, the existing roofing shall be completely replaced or re-constructed.
3. The added room and open shed super structure shall be completely removed. However, the existing slabs on grade can be salvaged
4. Considering the potential high flood level, which may be 3 to 4 feet higher than the surrounding grade we recommend building a 6 feet tall CMU protection walls on the North side of the building. SK-7.1 and SK-7.2. This wall can be founded on the existing slab on grade.
5. For the aforementioned work we estimate a structural cost of $100,000



SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	INFLUENT PUMP STATION/WET WELL GROUND FLOOR PLAN	SK-7.1



1 CROSS SECTION
SK-7.2
SCALE: 1/8"=1'-0"

AHUIMANU WWPTF IMPROVEMENTS	INFLUENT PUMP STATION/WET WELL CROSS SECTION	SK-7.2

PHOTO 7.1 – NORTH EXTERIOR ELEVATION OF IPS

PHOTO 7.2 – PARTIAL EAST INTERIOR ELEVATION AT GROUND FLOOR PLAN

PHOTO 7.3 – BOTTOM PLAN

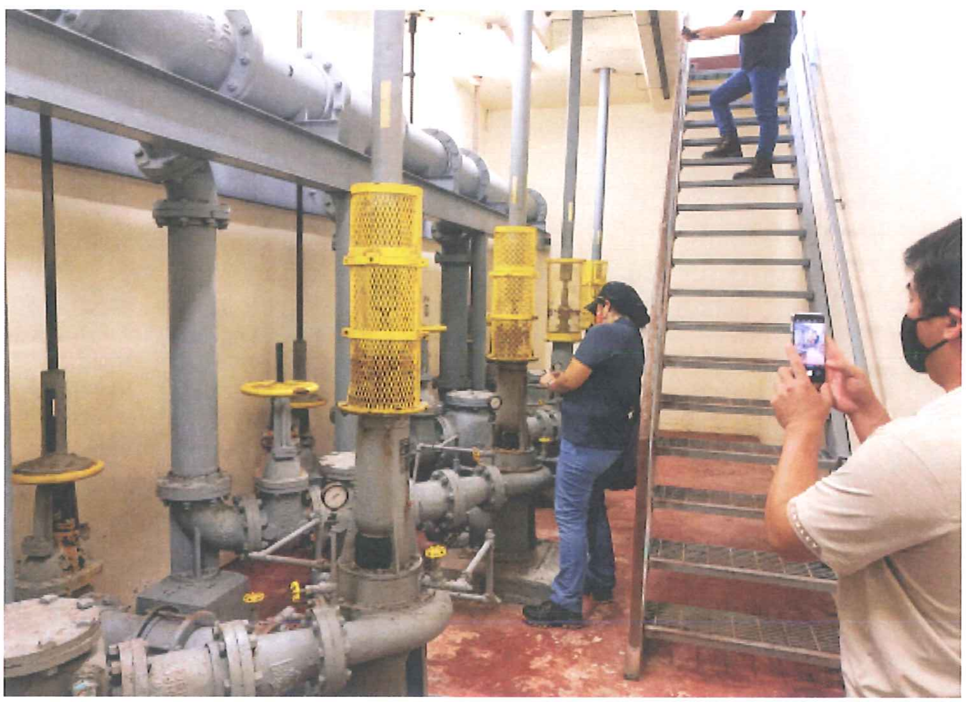


PHOTO 7.4 – BOTTOM PLAN

Appendix C

Pre-Assessment Consultation Letters Received

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DAVID Y. IGE
GOVERNOR OF HAWAII

ELIZABETH A. CHAR, 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:

January 18, 2022

Jaime Nishikawa, MS, P.E., LEED AP
R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, HI 96819
jaimen@rmtowill.com

Dear Mr. Nishikawa:

Thank you for your submittal requesting comments to the Draft Environmental Assessment Ahuimanu Wastewater Pre-Treatment Facility (WWPTF) Improvements and Equalization Facility Tax Map Key: (1) 4-7-004:006 (por.).

Project activities shall comply with the following Administrative Rules of the Department of Health:

- Chapter 11-39 Air Conditioning & Ventilating
- Chapter 11-41 Lead-based Paint Activities
- Chapter 11-45 Radiation Control
- Chapter 11-46 Community Noise Control
- Chapter 11-501 Asbestos Requirements
- Chapter 11-504 Asbestos Abatement Certification Program

Should you have any questions, please contact me at (808) 586-4700.

Sincerely,

Thomas G. Lileikis
Program Manager
Indoor and Radiological Health Branch

From: JK <jtkaneshiro@gmail.com>
Sent: Tuesday, January 18, 2022 1:47 PM
To: Jaime Nishikawa <jaimen@rmtowill.com>
Subject: Pre-Assessment Consultation for Draft EIS TML: 4-7-004:006

CAUTION: External Email

I have received the notice regarding the aforementioned project. I am a resident residing across from the Facility on Hui Koloa Place.

In general, I am in support of the project being proposed provided it meets all the necessary requirements of the federal, state, and county ordinances. I am aware of the age of these facilities being a long-time resident in Kaneohe.

According to the notice, it appears many of the equipment and machinery doesn't appear to function as it should requiring its replacement(s). However, there wasn't any information provided to indicate if the proposed replacements have taken into account changes in the community such as population growth, traffic, and developments. I am assuming they have been and the capacities of the facilities have been adjusted.

I know the property have been cleared recently of the trees. A temporary access was created to transport the cuttings that at times tied up traffic rather than utilizing the existing access probably due to on-site logistics. I assume this access will continue until the project is completed but not beyond that as it is not at the traffic light. I am sure the EIS will address any potential run-off from the parcel now that the tree are no longer there and will not cause flooding or blockage of Kahaluu Stream or Kahekili Highway.

I do not expect a direct response from your firm; just wanted to sure that my comments were already or will be considered.

Thank you for the opportunity.

Sincerely,

John Kaneshiro
47-335 Hui Koloa Pl.
Kaneohe, HI 96744

Sent from Mail for Windows

DISABILITY AND COMMUNICATION ACCESS BOARD

1010 Richards Street, Room 118 • Honolulu, Hawaii 96813
Ph. (808) 586-8121 • Fax (808) 586-8129

January 27, 2022

Ms. Jaime Nishikawa
Environmental Project Coordinator
R.M. Towill Corporation
2024 North King Street
Suite 200
Honolulu, HI 96819-34370

Regarding: Pre-Assessment Consultation for Draft Environmental Assessment, Ahuimanu Wastewater Pre-Treatment Facility (WWPTF) Improvements and Equalization Facility
Tax Map Key: (1) 4-7-004:006 (por.)

Dear Ms. Nishikawa:

The Disability and Communication Access Board (DCAB) would like to thank you for the opportunity to review and comment on the Draft Environmental Assessment for the Ahuimanu Wastewater Pre-Treatment Facility Improvements and Equalization Facility Project. The purpose of DCAB's review is to ensure that this project will take into account accessibility design requirements for persons with disabilities.

Because this project is being constructed on City & County land, it is covered by §103-50, Hawaii Revised Statutes (HRS). Construction of the Ahuimanu Wastewater Pre-Treatment Facility Improvements and Equalization Facility Project is required to comply with the Department of Justice's (DOJ) 2010 ADA Standards for Accessible Design (2010 Standards) http://www.ada.gov/2010ADAstandards_index.htm. To be consistent with the DOJ's standard, DCAB adopted the 2004 Americans with Disabilities Act Accessibility Guidelines (ADAAG) as of January 1, 2011 and passed interpretive opinions consistent with the 2010 ADA Standards. All new Interpretive Opinions can be viewed or downloaded at http://health.hawaii.gov/dcab/facility-access/interpretive-opinions/.

If this project is receiving federal funds, it will also have to comply with the requirements under Section 504 of the Rehabilitation Act, but this is not included in the DCAB review process. If you have any questions regarding your obligations under Section 504 of the Rehabilitation Act, you should contact the federal agency that is providing federal funds for your project.

Projects with construction documents that are covered by §103-50, HRS, are required to be submitted to DCAB for a formal document review. DCAB's review for this proposed project will include employee and public spaces.

Beyond DCAB's review process, program access obligations must be met under the ADA Title II provisions. This obligation may require additional means to provide access, especially where full compliance with the 2010 Standards cannot be achieved.

The above reflects DCAB's staff review and comments concerning the Draft Environmental Assessment for the Ahuimanu Wastewater Pre-Treatment Facility Improvements and Equalization Facility Project.

Should you have any further questions, please feel free to contact Duane Buote, Facility Access Coordinator at (808) 586-8121.

Sincerely,

Kristine Pagano

for KIRBY L. SHAW
Executive Director

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

RICK BLANGIARDI
MAYOR

ALEX KOZLOV, P.E.
DIRECTOR

HAKU MILLES, P.E.
DEPUTY DIRECTOR

January 28, 2022

SENT VIA EMAIL

Jaime Nishikawa
jaimen@rmtowill.com

Dear Jaime:

Subject: Pre-Assessment Consultation for Draft Environmental Assessment
Ahuimanu Wastewater Pre-Treatment Facility (WWPTF)
Improvements and Equalization Facility
TMK: (1) 4-7-004:006 (por.)

Thank you for the opportunity to review and comment. The Department of Design and Construction has no comments to offer at this time.

Should you have any further questions, please contact me at (808) 768-8480.

Sincerely,

for Alex Kozlov, P.E.
Director

AK:krn (871803)

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

RICK BLANGIARDI
MAYOR

SHELDON K. HAO
FIRE CHIEF

JASON SAMALA
DEPUTY FIRE CHIEF

January 28, 2022

Mr. Jaime Nishikawa, MS, P.E., LEED AP
Environmental Project Coordinator
R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819-3470

Dear Mr. Nishikawa:

Subject: Preassessment Consultation for an Environmental Assessment
Ahuimanu Wastewater Pretreatment Facility
Improvements and Equalization Facility
Kaneohe, Hawaii 96744
Tax Map Key: 4-7-004: 006 (Portion)

In response to your letter dated January 13, 2022, regarding the abovementioned subject, the Honolulu Fire Department reviewed the submitted information and determined that there will be no significant impact to fire department services.

Should you have questions, please contact Fire Captain Tim Caires of our Fire Prevention Bureau at 808-723-7094 or tcaires@honolulu.gov.

Sincerely,

CRAIG UCHIMURA
Acting Assistant Chief

CU/TC:bh

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

January 31, 2022

REF: RFD.5857.3

TO: Jaime Nishikawa, Environmental Project Coordinator
R. M. Towill Corporation

FROM: M. Kaleo Manuel, Deputy Director
Commission on Water Resource Management

SUBJECT: Ahuimanu Wastewater Pre-Treatment Facility (WWPTF) Improvements and Equalization Facility

FILE NO.: RFD.5857.3
TMK NO.: (1) 4-7-004:006:por

Thank you for the opportunity to review the subject document. The Commission on Water Resource Management (CWRM) is the agency responsible for administering the State Water Code (Code). Under the Code, all waters of the State are held in trust for the benefit of the citizens of the State, therefore all water use is subject to legally protected water rights. CWRM strongly promotes the efficient use of Hawaii's water resources through conservation measures and appropriate resource management. For more information, please refer to the State Water Code, Chapter 174C, Hawaii Revised Statutes, and Hawaii Administrative Rules, Chapters 13-167 to 13-171. These documents are available via the Internet at http://dlnr.hawaii.gov/cwrm.

Our comments related to water resources are checked off below.

[ ] 1. We recommend coordination with the county to incorporate this project into the county's Water Use and Development Plan. Please contact the respective Planning Department and/or Department of Water Supply for further information.

[ ] 2. We recommend coordination with the Engineering Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

[ ] 3. We recommend coordination with the Hawaii Department of Agriculture (HDOA) to incorporate the reclassification of agricultural zoned land and the redistribution of agricultural resources into the State's Agricultural Water Use and Development Plan (AWUDP). Please contact the HDOA for more information.

[X] 4. We recommend that water efficient fixtures be installed and water efficient practices implemented throughout the development to reduce the increased demand on the area's freshwater resources. Reducing the water usage of a home or building may earn credit towards Leadership in Energy and Environmental Design (LEED) certification. More information on LEED certification is available at http://www.usgbc.org/leed. A listing of fixtures certified by the EAP as having high water efficiency can be found at http://www.epa.gov/watersense.

[X] 5. We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at http://planning.hawaii.gov/czm/initiatives/low-impact-development/

[X] 6. We recommend the use of alternative water sources, wherever practicable.

[ ] 7. We recommend participating in the Hawaii Green Business Program, that assists and recognizes businesses that strive to operate in an environmentally and socially responsible manner. The program description can be found online at http://energy.hawaii.gov/green-business-program.

[X] 8. We recommend adopting landscape irrigation conservation best management practices endorsed by the Landscape Industry Council of Hawaii. These practices can be found online at http://www.hawaiiscape.com/wp-content/uploads/2013/04/LICH_Irrigation_Conservation_BMPs.pdf.

- [X] 9. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.
- [ ] 10. The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit is required prior to use of water. The Water Use Permit may be conditioned on the requirement to use dual line water supply systems for new industrial and commercial developments.
- [X] 11. The Hawaii Water Plan is directed toward the achievement of the utilization of reclaimed water for uses other than drinking and for potable water needs in one hundred per cent of State and County facilities by December 31, 2045 (§174C-31(g)(6), Hawaii Revised Statutes). We strongly recommend that this project consider using reclaimed water for its non-potable water needs, such as irrigation. Reclaimed water may include, but is not limited to, recycled wastewater, gray water, and captured rainwater/stormwater. Please contact the Hawaiʻi Department of Health, Wastewater Branch, for more information on their reuse guidelines and the availability of reclaimed water in the project area.
- [ ] 12. A Well Construction Permit(s) is (are) are required before the commencement of any well construction work.
- [ ] 13. A Pump Installation Permit(s) is (are) required before ground water is developed as a source of supply for the project.
- [ ] 14. There is (are) well(s) located on or adjacent to this project. If wells are not planned to be used and will be affected by any new construction, they must be properly abandoned and sealed. A permit for well abandonment must be obtained.
- [ ] 15. Ground-water withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.
- [ ] 16. A Stream Channel Alteration Permit(s) is (are) required before any alteration can be made to the bed and/or banks of a steam channel.
- [ ] 17. A Stream Diversion Works Permit(s) is (are) required before any stream diversion works is constructed or altered.
- [ ] 18. A Petition to Amend the Interim Instream Flow Standard is required for any new or expanded diversion(s) of surface water.
- [ ] 19. The planned source of water for this project has not been identified in this report. Therefore, we cannot determine what permits or petitions are required from our office, or whether there are potential impacts to water resources.

- [ ] OTHER:

If you have any questions, please contact Neal Fujii of the Planning Branch at 587-0216 or Ryan Imata of the Regulation Branch at 587-0225.

-----Original Message-----
From: Liu, Rouen <rouen.liu@hawaiianelectric.com>
Sent: Friday, February 4, 2022 5:54 PM
To: Jaime Nishikawa <jaimen@rmtowill.com>
Subject: Pre Assessment consultation Ahuimanu Wastewater Pre-Treatment Facility Draft EA - HECO response

CAUTION: External Email

Dear Mr. Nishikawa,

Thank you for the opportunity to comment on the subject project. Hawaiian Electric Company has no objection to the project. Should Hawaiian Electric have existing easements and facilities on the subject property, we will need continued access for maintenance of our facilities. We appreciate your efforts to keep us apprised of the subject project in the planning process. Please be sure the contractor submits the service request in a timely fashion relative to when they expect energizing of electrical service. As the proposed Ahuimanu WWPTF project comes to fruition, please continue to keep us informed.

Should there be any questions, please contact me at 543-7245.

Thank you,
Rouen Liu
Permit Engineer
Hawaiian Electric Company

DAVID Y. IGE
GOVERNOR

JADE T. BUTAY
DIRECTOR

Deputy Directors
ROSS M. HIGASHI
EDUARDO P. MANGLALLAN
PATRICK H. MCCAIN
EDWIN H. SNIFFEN

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:
DIR 0084
HWY-O 2.22-0058

February 7, 2022

VIA EMAIL: jaimen@rmtowill.com

Ms. Jaime Nishikawa, MS, P.E., LEED AP
Environmental Project Coordinator
R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819-3470

Dear Ms. Nishikawa:

Subject: Pre-Assessment Consultation for Draft Environmental Assessment
Ahuimanu Wastewater Pre-Treatment Facility Improvements and
Equalization Facility, Tax Map Key: (1) 4-7-004-006 (por.)

Thank you for your letter dated January 13, 2022, asking for comments, concerns, or regulatory requirement that the Hawaii Department of Transportation may have on the subject project.

Our Highways Division, Oahu District Office has reviewed the proposed work and we do not anticipate any affect on our drainage system in the area nor any impact to our right-of-way. Therefore, we do not have comments.

If you have any further questions, please contact Michael K. Medeiros, Oahu District Engineer of our Highways Division at (808) 831-6700, ext. 128 or email at mike.medeiros@hawaii.gov.

Sincerely,

JADE T. BUTAY
Director of Transportation

DAVID Y. IGE
GOVERNOR OF HAWAII

ELIZABETH A. CHAR, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:

LUD – 1 4 7 004 006 PreAsmnt
DEA Ahuimanu WWPTF

February 7, 2022

Ms. Jaime Nishikawa, MC, P.E., LEED AP
Environmental Project Coordinator
R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819-3470
Email: jaimen@rmtowill.com

Dear Ms. Nishikawa:

Subject: Pre-Assessment Consultation for Draft Environmental Assessment
Ahuimanu Wastewater Pre-Treatment Facility (WWPTF)
Improvements and Equalization Facility
47-305 Kahekili Highway, Kaneohe, Hawaii 96744
TMK (1) 4-7-004: 006

Thank you for allowing us the opportunity to provide comments for the subject project.

The subject project shall comply with applicable provisions of Chapter 11-62, Hawaii Administrative Rules, "Wastewater Systems." In addition, please be informed that the proposed wastewater system may have to include design considerations to address any effects associated with the construction of and/or discharges from the wastewater systems to any public trust, Native Hawaiian resources or the exercise of traditional cultural practices.

Should you have any questions, please call Mr. Mark Tomomitsu of my staff at (808) 586-4294.

Sincerely,

SINA PRUDER, P.E., CHIEF
Wastewater Branch

LM:bk

From: James Migia <James.Migia@hawaiiantel.com>
Sent: Wednesday, February 9, 2022 11:36 AM
To: Jaime Nishikawa <jaimen@rmtowill.com>
Cc: Sean Cross <Sean.Cross@hawaiiantel.com>; HT-Plan Reviews <HT-PlanReviews@hawaiiantel.com>; Stephen Tercino <Stephen.Tercino@hawaiiantel.com>; Robert Klamp <Robert.Klamp@hawaiiantel.com>
Subject: RE: Letter from R.M. Towill - AHUIMANU WASTERWATER TREATMENT PLANT

CAUTION: External Email

HI Jaime,

Thank you for sending over the plans for the rehabilitation of the Ahuimanu Treatment Plant. Will there be any exterior structural changes at the plant? I didn't see any changes between the existing and the proposed drawings. Also after reviewing our cable maps we are servicing the facility with aerial cables/terminals. Do you have any plans/drawings of the interior renovations that may shift the location of how our service drops enter the bldg.?

Thank you,

James Migia

Network Engineer
Hawaiian Telcom
O: 808.888.1765 | C: 808.321.9675
James.Migia@hawaiiantel.com

From: HT-Plan Reviews <HT-PlanReviews@hawaiiantel.com>
Sent: Monday, January 24, 2022 10:33 AM
To: Stephen Tercino <Stephen.Tercino@hawaiiantel.com>
Cc: HT-Plan Reviews <HT-PlanReviews@hawaiiantel.com>; Sean Cross <Sean.Cross@hawaiiantel.com>
Subject: FW: Letter from R.M. Towill

Aloha Stephen!

Upon your return can you please review attached draft EA for Ahuimanu Wastewater Treatment Facility Rehabilitation and provide any comments/feedback to Jaime? They are asking for written comments within 30 days from the letter, which was Jan. 13th. I'll email to let them know that this has been assigned and to send correspondence to our HT-PlanReviews so we can respond quicker in the future. Thank you!

Greg Kawachi
Specialist – Structure Engineer
O: 808.546.7666
C: 808.779.8324

From: Daniel Masutomi <Daniel.Masutomi@hawaiiantel.com>
Sent: Saturday, January 22, 2022 11:06 AM
To: HT-Plan Reviews <HT-PlanReviews@hawaiiantel.com>; Kalani Andrade <kalani.andrade@hawaiiantel.com>; Sean Cross <Sean.Cross@hawaiiantel.com>
Subject: FW: Letter from R.M. Towill

Fyi & action.

****
Daniel Masutomi
Director – Network Planning & Engineering
Hawaiian Telcom
1177 Bishop Street, Suite #32
Honolulu, HI 96813
Main: 808-546-2534
Cell: 808-927-3058
daniel.masutomi@hawaiiantel.com

From: Cathy Higa <Cathy.Higa@hawaiiantel.com>
Sent: Saturday, January 22, 2022 10:18 AM
To: Daniel Masutomi <Daniel.Masutomi@hawaiiantel.com>
Cc: Su Shin <Su.Shin@hawaiiantel.com>
Subject: Letter from R.M. Towill

Dan,
Attached is a letter addressed to Su from R.M. Towill dated January 13, 2022, regarding Pre-Assessment Consultation for Draft Environmental Assessment 'Ahuimanu Watewater Pre-Treatment Facility.

If you would like the original letter, I will leave it on my desk ledge for you.

Thanks,
Cathy

DAVID Y. IGE
GOVERNOR

KEITH T. HAYASHI
INTERIM SUPERINTENDENT

STATE OF HAWAIʻI
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAIʻI 96804

OFFICE OF FACILITIES AND OPERATIONS

GHH		KYY	
JHY		CWL	
CDL		DKT	
REC'D FEB 11 2022 RMTC			
MSI		RES	
AS			

February 10, 2022

Jaime Nishikawa, MS, P.E., LEED AP
R.M. Towill Corporation
2024 North King Street Suite 200
Honolulu, Hawaii 96819

Re: Pre-Assessment Consultation for the Draft Environmental Assessment
Ahuimanu Wastewater Pre-Treatment Facility (WWPTF)
Improvements and Equalization Facility
Tax Map Key: (1)4-7-004:006 (por.)

Dear Mr. Nishikawa:

Thank you for your letter dated January 13, 2022. The Hawaii State Department of Education (Department) has the following comments on the Pre-Assessment Consultation for the Draft Environmental Assessment for the Ahuimanu Wastewater Pre-Treatment Facility Improvements and Equalization Facility (Project).

Based on the information provided, the proposed Project will not impact Department facilities.

Thank you for the opportunity to comment. Should you have questions, please contact Robyn Loudermilk, School Lands and Facilities Specialist with the Facilities Development Branch, Planning Section, at (808) 784-5093 or via email at robyn.loudermilk@k12.hi.us.

Sincerely,

Roy Ikeda
Interim Public Works Manager
Planning Section

RI:ctc

c: Facilities Development Branch

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

RICK BLANGIARDI
MAYOR

DEAN UCHIDA
DIRECTOR

DAWN TAKEUCHI APUNA
DEPUTY DIRECTOR

EUGENE H. TAKAHASHI
DEPUTY DIRECTOR

February 11, 2022

2022/ELOG-165(MAK)

Mr. Jaime Nishikawa
R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819

Dear Mr. Nishikawa:

SUBJECT: Pre-Assessment Consultation - Environmental Analysis
Ahuimanu Wastewater Pre-Treatment Facility - Ahuimanu
Tax Map Key (TMK) 4-7-004: 006

This in response to your letter, received January 18, 2022, requesting comments regarding the upcoming preparation of an Environmental Assessment (EA). We understand that the proposal is to rehabilitate essential facilities and equipment at the Ahuimanu Wastewater Pre-Treatment Facility on the subject property. Based on the information in your letter, the Department of Planning and Permitting has the following comments that should be addressed in the Draft EA.

1. The Draft EA should demonstrate how the proposed Project will conform to the objectives, policies, and guidelines of the Oahu General Plan and the Koolaupoko Sustainable Communities Plan, especially the policies found in Section 4.3.3 and the guidelines found in Section 4.3.4.

2. According to our records, Conditional Use Permit No. 1999/CUP1-15 was issued on April 6, 1999, which authorized the joint development of TMKs 4-7-004: 006 and 4-7-37:030. Pursuant to LUO Section 21 5.380, all lots included in a Joint Development Agreement are treated as one zoning lot. Therefore, the Draft EA should include TMK 4-7-37:030 as part of the Project.

3. Public uses and structures qualify for Zoning Waiver Permits under LUO Section 21-2.130. The Draft EA should state whether the Project is likely to require a Zoning Waiver Permit.

Should you have any questions, please contact Michael Kat, of our Zoning Regulations and Permits Branch, at (808) 768-8013 or via email at michael.kat@honolulu.gov.

Very truly yours,

FOR: Dean Uchida
Director

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulupd.org

RICK BLANGIARDI
MAYOR

RADE K. VANIC
INTERIM CHIEF

OUR REFERENCE EO-DK

February 15, 2022

SENT VIA EMAIL

Ms. Jamie Nishikawa
jaimen@rmtowill.com

Dear Ms. Nishikawa:

This is in response to your letter of January 13, 2022, requesting input on the Pre-Assessment Consultation, Draft Environmental Assessment, for the planned Ahuimanu Wastewater Pre-Treatment Facility Improvements and Equalization Facility project located in Kaneohe.

The Honolulu Police Department (HPD) has reviewed the plans and has some concerns. The HPD recommends that adequate notification be made to the public and businesses in the area in the event of road closures. Any impacts to vehicular traffic, particularly off of Kahekili Highway (a main thoroughfare in the area), may lead to complaints.

If there are any questions, please call Major Crizalmer Caraang of District 4 (Kaneohe, Kailua, Kahuku) at (808) 723-8639.

Thank you for the opportunity to review this project.

Sincerely,

DARREN CHUN
Assistant Chief of Police
Support Services Bureau

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

February 15, 2022

Ms. Jaime Nishikawa
R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819

Dear Ms. Nishikawa,

Subject: Your Letter Dated January 13, 2022 Requesting Pre-Assessment Consultation Comments on the Draft Environmental Assessment for the Ahuimanu Wastewater Pre-Treatment Facility Improvements and Equalization Facility Located Along Kahekili Highway
Tax Map Key: 4-7-004: 006

Thank you for the opportunity to comment on the proposed improvements at the Ahuimanu Wastewater Pre-Treatment Facility.

The existing water system is adequate to accommodate the proposed development. However, please be advised that this information is based upon current data, and therefore, the Board of Water Supply (BWS) reserves the right to change any position or information stated herein up until the final approval of the building permit application. The final decision on the availability of water will be confirmed when the building permit application is submitted for approval.

When water is made available, the applicant will be required to pay our Water System Facilities Charges for resource development, transmission, and daily storage.

Water conservation measures are required for all proposed developments. These measures include utilization of non-potable water for irrigation using rain catchment, drought tolerant plants, xeriscape landscaping, efficient irrigation systems, such as a drip system and moisture sensors, and the use of Water Sense labeled ultra-low flow water fixtures and toilets.

The proposed project is subject to BWS Cross-Connection Control and Backflow Prevention requirements prior to the issuance of the Building Permit Applications.

The BWS has a 30-inch water main traversing through the parcel. This water main shall be located within paved roadways and be made accessible for repairs and maintenance. Any structures should be adequately set back from the water main easement for safety and to prevent damage to the structures during breaks, repair, and maintenance events.

The construction drawings should be submitted for our review, and the construction schedule should be coordinated to minimize impact to the water system.

The on-site fire protection requirements should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

If you have any questions, please contact Robert Chun, Project Review Branch of our Water Resources Division at (808) 748-5443.

Very truly yours,

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

DEPARTMENT OF FACILITY MAINTENANCE

CITY AND COUNTY OF HONOLULU

1000 Ulu`ohia Street, Suite 215, Kapolei, Hawaii 96707
Phone: (808) 768-3343 • Fax: (808) 768-3381
Website: www.honolulu.gov

RICK BLANGIARDI
MAYOR

DAWN B. SZEWCZYK, P.E.
DIRECTOR AND CHIEF ENGINEER DESIGNATE

WARREN K. MAMIZUKA
ACTING DEPUTY DIRECTOR

IN REPLY REFER TO:
DRM 22-70

February 15, 2022

R. M. Towill Corporation
Ms. Jamie Nishikawa, MS, P.E., LEED AP
2024 N. King Street
Honolulu, Hawaii 96819-3470

Dear Ms. Nishikawa:

Subject: Pre-Assessment Consultation for Draft Environmental Assessment, Ahuimanu Wastewater Pre-Treatment Facility (WWPTF) Improvements and Equalization Facility
Tax Map Key: (1) 4-7-004:006 (por.)

Thank you for the opportunity to review and comment on the subject project.

The Department of Facility Maintenance (DFM) has an existing Ahuimanu Dewatering Facility (TMK: 4-7-37:030) which is adjacent and north of the Ahuimanu Wastewater Pre-Treatment Facility. See attached map. DFM also maintains Ahuimanu Stream that runs adjacent to the proposed Ahuimanu Wastewater Pre-Treatment Facility. What anticipated impacts will your proposed Pre-Treatment Facility have on our Dewatering Facility and Ahuimanu Stream?

If you have any questions, please call Mr. Kyle Oyasato of the Division of Road Maintenance at 768-3697.

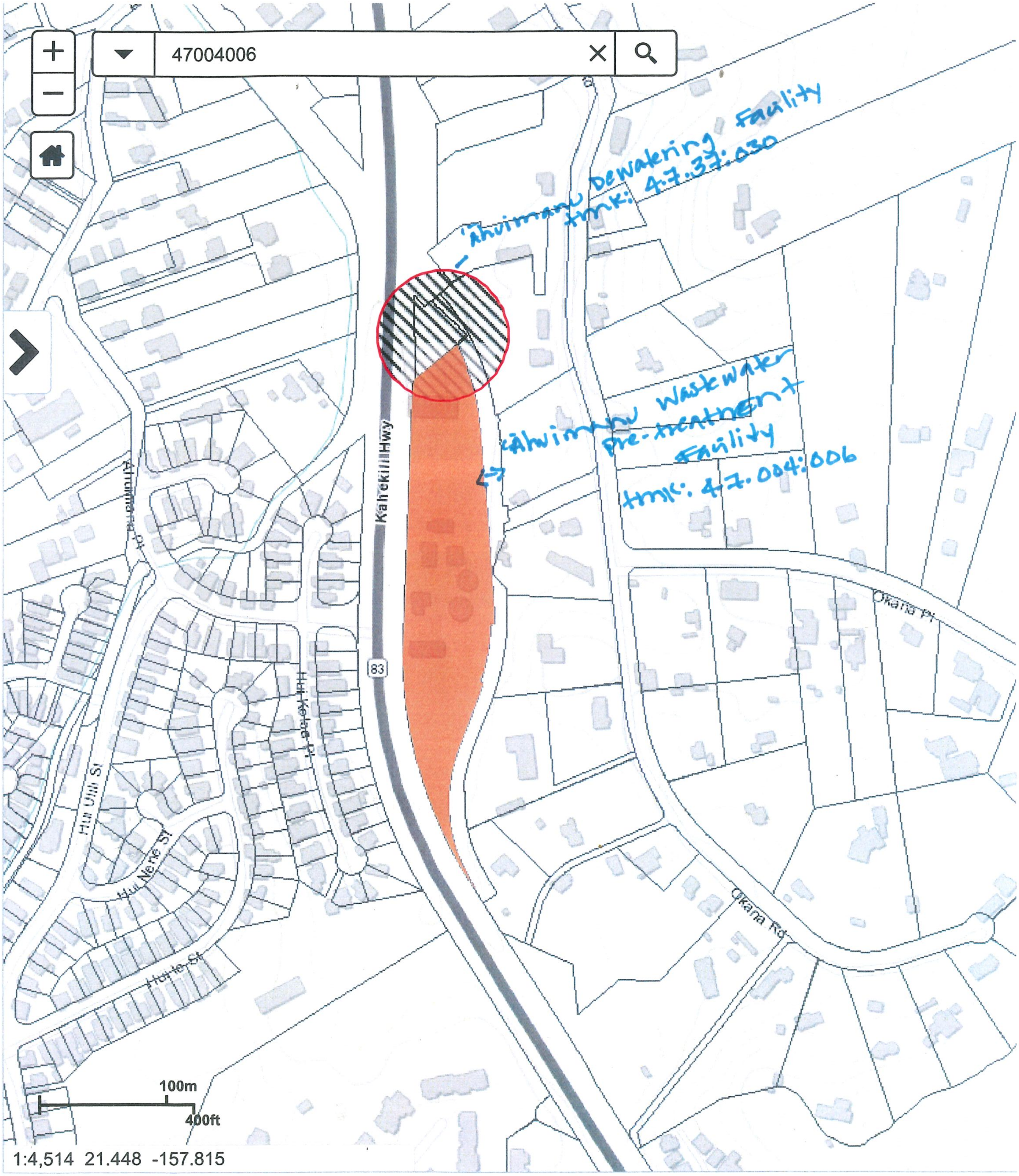
Sincerely,

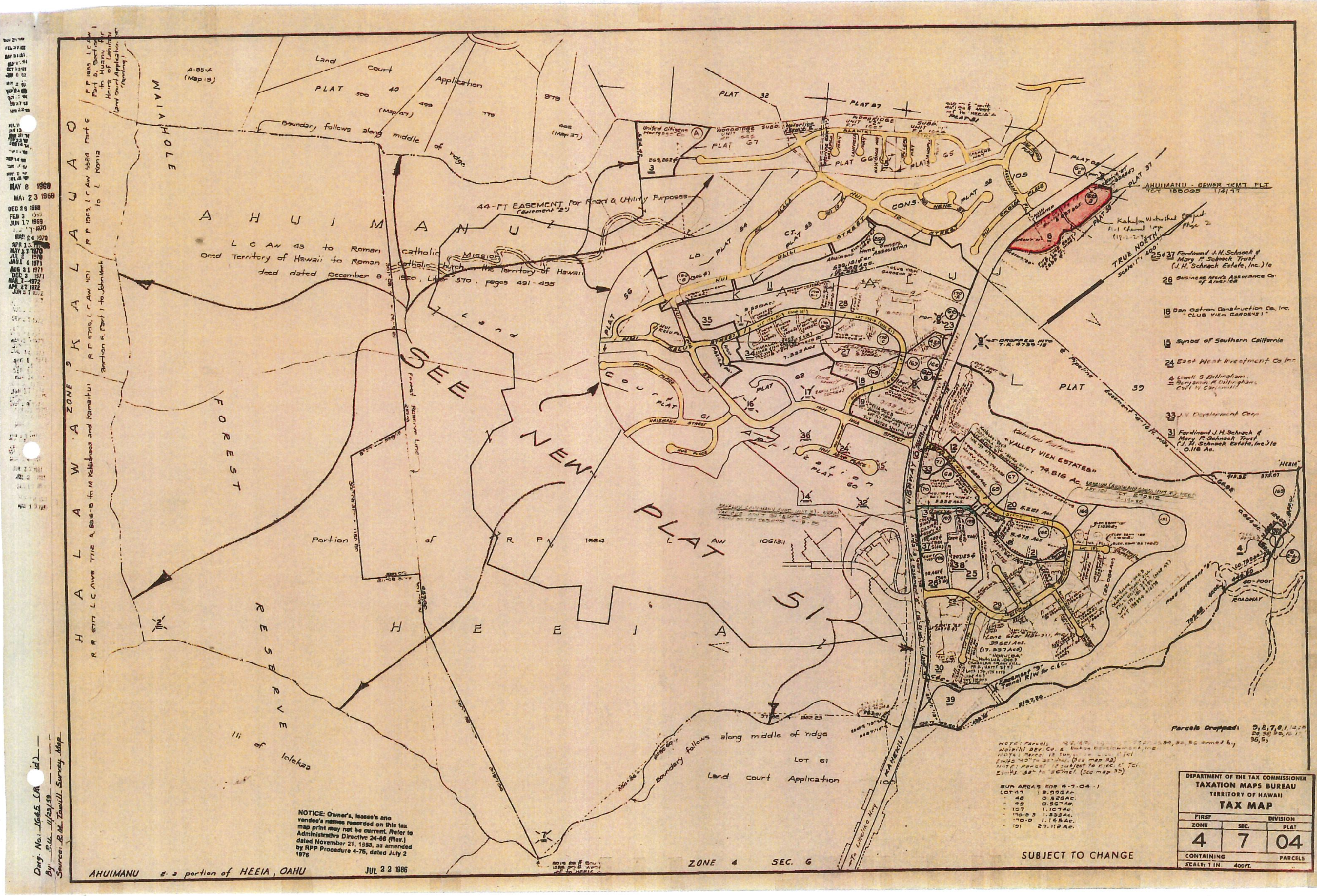
Dawn B. Szewczyk, P.E.
Director and Chief Engineer Designate

Attachment

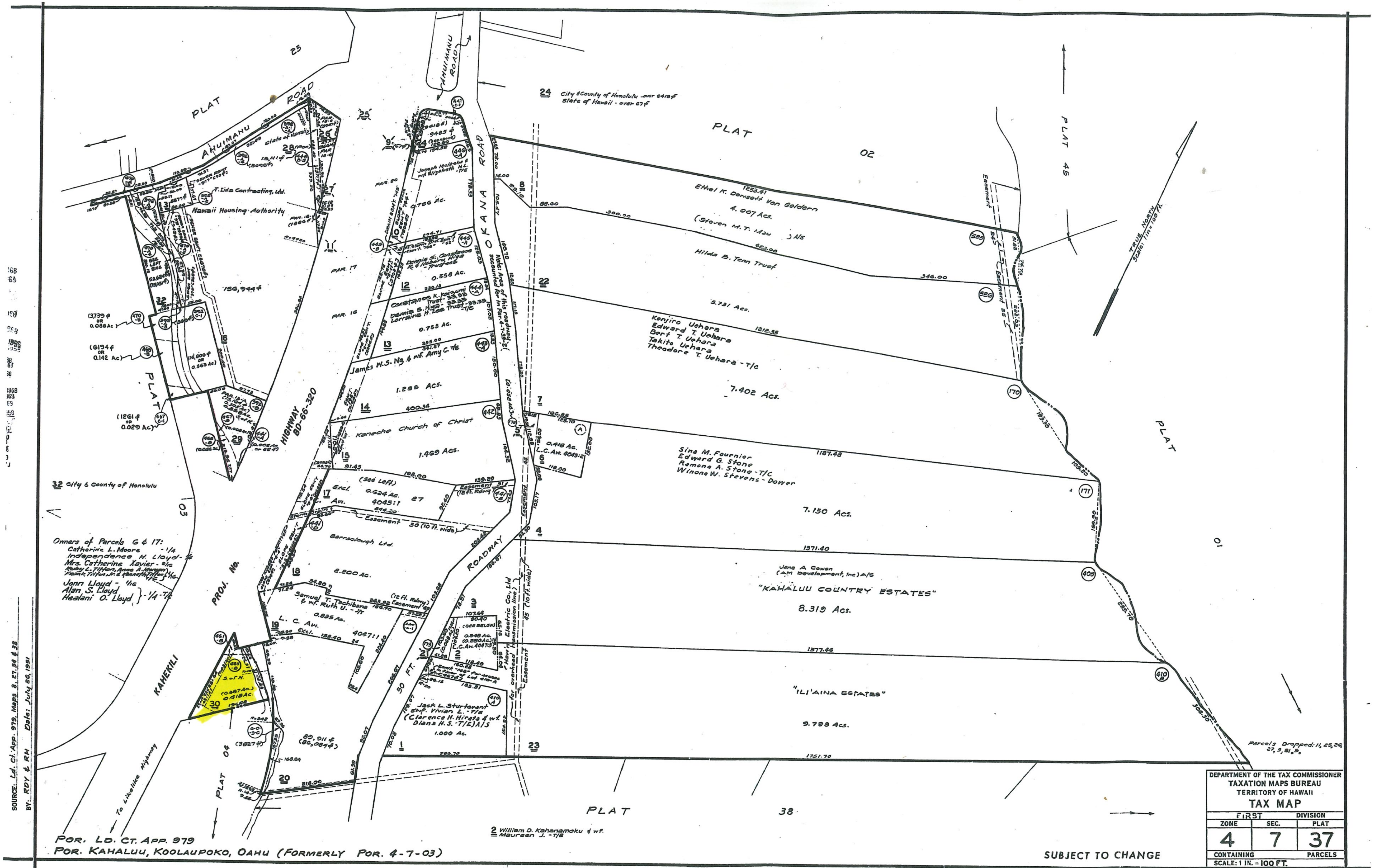
Lōkahi Console Cori Sonognini Tuesday, February 8th, 2022, 02:11 PM

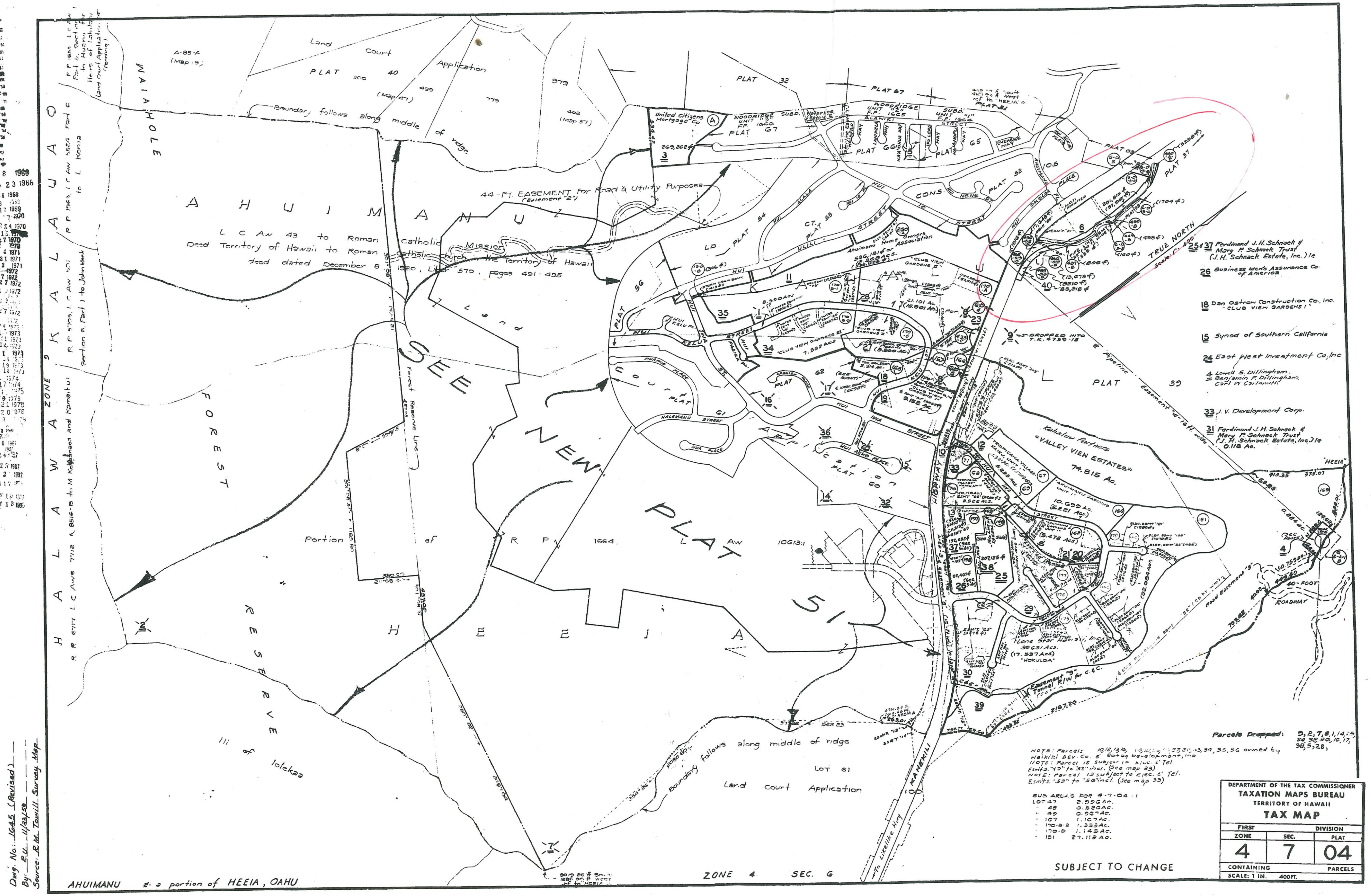
Map View





Dwg. No: 1645 (Revised)
Source: R.M. Towill Survey Map
HALAWA
ZONE 9
KALAUAO
MAIAHOLE
AHUIMANU
L C Aw 43 to Roman Catholic Mission
Deed Territory of Hawaii to Roman Catholic Church the Territory of Hawaii
deed dated December 8, 1950, Liber 570, pages 491-495
44-FT EASEMENT for Road & Utility Purposes
Boundary follows along middle of ridge
Land Court Application
FOREST RESERVE
Portion of R P 1664
HEEIA
SEE NEW PLAT 51
PLAT 32
PLAT 56
PLAT 58
PLAT 60
PLAT 61
PLAT 62
PLAT 65
PLAT 66
PLAT 67
PLAT 39
"VALLEY VIEW ESTATES"
74.816 Ac.
KAHEKILI HIGHWAY
To Likelike Hwy
TRUE NORTH
Scale: 1 in. = 400 ft.
AHUIMANU - SEWER TEMP. PLT.
Lot 61
Land Court Application
25 & 37 Ferdinand J.H. Schnack & Mary P. Schnack Trust (J.H. Schnack Estate, Inc.) Ile
28 Business Men's Assurance Co. of America
18 Dan Ostrow Construction Co., Inc. "CLUB VIEW GARDENS"
15 Synod of Southern California
24 East West Investment Co. Inc.
4 Lowell S. Dillingham & Benjamin F. Dillingham, Cust. to C. Dillingham
33 J V Development Corp.
31 Ferdinand J.H. Schnack & Mary P. Schnack Trust (J.H. Schnack Estate, Inc.) Ile 0.118 Ac.
Parcels Dropped: 9, 2, 7, 8, 11, 12, 13, 26, 30, 35, 36, 5.
NOTICE: Owner's, lessee's and vendee's names recorded on this tax map print may not be current. Refer to Administrative Directive 24-66 (Rev.) dated November 21, 1953, as amended by RPP Procedure 4-76, dated July 2 1976
AHUIMANU & a portion of HEEIA, OAHU
JUL 2 2 1986
ZONE 4 SEC. 6
SUBJECT TO CHANGE
DEPARTMENT OF THE TAX COMMISSIONER
TAXATION MAPS BUREAU
TERRITORY OF HAWAII
TAX MAP
FIRST DIVISION
ZONE 4
SEC. 7
PLAT 04
CONTAINING PARCELS
SCALE: 1 IN. = 400 FT.


PLAT 25
AHUIMANU ROAD
AHUIMANU ROAD
24 City & County of Honolulu - over 64.18% State of Hawaii - over 67%
PLAT 02
PLAT 45
TRUE NORTH Scale: 1 in. = 100 ft.
T. Ida Contracting, Ltd.
Hawaii Housing Authority
State of Hawaii
OKANA ROAD
Ethel K. Dorsett Von Geldern
4.007 Acs.
(Steven M. T. Mau) A/S
Hilda B. Tenn Trust
5.731 Acs.
Kenjiro Uehara
Edward T. Uehara
Bert T. Uehara
Takito Uehara
Theodore T. Uehara - T/C
7.402 Acs.
Joseph Holtcha & wf. Elizabeth H.L.
0.766 Ac.
0.558 Ac.
Constance K. Kaizumi Trust
0.753 Ac.
James W. S. Ng & wf. Amy C. Te
1.285 Acs.
Kaneohe Church of Christ
1.469 Acs.
0.418 Ac. L.C. Aw. 4045:2
Sina M. Fournier
Edward G. Stone
Ramone A. Stone - T/C
Winona W. Stevens - Dower
7.150 Acs.
HIGHWAY 5D-66-320
156,944 sf
32 City & County of Honolulu
PLAT 03
Owners of Parcels 6 & 17:
Catherine L. Moore - 1/4
Independence H. Lloyd - 1/4
Mrs. Catherine Xavier - 2/16
John Lloyd - 1/16
Alan S. Lloyd
Healani O. Lloyd } - 1/4 - T/C
Excl. 0.624 Ac. L.C. Aw. 4045:1
Easement 50 (10 ft. wide)
Barraclough Ltd.
2.200 Ac.
Samuel T. Tachibana & wf. Ruth U. - T/T
0.835 Ac.
L.C. Aw. 4047:1
ROADWAY
PROJ. No.
KAHEKILI
50 FT.
Jane A. Cowen (AM Development, Inc) A/S
"KAHALUU COUNTRY ESTATES"
8.319 Acs.
"ILI'AINA ESTATES"
9.728 Acs.
Jack L. Sturtevant & wf. Vivian L. - T/E
(Clarence H. Hirata & wf. Diana H. S. - T/E) A/S
1.000 Ac.
(0.387 Ac.) 0.418 Ac.
PLAT 04
To Likelike Highway
PLAT 01
Parcels Dropped: 11, 25, 26, 27, 9, 31, 5
PLAT 38
2 William D. Kahanamoku & wf. Maureen J. - T/E
SOURCE: Ld. Ct. App. 979, Maps 8, 27, 34 & 38
BY: ROY & RH Date: July 26, 1951
POR. LD. CT. APP. 979
POR. KAHALUU, KOOLAUPOKO, OAHU (FORMERLY POR. 4-7-03)
SUBJECT TO CHANGE
DEPARTMENT OF THE TAX COMMISSIONER
TAXATION MAPS BUREAU
TERRITORY OF HAWAII
TAX MAP
FIRST DIVISION
ZONE 4 SEC. 7 PLAT 37
CONTAINING PARCELS
SCALE: 1 IN. = 100 FT.



AHUIMANU
L C Aw 43 to Roman Catholic Mission
Deed Territory of Hawaii to Roman Catholic Church Mission, The Territory of Hawaii deed dated December 8 1950, Liber 570, pages 491 - 495
44-FT. EASEMENT for Road & Utility Purposes (Easement "2")
SEE NEW PLAT 51
Land Court Application
PLAT 40
PLAT 32
PLAT 37
PLAT 39
PLAT 52
PLAT 53
PLAT 54
PLAT 56
PLAT 60
PLAT 61
PLAT 62
PLAT 65
PLAT 66
PLAT 67
Boundary follows along middle of ridge
WAIAHOLE
KAALAEA
FOREST RESERVE
Forest Reserve Line
Portion of R P 1664 L Aw 10613:1
HEEIA
KAHALUU
Ili of Iolekaa
United Citizens Mortgage Co.
WOODRIDGE SUBD.
"CLUB VIEW GARDENS"
Kahaluu Partners "VALLEY VIEW ESTATES" 74.815 Ac.
KAHEKILI HIGHWAY
To Likelike Hwy
Pipeline Easement
TRUE NORTH
40-FOOT ROADWAY
"HEEIA"
25 37 Ferdinand J.H. Schnack & Mary P. Schnack Trust (J.H. Schnack Estate, Inc.) le
26 Business Men's Assurance Co. of America
18 Dan Ostrow Construction Co., Inc. "CLUB VIEW GARDENS I"
15 Synod of Southern California
24 East West Investment Co., Inc
4 Lowell S. Dillingham, Benjamin F. Dillingham, Carl H Carlsmith
33 J. V. Development Corp.
31 Ferdinand J.H. Schnack & Mary P. Schnack Trust (J. H. Schnack Estate, Inc.) le 0.118 Ac.
Parcels Dropped: 5, 2, 7, 8, 1, 14, 6, 24, 32, 36, 16, 17, 38, 5, 28,
SUB AREAS FOR 4-7-04-1
LOT 47 2.556 Ac.
48 0.526 Ac.
49 0.567 Ac.
107 1.107 Ac.
170-B-3 1.333 Ac.
170-D 1.145 Ac.
101 27.118 Ac.
SUBJECT TO CHANGE
DEPARTMENT OF THE TAX COMMISSIONER
TAXATION MAPS BUREAU
TERRITORY OF HAWAII
TAX MAP
FIRST DIVISION
ZONE 4 SEC. 7 PLAT 04
CONTAINING PARCELS
SCALE: 1 IN. 400 FT.
AHUIMANU & a portion of HEEIA, OAHU
ZONE 4 SEC. 6
Dwg. No: 1645 (Revised)
By: R.W. 11/28/58
Source: R.M. Towill Survey Map

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

February 16, 2022

LD 0047

R.M. TOWILL CORPORATION
Attn: Jaime Nishikawa
2024 North King Street, Suite 200
Honolulu, HI 96819-3470

Via email: jaimen@rmtowill.com

Dear Sirs:

SUBJECT: **Pre-Consultation for Draft Environmental Assessment**
'Ahuimanu Wastewater Pre-Treatment Facility Improvements & Equalization
'Ahuimanu, Island of Oahu, Hawaii
TMK: (1) 4-7-004:006

Thank you for the opportunity to review and comment on the subject project. The Land Division of the Department of Land and Natural Resources (DLNR) distributed copies of your request to DLNR's various divisions for their review and comment.

Enclosed are comments received from our (a) Division of Aquatic Resources, (b) Engineering Division, and (c) Office of Conservation and Coastal Resources. Should you have any questions about the attached response(s), please feel free to contact Barbara Lee via email at barbara.j.lee@hawaii.gov. Thank you.

Sincerely,

Russell Tsuji

Russell Y. Tsuji
Land Administrator

Enclosure(s)
cc: Central Files

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

January 24, 2022

LD 0047

MEMORANDUM

TO: **DLNR Agencies:**
_X_ Div. of Aquatic Resources *(via email: kendall.l.tucker@hawaii.gov)*
__ Div. of Boating & Ocean Recreation
_X_ Engineering Division *(via email: DLNR.Engr@hawaii.gov)*
_X_ Div. of Forestry & Wildlife *(via email: rubyrosa.t.terrago@hawaii.gov)*
__ Div. of State Parks
_X_ Commission on Water Resource Management *(via email: DLNR.CWRM@hawaii.gov)*
__ Office of Conservation & Coastal Lands
_X_ Land Division – Oahu District *(via email: barry.w.cheung@hawaii.gov)*

FROM: Russell Y. Tsuji, Land Administrator Russell Tsuji

SUBJECT: **Pre-Consultation for Draft Environmental Assessment**
'Āhuimanu Wastewater Pre-Treatment Facility Improvements and Equalization

LOCATION: 'Āhuimanu, Island of Oahu, Hawaii
TMK: (1) 4-7-004:006 (por.)

APPLICANT: **R.M. TOWILL CORPORATION on behalf of the City & County of Honolulu Department of Environmental Services**

Transmitted for your review and comment is information on the above-referenced project. Please review the attached information and submit any comments by the internal deadline of **February 11, 2022** to barbara.j.lee@hawaii.gov at the Land Division.

If no response is received by the above due date, we will assume your agency has no comments at this time. Should you have any questions about this request, please contact Barbara Lee at barbara.j.lee@hawaii.gov. Thank you.

BRIEF COMMENTS:

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(✓) Comments are included/attached.

Signed: [signature]
Print Name: Brian J. Neilson- Administrator
Division: Aquatic Resources
Date: Jan 26, 2022

Attachments
Cc: Central Files

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF AQUATIC RESOURCES
1151 PUNCHBOWL STREET, ROOM 330
HONOLULU, HAWAII 96813

Date: January 25, 2022
DAR # 6256/LD0047

MEMORANDUM
TO: Brian J. Neilson
DAR Administrator

FROM: Paul Murakawa, Aquatic Biologist *Paul Y. Murakawa*

SUBJECT: Pre-Assessment Consultation for Draft Environmental Assessment Ahuimanu Wastewater Pre-Treatment Facility (WWPTF) Improvements & Equalization Facility

Request Submitted by: Russell Tsuji, Administrator Land Division

Location of Project: Tax Map Key: (1) 4-7-004:006 (por.). Ahuimanu, Oahu, Hawaii

Brief Description of Project:
The City and County of Honolulu (CCH), Department of Environmental Services (ENV) proposes to rehabilitate essential facilities and equipment at the Ahuimanu Wastewater Pre-Treatment Facility (WWPTF). The proposed action consists of rehabilitating the on-site wastewater storage system and associated pumps and piping at the Ahuimanu WWPTF to ensure operations continue to provide approximately 800,000 gallons of storage during storage events or wet weather flow conditions. The structural conditions of the wastewater storage system, which utilize two (2) Equalization (EQ) Basins, Primary Clarifier (PC), Aerobic Digester and Rapid Block Tank, have significantly deteriorated and require rehabilitation or replacement of existing tanks, equipment and piping.

Comments:
☐ No Comments ☒ Comments Attached

Thank you for providing DAR the opportunity to review and comment on the proposed project. Should there be any changes to the project plan, DAR requests the opportunity to review and comment on those changes.

Comments Approved: [signature] Date: Jan 25, 2022
Brian J. Neilson
DAR Administrator

DAR# 6256/LD0047

Brief Description of Project

The proposed action includes the following:

1. Rehabilitate on-site wastewater storage system to prevent wastewater spills during storage events (FM or pump station failure or maintenance/conditional assessment shutdown) or projected peak wet weather flow conditions.
2. Renovate the Headworks to accommodate new screening and grit removal equipment and replace the non-functional OCS.
3. Renovate the IPS Building to accommodate an office/bathroom and rehabilitate interior equipment and utilities.
4. Replace deteriorating equipment located within the existing EPS and Auxiliary Generator and Blower Buildings, upgrade SCADA and the security systems, demolish the non-operational Sludge De-watering Building, and other general landscape/drainage improvements.

DAR# 6256/LD0047

Comments

The Division of Aquatic Resources (DAR) would like to request that Best Management Practices (BMPs) be included in the Draft Environmental Assessment. This is to ensure that the
contractor(s) implement the BMPs to minimize runoff/sedimentation and land-based sources of pollution (LBSP) at the project area where there is the opportunity (e.g. any site where there will be excavation, grading, or sediment/pollutant producing activities) for discharge into nearby Ahuimanu Stream. These BMPs may include (but not limited to) any type of barrier (e.g. sediment fences, silt screens/curtains, bags, environmental socks, petroleum absorption diapers) that limits the amount of runoff, sediment, or LBSP (e.g. petroleum products, chemicals, debris, etc.) to the maximum extent possible. This is important given the immediate proximity of Ahuimanu Stream. Periods of heavy rains increases runoff and there is a higher risk of sediment or LBSP ending up in Ahuimanu Stream.

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

January 24, 2022

LD 0047

MEMORANDUM

FROM:
~~TO:~~ **DLNR Agencies:**
_X_Div. of Aquatic Resources *(via email: kendall.l.tucker@hawaii.gov)*
__Div. of Boating & Ocean Recreation
_X_Engineering Division *(via email: DLNR.Engr@hawaii.gov)*
_X_Div. of Forestry & Wildlife *(via email: rubyrosa.t.terrago@hawaii.gov)*
__Div. of State Parks
_X_Commission on Water Resource Management *(via email: DLNR.CWRM@hawaii.gov)*
__Office of Conservation & Coastal Lands
_X_Land Division – Oahu District *(via email: barry.w.cheung@hawaii.gov)*

TO:
~~FROM:~~ Russell Y. Tsuji, Land Administrator Russell Tsuji
SUBJECT: **Pre-Consultation for Draft Environmental Assessment**
‘Āhuimanu Wastewater Pre-Treatment Facility Improvements and Equalization
LOCATION: ‘Āhuimanu, Island of Oahu, Hawaii
TMK: (1) 4-7-004:006 (por.)
APPLICANT: **R.M. TOWILL CORPORATION on behalf of the City & County of Honolulu Department of Environmental Services**

Transmitted for your review and comment is information on the above-referenced project. Please review the attached information and submit any comments by the internal deadline of **February 11, 2022** to barbara.j.lee@hawaii.gov at the Land Division.

If no response is received by the above due date, we will assume your agency has no comments at this time. Should you have any questions about this request, please contact Barbara Lee at barbara.j.lee@hawaii.gov. Thank you.

BRIEF COMMENTS:

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(✓) Comments are included/attached.

Signed:
Print Name: Carty S. Chang, Chief Engineer
Division: Engineering Division
Date: Feb 3, 2022

Attachments
Cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji
Ref: Pre-Consultation for Draft Environmental Assessment
‘Āhuimanu Wastewater Pre-Treatment Facility Improvements and Equalization
Location: ‘Āhuimanu, Island of Oahu, Hawaii
TMK(s): (1) 4-7-004:006 (por.)
Applicant: R.M. TOWILL CORPORATION on behalf of the City & County of Honolulu Department of Environmental Services

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high-risk areas). Be advised that 44CFR, Chapter 1, Subchapter B, Part 60 reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood zones subject to NFIP requirements are identified on FEMA’s Flood Insurance Rate Maps (FIRM). The official FIRMs can be accessed through FEMA’s Map Service Center (msc.fema.gov). Our Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT) could also be used to research flood hazard information.

If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7139.
- Kauai: County of Kauai, Department of Public Works (808) 241-4849.

Signed: [signature]
CARTY S. CHANG, CHIEF ENGINEER

Date: Feb 3, 2022

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

January 24, 2022

LD 0047

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources *(via email: kendall.l.tucker@hawaii.gov)*
__Div. of Boating & Ocean Recreation
X Engineering Division *(via email: DLNR.Engr@hawaii.gov)*
X Div. of Forestry & Wildlife *(via email: rubyrosa.t.terrago@hawaii.gov)*
__Div. of State Parks
X Commission on Water Resource Management *(via email: DLNR.CWRM@hawaii.gov)*
__Office of Conservation & Coastal Lands
X Land Division – Oahu District *(via email: barry.w.cheung@hawaii.gov)*

Russell Tsuji

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: **Pre-Consultation for Draft Environmental Assessment**
‘Āhuimanu Wastewater Pre-Treatment Facility Improvements and Equalization
LOCATION: ‘Āhuimanu, Island of Oahu, Hawaii
TMK: (1) 4-7-004:006 (por.)
APPLICANT: **R.M. TOWILL CORPORATION on behalf of the City & County of Honolulu Department of Environmental Services**

Transmitted for your review and comment is information on the above-referenced project. Please review the attached information and submit any comments by the internal deadline of **February 11, 2022** to barbara.j.lee@hawaii.gov at the Land Division.

If no response is received by the above due date, we will assume your agency has no comments at this time. Should you have any questions about this request, please contact Barbara Lee at barbara.j.lee@hawaii.gov. Thank you.

BRIEF COMMENTS:

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(✓) Comments are included/attached.

Signed:
Print Name: DAVID G. SMITH, Administrator
Division: Division of Forestry and Wildlife
Date: Mar 8, 2022

Attachments
Cc: Central Files

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

March 7, 2022

MEMORANDUM *Log no.3501*

TO: RUSSELL Y. TSUJI, Land Administrator
Land Division

FROM: DAVID G. SMITH, Administrator
Division of Forestry and Wildlife

SUBJECT: **Division of Forestry and Wildlife Comments for Pre-Consultation on a Draft Environmental Assessment (DEA) Regarding Proposed ʻĀhuimanu Wastewater Pre-Treatment Facility Improvements and Equalization on Oʻahu**

The Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) has received your request for comments for pre-consultation on a DEA regarding a proposed ʻĀhuimanu wastewater pre-treatment facility improvement and equalization project in ʻĀhuimanu, O'ahu, TMK: (1) 4-7-004:006. The proposed project consists of rehabilitation of the onsite wastewater storage system, renovation of the Headwork to accommodate new screening and grit removal equipment, replacement of the non-functional odor control system, and renovation of the Influent Pump Station to accommodate an office with a bathroom. Other proposed improvements include the replacement of deteriorated equipment located within the existing Effluent Pump Station and Auxiliary Generator and Blower Building, upgrades to the Supervisory Control and Data Acquisition and security systems, demolition of the non-operational Sludge Dewatering Building, and other general landscape and drainage improvements.

The State listed Hawaiian Hoary Bat or ʻŌpeʻapeʻa (*Lasiurus cinereus semotus*) could potentially occur in the vicinity of the project and may roost in nearby trees. Any required site clearing should be timed to avoid disturbance to bats during their birthing and pup rearing season (June 1 through September 15). During this period woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed. Barbed wire should also be avoided for any construction because bats can become ensnared and killed by such fencing during flight.

Artificial lighting can adversely impact seabirds that may pass through the area at night by causing disorientation. This disorientation can result in a collision with manmade structures or the grounding of birds. For nighttime work that might be required, DOFAW recommends that all lights used to be fully shielded to minimize the attraction of seabirds. Nighttime work that requires outdoor lighting should be avoided during the seabird fledging season from September 15 through December 15. This is the period when young seabirds take their maiden voyage to the open sea.

Permanent lighting also poses a risk of seabird attraction, and as such should be minimized or eliminated to protect seabird flyways and preserve the night sky. For illustrations and guidance related to seabird-friendly light styles that also protect seabirds and the dark starry skies of Hawaiʻi please visit https://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf.

State listed waterbirds such as the Hawaiian Duck (*Anas wyvilliana*), Hawaiian Stilt (*Himantopus mexicanus knudseni*), Hawaiian Coot (*Fulica alai*), and Hawaiian Common Gallinule (*Gallinula chloropus sandvicensis*) could potentially occur in the vicinity of the proposed project site. It is against State law to harm or harass these species. If any of these species are present during construction activities, then all activities within 100 feet (30 meters) should cease, and the bird should not be approached. Work may continue after the bird leaves the area of its own accord. If a nest is discovered at any point, please contact the Oʻahu Branch DOFAW Office at (808) 973-9778.

The State endangered Hawaiian Short-eared Owl or Pueo (*Asio flammeus sandwichensis*) could also potentially occur in the project site vicinity. The Pueo is a crepuscular species, most active during dawn and dusk twilights. DOFAW recommends twilight pre-construction surveys by a qualified biologist prior to clearing vegetation. If Pueo nests are present, a buffer zone should be established in which no clearing occurs until nesting ceases, and DOFAW staff should be notified.

DOFAW recommends minimizing the movement of plant or soil material between worksites. Soil and plant material may contain pathogens, pests such as Little Fire ants and/or Coconut Rhinoceros beetles, or invasive plant parts that could harm our native species and ecosystems. We recommend consulting the Oʻahu Invasive Species Committee (OISC) at (808) 266-7994 to plan, design, and construct the project to learn of any high-risk invasive species in the area ways to mitigate their spread. All equipment, materials, and personnel should be cleaned of excess soil and debris to minimize the risk of spreading invasive species.

DOFAW recommends using native plant species for landscaping that are appropriate for the area (i.e., climate conditions are suitable for the plants to thrive, historically occurred there, etc.). Please do not plant invasive species. DOFAW recommends consulting the Hawaiʻi-Pacific Weed Risk Assessment website to determine the potential invasiveness of plants proposed for use in the project (https://sites.google.com/site/weedriskassessment/home). We recommend that you refer to www.plantpono.org for guidance on the selection and evaluation of landscaping plants.

We appreciate your efforts to work with our office for the conservation of our native species. Should the scope of the project change significantly, or should it become apparent that threatened or endangered species may be impacted, please contact our staff as soon as possible. If you have any questions, please contact Paul Radley, Protected Species Habitat Conservation Planning Coordinator at (808) 295-1123 or paul.m.radley@hawaii.gov.

Sincerely,

DGS

DAVID G. SMITH
Administrator

DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

ref:OCCL:RB

Correspondence OA-22-105

Jan 21, 2022

Jaime Nishikawa
Environmental Project Coordinator
R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, HI 96819

SUBJECT: Request for Pre-Assessment Consultation for Draft Environmental Assessment ʻĀhuimanu Wastewater Pre-Treatment Facility (WWPTF) Improvements and Equalization Facility
Ahuimanu, Heeia, Oahu
TMK: (1) 4-7-004:006 (por)

Dear Mr. Nishikawa,

The Office of Conservation and Coastal Lands (OCCL) has reviewed your pre-assessment consultation for the above referenced subject matter. The proposed project actions are: (1) rehabilitate the onsite wastewater storage system; (2) renovate the Headworks to accommodate new screening and grit removal equipment and replace the non-functional OCS; (3) renovate the IPS Building to accommodate an office/bathroom and rehabilitate the interior equipment and utilities; and (4) replace deteriorating equipment located within the existing EPS and Auxiliary Generator and Blower Buildings, upgrade SCADA and the security systems, demolish the non-operational Sludge Dewatering Building, and other general landscape/drainage improvements.

This TMK and the proposed work do not appear to be in the Conservation district. Therefore, the OCCL has no jurisdiction and no comment on the WWPTF improvements and equalization facility.

Should you have any questions, please feel free to contact Rachel Beasley at Rachel.e.beasley@hawaii.gov or work cell 798-648.

Sincerely,

S Michael Cain

Michael Cain, Acting Administrator
Office of Conservation and Coastal Lands

cc: C&C of Honolulu-DPP
ODLO

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 • web: www.honolulu.gov

RICK BLANGIARDI
MAYOR

J. ROGER MORTON
DIRECTOR

JON Y. NOUCHI
DEPUTY DIRECTOR

TP1/22-872001

February 16, 2022

Ms. Jaime Nishikawa, MS, P.E., LEED AP
Environmental Project Coordinator
R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819

Dear Ms. Nishikawa:

Thank you for the opportunity to provide written comments regarding the Pre-Assessment Consultation for Draft Environmental Assessment; Ahuimanu Wastewater Pre-Treatment Facility (WWPTF); Improvements and Equalization Facility; Tax Map Key: (1) 4-7-004:006 (por.). We have the following comments.

1. Neighborhood Impacts. The area representatives, neighborhood board, as well as the area residents, businesses, emergency personnel (fire, ambulance, and police), Oahu Transit Services, Inc. (TheBus and TheHandi-Van), etc., should be kept apprised of the details and status throughout the project and the impacts that the project may have on the adjoining local street area network.

2. Bus Stops. The project site is in the immediate vicinity of bus stops. Please coordinate roadway improvements with DTS – Transportation Mobility Division (TMD). Contact DTS-TMD at TheBusStop@honolulu.gov

3. Disability and Communication Access Board (DCAB). Project plans (vehicular and pedestrian circulation, sidewalks, parking and pedestrian pathways, vehicular ingress/egress, etc.) should be reviewed and approved by DCAB to ensure full compliance with Americans with Disabilities Act requirements.

Should you have any questions, please contact Greg Tsugawa, of my staff, at (808) 768-6683.

Very truly yours,

J. Roger Morton
Director