Final Environmental Impact Statement

for the

Central Oahu Wastewater Facilities Plan

Proposing Agency:

City and County of Honolulu
Department of Design and Construction

This Document is prepared pursuant to Chapter 343, Hawai`i Revised Statutes, as amended, and Chapter 200 of Title 11, State of Hawai`i Department of Health Administrative Rules, Environmental Impact Statement

This document and all other ancillary documents were prepared under my direction.

Responsible Official: _____ Date: MAY 19 2008

Accepting Authority:

City and County of Honolulu, Department of Planning and Permitting

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GLOSSARY OF ACRONYMS

AAR	Alternatives Analysis Report
AAF	Army Air Field
AAQS	Ambient Air Quality Standards
ADC	Agribusiness Development Corporation
ALISH	Agriculture Lands of Importance in the State of Hawai`i
AQIR	Air quality impact report
BMP	Best Management Practices
BWS	City and County of Honolulu, Board of Water Supply
CAA	Clean Air Act
CFR	U.S. Code of Federal Regulations
CIA	Cultural Impact Assessment
City	City and County of Honolulu
CORP	Central O`ahu Regional Park
COWFP	Central O`ahu Wastewater Facilities Plan
CWA	Clean Water Act
CWB	Clean Water Branch
CZM	Coastal Zone Management
DAFT	Dissolved Air Flotation Thickener
DAR	Department of Land and Natural Resources, Division of Aquatic Resources
dBA	A- weighted Decibel
DBEDT	State of Hawai`i, Department of Business Economic Development and Tourism
DDC	City and County of Honolulu, Department of Design and Construction
DFC	Dole Food Company
DLNR	State of Hawai`i, Department of Land and Natural Resources
DNL	Day-Night Average Sound Level
DO	Dissolved Oxygen
DOH	State of Hawai`i, Department of Health
DOT	State of Hawai`i, Department of Transportation
DPP	City and County of Honolulu, Department of Planning and Permitting
EIS	Environmental Impact Statement
EISPN	Environmental Impact Statement Preparation Notice
ENV	City and County of Honolulu, Department of Environmental Services
EO	Executive Order
EPA	U. S. Environmental Protection Agency
F	Fahrenheit
FC	Final Clarifier
FEMA	Federal Emergency Management Agency
GIS	geographic information system
HAR	Hawai`i Administrative Rules
HECO	Hawaiian Electric Company
HRS	Hawai`i Revised Statutes
I/I	Infiltration and Inflow
I-2	City Zoning Ordinance, Intensive Industrial
ILWU	International Longshoreman Workers Union
IPS	Influent Pump Station
kg	kilogram

kv	kilovolt
KWC	Kunia Water Cooperative
lbs	pounds
LUC	State of Hawai`i, Land Use Commission
MBR	membrane bioreactor
mg	milligrams
mgd	million gallons per day
MSL	mean sea level
n/a	not applicable
n.d.	no date
NCTAMS PAC	U.S. Naval Computer and Telecommunications Area Master Station Pacific
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NWS	National Weather Service, Pacific Region
O&M	Operations and Maintenance
OEQC	State Office of Environmental Quality Control
OHA	Office of Hawaiian Affairs
OWMP	O`ahu Water Management Plan
P-1	City Zoning Ordinance, Restricted Preservation
PC	primary clarifier
PWWF	Peak Wet Weather Flow
R-1	DOH Class 1 recycled water
RCP	Reinforced concrete pipe
SHPD	Department of Land and Natural Resources, Historic Preservation Division
SMA	Special Management Area
SRF	State Revolving Fund
State	State of Hawai`i
TDS	Total Dissolved Solids
TLCG	The Limtiaco Consulting Group
TMDL	Total Maximum Daily Load
TMK	Tax Map Key
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
U.S.	United States
UIC	Underground Injection Control
USACE	United States Army Corps of Engineers
USC	United States Code
USDC	United States District Court
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Service
UV	ultraviolet
w.i.p.	work-in-progress
WRF	Water Recycling Facility
WSC	Waialua Sugar Company
WWAC	Wahiawā Wastewater Advisory Committee
WWPS	Wastewater Pump Station
WWPTF	Wastewater Preliminary Treatment Facility
WWS	Waiāhole Water System
WWTP	Wastewater Treatment Plant

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1.0 EXECUTIVE SUMMARY

1.1 Introduction and Description of the Action

This Environmental Impact Statement (EIS) examines proposed wastewater facility improvements in Central O`ahu, defined by the Wahiawā wastewater system through the year 2020, as currently described in the *(Prefinal) Central Oahu Wastewater Facilities Plan* (TLCG, w.i.p.) prepared for the City and County of Honolulu, Department of Design and Construction (DDC). The *Central Oahu Wastewater Facilities Plan* (COWFP) is hereby incorporated by reference. The COWFP will also be referred to as "the facilities plan" in this EIS. The original EIS Preparation Notice (EISPN) for the project was issued on August 23, 2000, but further action was postponed. A revised EISPN was issued on September 8, 2007. The project includes a public participation program for the purpose of disseminating information and receiving input from Central O`ahu residents, regulatory agencies, private stakeholders, and other members of the public. A kickoff meeting and two public workshops have been conducted to date. Interested organizations and the public will have additional opportunities to review and provide input on the project through additional public hearings and publication of the Draft and Final EIS documents.

The recommendations from the COWFP that are evaluated in this EIS pertain to (1) the Wahiawā wastewater collection system, (2) the Wahiawā wastewater treatment plant (WWTP), and (3) the long-term wastewater disposal strategy for the service area. The study area is the Wahiawā wastewater service district, which comprises the historical plantation community of Wahiawā, the small residential community of Whitmore Village, and the military facility known as U.S. Naval Computer and Telecommunications Area Master Station Pacific (NCTAMS PAC). Figures 1, 2 and 3 depict the general area where project actions would primarily occur. Figure 4 depicts the wastewater facilities that serve the study area. U.S. Army wastewater facilities at Schofield Barracks and Wheeler Army Airfield (AAF) are outside the scope of the COWFP and this EIS.

> WASTEWATER COLLECTION SYSTEM. A network of roughly 230,000 feet of gravity sewers and seven (7) wastewater pump stations (WWPSs) and force mains collect and convey wastewater from the service area to the Wahiawā WWTP. The system serves approximately 22,000 residents in an area encompassing approximately 1,600 acres (Fukunaga and Associates, 1999 as cited in TLCG, w.i.p.). The Whitmore Village Wastewater Preliminary Treatment Facility (WWPTF) that was built in 1994 to divert flow from the Whitmore Village WWTP (an abandoned facility) is part of the Wahiawā wastewater collection system.
>
> No significant population changes are projected for the Wahiawā service area through the year 2020 (TLCG, w.i.p.). Nearly all of the existing gravity sewer lines serving Central O`ahu were theoretically determined to have adequate hydraulic capacity (assuming clean and undamaged pipes) to meet both current and future design peak flows such that no sewer line capacity (size) upgrades are recommended (Ibid).

The COWFP recommends several capital improvements and programs that pertain to the wastewater collection system:

- Perform manhole work that helps to maintain and reduce excessive groundwater infiltration and excessive inflow of rainwater during wet weather;
- Initiate and implement a public education program and a plumbing code enforcement program;
- Address various physical sewer line deficiencies by repairing sags in sewer lines, removing trees and tree roots, and performing spot repairs and reconstruction;
- Continue current routine and scheduled maintenance actions affecting sewers both with and without problems;
- Increase the capacity of some of the collection system's WWPSs;
- Conduct rehabilitation work at the Whitmore Village Wastewater Preliminary Treatment Facility (WWPTF); and
- Require individual wastewater systems to cease operation and connect to the sewer system.

WASTEWATER TREATMENT. The Wahiawā WWTP was constructed in 1927 as a primary treatment facility (Figure 5). Throughout its operation, the plant has discharged effluent into Wahiawā Reservoir, which receives water from and overflows into Kaukonahua Stream. In 1967, the WWTP was expanded and upgraded to provide secondary treatment utilizing an activated sludge process. Wastewater sludge is hauled via tanker trucks to the Honouliuli WWTP for further treatment and disposal.

Tertiary treatment upgrades were completed in December 2002 in order to satisfy the March 1998 Consent Decree with the State Department of Health (DOH) (Civ. No 94-1896-05 issued on March 2, 1998). The following objectives are stated in the consent decree: (1) provide a long-term reliable solution for effluent disposal from the Wahiawā WWTP; (2) improve reservoir water quality; and (3) promote resource conservation through wastewater reclamation. Accomplished improvements to the treatment system allow sand filtration of secondary effluent, ultraviolet (UV) disinfection in lieu of chlorine disinfection, and effluent discharge into Wahiawā Reservoir via a new deep-water outfall. **Currently, the Wahiawa WWTP produces R-2 quality effluent (although DOH has not certified it as such); nonetheless, the tertiary treatment improvements completed in December 2002** generally enable the Wahiawā WWTP to produce effluent meeting the DOH Class 1 recycled water (R-1) quality standards **(although DOH has not certified it as such)**. Additional improvements such as emergency storage or alternate disposal for reduced

quality effluent are required before the Wahiawā WWTP can be fully certified as an R-1 WWTP, as defined in the May 15, 2002 DOH water reuse guidelines.

~~Tertiary treatment upgrades were completed in December 2002 in order to satisfy the March 1998 Consent Decree with the State Department of Health (DOH) (Civ. No 94-1896-05 issued on March 2, 1998). The following objectives are stated in the consent decree: (1) provide a long-term reliable solution for effluent disposal from the Wahiawā WWTP; (2) improve reservoir water quality; and (3) promote resource conservation through wastewater reclamation. Accomplished improvements to the treatment system allow sand filtration of secondary effluent, ultraviolet (UV) disinfection in lieu of chlorine disinfection, and effluent discharge into Wahiawā Reservoir via a new deep-water outfall. The improvements generally enable the Wahiawā WWTP to produce effluent meeting the DOH Class 1 recycled water (R-1) quality standards. Additional improvements such as emergency storage or alternate disposal for reduced-quality effluent are required before the Wahiawā WWTP can be fully certified as an R-1 WWTP, as defined in the May 15, 2002 DOH water reuse guidelines.~~

The Wahiawā WWTP currently treats an average of 1.98 million gallons per day (mgd) (TLCG, w,i.p.) of domestic wastewater from the Wahiawā collection system. The average daily flow received at the WWTP represents 80 percent of its design dry weather capacity of 2.5 mgd. There is no impending need for more dry weather capacity because no significant population growth is projected for the Wahiawā service area.

A study and implementation of measures to minimize sanitary sewer overflows (i.e., spills) island-wide was promulgated by the 1995 Consent Decree with the U.S. Environmental Protection Agency (EPA) (U.S.D.C. Civ. No 94-00765 DAE Order of May 15, 1995). The Wahiawā study was completed and reported in *Sewer Rehabilitation and Inflow/Infiltration Minimization Study, Volume 6 of 9* (Fukunaga & Associates, Inc., 1999). The EPA approved the plan for the projects that will need to be implemented by their recommended timeline, between now and 2020.

- Modify the Influent Pump Station (IPS) influent channel to enable bypassing of excess flows and to receive return flows from storage;
- Demolish the abandoned Final Clarifier (FC) No. 2 to accommodate construction of a new 368,000-gallon storage tank equipped with return flow pumps;
- Expand the IPS capacity to approximately 7.0 mgd; and
- Install piping and appurtenances between the new storage tank and IPS.

The requirements described above have promulgated the Wahiawā WWTP IPS Upgrade and Equalization Facility project, which is currently in the planning stage; construction is expected to commence in 2009. The following recommended improvements for the equalization of peak raw wastewater flow are expected to significantly reduce the potential for sanitary sewer overflows at the Wahiawā WWTP:

- Upgrade/restore IPS capacity to 6.5 mgd, install flow metering, modify influent channel for bypass and return of stored flow, and upgrade headworks;
- Provide 368,000-gallon storage by rehabilitating existing tanks to store peak raw influent; and
- Install new piping and appurtenances.

The Wahiawā WWTP IPS Upgrade and Equalization Facility project includes an Alternatives Analysis Report (AAR) which will examine the potential implementation of membrane bioreactors (MBR) treatment technology at the Wahiawā WWTP. Implementation of this type of technology could allow the removal of several traditional treatment processes, thereby creating available tanks for restoration and reuse as storage while greatly improving effluent quality. Changes to the wastewater treatment process may also be promulgated by future regulations and third-party disposal or reuse agreements that alter the disposal strategy for the Wahiawā WWTP. The AAR for the Wahiawā WWTP IPS Upgrade and Equalization Facility project is currently being developed by the City and County of Honolulu (City). It should also be noted, that an additional separate environmental document will be prepared in support of the AAR for the Wahiawā WWTP IPS Upgrade and Equalization Facility project.

The Wahiawā system also includes the Whitmore Village WWPTF (Figure 6) that began operation in March 1994, following the closure of the Whitmore Village WWTP and diversion of the flow to the Wahiawā system. The Whitmore Village WWTP previously discharged flow to the north fork of the Kaukonahua Stream. The Whitmore Village WWPTF is located along Whitmore Avenue, approximately 1,500 feet west of the easement access point to the Whitmore Village WWTP The Whitmore WWPTF treats the wastewater flow generated by both Whitmore Village and NCTAMS PAC. The WWPTF grinds large solids in the wastewater and removes the heavier grit material to minimize clogging problems in a downstream inverted siphon line. This inverted siphon is the largest of the four inverted siphons facilities in the Wahiawā collection system.

WAHIAWĀ RESERVOIR (THE CURRENT DISPOSAL SITE). Since Wahiawā Reservoir (refer to Figure 7 in Chapter 3) is the primary receiving water for the Wahiawā WWTP effluent, it is appropriate to discuss the existing conditions of the reservoir. It is also important to note that the reservoir receives water from and overflows into Kaukonahua Stream, which outlets at Kaiaka Bay on the North

Shore. Overflows have become more commonplace with the reduced agricultural water demands from the reservoir following the demise of the cane sugar industry.

Dole Food Company (DFC) owns the Wahiawā Reservoir Dam. Ownership of the dam site is split down the middle following the old Kaukonahua Stream bed between the Galbraith Trust Estate (eastern half) and DFC (western half).

The Galbraith Trust Estate also owns approximately 2,200 acres of land north of Wahiawā Reservoir. Much of the northern shore of the north fork of Kaukonahua Stream is adjacent to and/or part of the Galbraith Trust Estate. Of the 2,200 acres, there are approximately 2,060 acres of agricultural lands and approximately 140 acres of reservoir, dam site, and gulch lands. The 140 acres of reservoir, dam site, and gulch lands are leased to DFC. DFC pays rent to the Galbraith Trust Estate for its use of water based upon the Trust's proportional ownership and share of the lands under Wahiawā Reservoir.

The Waialua Sugar Company (WSC) built the Wahiawā Reservoir Dam between 1905 and 1906 for irrigation purposes. Other activities and benefits have since been derived from the dam and the reservoir. For example, public benefits have included treated wastewater disposal, flood control, stormwater drainage, sediment control, and recreational fishing. The reservoir is considered a valuable recreational resource and includes both the Wahiawā Public Fishing Area and the Wahiawā Freshwater Park.

Beginning in the early 1990s, Hawaii's sugarcane industry experienced a steady decline. DFC, which wholly owned the WSC, began to farm a variety of crops on former sugarcane fields in 1994. In September 1996, the last sugarcane field on O'ahu was harvested by the WSC, which has since been dissolved.

PROPOSED WASTEWATER DISPOSAL. Wahiawā WWTP is the only treatment plant in the State of Hawai`i (State) that disposes effluent into an inland surface water system—the Wahiawā Reservoir. The reservoir overflows into Kaukonahua Stream and eventually discharges to Kaiaka Bay. The affected water bodies are listed by the DOH as impaired, which has prompted evaluations of the decades-long disposal practice. The non-renewable National Pollutant Discharge Elimination System (NPDES) permit issued by DOH to the City, effective from 1989 to 1994, compelled the City to implement a new wastewater disposal solution.

No new disposal strategy was implemented before the NPDES permit expired in 1994. The 1998 Consent Decree set an interim disposal objective for the Wahiawā WWTP, including upgrading treatment with filtration and UV disinfection and discharging via a new deep-water outfall into Wahiawā Reservoir. Upon completion of the upgrades in December 2002, the City submitted a new NPDES application to the DOH, approval of which is still

pending. Discharges into the Wahiawā Reservoir remain authorized under the terms of the 1998 Consent Decree.

Recent discussions with the Honolulu Board of Water Supply (BWS) have resulted in direct reuse of R-1 water becoming the "preferred" alternative for disposal of treated effluent from the Wahiawā WWTP. **According to DOH guidelines, R-1 water is the highest quality of recycled water and allows the most uses for irrigation (see Section 5.5.1 for a more detailed discussion of R-1 water).** This is discussed as Disposal Alternative 5 in the COWFP and this EIS. It is now recognized that recycled water is a valuable resource which could reduce Central Oahu's dependence on potable water for irrigation of parks and golf courses, thereby conserving valuable water resources on the island. Nearby `Ewa is a prominent example of the successful use of non-potable water for irrigation.

To implement this proposed direct reuse system, an intergovernmental development agreement would need to be formed between the City's Department of Environmental Services (ENV) and the water purveyor, BWS, in cooperation with DOH, over the installation, operation, maintenance and ownership of the system, including the quality and quantity of supply.

A tertiary treatment upgrade was completed at the Wahiawā WWTP in December 2002 to comply with the March 1998 Consent Decree. DOH is in general agreement that the Wahiawā WWTP can meet R-1 effluent quality according to the 1993 Guidelines for the Treatment and Use of Recycled Water, provided certain conditions are met.

High quality effluent will continue to be disposed into Wahiawā Reservoir until an alternative solution, such as the direct reuse alternative mentioned above, can be implemented. Effluent disposal into the reservoir is considered an "indirect" reuse application because the reservoir is part of the Kaukonahua Stream watershed and is used for agricultural irrigation. The proposed "direct" reuse system uses a closed conduit to transmit effluent to its application site. A direct reuse system will reduce the flow of nutrients released into Wahiawā Reservoir, thereby generally benefiting the reservoir and expanding its use for recreational activities such as fishing. It will also help the City to meet future Total Maximum Daily Load (TMDL) limits in Kaukonahua Stream and Kaiaka Bay.

General project information is listed below.

THE PROPOSED ACTION:	Improvement of the facilities that comprise the Wahiawā wastewater system
THE APPLICANT:	City and County of Honolulu Dept. of Design and Construction 650 South King Street Honolulu, Hawaii 96813 Contact: Jay Hamai (808) 768-8750
APPLICANT'S CONSULTANT:	The Limtiaco Consulting Group 650 Iwilei Road, Suite 208 Honolulu, Hawaii 96817 Contact: John Katahira (808) 596-7790
EIS PREPARER:	Wil Chee - Planning, Inc. 1018 Palm Drive Honolulu, Hawaii 96814 Contact: Richard McGerrow (808) 596-4688
ACCEPTING AUTHORITIES:	City and County of Honolulu Dept. of Planning and Permitting 650 South King Street Honolulu, Hawaii 96813

TAX MAP KEY & LOT AREA (for specific sites):

Grandview WWPS	7 - 5 - 25: 98 / 7,045 square feet
Homelani WWPS	7 - 3 - 18: 01 / 7,500 square feet
Kemoo Farm WWPS	7 - 3 - 12: 14 / n/a
Lakeview WWPS	7 - 3 - 07: 01 / n/a
Nakula WWPS	7 - 4 - 18: 73 / n/a
Ohai WWPS	7 - 3 - 01: 51 / 1,120 square feet
Uwalu WWPS	7 - 2 - 01: 21 / n/a
Wahiawā WWTP	7 - 3 - 07: 02 / 6.1 acres
Wahiawā Reservoir	7 - 3 - 07: 01, 7 - 1 - 01: por. 08, 20, 21 / 300 acres
Whitmore Village WWPTF	por. of 7 - 1 - 02: 04 / n/a
Whitmore Village WWTP	por. of 7 - 1 - 02: 04 / n/a
Disposal Alternative 5	
Utility Corridor:	7 - 3 - 07: 02 California Avenue Ohai Street

Kamehameha Highway
7 - 6 - 01: 08
7 - 7 - 01: 01
Lanikuhana Avenue
9 - 4 - 05: 19
9 - 4 - 05: 48
9 - 4 - 05: 74
9 - 4 - 05: 69
9 - 4 - 06: 01
9 - 4 - 82: 01
Ka Uka Boulevard to Highway H-2

1.2 Summary of Beneficial and Adverse Impacts

The City is continuously striving to manage its regional wastewater facilities, identifying appropriate improvements that accommodate planned future growth, and addressing regulatory objectives to improve water quality and protect public health. Project actions would result in several beneficial impacts:

ENVIRONMENTAL CONSIDERATIONS. The implementation of new technologies at Central O`ahu wastewater facilities would upgrade the quality and/or reduce the amount of effluent discharged to Wahiawā Reservoir and generally result in a positive benefit to the aquatic environment. In addition, project actions that resolve the long-term permitting issues of the Wahiawā WWTP will help avoid future restrictions on new sewer connections, and thus will assist the DOH with its effort to eliminate septic tanks and cesspools, which have potentially harmful impacts on the environment.

Project actions that allow for and result in direct reuse of R-1 water could reduce Central Oahu's dependence on potable water for irrigation of parks and golf courses, thereby conserving valuable water resources on the island.

SOCIAL CONSIDERATIONS. The *Central O`ahu Sustainable Communities Plan* identifies no significant population changes for the Wahiawā community through the year 2025. As a result of this finding, the necessary major wastewater facility expansions will be programmed to accommodate existing levels of domestic wastewater flow because no significant increases in these flows are foreseen within the affected timeframe covered by COWFP, through the year 2020. The completion of proposed actions that upgrade the quality and/or reduce the amount of effluent discharged to Wahiawā Reservoir will generally be a positive benefit to the entire community that uses this recreation area.

ECONOMIC CONSIDERATIONS. The immediately surrounding community may experience no direct economic benefits from project actions; however, construction and material expenses are expected to generate general excise tax

and income tax revenues to the State of Hawai`i. The completion of project actions is expected to generate indirect economic benefits in the project area, especially if the effluent reuse alternatives can be applied in diversified agriculture and recreational facilities.

Impacts on environmental resources discussed in Chapter 5.0 and summarized in Table 3 (Chapter 6.0) are briefly described below:

GEOLOGY AND SOILS

- Direct (temporary) impacts from erosion and sedimentation due to construction may be anticipated.
- No significant long-term adverse impacts on Geology and Soils due to project actions have been disclosed.

TOPOGRAPHY

- Direct (temporary) impacts from erosion and sedimentation due to construction may be anticipated.
- No significant long-term adverse impacts on Topography due to project actions have been disclosed.

CLIMATE

- No significant long-term adverse impacts on Climate due to project actions have been disclosed.

HYDROLOGY

- Direct (temporary) impacts from erosion and sedimentation due to construction may be anticipated.
- No significant long-term adverse impacts on Hydrology due to project actions have been disclosed.

WATER QUALITY

- Direct (temporary) impacts from erosion and sedimentation due to construction may be anticipated.
- No significant long-term adverse impacts on Water Quality due to project actions have been disclosed.
- With the proposed WWTP improvements the number of sewage spills and overflows should significantly be reduced.
- **Potential impacts of continued effluent discharge into Wahiawā Reservoir under Disposal Alternative 1 would be during prolonged wet weather events when agricultural fields fed by the reservoir are saturated and cannot accept additional water, excess reservoir flows would need to be diverted into Kaukonahua Stream to minimize risk associated with potentially high reservoir levels.**

AIR QUALITY

- Direct (temporary) impacts to Air Quality due to construction may be anticipated.
- Indirect, off-site, construction-related impacts to air quality could result from the operation of concrete and asphalt batching plants which provide construction and paving materials. These plants emit particulate matter and gaseous pollutants.

- Indirect operational impacts to air quality could include emissions from the burning of fossil fuels to operate emergency generators at pumping stations and at the WWTP.
- Odor impacts to air quality may be expected, particularly during periods of warm weather or when calm conditions cause stagnant odors to remain in the vicinity of the Wahiawā WWTP. However, this is due to existing conditions, not the proposed action. WWTP improvements included in the Preferred Alternatives could potentially have a positive influence on odors emanating from the facility.
- No significant long-term adverse impacts on Air Quality due to project actions have been disclosed.

NOISE QUALITY

- Direct (temporary) noise quality impacts due to construction may be anticipated.
- No significant long-term adverse impacts on Noise Quality due to project actions have been disclosed.

FLORA

- Direct (temporary) impacts from erosion and sedimentation due to construction may be anticipated.
- No significant long-term adverse impacts on Flora due to project actions have been disclosed.

FAUNA

- Direct (temporary) impacts from erosion and sedimentation due to construction may be anticipated.
- No significant long-term adverse impacts on Fauna due to project actions have been disclosed.

HISTORICAL AND ARCHAEOLOGY

- No significant long-term adverse impacts on Historical, Archaeological and Cultural resources due to project actions have been disclosed.

NATURAL HAZARDS

- No significant long-term adverse impacts on Natural Hazards due to project actions have been disclosed.

SURROUNDING LAND USE

- Direct (temporary) impacts from erosion and sedimentation due to construction may be anticipated.
- Direct (temporary) impacts to air quality due to construction may affect the surrounding community.
- Direct (temporary) impacts to noise quality due to construction may affect the surrounding community.
- No significant long-term adverse impacts on Surrounding Land Use due to project actions have been disclosed.

AESTHETIC CONSIDERATIONS

- Temporary unsightly areas may be created resulting from construction. These areas may constitute a direct (temporary) impact to Aesthetics.

- Indirect impacts from reservoirs and large tanks and other facilities required to implement Disposal Alternative 5 – Direct Reuse may affect the aesthetics of the surrounding community.
- No significant long-term adverse impacts on Aesthetics due to project actions have been disclosed.

PUBLIC SERVICES

- Direct (temporary) impacts to Public Services due to construction may be anticipated. These may include temporary accidental outages of utilities such as communication lines and electrical lines. Roads may be partially blocked by construction activities.
- No significant long-term adverse impacts on Public Services due to project actions have been disclosed.

SOCIO-ECONOMIC CONDITIONS

- No significant long-term adverse impacts on Socio-Economic Conditions due to project actions have been disclosed.
- **As can be seen in Table 1, some people could consider the infrastructure costs of the proposed wastewater system improvements to be a negative impact to the socio-economic environment, particularly when viewed in relation to the multitude of other urgent community needs that must also be allocated from public funds.**

1.3 Summary of Proposed Mitigation Measures

Mitigation measures discussed in Chapter 5.0 and summarized in Table 4 (Chapter 6.0) are briefly described below:

GEOLOGY & SOILS

- Implement temporary and permanent erosion and sedimentation control measures to ensure compliance with applicable federal, state and county regulations. Required permits (grading, trenching, stockpiling and NPDES permits), may impose conditions to mitigate any potential impacts. Long-term mitigation may be provided by landscaping and property management.

TOPOGRAPHY

- Implement temporary and permanent erosion and sedimentation control measures to ensure compliance with applicable federal, state and county regulations. Required permits (grading, trenching, stockpiling and NPDES permits), may impose conditions to mitigate any potential impacts. Long-term mitigation may be provided by landscaping and property management.

CLIMATE

- No mitigation is warranted or proposed.

HYDROLOGY

- Implement temporary and permanent erosion and sedimentation control measures to ensure compliance with applicable federal, state and county

regulations. Required permits (grading, trenching, stockpiling and NPDES permits), may impose conditions to mitigate any potential impacts. Long-term mitigation may be provided by landscaping and property management.

WATER QUALITY

- Implement temporary and permanent erosion and sedimentation control measures to ensure compliance with applicable federal, state and county regulations. Required permits (grading, trenching, stockpiling and NPDES permits), may impose conditions to mitigate any potential impacts. Long-term mitigation may be provided by landscaping and property management.
- **Mitigation for potential impacts of continued effluent discharge into Wahiawā Reservoir under Disposal Alternative 1 would be as follows: The COWFP proposes upgrading wastewater treatment to provide appropriate treatment and storage of wet weather flow. With the proposed reduction of the City's discharge to the reservoir, whatever affect this discharge is determined to have on inundation and flooding at the reservoir would be diminished. As stated in EIS Section 3.2.2 (Flow Equalization and Storage), a concurrent City project calls for the planning and design of flow equalization facilities and accompanying wastewater treatment upgrades to minimize sanitary sewer overflows and improve reliability at the Wahiawa WWTP. This concurrent City project (referred to as the Wahiawā WWTP IPS Upgrade and Equalization Facility project or Wahiawā WWTP Modifications project) involves an engineering AAR and environmental review process. In addition, the following preferred alternatives in this COWFP EIS also address wastewater flow reduction in connection with the sewer system and WWTP:**
    - **The nature of the wastewater collection system allows for some wet-weather storage.**
    - **"Seal Manholes" is a collection system preferred alternative, discussed in Section 3.1.1 of this COWFP EIS, which would help to alleviate infiltration and inflow [I/I] into the sewer system.**
    - **"Construct New Sewers and or/Rehabilitate/Upgrade Existing Sewers" is a collection system preferred alternative, discussed in Section 3.1.4 of this COWFP EIS, which would help to alleviate I/I into the sewer system.**

AIR QUALITY

- Implementation of dust control measures during the construction period and the establishment of a watering system to reduce dust and particulate matter, erection of dust screens, etc. All construction vehicles should be properly maintained to control motor vehicle emissions.
- Off-site concrete and asphalt batching plants require DOH permits pursuant to state regulations. Issuance of necessary permits is contingent upon the ability of the batching plants to continuously comply with both emissions and ambient air quality standards.

- Operational impacts to air quality from emergency generators can be addressed by replacing older equipment with more fuel efficient units that have a lower emissions rating.
- An odor control system was installed at the Wahiawā WWTP in response to specific complaints. It is recommended that the City monitor the impact of odors of primarily hydrogen sulfide and various organic compounds emanating from the facility to better address odor concerns and respond to specific complaints.

NOISE QUALITY

- Use muffled construction equipment and restrict work to within the normally permitted hours of construction. Noisy construction activities are restricted on Sundays, holidays and during the early morning, and at night under DOH permit procedures. Operational noise requires modifications to existing ventilation openings with duct silencers, replacement of generator exhaust systems and other structural modifications. Buildings should be soundproofed to comply with state DOH noise limits.

FLORA

- Implement temporary and permanent erosion and sedimentation control measures to ensure compliance with applicable federal, state and county regulations. Required permits (grading, trenching, stockpiling and NPDES permits), may impose conditions to mitigate any potential impacts. Long-term mitigation may be provided by landscaping and property management.

FAUNA

- Implement temporary and permanent erosion and sedimentation control measures to ensure compliance with applicable federal, state and county regulations. Required permits (grading, trenching, stockpiling and NPDES permits), may impose conditions to mitigate any potential impacts. Long-term mitigation may be provided by landscaping and property management.

HISTORICAL AND ARCHAEOLOGY

- If subsurface archaeological resources are encountered during any construction or installation of upgraded wastewater facilities, such as new sewer lines or new storage tanks, construction activity shall be halted and the State Historic Preservation Division (SHPD) should be contacted immediately.

NATURAL HAZARDS

- Humans have little control over natural hazards; however, compliance with the Uniform Building Code requirements for earthquake shear and wind resistance is recommended. Follow O`ahu Civil defense procedures in the event of emergencies.

SURROUNDING LAND USE

- Implement temporary and permanent erosion and sedimentation control measures to ensure compliance with applicable federal, state and county regulations. Required permits (grading, trenching, stockpiling and NPDES permits), may impose conditions to mitigate any potential impacts. Long- term mitigation may be provided by landscaping and property management.

- To mitigate air quality effects, implement dust control measures during the construction period and establish a watering system to reduce dust and particulate matter, erect dust screens, etc. All construction vehicles should be properly maintained to control motor vehicle emissions.
- Construction noise mitigation includes the use of muffled construction equipment and restricting work within the normally permitted hours of construction.

AESTHETIC CONSIDERATIONS

- Temporary unsightly areas may be created resulting from construction activities. Contractor clean-up activities will be required at the end of construction activities.
- Landscaping, berms, fencing and painting may be required to mitigate aesthetics for reservoirs, large tanks and other facilities required to implement Disposal Alternative 5 - Direct Reuse.

PUBLIC SERVICES

- Temporary impacts may include temporary accidental outages of utilities and communication services during construction. Roads may be partially blocked by construction activities. Mitigation includes efforts to be aware of the locations of utility lines and a public awareness program to inform the public of diversions and detours to be implemented. Develop and implement traffic management plans as warranted.

SOCIO-ECONOMIC CONDITIONS

- **In order to fairly view cost as an impact, one must also consider the benefits that will be derived from this public expenditure. An efficient and well operated wastewater system is essential for human health and the well being of the community; thus, any expenditure to improve the system can be seen as a benefit to the public. In particular regard to Disposal Alternative 5 – Direct Reuse, the public benefit of saving on precious potable water for irrigation and the distribution of a marketable commodity weigh favorably against the expenditure to implement the effluent reuse system.**

1.4 Summary of Alternatives Considered

The alternatives discussion includes both structural and non-structural actions, which are listed and evaluated in Chapters 7.0, 8.0 and 9.0 of the COWFP.

WASTEWATER COLLECTION SYSTEM. Wastewater collection system alternatives were evaluated with regards to specific objectives for reducing wet weather I/I; reducing sewer-clogging problems; increasing the capability of the system to handle peak wet weather flows (PWWFs); and reducing illicit discharges to the collection system.

- Manhole work (e.g., sealing and rehabilitation) warrants a high priority due to its relatively low cost, potential for substantial reduction in inflow rates, and ease of implementation.

- The implementation of a comprehensive public education program and plumbing code enforcement program would serve to discourage detrimental actions (e.g., discharges of grease and extraneous materials, illicit discharges by private waste haulers in Wahiawā) that directly cause I/I problems and sewer clogging problems.
- Routine maintenance of sewers with and without problems is recommended over a more intensive inspection and maintenance program because of the relatively low frequency of spills and service requests in the Wahiawā system.
- The repair or rehabilitation of sewers that require frequent maintenance or exhibit structural problems is recommended; however, further investigation would be required to determine specific courses of action (e.g., whether spot repairs or entire line replacement is warranted, what types of replacement pipe are most appropriate, etc.).
- The City should place a high priority on obtaining a new NPDES permit from DOH to operate the Wahiawā WWTP and its new reclamation system, which could resolve the long term permitting issues concerning restrictions on new sewer connections. All parcels that are serviced by an individual wastewater system, including areas that would require the use of low-pressure sewer systems, should be required to connect to the municipal sewer system.
- The Grandview and Uwalu WWPSs have pumping capacities that are well below their theoretical pumping capacities and required design capacities. City maintenance personnel will initially investigate the possible causes of the reduced pumping capacities, such as constrictions in the force main or problems in the pumps themselves. Upgrade of the pumps may be required if pumping capacity cannot be easily restored.
- The Whitmore Village WWPTF operates satisfactorily. However, after over 20 years of operation it requires ongoing operation and maintenance (O&M) effort and is in need of some rehabilitation work. The ventilation system is corroded and needs replacement, and reinforced concrete walls have hairline cracks that should be repaired. The City would like to discontinue the use of this preliminary treatment facility if increased grit and solids loading on the downstream sewer lines and inverted siphon can be more conveniently handled by periodic cleaning of the lines. More studies are being conducted to determine which would be more feasible.
- The alternative to construct off-site wet weather flow storage basins was considered, but deemed infeasible because the Wahiawā WWPS sites (1) do not receive a significant amount of flow since they are in the upper reaches of the collection system; (2) are located in residential and commercial areas where noise, odor control, and aesthetics would be major concerns; and (3) have limited available land for new construction. The conversion of treatment tanks at the abandoned Whitmore WWTP into wet weather storage tanks was also considered, but would only relieve sporadic capacity problems at the Wahiawā

WWTP; therefore, the option of on-site wet weather flow storage basins is discussed as a WWTP alternative.

- The alternative to divert preliminary treated wastewater to other treatment facilities such as Honouliuli WWTP was considered, but deemed unviable for the purpose of rectifying relatively insignificant collection system capacity issues in Wahiawā. This option is more fully considered and discussed as a wastewater disposal alternative.
- A resident requested the consideration of on-site disposal of graywater (non-toilet wastewater from washing machines, bathing and sinks) as an alternative that could reduce wastewater flow. Widespread homeowner disposal and use of graywater was considered, but deemed impractical because it would require on-site treatment comparable to a septic tank system to remove potential contaminants such as fecal material and pathogens, and proper disposal according to DOH regulations under Hawai`i Administrative Rules (HAR) Chapter 11-62 "Wastewater Systems." For these reasons, the utilization of onsite graywater disposal systems was eliminated from further consideration.

WASTEWATER TREATMENT PLANT. Nine treatment related alternatives were considered in the COWFP to improve Central Oahu's wastewater system. Three of these alternatives were eliminated in the initial analysis of alternatives (refer to Section 3.5). The remaining six alternatives which are technically feasible are:

- Preliminary Treatment System Modifications
- Flow Equalization and Storage
- Additional Primary Clarifier
- Membrane Bioreactor
- Public Education
- Solids Processing and Handling

These alternatives are discussed more fully in Section 3.2 below.

WASTEWATER DISPOSAL. Five disposal alternatives were considered (refer to Section 3.3). They are:

- Disposal Alternative 1: Discharge into Wahiawā Reservoir
- Disposal Alternative 2: Transmission to DFC Irrigation Ditch
- Disposal Alternative 3: Transmission to Waiāhole Ditch
- Disposal Alternative 4: Transmission of Preliminary Treated Wastewater to Honouliuli WWTP
- Disposal Alternative 5: Direct Reuse

Alternative 3 was eliminated because the owner of Waiāhole Ditch does not wish to put treated effluent in the ditch. Alternative 4 was considered the most costly and a "last resort" scenario. Alternatives 1, 2, and 5 were considered technically feasible; however, Alternative 5: Direct Reuse would provide the most

environmental benefits by making use of the treated effluent (R-1 water) for irrigation purposes. This would reduce the amount of potable water currently being used for irrigation in Central O`ahu and would thereby conserve Oahu's precious water resources. However, under Disposal Alternative 1, high quality effluent will continue to be disposed into the Wahiawa Reservoir until an alternative solution, such as Disposal Alternative 5, can be implemented.

1.5 Summary of Unresolved Issues

The long-term objective of the Wahiawā WWTP will be determined upon the resolution of the following issues, as indicated in the COWFP:

- TMDL limits for Kaukonahua Stream, Kaiaka Bay, and Wahiawa Reservoir. With the phased development of TMDL limits for all of these water bodies currently underway by the DOH, the TMDL limits will set pollutant-loading limits for all point and non-point source discharges into Kaukonahua Stream, Wahiawā Reservoir, and Kaiaka Bay.
- Classification of agricultural ditches as "State waters". Under the current 2004 version of HAR 11-54 "Water Quality Standards", the classification would require NPDES permits for discharges into agricultural irrigation ditches, such as DFC's irrigation ditch, if the ditch can overflow into the adjacent State waters.
- Application of the 2002 recycled water guidelines and the 2004 revision of HAR 11-62 "Wastewater Systems". It is not clear whether the City can obtain a NPDES permit, as required under the 1998 Consent Decree, without compliance with these updated guidelines and regulations. The City feels it has met the majority of its obligations under the 1998 Consent Decree, but its application for a NPDES permit has yet to be approved by the DOH.
- Recycled water application in the BWS "No-Pass" zone. The BWS undertook a study to see if recycled water can be safely used on Hawaiian soils above potable aquifers. The final report did not find cause to ban the use of wastewater effluent for irrigation above the "No-Pass" line. The report did not recommend lifting restrictions immediately: it instead recommended further study using low Total Dissolved Solids (TDS) effluent (e.g., Wahiawā WWTP's), testing for emerging pollutants, and extending the test period to include varying weather conditions.
- Diversified agriculture. Total planted acreage, crop variety, and public health are key factors that will determine the water quality and quantity desired from Wahiawā Reservoir or from the Wahiawā WWTP's effluent.
- New opportunities for integrating the City's and U.S. Army facilities. The recent privatization of the Schofield Barracks wastewater system and potential discontinuation of their discharge agreement with DFC may favor the integration of facilities, since the private operator of the Schofield Barracks system may have fewer restrictions on entering a utility partnership agreement with the City and the

BWS. The COWFP did not develop a plan for such an agreement, as it is outside of the scope of the study and would be subject to negotiation between a multitude of parties. **The final decision for any future modifications to the Schofield Barracks wastewater system must be approved by the Army.**

- Integrated water resource planning. The role of recycled water as a source of non-potable water is gaining favor from the regulatory community and water purveyors. Decreasing allocations of imported water from the Waiāhole ditch, urban development in Central and Leeward O`ahu, and the demise of sugar cultivation (which had the effect of recharging underlying aquifers) have increased the need for and development of alternative water sources. Developing such opportunities for water reuse is beyond the normal range of services provided by ENV and, in order for this to come to fruition, would likely require a greater effort by the BWS, the State Department of Land and Natural Resources (DLNR), and private interests.
- Resolution to the City's use of DFC property for the new deep-water outfall. The Wahiawā WWTP currently disposes its effluent into Wahiawā Reservoir via a deep-water outfall, for which associated land easement issues are currently under discussion. **The landowner of the property where the new deep-water outfall is located, DFC (which includes Wahiawa Water Company, Inc.), claims that the City discharges through the WWTP outfall onto private property without permission and without compensation. The City's position is that Wahiawa Water Company, Inc. ("Wahiawa Water") has no basis to claim compensation for the discharge of treated effluent into the Wahiawa Reservoir. This is because the City has a preexisting right to discharge such effluent into the reservoir by virtue of previous sewer outfall easements granted to the City by Wahiawa Water or its predecessor in title. Recently, the First Circuit Court agreed with the City and ruled that the City has a preexisting right to discharge into the reservoir, and, therefore, denied compensation to DFC for the discharge of treated effluent through the deep-water outfall pipeline.**

The unresolved issues listed above directly impact the range of wastewater reuse and disposal alternatives available to the City's Department of Design and Construction (DDC).

1.6 Compatibility with Land Use Plans and Policies

Project actions to be implemented and accomplished by the DDC are to be in compliance with existing federal policies (e.g., Section 404, Clean Water Act [CWA] - U.S. Army Corps of Engineers [USACE] Permit; Section 401, CWA - Water Quality Certification; Section 402, CWA - NPDES Permit; Executive Order 11990, Protection of Wetlands) and State policy documents (e.g., the Hawai`i State Plan and the State of Hawai`i Land Use Law). Anticipated project actions also are expected to be in compliance with City policies such as the General Plan for the City and the *Central*

O`ahu Sustainable Communities Plan. Latest zoning designations for the affected project site are consistent with project actions.

1.7 List of Applicable Regulations

This EIS has been undertaken in accordance with the Environmental Review process (Chapter 343, Hawai`i Revised Statutes [HRS]). The applicant is seeking acceptance and approval of the EIS with its submissions to the State, Office of Environmental Quality Control (OEQC).

Federal, state and county regulatory requirements and guidelines that pertain to wastewater facilities are listed below:

Public Law 92-500 (Clean Water Act)

40 Code of Federal Regulations (CFR) 503, Use and Disposal of Sewage Sludge

40 CFR 257, Criteria for Classification of Solid Waste Disposal Facilities and Practices

40 CFR 258, Criteria for Municipal Solid Waste Landfills

HAR, Title 11, Chapter 23, Underground Injection Control

HAR, Title 11, Chapter 54, Water Quality Standards

HAR, Title 11, Chapter 55, Water Pollution Control

HAR, Title 11, Chapter 61, Mandatory Certification of Operating Personnel in Wastewater Treatment Facilities

HAR, Title 11, Chapter 62, Wastewater Systems

DOH, Water Quality Management Plan for the City

DOH, Guidelines for the Treatment and Use of Recycled Water

City, Revised Ordinances of Honolulu, Chapter 14, Public Works Infrastructure Requirements including Fees and Services

City, Design Standards, Department of Wastewater Management, Volumes I and 2

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Legend

Project Area

City and County Wastewater Treatment Plant District Boundary

N

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STUDY AREA-CITY & COUNTY OF HONOLULU WASTEWATER SYSTEMS

Central Oahu Wastewater Facilities Plan
Wahiawa, Oahu, Hawaii

EIS Figure

1

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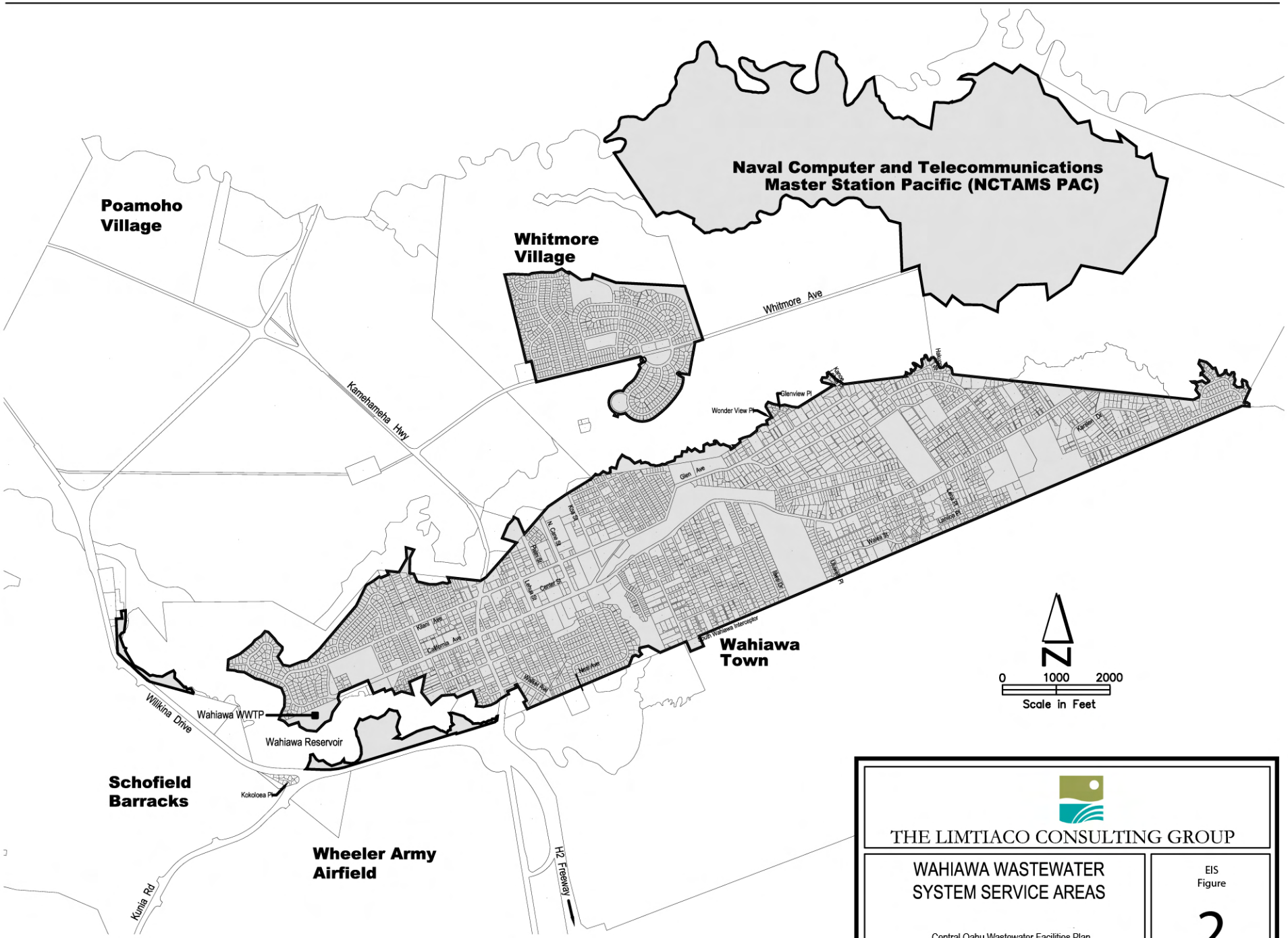

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WAHIAWA WASTEWATER SYSTEM SERVICE AREAS

Central Oahu Wastewater Facilities Plan
Wahiawa, Oahu, Hawaii

EIS Figure 2

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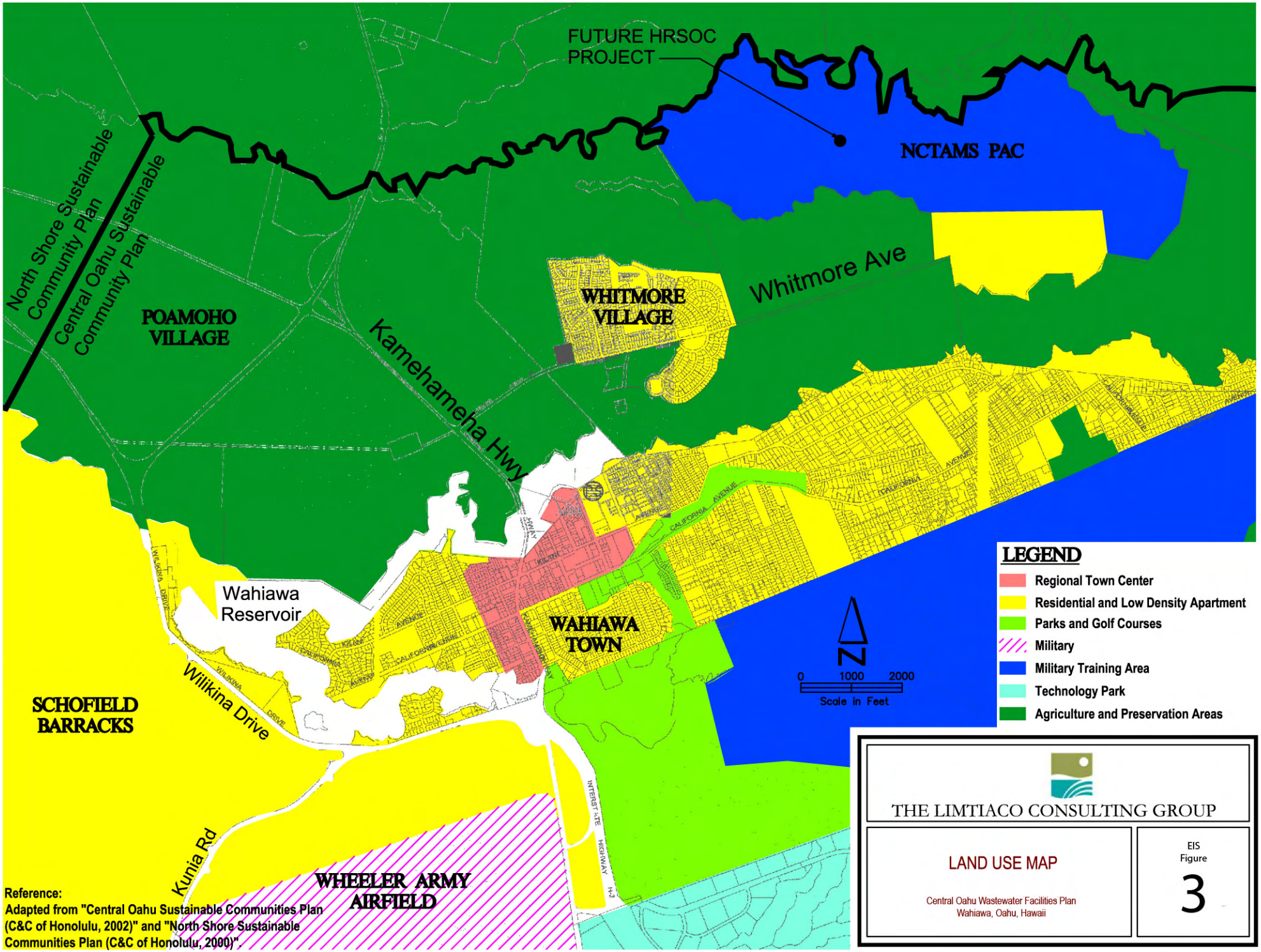

Reference:
Adapted from "Central Oahu Sustainable Communities Plan (C&C of Honolulu, 2002)" and "North Shore Sustainable Communities Plan (C&C of Honolulu, 2000)".

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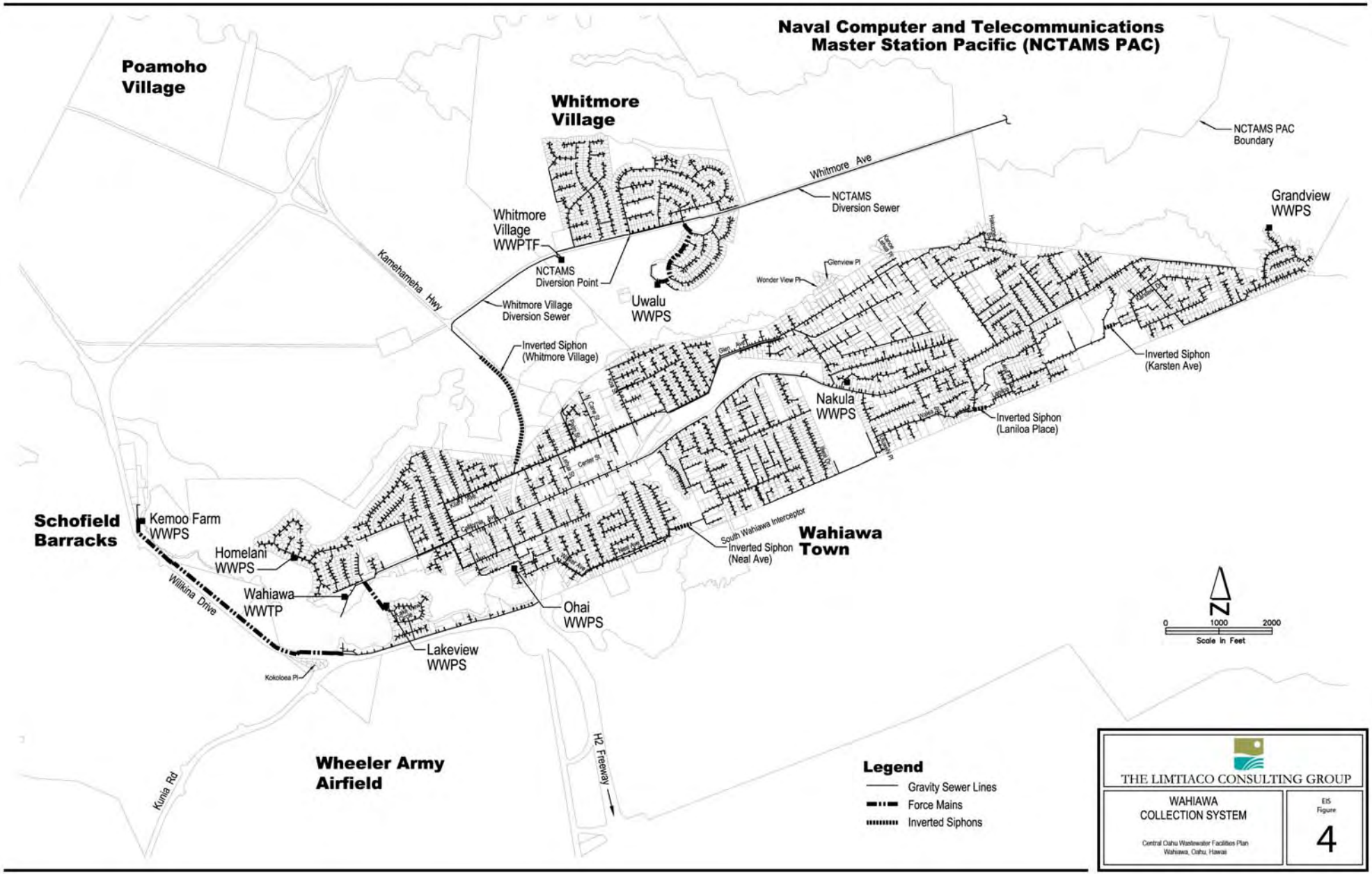
Naval Computer and Telecommunications Master Station Pacific (NCTAMS PAC)
Poamoho Village
Whitmore Village
NCTAMS PAC Boundary
Whitmore Ave
NCTAMS Diversion Sewer
Grandview WWPS
Whitmore Village WWPTF
NCTAMS Diversion Point
Kamehameha Hwy
Whitmore Village Diversion Sewer
Uwalu WWPS
Inverted Siphon (Whitmore Village)
Inverted Siphon (Karsten Ave)
Nakula WWPS
Inverted Siphon (Laniloa Place)
Schofield Barracks
Kemoo Farm WWPS
Homelani WWPS
Wahiawa WWTP
Wilikina Drive
South Wahiawa Interceptor
Inverted Siphon (Neal Ave)
Wahiawa Town
Ohai WWPS
Lakeview WWPS
Kokoloea Pl
Wheeler Army Airfield
Kunia Rd
H2 Freeway
N
0 1000 2000
Scale in Feet
Legend
Gravity Sewer Lines
Force Mains
Inverted Siphons
THE LIMTIACO CONSULTING GROUP
WAHIAWA COLLECTION SYSTEM
Central Oahu Wastewater Facilities Plan
Wahiawa, Oahu, Hawaii
EIS Figure
4

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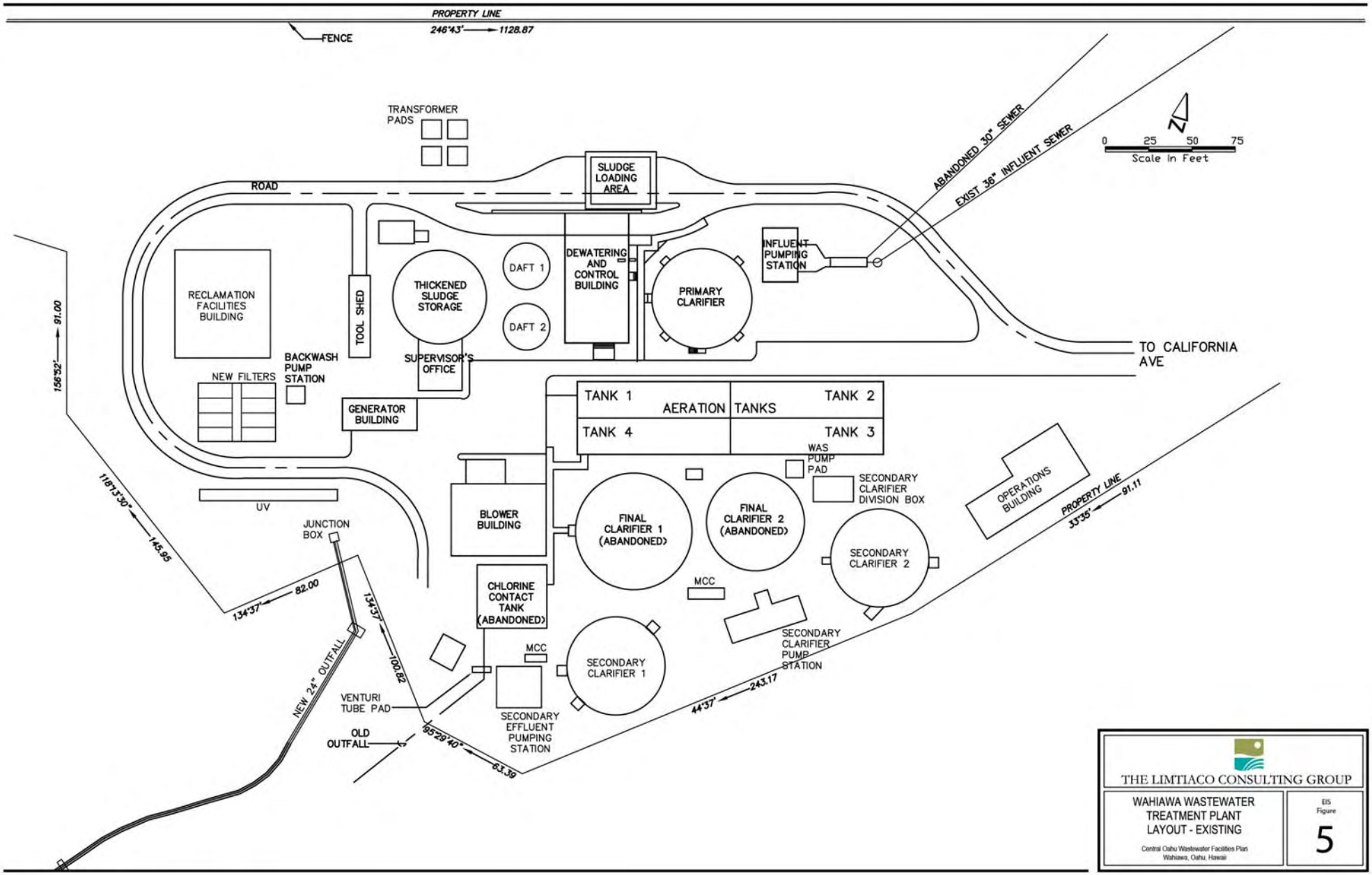

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WAHIAWA WASTEWATER TREATMENT PLANT LAYOUT - EXISTING

Central Oahu Wastewater Facilities Plan
Wahiawa, Oahu, Hawaii

EIS Figure 5

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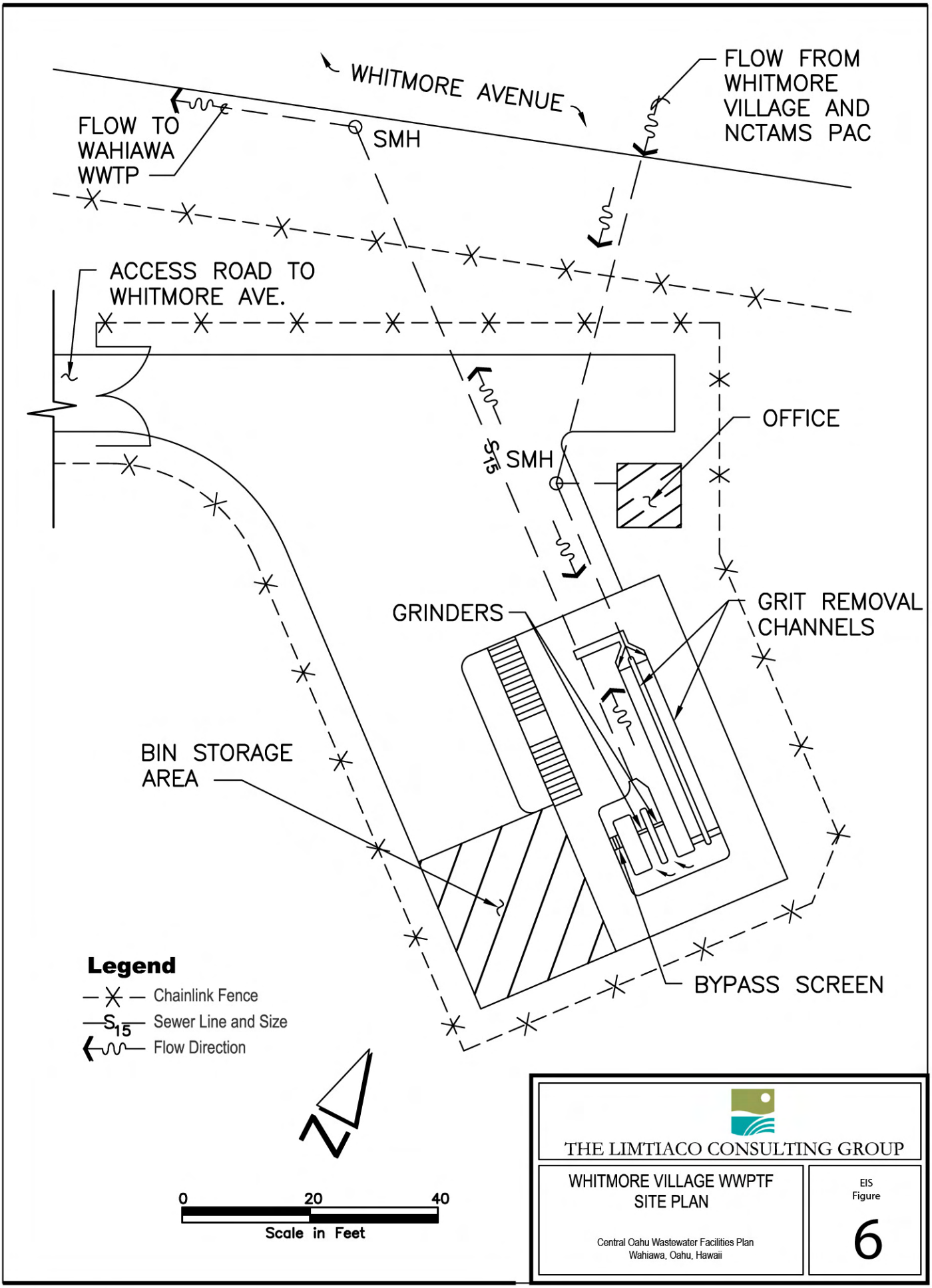
WHITMORE AVENUE
FLOW FROM WHITMORE VILLAGE AND NCTAMS PAC
FLOW TO WAHIAWA WWTP
SMH
ACCESS ROAD TO WHITMORE AVE.
OFFICE
S15
SMH
GRINDERS
GRIT REMOVAL CHANNELS
BIN STORAGE AREA
BYPASS SCREEN
Legend
Chainlink Fence
Sewer Line and Size
Flow Direction
0
20
40
Scale in Feet
THE LIMTIACO CONSULTING GROUP
WHITMORE VILLAGE WWPTF SITE PLAN
Central Oahu Wastewater Facilities Plan
Wahiawa, Oahu, Hawaii
EIS Figure
6

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2.0 PURPOSE OF AND NEED FOR ACTION

2.1 Overview

The DDC is responsible for the project planning, design, and construction of municipal wastewater systems on the island of O`ahu. The DDC proposes to improve wastewater facilities that serve the Central O`ahu area defined by the Wahiawā wastewater service area, thereby affecting communities situated on the Schofield or Leilehua Plateau in the area between the Ko`olau and Wai`anae Mountain Ranges.

The Wahiawā wastewater service area, which encompasses the tributary areas of the Wahiawā WWTP, includes Wahiawā Town, Whitmore Village, and NCTAMS PAC. Wahiawā Town, a historical plantation community, is located between the urban growth of Central O‘ahu and the agricultural and rural areas of Oahu’s North Shore. Whitmore Village is a small residential community just north of Wahiawā Town, and NCTAMS PAC is a military facility located approximately one mile east of Whitmore Village. The Wahiawā wastewater service area encompasses a total of approximately 1,610 acres.

The region defined as Central O`ahu extends north towards Waialua and south towards the `Ewa Plain. The Development Plan area for Central O`ahu (the Development Plan is now known as the *Central O`ahu Sustainable Communities Plan)* includes the following towns and communities: Wahiawā, Whitmore Village, NCTAMS PAC, Mililani, Mililani Mauka, Royal Kunia, Koa Ridge, Waiawa, Waipahu, Waikele, and Waipi`o. Note that the Sustainable Communities Plan includes communities that are not in the Wahiawā WWTP service district, such as Mililani and Waipahu. These communities are served by the Honouliuli WWTP and are currently covered under the *West Māmala Bay Facilities Plan* (Wilson Okamoto and Associates, Inc. and Brown and Caldwell, 2001).

Military installations located in Central O`ahu include Schofield Barracks Military Reservation, Wheeler Army Airfield (AAF), Camp Stover, Kunia Military Reservation, and Helemano Military Reservation. These facilities are served by a separate wastewater system—the Schofield Barracks wastewater system—that was previously wholly owned and operated by the U.S. Army. In 2001 the U.S. Army issued a proposal to privatize the wastewater treatment system, and in 2004 Aqua Engineers, Inc. entered into a long-term agreement with the U.S. Army to own, operate, and upgrade the Schofield Barracks wastewater system. The *Final EIS for the Schofield Barracks Wastewater Treatment Plant, Effluent Treatment and Disposal, Oahu, Hawaii* (Wilson Okamoto & Associates, Inc., 2000) addresses the concerns associated with the Army’s wastewater system. Facilities and lands that fall under federal jurisdiction are beyond the scope of the COWFP and this attendant EIS to address.

The DFC owns considerable acreage in Central O`ahu. Treated effluent from the Wahiawā municipal wastewater system is discharged to Wahiawā Reservoir—a man-made water resource that contributes to the irrigation of over 7,000 acres of agricultural lands spanning the region from northern Central O`ahu to the North Shore.

Wastewater treatment and disposal for Wahiawā Town, Whitmore Village and NCTAMS PAC are accomplished via the Wahiawā WWTP (see Figure 5). This facility generates wastewater effluent that is discharged via a deep-water outfall to Wahiawā Reservoir and biosolids that are hauled to the Honouliuli WWTP for treatment and disposal. The Wahiawā WWTP is located approximately 500 feet from the end of California Avenue and 0.5 miles southwest of Ka`ala Elementary School. The Wahiawā WWTP site is located on a 6.1-acre parcel comprising a portion of Tax Map Key (TMK) 7-3-007:002. This parcel is owned by the City. Other components of the Wahiawā wastewater system are interspersed throughout the study area. Collection pipes and gravity sewers are generally located within the existing transportation corridors. Some of the affected transportation corridors fall within the jurisdiction of the State Department of Transportation (DOT).

The COWFP and this EIS examine wastewater facilities in the project area that would be affected by proposed improvements. The COWFP presents the proposed improvements for the Wahiawā wastewater service district on the island of O`ahu through the year 2020. These improvements are summarized in Section 1.1 of this EIS.

The DDC initiated the development of the COWFP in conjunction with the EIS to encourage public participation from a very early stage in the project. The COWFP considers alternatives and recommendations that may be programmed and implemented by the year 2020. Alternatives and recommendations previously discussed in other planning and environmental review documents have been incorporated and re-examined in the COWFP and this supporting EIS (refer to Section 2.4).

The Wahiawā Wastewater Advisory Committee (WWAC)—a group of representatives from agencies, organizations, businesses, and the affected community—re-convened on June 13, 2000. The EISPN for the *Central Oahu Facilities Plan* (as the COWFP was then titled) project was published in *The Environmental Notice* on August 23, 2000. A first workshop was held on August 26, 2000 in Wahiawā Town to provide an opportunity for the affected community to participate in the development of a long-term wastewater management strategy for Central O`ahu and to provide input or voice their comments to the project team. A follow-up workshop was held in Wahiawā Town on October 4, 2000. At that time, the EIS process did not proceed and a Draft EIS was not completed. Project revisions have since been incorporated into the plan. A revised EISPN for the COWFP was published in *The Environmental Notice* on September 8, 2007.

The COWFP includes an implementing strategy for improvements and alternatives recommended by the DDC.

2.2 Project Need

Capital improvements through the year 2020 for wastewater facilities in the Wahiawā wastewater service area will be determined by a number of factors including regulatory considerations, land use patterns, existing and emerging technologies for wastewater disposal and reuse, and community concerns. The COWFP and this attendant EIS are documents that strive to organize the various strategies formulated to address the needs summarized below.

- The need to conform to the utility planning, environmental management, and population growth objectives set forth in the *Central O`ahu Sustainable Communities Plan*;

- The need to address deficiencies in the existing sewer and treatment system;

- The need to comply with recent and anticipated changes in environmental regulations;

- The opportunity to implement a reuse system using DOH Class 1 recycled water (R-1) water;

- The need to act in accordance with HAR Chapter 11-62-23.1 requirements for Public Wastewater Treatment Works (75 percent Design Capacity Rule); and

- The need promulgated by Consent Decrees.

The following paragraphs summarize applicable considerations.

EPA CONSENT DECREE – MAY 1995.

This federal consent decree (U.S.D.C. Civ. No 94-00765 DAE Order of May 15, 1995) promulgated the study and implementation of measures to minimize sanitary sewer overflows (i.e., spills) island-wide. The Wahiawā study was completed and reported in *Sewer Rehabilitation and Inflow/Infiltration Minimization Study, Volume 6 of 9* (Fukunaga & Associates, Inc., 1999). The study recommended a number of improvements for the Wahiawā collection system. Recommended capital improvements included increased storage capacity for PWWFs and redundant sewers for capacity reliability in certain critical sewers. The EPA approved the plan for the projects that will need to be implemented by their recommended timeline, between now and year 2020.

DOH CONSENT DECREE – MARCH 2, 1998.

Since 1927, the City has been disposing effluent from its Wahiawā WWTP into Wahiawā Reservoir—a feature constructed for irrigation by WSC, the former parent company of DFC. This practice now requires a NPDES permit administered by the DOH. The NPDES permit (Permit No. HI 0020125) for the discharge was renewed on April 7, 1989 and subsequently expired in March

1994. The permit has not been renewed, but a consent agreement was reached with the DOH to develop an alternative solution for the disposal of the effluent from the Wahiawā WWTP.

The DOH consent decree (Civ. No 94-1896-05 issued on March 2, 1998) had a three-year time limit for implementation. On May 21, 2001, the consent decree was amended to allow the City to complete the Wahiawā wastewater system upgrades while a new NPDES permit application was processed. Modification No. 1 to the Consent Decree and Order filed on March 2, 1998 states that the City may discharge effluent through either the outfall identified in the NPDES Permit No. HI 0020125 or the reclamation system deep outfall (latitude 21 29 36.8112; longitude 158 2 32.7991).

The objectives stated in the consent decree signed by the City and DOH are to (1) provide a long-term reliable solution for effluent disposal from the Wahiawā WWTP; (2) improve reservoir water quality; and (3) promote resource conservation through wastewater reclamation. Specific actions intended to accomplish the objectives of the DOH consent decree are defined in the City agreement with DOH and are listed below.

- The City shall make treatment modifications to reclaim wastewater, as defined by the DOH Wastewater Branch's "Guidelines for the Treatment and Use of Reclaimed Water", dated November 1993, without nutrient removal, from the Wahiawā WWTP now reported to be approximately 2.0 mgd;
- The effluent shall be discharged through a deep-water outfall into Wahiawā Reservoir; and
- Water quality samples shall be collected at various locations in the vicinity of the outfall for a period of up to one year after implementation of the treatment plant upgrades and may terminate sooner once water quality improvements have been quantified and documented.

The City completed construction of the upgrades at the Wahiawā WWTP that were described in the *Final EA for the Wahiawa Treatment Plant Modifications and Outfall Adjustment, Wahiawa, Oahu, Hawaii* prepared by Calvin Kim and Associates, Inc. and Gerald Park Urban Planner (May 1999) in year 2001. Improvements included a deep outfall into the Wahiawā Reservoir, filtration and UV disinfection processes for R-1 reclaimed water production, and new deeper secondary clarifiers for treatment reliability.

Concerns pertaining to both the federal and state consent decrees contributed to restrictions on new sewer connections despite a DOH mandate to eliminate the use of cesspools and septic tanks. The goal is to protect public health from wastewater spills and inefficient treatment. Connections that do not impair the

existing wastewater system are allowed. Requests for new sewer connections are reviewed on a case-by-case basis.

2.3 Project Goals and Objectives

The purpose of undertaking the COWFP was to develop a rational, well-coordinated approach to implement the various capital improvements that will satisfy the wastewater demands of the Wahiawā wastewater service area through the year 2020. The list of recommended project actions (refer to Section 1.1) was developed from reviews of technical considerations, as well as public participation and input in the decision-making process. The City's overall objective is to define and implement an environmentally viable and cost-effective strategy for the long-term disposal of wastewater from the Wahiawā municipal wastewater system.

Goals. Specific goals for the Wahiawā wastewater system are:

- Improve collection system reliability,
- Connect unsewered areas to the sewer system,
- Improve WWTP reliability,
- Improve WWTP effluent water quality,
- Improve water quality in Wahiawā Reservoir,
- Provide recycled water for irrigation,
- Enhance/improve recycled water reservoirs, and
- Integrate city, federal, and private facilities and programs.

These goals were developed with input from the WWAC. The WWAC was reconvened in 2000 and public workshops were held to brainstorm, discuss, and prioritize various goals and alternatives for the COWFP. The WWAC consisted of Wahiawā-area residents, community representatives, elected officials, public and private stakeholders, and government officials representing the City, the State, and the U.S. military.

2.4 Project Scope

This EIS for the COWFP has been prepared pursuant to Chapter 343 HRS, as amended, "Environmental Impact Statements" (the EIS law), and the associated HAR Title 11, Chapter 200, "Environmental Impact Statement Rules." The use of State or county lands or funds triggers the EIS law for the proposed action discussed in this document.

The EIS is intended to serve as a comprehensive environmental disclosure document. The intent of this document is to define the scope and analysis of the proposed action and serves to ensure that comprehensive and systematic consideration is given to potential impacts of the proposed action upon the natural and man-made environment.

This EIS incorporates by reference the following studies and plans that contribute to the proposed wastewater improvement strategy for the Wahiawā municipal wastewater system evaluated in this EIS:

- *Final Environmental Assessment for the Wahiawa Treatment Plant Modifications and Outfall Adjustment, Wahiawa, Oahu, Hawaii* dated May 1999 and prepared by Calvin Kim and Associates, Inc. and Gerald Park Urban Planner for the DDC.
- *Sewer Rehabilitation and Infiltration & Inflow (I/I) Minimization Study, Volume 6 of 9, Wahiawa I/I Engineering Report* dated December 1999 and prepared by Fukunaga and Associates, Inc. for the DDC.
- *Central Oahu Sustainable Communities Plan* dated December 2002 and prepared by the DPP.
- *Final Environmental Impact Statement for the Schofield Barracks Wastewater Treatment Plant Effluent Treatment and Disposal, Oahu, Hawaii* dated February 2000 and prepared by Wilson Okamoto & Associates, Inc. for the Department of the Army.
- *Environmental Impact Statement Preparation Notice for the Central Oahu Wastewater Facilities Plan* dated August 2007 and prepared by Wil Chee - Planning & Environmental for the DDC.
- *(Pre-Final) Central Oahu Wastewater Facilities Plan*, work-in-progress, and prepared by TLCG for the DDC.

The COWFP identifies capital improvements for the Wahiawā wastewater system to be implemented by year 2020. The Sewer Rehabilitation and I/I Minimization Program currently being undertaken by the City is a key component in the identification of necessary collection system improvements. The Sewer Rehab and I/I Program includes the assessment of the hydraulic and structural condition of the collection system. It is generally presumed that future work would be phased or timed according to established priorities, funding availability, and overall need.

3.0 ALTERNATIVES

The discussion in this chapter is a summary of the alternatives presented in the COWFP to improve the existing Central O`ahu wastewater system. The information is taken from the COWFP.

A variety of alternatives can be conceived to fulfill the desired goals of the facilities plan. These alternatives are not limited to “brick and mortar” solutions. Management strategies and programs can also provide critical support to help achieve wastewater system goals. Hence, alternatives can be loosely categorized as structural and non-structural. Structural alternatives are generally new, replacement, or rehabilitated facilities and equipment. Non-structural alternatives include public education programs, effective enforcement of permits and regulations, and preventive maintenance programs.

Over the past decade, the City, U.S. Army, and the WWAC have introduced a number of alternative scenarios for wastewater treatment and disposal to address some of the issues discussed in Section 2.2 of this EIS. Strategies involving joint facilities between intergovernmental agencies were considered during a previous planning endeavor that officially began in February 1994. Although a joint U.S. Army and City project for wastewater treatment and disposal for Central O`ahu was formulated during the previous endeavor, the two parties were unable to jointly negotiate a satisfactory agreement and the process was terminated in June 1998.

The following alternatives are divided into the three major components of the wastewater system: collection, treatment and disposal. The end result of the planning and EIS process will be to recommend a combination of several alternatives for implementation.

3.1 Wastewater Collection System Alternatives.

Maintaining a high degree of reliability in the collection system is a key wastewater management goal. Specific objectives to increase reliability include:

- Reduce wet weather I/I,
- Reduce sewer-clogging problems,
- Increase capability to handle PWWFs, and
- Reduce illicit discharges to the collection system.

Another objective related to the collection system is to connect unsewered parcels currently serviced by individual wastewater systems to the Wahiawā wastewater system.

Presented below are possible alternatives and options to meet the various collection system goals and objectives.

3.1.1 SEAL MANHOLES

Inflow of storm runoff through manhole covers, particularly in areas that are inundated due to poor drainage, can be significant. The City has an ongoing program to outfit manholes with "rain stopper" inserts to minimize the amount of rainwater entering the manhole cover pick-holes and leaking between the cover and frame. To date, it is estimated that the City has outfitted well over half the manhole covers in Wahiawā (TLCG, w.i.p.). The plastic dish-shaped inserts resting on the rim of the manhole frame (below the cover) capture the leaking rainwater, which minimizes rainwater entry into the manhole.

Substantial inflow could potentially also enter manholes below the frame due to misalignment, damaged mortar or cone, or other problems. In some cases, rain induced infiltration may also enter through the manhole cone if the surrounding soil is highly permeable and the cone exhibits porous brick mortar joints. Corrective actions include repairing the defect or using one of many commercially available manhole repair products.

Evaluation:
The proposed manhole sealing program could potentially reduce peak wet weather inflow by over 1 mgd. The total recommended budget for the sealing and rehabilitation of manholes in the Wahiawā collection system is $300,000. This budget includes inspections, manhole inserts, frame and cover replacements/repairs, and rehabilitation of two deteriorated manholes at the Lakeview WWPS force main and the discharge manhole for the Kemoo Farm WWPS. The manhole work should be given high priority due to the relatively low cost, the potential for substantial reduction in inflow rates, and ease of implementation. This alternative is determined to be one of a set of Preferred Alternatives, to be included and evaluated as a component of the Proposed Action.

3.1.2 PUBLIC EDUCATION AND ENFORCEMENT OF PLUMBING CODE

Many of the I/I and sewer clogging problems can be directly attributed to wastewater collection system user actions. Detrimental actions by users typically include:

- Illicit connection of roof gutter downspouts and outdoor floor drains;
- Failure to install/replace cleanout covers, which cause inflow and become an entry point for extraneous materials;
- Root intrusion caused by planting trees too close to sewer lines; and
- Disposal of grease and extraneous non-biodegradable materials such as rocks, cans, sticks, toys, and rags into the sewers.

It has been suggested that the City increase efforts to educate the public as to how they can be a significant cause of sewer system problems and can take proactive actions to

reduce these problems. Many members of the public likely are unaware of the nature and consequences of the detrimental practices described above. It is believed that many of the sewer system problems could be significantly reduced by an ongoing, effective public education program. The City could more aggressively pursue the problem of illicit connections by implementing a more comprehensive enforcement program that cites homeowners for plumbing connection violations.

Illicit dumping of toxic and/or high strength wastes, as well as grease, grit and other substances into the Wahiawā wastewater system by private haulers is believed to contribute to problems in the wastewater system. Problems associated with illicit dumping include performance problems at the Wahiawā WWTP, clogs in the sewer lines—particularly where the sewer lines sag, and fishkills at the Wahiawā Reservoir.

The public education program could also include the promotion of High Efficiency Toilets, Waterless Urinals, and Low-Flow Water Fixtures. The installation of these low-use water fixtures would considerably reduce the waste stream to the wastewater facility.

Evaluation:
Studies have shown that I/I generated by users' private sewer connections can account for 50 percent of the I/I problems and sewer clogging problems in a wastewater system (Water Environment Federation, 1999, as cited in TLCG, w.i.p.). Case studies indicate that public education programs, plumbing code enforcement programs, and sewer lateral repair programs can be effective in curbing I/I generated within users' properties. However, groundwater infiltration in the Wahiawā collection system is relatively low. Thus, widespread repair of existing service laterals is not expected to be a cost-effective solution to reduce I/I. A public education program combined with an inspection and enforcement program would likely be highly cost-effective. A public education program could also educate the public to be aware of illicit dumping by private waste haulers and on the need and procedures to report such incidents.

A public education program would promote lowering of private property I/I, reducing the discharge of grease and extraneous materials, and curbing illicit dumping by waste haulers. This would have the following benefits:

- Reduce PWWFs throughout the system, thus minimizing the need for sewer line upgrades and reducing capital expenditures at the Wahiawā WWTP (for such key liquid stream processes as wet weather storage/equalization, influent pumping, headworks, aeration tanks, clarifiers, disinfection).

- Lower the risk of spills and backups, thereby reducing the associated adverse impacts such as water quality impacts, public health hazards, cleanup costs, public notification and other administrative costs, tarnishing of public image, and fines.

- Reduce maintenance costs due to lower required cleaning frequency to minimize spill risk, fewer service calls, and less risk of spills from clogging.

- Reduce the frequency and severity of plant upsets at the Wahiawā WWTP (and in some cases, possibly fishkills which may result from the plant upset or toxic material discharge) due to illicit dumping of wastes by private haulers.

The total cost of a public education program would be relatively low compared to the potential benefits. A public education and enforcement budget of $300,000 is proposed. This budget would include a general public education program for Wahiawā, fieldwork for a parcel-by-parcel inspection program to identify illicit connections, and follow-up notices to the homeowners by the City. The public education program could include articles in local Wahiawā publications, mailed flyers, and presentations at community meetings. This alternative is determined to be one of a set of Preferred Alternatives to be included and evaluated as a component of the Proposed Action.

3.1.3 MAINTAIN/INTENSIFY MAINTENANCE PROGRAM

Compared to other areas on O`ahu, the number of spills in the Wahiawā system is not significant. The relatively small size of the system and the rigorous maintenance program already in place appears to counteract the propensity for spills due to problems such as sags, tree roots and pipe-clogging materials, displaced joints, and sink holes experienced with the aging system. Currently, sewer segments with clogging problems are subjected to cleaning at routine intervals. Cleaning intervals are adjusted for specific areas as required depending on the severity of the problem. Nonetheless, this alternative proposes intensifying inspection of all sewers and increasing the level of maintenance which may further reduce the number of spills. This alternative is essentially the “status quo” course of action in regards to the sewer clogging issue since the current routine of performing intense cleaning at problem areas and routine cleaning at other areas would continue.

Generally speaking, if the sewer system is not upgraded or rehabilitated, maintenance requirements can be expected to increase over time due to continued development of additional problem segments in the aging system.

<u>Evaluation</u>:
Since the number of spills in the Wahiawā system is low, intensifying the level of inspection and maintenance of all sewers in the system may not be cost-effective at the present time due to the need to allocate manpower and funds to other collection systems on O`ahu that have more severe clogging and spill problems. Until the benefits of the other recommended alternative actions are realized, it is recommended that routine maintenance of sewers be continued at an estimated annual cost of $170,000. This alternative is determined to be one of a set of Preferred Alternatives to be included and evaluated as a component of the Proposed Action.

3.1.4 CONSTRUCT NEW SEWERS AND/OR REHABILITATE/UPGRADE EXISTING SEWERS

This alternative primarily focuses on near-term construction of new sewer lines or rehabilitating existing sewer lines to eliminate significant capacity or clogging problems. This alternative also includes actions to improve the performance of the inverted siphons. On a longer term basis, this alternative should also encompass a comprehensive sewer assessment program. This program would involve closed-circuit television inspection of all the lines and proactive rehabilitation of deficient sewers.

Evaluation:
The alternative of constructing new sewer lines is applicable to situations in which the existing line:

1. is significantly undersized,
2. has a sag condition that results in significant solids deposition and grease accumulation problems,
3. has severely displaced joints, and
4. has significant structural integrity problems that cannot be readily corrected by other sewer rehabilitation methods.

To improve the performance and reduce the maintenance requirements for the three inverted siphon systems requiring frequent maintenance, the option of installing new High Density Polyethylene inverted siphon lines using directional drilling technology was considered. The new inverted siphon lines would provide a smooth corrosion-resistant pipe without sharp bends or joints to facilitate maintenance and reduce clogging problems. The directional drilling technology would be ideal for the inverted siphons due to the need to cross streams and gulches.

Based on the sewer line maintenance requirements and problems, the COWFP identified potential sewer replacement and rehabilitation projects for specific problem areas. It was concluded that it would generally be cost-effective to fix sags in the sewer line due to reductions in maintenance costs. Lining the entire length of sewer with cured-in-place pipe lining to eliminate tree root problems, however, is generally not cost-effective. Removal of the tree roots (and trees, if possible), and localized spot pipeline replacement and repairs would appear to be a more cost-effective course of action. Construction of new inverted siphons would appear to be difficult to justify based on reduction of maintenance costs alone. It is recommended that tree root problems in inverted siphons be handled in a manner similar to that recommended for sewers.

A capital improvement budget of $2.5 million, including escalation and contingencies, is recommended for a project to repair the various sewer line deficiencies. The budget, includes some funding for removal of roots/trees and replacement/rehabilitation of sewers with tree root problems in appropriate areas, and limited inverted siphon rehabilitation work. Similar to the sewer work, the inverted siphon rehabilitation work is assumed to consist primarily of removal of tree roots and trees causing root intrusion

problems, and spot repairs to the pipeline. All the work is proposed to be accomplished under a single contract to benefit from economy of scale factors. An engineering report should be prepared to investigate the specific work required and evaluate the cost-effectiveness of the various alternative courses of action. This alternative is determined to be one of a set of Preferred Alternatives to be included and evaluated as a component of the Proposed Action.

3.1.5 INCREASE CAPACITY OF WASTEWATER PUMPING STATIONS

This alternative focuses on increasing the capacity of the Grandview and Uwalu WWPSs. Based on field measurements, the pumping capacities of these two pump stations are well below their theoretical pumping capacities and the required design capacities.

Initial actions under this alternative would involve City maintenance personnel investigating the possible causes of the reduced pumping capacities, such as constrictions in the force main or pump problems. Pump problems are generally repaired by maintenance personnel with assistance from City engineers and a pump repair contractor, if necessary. Upgrade of the pumps and associated equipment may be required in the event that the pumping capacity cannot be readily restored.

Evaluation:
The need for major upgrades of the pump stations and force mains is not anticipated. The City is currently investigating force main integrity at critical areas on the island. The force mains in the Wahiawā area are not included in these investigations at this time. This is likely because of the smaller force main diameters, relatively low repair and replacement history, and the absence of saltwater (which increases corrosion) in this area. However, the City should consider including this area in future investigations.

The remaining service life of the force mains in Wahiawā is uncertain due to the lack of breaks in the lines. The force mains could conceivably operate with minimal problems through the year 2020. At the present time, replacement of the force mains is not recommended due to other more pressing capital improvement needs and the general lack of evidence justifying the need for pipeline replacement. Breaks in the force main are not expected to have catastrophic impacts on the environment and the public. In the meantime, in the event that future force main breaks occur due to internal or external corrosion, the breaks can be repaired and replacement of the force main can then be programmed as required.

This alternative represents correcting an operation rather than upgrading the design capacity of the system. The estimated budget for this alternative is $400,000 ($200,000 for each station). Work would involve cleaning the force main, repairing mechanical pump problems, or replacing the pumps and/or motors. The cost of the work is not significant and could potentially be funded by the O&M budget. The need for major upgrades of the pump stations is not anticipated. This alternative is determined to be

one of a set of Preferred Alternatives to be included and evaluated as a component of the Proposed Action.

3.1.6 REHABILITATE WHITMORE VILLAGE WASTEWATER PRELIMINARY TREATMENT FACILITY

Although the Whitmore Village WWPTF operates satisfactorily, through the year 2020, the facility requires ongoing operation and maintenance effort and is currently in need of some rehabilitation work. The ventilation system requires replacement due to corrosion, and hairline cracks in the reinforced concrete walls should be repaired. In lieu of rehabilitating and continuing to operate the facility, the City would like to consider discontinuing its use if increased grit and solids loading on the downstream sewer lines, particularly the inverted siphon, can be satisfactorily and more economically handled by periodic cleaning of the lines. More studies are being conducted to determine which would be more feasible.

Evaluation:
The question posed by this alternative is whether discontinuing pretreatment at the facility, which involves grinding and grit removal, would be more cost-effective than rehabilitating and continuing to use the facility. The primary concern is the possible clogging of the Whitmore Village inverted siphon. The inverted siphon conveys wastewater from Whitmore Village and NCTAMS PAC across the north fork of the Wahiawā Reservoir.

Although the Whitmore Village WWPTF may not be absolutely necessary to prevent clogging of the inverted siphon, it does provide some benefit and insurance against catastrophic clogging and spills.

Regular periodic cleaning of the inverted siphon would cost substantially less than the cost of rehabilitating and continuing operation of the Whitmore Village WWPTF. It is estimated that annual cleaning of the two inverted siphon pipes would cost on the order of $5,000 to $10,000 per year depending the amount of sediments and difficulties in accessing the pipes. In comparison, rehabilitation of the Whitmore Village WWPTF would cost $100,000, and the estimated total cost per year of keeping the pretreatment facility in operation would be on the order of $20,000.

The City will ultimately need to determine whether cost savings associated with shutting down the Whitmore Village WWPTF are worth the increased risk of possibly clogging the inverted siphon and probably increasing inverted siphon maintenance requirements. The pretreatment facility could be shut down on a trial basis for a year to determine the impact on downstream facilities. This alternative is determined to be one of a set of Preferred Alternatives to be included and evaluated as a component of the Proposed Action.

3.1.7 CONSTRUCT WET WEATHER FLOW STORAGE FACILITIES

Another alternative that is sometimes used to accommodate high flows caused by wet weather I/I involves the use of storage basins. Storage basins are used to temporarily store excess flow during high flow periods. The stored wastewater is then discharged back into the system for treatment and disposal during normal lower flow periods.

The storage basins may be located within the collection system (i.e., pretreatment facilities, pump stations or deep gravity sewers) or at the wastewater treatment facility itself.

Evaluation:
Storage facilities located at the treatment plant will reduce flows at the treatment plant, but will not resolve capacity concerns in the upstream sewer system. Storage facilities within the collection system are sometimes located at existing WWPS sites. The storage facilities within the collection system will reduce the magnitude of peak flows in the downstream sewer system. However, the amount of flow stored will be limited to the flow at the storage facility site. Public opposition will normally be encountered for wastewater storage facilities located at pump stations or other sites in residential areas due to concerns with odor, noise, and aesthetics.

A brief evaluation of locating wet weather flow storage facilities at the Wahiawā WWPSs was conducted as part of the facilities plan. It was concluded that none of the WWPS sites are feasible for use as flow storage sites. Reasons for this conclusion are as follows:

- Most of the pump stations are located in the upper reaches of the collection system and therefore do not receive a significant amount of flow. The two largest pump stations at Lakeview Circle and Uwalu have projected year 2020 peak design flows of only 0.45 mgd and 0.54 mgd, respectively. Since peak design flows at the Wahiawā WWTP are in excess of 10 mgd, storing all of the flow at these two sites would have an insignificant impact on attenuation of peak flows.

- All of the pump stations are located in residential areas, except for the Lakeview Circle pump station, which is located in a commercial area. Extensive provisions to mitigate noise, odor control, and aesthetic impacts would be required.

- All of the pump station sites have limited land area available for the construction of storage facilities.

For the above reasons, this alternative is eliminated from further consideration in this EIS.

3.1.8 DIVERT PRELIMINARY TREATED WASTEWATER TO HONOULIULI WWTP

This alternative focuses on the diversion of preliminary treated wastewater from the Wahiawā WWTP to the Honouliuli WWTP. For the Wahiawā wastewater system, diversion of preliminary treated wastewater to other treatment facilities such as the Honouliuli WWTP would be primarily to resolve treatment plant capacity and effluent disposal problems. However, it should be noted that the sewer and pump station capacity problems are relatively insignificant in Wahiawā. From the standpoint of effluent disposal, the diversion of preliminary treated wastewater is discussed in the facilities plan and herein as a wastewater disposal alternative. (See Section 3.3.4 below.)

Evaluation:
The high cost of this alternative cannot be justified based on rectifying collection system capacity issues alone since the sewer and pump station capacity problems are relatively insignificant in Wahiawā. For this reason, this alternative is eliminated from further consideration in this EIS.

3.1.9 UTILIZE ONSITE GRAYWATER DISPOSAL SYSTEM

This alternative focuses on the application of graywater systems. Graywater is composed of non-toilet wastewater such as water from washing machines, bathing, and sinks. Onsite graywater disposal would: 1) reduce the production of wastewater required for transmission, treatment, and disposal, and 2) conserve potable water resources through reuse.

Evaluation:
The disposal and use of graywater is regulated by the DOH under its HAR Chapter 11-62, “Wastewater Systems” regulations. The regulations state that graywater first be pretreated by the use of a septic tank “when required” and then disposed of by a DOH approved method. The regulations indicate that acceptable disposal methods include conveyance to a sand filter, absorption trenches and beds, mounds or seepage pits, or if properly disinfected, to an irrigation system. The costs for onsite treatment of graywater would therefore be comparable to a conventional septic tank system; **however, given that additional plumbing would be required for diversion and distribution of the graywater, costs associated with onsite graywater systems would be site-specific and vary. It should be noted that to install a graywater system on an existing home is generally more costly and more complicated than to develop a system for a new home. Although graywater has some benefits, such as its use for irrigation (thus replacing the use of potable water) and its use as fertilizer due to its nutrient content, graywater does have some drawbacks.** Graywater can potentially be contaminated with fecal material and pathogens. Based on the current requirements of the DOH, widespread homeowner reuse of graywater for yard irrigation in accordance with the regulations is not considered practical. It would be costly and difficult to fully comply with the requirements due to the septic tank

pretreatment requirement and the disinfection requirement for irrigation reuse. For these reasons, this alternative is eliminated from further consideration in this EIS.

3.1.10 CONNECT UNSEWERED AREAS TO THE SEWER SYSTEM

The construction of treatment and outfall facilities at the Wahiawā WWTP was intended to comply with the 1998 Consent Decree and clear the way for obtaining a new NPDES permit. Since 1927 the City has been disposing secondary effluent from its Wahiawā WWTP into Wahiawā Reservoir, a feature constructed for irrigation. This practice now requires a NPDES permit administered by DOH. A non-renewable NPDES permit (HI 0020125) for the discharge was issued by the DOH in 1989 and subsequently expired in March 1994. The permit was not renewed; however, in lieu of an alternative disposal strategy and a current NPDES permit, the consent agreement was reached with the DOH and set the interim disposal objective for the Wahiawā WWTP—upgrading treatment with filtration and UV disinfection and discharging via a new deep-water outfall into Wahiawā Reservoir. Resolving the NPDES permit issue will allow parcels that have been waiting to connect to the wastewater system, to do so.

The City should take proactive action on owners of parcels that have not connected due to the owner's desire to avoid sewer connection expenses and user fees. The City has used various means to encourage or "force" these owners to connect, such as by curtailing City cesspool pumping services. Owners of parcels that were not connected in the past due to the sewer lines being at too high an elevation for gravity flow should be encouraged to install onsite grinder pumping systems and low-pressure sewers. Technology of packaged-type, low-pressure pumping systems for individual homes have improved significantly in recent years.

<u>Evaluation</u>:
The low-pressure pumping technology allows homes that are located below the gravity sewer line to be serviced by a small grinder pumping system located at the home and a shallow small-diameter, low pressure force main. Where multiple homes are serviced, the low-pressure force main system would be shared by the various homeowners.

The estimated cost for the low-pressure grinder pumping station, plumbing modifications, and force main lateral is $10,000 per home. A budgetary capital cost for the force main is $180 per linear foot. As an example, to service the homes in the Glenview Place and Wonder View Place area, it is estimated that the total project capital cost would be about $22,000 per home. Although this cost is very reasonable compared to the use of conventional sewers and pumping stations, it is unlikely that the homeowners would support the project unless a large portion of the cost is funded by the City. Partial funding of the low-pressure sewer system may be justifiable based on City's goal to sewer all homes in Wahiawā and the resulting public health and environmental benefits. This alternative is determined to be one of a set of Preferred Alternatives to be included and evaluated as a component of the Proposed Action.

3.2 Wastewater Treatment Alternatives.

Alternatives for improvements at the Wahiawā WWTP address the wastewater system goals and objectives listed in Section 2.3. These projects will strive to improve treatment reliability, support the anticipated long-term disposal requirements, and enable the development of a sustainable recycled water program. It should be noted that the COWFP will not be recommending any Wahiawā WWTP improvements that may be required to meet future regulatory requirements or to fulfill future third-party agreements with regard to the disposal or reuse of effluent. Recommended WWTP improvements can only be determined after thorough investigation of existing conditions, project requirements, and analyses of possible alternatives.

Therefore, WWTP improvements will be determined after further studies and investigations are conducted through the Wahiawā WWTP IPS Upgrade and Equalization Facility project. As previously mentioned, the Wahiawā WWTP IPS Upgrade and Equalization Facility project is in the planning stage and an AAR is currently being developed by the City. It should also be noted, that an additional separate environmental document will be prepared in support of the AAR for the Wahiawā WWTP IPS Upgrade and Equalization Facility project. These further studies will be conducted to determine which of the specific WWTP improvement alternatives will be employed.

3.2.1 PRELIMINARY TREATMENT SYSTEM MODIFICATIONS

The cyclonic separator in the primary sludge line serves as the grit removal system for the Wahiawā WWTP. The separator is activated mainly in wet weather, high-flow situations. During dry weather, grit tends to settle in the influent channel, and the plant staff performs manual cleaning of this area.

Provided there is no significant expansion of the Wahiawā wastewater service area, total grit loads into the plant should not change significantly as long as the collection system is properly maintained. Reducing structural defects in gravity sewer lines and eliminating illegal surface drainage connections can decrease grit, sediment, and debris input into the WWTP.

Structural and hydraulic modifications of the influent channel, IPS, and primary treatment facilities can alter grit settling locations. Any proposed changes should consider possible impacts on the management of grit and debris at the WWTP and will likely require an upgrade in the grit removal process. Additionally, if MBR treatment upgrades are employed (see Section 3.2.6 below), grit removal improvements as well as coarse and fine screening treatment will need to be implemented.

Evaluation:
This alternative is technically feasible. Detailed evaluation of the preliminary treatment system modifications will be performed in the AAR for the Wahiawā WWTP IPS Upgrade and Equalization Facility project, which is currently being developed by the City. It should also be noted, that an additional separate environmental document will be prepared in support of the AAR for the Wahiawā WWTP IPS Upgrade and Equalization Facility project. For the purposes of this EIS, this alternative will be treated as one of a set of Preferred Alternatives to be included and evaluated as a component of the Proposed Action until the City has determined its feasibility.

3.2.2 FLOW EQUALIZATION AND STORAGE

A concurrent City project calls for the planning and design of flow equalization facilities and accompanying IPS upgrades to minimize sanitary sewer overflows at the Wahiawā WWTP. Part of the IPS upgrade will include a new influent flow monitoring system, which will flow-pace the influent water quality sampler. The basic options for the equalization project are presented below.

In the interim, the abandoned FCs and the chlorine contact channel are being utilized for wet weather storage.

FLOW EQUALIZATION OF RAW INFLUENT. The *Sewer Rehab I/I Study* (Fukunaga and Associates, 1999) recommended an onsite flow equalization basin at the Wahiawā WWTP to manage the design PWWF.

FLOW EQUALIZATION OF PRIMARY EFFLUENT. Recognizing a need for a redundant primary clarifier (PC) at the WWTP, the *Sewer Rehab I/I Study* (Fukunaga and Associates, 1999) also recommended the evaluation of peak-flow storage of primary effluent as an alternative to raw influent storage.

WHITMORE VILLAGE WWTP CONVERSION TO FLOW EQUALIZATION. A storage basin can also be located at the abandoned Whitmore Village WWTP to reduce the peak flow and required equalization storage at the Wahiawā WWTP.

STORAGE OF REDUCED-QUALITY EFFLUENT FOR RETREATMENT. The DOH's 2002 Guidelines for the Treatment and Use of Recycled Water (also referred to as the 2002 reuse guidelines) require either an alternate disposal method or emergency storage or retreatment for times when recycled water does not meet its water quality criteria. In Section 3.3 Wastewater Disposal Alternatives below, the regulatory and receiving water issues for handling of reduced-quality effluent are discussed.

Evaluation:
FLOW EQUALIZATION OF RAW INFLUENT. This alternative would involve the addition of a 368,000-gallon equalization basin and upgrading the IPS to 7.0 mgd. The site of the abandoned FCs was chosen for the basin. The FCs were abandoned in-place following

the construction of the tertiary treatment upgrades in December 2002. The total construction cost of this alternative would be $7.58 million (in July 2007 dollars).

Converting the abandoned FCs for flow equalization storage was also considered. If it could be demonstrated that the plant can be periodically stressed to 7.0 mgd, then converting the abandoned FCs to equalization basins would be a viable alternative. There will be potential for odors associated with raw influent storage, so retrofitting the FCs with aerating mechanisms should be considered. Although these abandoned structures would not be ideal, this approach is plausible for the interim storage of flows in excess of the IPS capacity. The preliminary budget cost estimate for rehabilitation of the existing tanks and restoration of IPS rating capacity of 6.5 mgd is $1.4 million.

FLOW EQUALIZATION OF PRIMARY EFFLUENT. Flow equalization of primary effluent instead of raw influent has the following benefits:

1) the cleanup of sludge and debris following storms will be less troublesome,
2) the need for mixers or aerators to keep solids in suspension is eliminated, and
3) the likelihood of odor problems is reduced.

An IPS capacity upgrade is planned, and a new, redundant PC is an alternative contained in the facilities plan. Hence, many of the improvements needed to accompany a primary effluent equalization basin have individual merits. Furthermore, the simplified cleanup procedure and lessened need for aeration and mixing makes the prospect of utilizing the abandoned FCs and Chlorine Contact Channel for storage more practicable. For these reasons, flow equalization of primary effluent is an option to be considered for minimizing sanitary sewer overflow.

The abandoned FCs will be demolished to make room for a new, 368,000-gallon equalization basin, similar to the project proposed for raw influent equalization. The IPS pumps will be upgraded to a rated capacity of 10.16 mgd. The preliminary budget estimate of this alternative (excluding the new PC) is $6.5 million.

WHITMORE VILLAGE WWTP CONVERSION TO FLOW EQUALIZATION. ENV is pursuing the installation of a permanent equalization storage facility at the Wahiawā WWTP, which eliminates the need for storage at the Whitmore Village WWTP and the additional cost of operating and maintaining a remote storage facility. Thus, this alternative is eliminated from further consideration in this EIS.

STORAGE OF REDUCED-QUALITY EFFLUENT FOR RETREATMENT. The north side of the Wahiawā WWTP should be reserved for an emergency storage basin, anticipated to be about 6 million gallons. The purpose of this basin is to store reduced-quality effluent until daily water quality analyses, specifically fecal coliform, on the R-1 effluent are completed. As long as the effluent water quality meets R-1 criteria, the effluent can be discharged from the storage tanks, which should be operated at levels that provide an average hydraulic residence time of one day. If any effluent sample does not meet the

required water quality standards, discharge into the transmission pipeline is suspended until the problem is corrected, thus raising the water levels in the tanks. Samples on the effluent and tank contents are taken until the water quality returns to compliance levels. Effluent disposal is commenced when compliance levels are reestablished. As an option, the effluent can be recycled through the plant for retreatment as long as the WWTP has available treatment capacity.

This sizing and effluent management plan differs from the 2002 water reuse guidelines, which simply require one day's storage. Unlike turbidity, which can be monitored continuously, fecal coliform analyses require a one-day time period to obtain the results. The preliminary budgetary cost estimate of this alternative is $8 million.

Detailed evaluation of the flow equalization and storage will be performed in the AAR for the Wahiawā WWTP IPS Upgrade and Equalization Facility project, which is currently being developed by the City. It should also be noted, that an additional separate environmental document will be prepared in support of the AAR for the Wahiawā WWTP IPS Upgrade and Equalization Facility project. These further studies will be conducted to determine which of the above flow equalization and storage alternatives will be employed. For the purposes of this EIS, flow equalization and storage as a general objective will be retained as one of a set of Preferred Alternatives to be included and evaluated as a component of the Proposed Action.

3.2.3 ADDITIONAL PRIMARY CLARIFIER

To enhance the overall performance reliability of the WWTP, a redundant PC would enable inspection and maintenance activities on the existing PC and its submerged equipment. This improvement would also increase the primary sedimentation capacity, if the IPS were similarly upgraded. A redundant PC would also enable additional storage of PWWF of partially treated effluent and would allow for maintenance and repair of the existing PC.

Evaluation:
At the proposed equalized PWWF of 6.5 mgd, one PC alone is approaching its process limit. At the unattenuated peak flow of 10.16 mgd, two PCs are required. Therefore, whether equalization basins are located upstream or downstream of the primary sedimentation process, a new 2nd PC is highly desired for redundancy and for improved process efficiency under wet weather flow conditions.

The preliminary location for the new PC, east of the IPS, was selected over two other locations. Estimated construction cost of the new clarifier would be $2.05 million (July 2007 dollars). Although, an MBR would eliminate the need for a back-up PC (see Section 3.2.6 below).

Detailed evaluation of the additional PC and MBR upgrade will be performed in the AAR for the Wahiawā WWTP IPS Upgrade and Equalization Facility project, which is

currently being developed by the City. It should also be noted, that an additional separate environmental document will be prepared in support of the AAR for the Wahiawā WWTP IPS Upgrade and Equalization Facility project. These further studies will be conducted to determine which of the above will be employed. Therefore, for the purposes of this EIS, this alternative is determined to be one of a set of Preferred Alternatives to be included and evaluated as a component of the Proposed Action; however, if the MBR alternative is implemented (Section 3.2.6 below) this alternative will be eliminated.

3.2.4 NUTRIENT REMOVAL UPGRADES

There presently is no nitrogen or phosphorous limits for the discharge into Wahiawā Reservoir. The future establishment of nutrient TMDL limits for Kaiaka Bay, Kaukonahua Stream, and Wahiawā Reservoir is anticipated to place nutrient-load limits for the discharge of Wahiawā WWTP effluent into Wahiawā Reservoir. The TMDL program may necessitate some degree of nutrient removal, especially if the tertiary effluent is not fully or partially diverted from the watershed.

Evaluation:
This should be considered a "worst case" scenario, in the event that stringent TMDL limits are established and that a recycled water program cannot be successfully implemented to divert effluent from Wahiawā Reservoir. To allow for this possibility, the area immediately east of the aeration basins should be reserved for future expansion.

The capital cost estimate for aeration tank modification and expansion is $1.55 million (July 2007 dollars); however, the decision to upgrade the plant with nutrient-removal capabilities should be deferred until the DOH sets the TMDL limits. Since this is a "worst case" scenario, it is eliminated from further consideration in this EIS.

3.2.5 DISINFECTION IMPROVEMENTS

Chlorination Facility
Conversion from chlorine disinfection to UV disinfection was part of the tertiary treatment upgrades completed in December 2002. The main benefit of this conversion is the elimination of the safety hazards associated with the transportation, storage, and use of chlorine gas. The chlorine disinfection facility at the WWTP should be preserved, taking proper safety precautions, for possible conversion to provide residual disinfection with the R-1 water distribution system.

Ozone Disinfection
This alternative considers the use of ozone disinfection to supplement the existing UV disinfection process at the Wahiawā WWTP. As an alternative to chlorine disinfection (e.g., with chlorine gas or sodium hypochlorite) and UV disinfection, ozone disinfection has been employed in a number of WWTPs in the United States. However, there are

no known or approved applications of ozone for Water Recycling Facilities (WRF) in Hawai`i.

Evaluation:
Because it is rarely used, the existing pretreatment chlorine injection system should be regularly inspected and maintained or it should be locked down to eliminate safety hazards and the possibility of accidental release into process basins.

There are no known or approved applications of ozone for WRFs in Hawai`i and in California. With very little industry experience with ozone disinfection for water reclamation, the design requirements for supplemental disinfection with ozone to meet the 2002 water reuse guidelines would have to be determined by testing and regulatory approval. Because of the effort and expense involved in determining the feasibility of supplemental ozone disinfection, it is not recommended that ozone disinfection be pursued as a disinfection alternative for the Wahiawā WWTP at this time.

Since the chlorine injection system is already in place, but not often used, and ozone disinfection is not recommended at this time, this alternative would come under the category of No Action and is eliminated from further consideration in this EIS.

3.2.6 MEMBRANE BIOREACTOR

In recent years, MBRs for combined primary, secondary, and tertiary treatment have been employed in new and existing plants, especially those that can benefit from the production of a high-quality effluent. MBR is, in essence, a combined activated sludge secondary treatment and tertiary filtration process that employs membranes with a pore size less than 1 micron (1/1000th of 1 millimeter) as a physical barrier to exclude suspended solids and organic material from the effluent.

For the Wahiawā WWTP, converting to a new MBR system could eliminate the need for the primary, secondary, and the abandoned FCs, as well as the existing sand filters. This also would preclude the need for a second PC.

Because high-quality effluent is produced with MBR treatment, the disinfection loading requirements could be reduced, allowing the existing UV system to work more effectively and reliably. The existing aeration basins could be modified to accommodate MBR process modifications. In a confined facility such as the Wahiawā WWTP, MBR treatment could significantly reduce the treatment system footprint. MBRs may be employed without an upstream PC, but coarse/fine screening and grit removal are needed, which would require upgrading the pretreatment facility.

Evaluation:
Advantages of an MBR were mentioned above. Some disadvantages of an MBR are as follows:

- MBR is an energy-intensive treatment process.
- MBR is a new technology and long-term costs are not well-established.
- Although there are a number of manufacturers, capital costs are relatively high. Conversion of an existing facility may require committing to a particular manufacturer or MBR configuration, which would reduce competitive bidding.
- Treatment plant personnel would need to be re-trained in order to operate an MBR facility.

Detailed evaluation of the MBR upgrade will be performed in the AAR for the Wahiawā WWTP IPS Upgrade and Equalization Facility project, which is currently being developed by the City. It should also be noted, that an additional separate environmental document will be prepared in support of the AAR for the Wahiawā WWTP IPS Upgrade and Equalization Facility project. For the purposes of this EIS this alternative will be treated as a Preferred Alternative to be included and evaluated as a component of the Proposed Action until the City has determined its feasibility.

3.2.7 PUBLIC EDUCATION

In the WWTP, toxic substances that are dumped into the sewer system by community members can kill the biological organisms required for wastewater treatment. It can take days or weeks for the treatment process to recover fully. In addition, these substances can be toxic to wildlife in the WWTP's receiving waters. A public education program emphasizing the environmental and legal consequences of illicit dumping of toxic substances should be launched to help eliminate such practices.

Evaluation:
A public education program informing the public of the consequences of dumping toxic substances into the sewer system would be a cost-effective method of improving the treatment of wastewater. This program could be combined with the public education efforts concerning wastewater collection described in Section 3.1.2. This alternative is determined to be one of a set of Preferred Alternatives to be included and evaluated as a component of the Proposed Action.

3.2.8 SOLIDS PROCESSING AND HANDLING

The City completed the Dissolved Air Flotation Thickener (DAFT) and sludge storage tank conversions in 2002 (DAFTs are used to thicken primary sludge and waste activated sludge so that they can be hauled away by truck for processing and disposal); however, it was discovered that the solids processing system would not work effectively from a hydraulic standpoint. Various treatment improvements may influence the amount of solids generated. For example, if nutrient removal is incorporated, solids generation is expected to increase due to the higher level of treatment. If these types of treatment improvements are considered, sludge handling requirements should be re-evaluated.

Evaluation:
Modifications were made to correct a hydraulic problem with the solids processing system. Any proposed physical or operational modifications to the activated sludge basins and secondary clarifiers should verify the adequacy of the DAFT system and storage tank.

On a typical day, anywhere from two to six truckloads of thickened sludge are delivered to the Honouliuli WWTP from the Wahiawā WWTP. Truck circulation in and out of the WWTP will continue to be an issue. Future plant improvement projects should ensure that the area east of the sludge loading station is maintained for truck turnaround.

Detailed evaluation of the solids processing and handling will be performed in the AAR for the Wahiawā WWTP IPS Upgrade and Equalization Facility project, which is currently being developed by the City. It should also be noted, that an additional separate environmental document will be prepared in support of the AAR for the Wahiawā WWTP IPS Upgrade and Equalization Facility project. For the purposes of this EIS, this alternative will be treated as and is determined to be one of a set of Preferred Alternatives to be included and evaluated as a component of the Proposed Action.

3.2.9 ADVANCED TREATMENT AT A NEW CONSTRUCTED WETLANDS FACILITY

This alternative considers the use of constructed wetlands as an adjunct to, or to replace, the Wahiawā wastewater system. Constructed wetlands are engineered aquatic systems with generally low operating and maintenance costs. Constructed wetlands are commonly employed to provide advanced treatment with reduced nutrient and pathogen levels. A secondary benefit of constructed wetlands is the creation of wildlife habitat.

Evaluation:
Given that tertiary treatment upgrades were completed at the Wahiawā WWTP in December 2002, a constructed wetlands project in Central O`ahu would have limited applicability, perhaps serving as:

1) a polishing process to reduce nutrient levels,
2) a redundant advanced treatment process in the event of a process upset or shutdown at the Wahiawā WWTP, or
3) flow diversion out of the Wahiawā collection and treatment system, should hydraulic or process capacities be exceeded.

These three objectives, individually or combined, are not compelling enough to consider constructed wetlands as an adjunct to, or to replace, the Wahiawā wastewater system. Furthermore, nutrient-removal upgrades can be made to the existing activated sludge system, there are other alternatives to divert tertiary effluent to reduce nutrient loads on

the watershed, and finally the land requirement for a constructed wetlands facility is substantial. Thus, wetlands treatment is eliminated from further consideration in this EIS.

3.3 Wastewater Disposal Alternatives

Of the COWFP's eight goals discussed in Section 2.3, at least four are directly derived from concerns relating to effluent disposal practices in Central O`ahu. The Wahiawā WWTP currently disposes its effluent into Wahiawā Reservoir via a new deep-water outfall, for which associated land easement issues are currently under discussion. The reservoir overflows into Kaukonahua Stream and eventually discharges into Kaiaka Bay. These water bodies are listed by the DOH as impaired. Thus, although it accounts for approximately 5 percent of the total flow into the reservoir (and this percentage diminishes further downstream in the watershed), the effluent has a potential impact on areas from Wahiawā to the North Shore.

The Wahiawā WWTP is the only treatment plant in the State that disposes wastewater effluent into inland surface water. Due to the nature of the watershed into which the WWTP discharges its effluent, the elimination of wastewater discharge into Wahiawā Reservoir has been under evaluation for a number of years. The DOH issued a non-renewable NPDES permit, effective from 1989 to 1994, which compelled the City to implement a new disposal solution. In the history of the Wahiawā WWTP, this was perhaps the most forceful action by the State urging the City to divert its effluent from the reservoir. To this end, the original alternatives that the City pursued included:

- Conversion of the WWTP to a WWPTF and WWPS, and transmission to the Honouliuli WWTP for treatment and discharge/reuse (a combined project with wastewater facilities at Schofield Barracks).

- Transmission of secondary effluent to a constructed wetlands facility on agricultural lands north of Wahiawā for advanced treatment and reuse/discharge.

- Upgrading to tertiary treatment at the Wahiawā WWTP and reuse on agricultural lands north of Wahiawā.

Although these alternatives were conceived and advanced in earnest by the City and other parties, the NPDES permit expired in 1994 without the City implementing a new disposal plan, and the City continues to discharge under the authority and terms of the 1998 Consent Decree.

For all of the disposal alternatives described below (except for Disposal Alternative 4 – Transmission of Preliminary Treated Wastewater to Honouliuli WWTP), WWTP improvements would still be carried out or implemented and, therefore, disposal would be of improved effluent quality **(i.e., R-1 quality). Overall, it is important to note that**

under the proposed improvements to the Wahiawā WWTP as presented in this EIS and being evaluated in the previously-mentioned AAR for the Wahiawā WWTP IPS Upgrade and Equalization Facility project (including the additional separate environmental document prepared in support of the AAR), the City desires to enhance the Wahiawā WWTP's effluent quality and reliably treat wastewater to produce R-1 quality recycled water (certified by DOH).

3.3.1 DISPOSAL ALTERNATIVE 1: DISCHARGE INTO WAHIAWĀ RESERVOIR

Alternative 1 is the year-round discharge of improved-quality effluent into Wahiawā Reservoir (Figure 7). Reservoir water will continue to be ~~withdrawn for indirect agricultural reuse and excess reservoir waters will be released into Kaukonahua Stream and, eventually, Kaiaka Bay~~ **indirectly recycled and withdrawn for agricultural reuse and may be diverted into Kaukonahua Stream and, eventually, Kaiaka Bay. "Indirect" reuse is defined as when the Wahiawā WWTP's treated effluent is discharged into a natural water environment before being reused. A "direct" reclamation project is defined by the use of a closed system of conduits and storage basins to provide recycled water to the user. Hence, under Disposal Alternative 1 – Discharge into Wahiawā Reservoir, the reservoir water would be used for agricultural irrigation and the Wahiawā WWTP's effluent would be "indirectly" recycled.**

This alternative will require an NPDES permit to discharge tertiary effluent into the reservoir and a discharge/reuse agreement between the City and DFC which could require R-1 certification by DOH.

Evaluation:
This alternative is technically feasible and would dispose of improved-quality effluent into Wahiawā Reservoir until an alternative disposal solution such as Disposal Alternative 5 is implemented. Therefore, Disposal Alternative 1 is the second or interim preferred disposal alternative. It differs from the No Action Alternative in that it **involves the production of** improved-quality effluent while the No Action Alternative **consists of current-quality effluent. The WWTP currently produces R-2 quality effluent (though DOH has not certified it as such), although it should be noted that based on the tertiary treatment upgrades completed in December 2002 the WWTP is now capable of producing R-1 quality effluent, although DOH has not certified it as such.**

DFC has expressed strong opposition to the use of Wahiawā Reservoir as a disposal site on similar grounds to those expressed by ADC concerning Disposal Alternative 3: Disposal into Waiāhole Ditch (See Section 3.3.3 below). According to the DOH 2002 water reuse guidelines (and the 2004 revisions to HAR 11-62), R-2 water is not allowed for "food crops where recycled water contacts the edible portion of the crop, including all root crops." Suitable irrigation uses for R-2 quality recycled water, established by the DOH Wastewater Branch, are shown in

Table 2 (see Section 5.5.1). However, as is also presented in Table 2 and per the City's desire to enhance the Wahiawā WWTP's effluent quality and reliably treat wastewater to produce R-1 quality recycled water (certified by DOH), use of R-1 water would not have this restriction and could be used for irrigation of all crops (including spray, drip, and surface and subsurface watering).

Disposal Alternative 5, described below is the first preferred disposal alternative because it has the advantage of reusing treated water (DOH certified R-1 water), thus conserving precious potable water resources. ~~Therefore~~ **Since** Disposal Alternative 1 is **considered to be the interim or second preferred disposal alternative, it is** included and evaluated as a component of the Proposed Action.

3.3.2 DISPOSAL ALTERNATIVE 2: TRANSMISSION TO DFC IRRIGATION DITCH

The diversion of Wahiawā WWTP's R-1 quality effluent from the Wahiawā Reservoir to the DFC's irrigation ditch near the Wilson Dam would provide water for the diversified agriculture industry on former sugarcane fields north of Wahiawā. Figure 8 depicts the location of the ditch and a suggested alignment for the transmission line. This is the disposal alternative with the shortest pipeline diverting effluent from Wahiawā Reservoir. This alternative would also involve intermittent and interim discharge of any unused tertiary effluent from the WWTP into Wahiawā Reservoir. This would occur during wet weather conditions when recycled water demands decrease and until such time that the transmission line connects to the irrigation ditch. During such periods, this alternative would be similar to Disposal Alternative 1 from an operational standpoint.

This alternative will require NPDES permits to discharge into the irrigation ditch and/or the reservoir; a discharge/reuse agreement between the City and DFC, which could require R-1 certification by DOH; a pump station and force main from the Wahiawā WWTP to the irrigation ditch; and DOH reuse approval for irrigation with R-1 water.

Evaluation:
Like Disposal Alternative 1, Disposal Alternative 2 is technically feasible. While feasible, this disposal alternative lacks the many advantages of Disposal Alternative 5 (discussed in Section 3.3.5 below) such as creating a marketable product in recycled water and conserving potable water which is currently used for irrigation in the area. Therefore, this alternative is eliminated from further consideration in this EIS.

3.3.3 DISPOSAL ALTERNATIVE 3: TRANSMISSION TO WAIĀHOLE DITCH

Under this alternative, R-1 quality water will be distributed via a new pump station and transmission lines southward to the Waiāhole Ditch, located in Mililani. Figure 9 depicts the location of the ditch and a suggested alignment for the transmission line.

The Waiāhole Water System (commonly referred to as the Waiāhole ditch) is managed and maintained by the Agribusiness Development Corporation (ADC) and extends 26.4 miles from Kahana to Honouliuli. The ADC's main role is to facilitate and provide direction for the transition of Hawaii's agriculture industry from a dual-crop economy (i.e., dominance of sugar and pineapple plantations) to a multi-crop economy (i.e., one composed of diversified crops).

This alternative would also involve intermittent and interim discharge of any unused tertiary effluent from the WWTP into Wahiawā Reservoir. This would occur during wet weather conditions when recycled water demands decrease and until such time that the transmission line connects to the irrigation ditch. During such periods, this alternative would be similar to Disposal Alternative 1 from a regulatory standpoint.

From an operational and regulatory standpoint, Disposal Alternative 3 is similar to Disposal Alternative 2, with the key differences being: 1) the transmission line is considerably longer and runs through Mililani Town, and 2) the ADC and Castle & Cooke, the major owner of agricultural lands in the area, are the primary stakeholders.

Alternative 3 will require NPDES permits to discharge into the irrigation ditch and/or the reservoir; a discharge/reuse agreement between the City and ADC, which could require R-1 certification by DOH; a pump station and force main from the Wahiawā WWTP to the irrigation ditch; and DOH reuse approval for irrigation with R-1 water.

Evaluation:
As owner/operator of the Waiāhole Water System (WWS), ADC has major concerns regarding Disposal Alternative 3 (See Appendix F: EISPN Correspondence). ADC asserts that:

- The WWS Diverts dike-impounded water from Windward O`ahu to Central O`ahu farmers.
- Although it is an open-ditch irrigation system, WWS delivers very high-quality water to its users.
- If Alternative 3 were to be chosen, the disposal of R-1 water into the WWS will degrade its water quality and may restrict how the irrigation water could be used.
- There are concerns on certification, health and safety issues.
- There are further concerns on the public perception and marketability of vegetable crops irrigated by treated water. For these reasons, ADC is strongly opposed to using the WWS as a disposal alternative.

The Kunia Water Cooperative (KWC), an organization of farmers who use Waiāhole Ditch water, has also stated its opposition to Disposal Alternative 3 (See Appendix F: EISPN Correspondence). KWC asserts the following:

- Although the agricultural cooperative supports the reuse of water, it also recognizes the need for farmer flexibility. Not all farmers in the area at all times could use mixed water without incurring additional regulatory costs.

- Recycled waste water should not be added to general use irrigation water, but instead be targeted for specific known end-users and delivered directly to those areas.

For the above reasons Disposal Alternative 3 is not recommended. ADC does not want R-1 effluent in the Waiāhole Ditch at this point in time. Many of the farmers associated with the ADC are likely to oppose the use of recycled water due to potential adverse public perception and the possibility of decreased marketability for their produce. Therefore, this alternative is eliminated from further consideration in this EIS.

3.3.4 DISPOSAL ALTERNATIVE 4: TRANSMISSION OF PRELIMINARY TREATED WASTEWATER TO HONOULIULI WASTEWATER TREATMENT PLANT

This alternative entails adding screening and grit removal and installation of a new pump station at the Wahiawā WWTP, in turn converting it to a WWPTF. All preliminary treated wastewater will then flow through Mililani and eventually enter the Honouliuli WWTP for treatment and disposal. Due to pipeline capacity limitations, it is presumed that a new transmission line running the entire distance between the Wahiawā WWTP and the Honouliuli WWTP will be required. Figure 10 shows a possible alignment that transmits Wahiawā flows down Kamehameha Highway to Mililani, through Waipahu and the Waipi`o Peninsula, across West Loch and the `Ewa Plain to the Honouliuli WWTP.

Upon entering the Honouliuli WWTP, treated wastewater has two basic disposal options: (1) direct reuse, (the reclamation system is operated by the BWS); or (2) disposal via the Honouliuli deep ocean outfall.

<u>Evaluation</u>:
Disposal Alternative 4 is not a favorable option to the City because of cost constraints ($65,737,000) and project duration (see Table 1). Even assuming an MBR upgrade, which may not be needed, at the Wahiawā WWTP in conjunction with the other disposal alternatives and discounting possible upgrades to the Honouliuli WWTP, Disposal Alternative 4 is the most costly. Additionally, the possible change associated with this disposal alternative to the treatment level of Wahiawā's wastewater from its current tertiary treatment to primary treatment only at the Honouliuli WWTP may create additional regulatory problems due to the existing Clean Water Act (CWA) Section 301(h) waiver for the Honouliuli WWTP. The 301(h) waiver may be further jeopardized under Disposal Alternative 4, with potential large cost impacts to the City.

Only if all other disposal alternatives for the Wahiawā WWTP are exhausted, should Disposal Alternative 4 be reconsidered. At that point, the *West Mamala Bay Facilities Plan* (Wilson Okamoto and Associates, Inc. and Brown and Caldwell, 2001) should be revised with Wahiawā wastewater system flows included. The Honouliuli WWTP NPDES permit will also have to be modified to include incoming flows from the Wahiawā wastewater system. This alternative is, therefore, eliminated from further consideration in this EIS.

3.3.5 DISPOSAL ALTERNATIVE 5: DIRECT REUSE

Alternative 5 calls for the direct reuse of R-1 water from the Wahiawā WWTP through a recycled water distribution system. The overall concept for the recycled water distribution system is to provide as much of Wahiawā WWTP's R-1 water for direct reuse as possible.

The ENV is responsible only for the collection, treatment, and disposal of wastewater. Therefore, a long-term partnership between the ENV and a water purveyor, as well as prospective users, would be necessary in order to implement this disposal alternative. The BWS is the lead as purveyor of potable and non-potable water throughout O`ahu and has shown a strong interest in Disposal Alternative 5, although a formal ENV-BWS agreement does not yet exist. An intergovernmental agreement will be required between the City and the water purveyor (BWS) over the installation, operation, maintenance and ownership of the system, including the quality and quantity of supply. The water purveyor would be primarily responsible for the funding, construction, and operation of the direct reuse recycled water distribution system. The BWS has developed a preliminary plan to implement this direct reuse disposal alternative, illustrated in Figure 11.

This alternative would also involve intermittent and interim discharge of any unused tertiary effluent from the WWTP into Wahiawā Reservoir. This would occur during wet weather conditions when recycled water demands decrease and until such time that the direct reuse recycled water distribution system connects to potential users as much as necessary. During such periods, this alternative would be similar to Disposal Alternative 1 from an operational standpoint.

Disposal Alternative 5 will require that the ENV and water purveyor reach an agreement over ownership of facilities and custody of the R-1 effluent. Part of this agreement will require that the City obtain certification as an R-1 treatment facility by DOH. The ENV will be responsible for the WWTP upgrades to achieve R-1 certification. Additionally, this alternative will require an NPDES permit to discharge tertiary effluent that is not reused into the reservoir; a water custody agreement between the ENV and water purveyor; and direct reuse infrastructure (responsibility of the water purveyor), which includes pump stations, water storage facilities, and distribution pipelines.

BWS has programmed the preliminary design of the recycled water system in Fiscal Year 2008. Construction is tentatively programmed in Fiscal Years 2010 through 2012 subject to budget approval.

<u>Evaluation</u>:
This alternative will create a marketable product in recycled water, thus benefiting the City. It will also make a major contribution to conservation of water resources on O`ahu because current practice in Central O`ahu is to use potable water for irrigation of public

parks and golf courses. There are many proven benefits to using recycled water for direct reuse application. The following lists some of the potential benefits associated with the direct reuse of the Wahiawā WWTP's effluent (TLCG, 2005):

- It can be a drought-proof and reliable supply of water.
- It can replace potable water that currently is used for non-potable purposes.
- In some instances, availability of recycled water has stimulated the State's economic development by attracting business activity.
- Provides a mechanism for nutrients in wastewater to be utilized by vegetation, thereby reducing the need for fertilization in most instances.
- Provides environmental benefits, such as:
    - reducing the demand on and depletion of other water sources (e.g., groundwater) for non-potable uses, and
    - reducing the disposal of wastewater effluent into the natural environment.

For these reasons Disposal Alternative 5 – Direct Reuse is the first Preferred Alternative for disposal of wastewater from the Wahiawā WWTP and is included and evaluated as a component of the Proposed Action. Although Disposal Alternative 5 is the first preferred disposal alternative, it involves the preparation of multi-agency agreements and considerable construction time to lay in the supply lines from Wahiawā WWTP to the Central O`ahu Regional Park (CORP) and beyond. In the interim, Disposal Alternative 1, described in Section 3.3.1 above, is the second preferred disposal alternative.

3.4 No Action Alternatives

3.4.1 WASTEWATER COLLECTION: NO ACTION

In general, the No Action option refers to the performance of maintenance actions at current levels and frequencies. No Action involves relatively no change to the current practice of performing repairs or improvements when problems manifest themselves as ruptures or force main overflows (i.e., spills) or are otherwise discovered by direct observation. This alternative would not address the deficiencies in the collection system in a timely manner, since problems would primarily be corrected only as they occur. The potential risks to public health and the severity of environmental concerns resulting from deficiencies in the wastewater collection system would correspond to the frequency of overflows or other related problems in the system.

3.4.2 WASTEWATER TREATMENT: NO ACTION

The No Action alternative for treatment involves the continuation of the current program for wastewater treatment in Central O`ahu that was promulgated by the 1998 DOH

Consent Decree. With No Action, improvements currently underway to address regulatory considerations would continue as planned and programmed. The WWTP improvements are currently in the planning phase; therefore, it is not known whether planned improvements are still appropriate to accomplish both current and future wastewater treatment objectives. An additional separate environmental document in support of these improvements will be prepared to assist in the determination of the recommended new facilities. Furthermore, the NPDES permit application is currently being processed by the DOH. Additional programmed improvements not required by the consent decree (e.g., construction of the reclamation building) are underway.

3.4.3 WASTEWATER DISPOSAL: NO ACTION

With No Action, the current practice of disposing current-quality effluent via outfall into Wahiawā Reservoir would continue. The reservoir overflows into Kaukonahua Stream and eventually discharges into the ocean at Kaiaka Bay. **Currently, the Wahiawā WWTP produces R-2 quality effluent (although DOH has not certified it as such). However, the tertiary treatment** improvements recently completed **in December 2002** at the Wahiawā WWTP allow the facility to generate R-1 quality effluent (although not DOH-certified as R-1 quality). **Nonetheless**, this effluent disposal alternative may not be viable when the unresolved issues (refer to Section 1.5) are eventually resolved. Anticipated limited viability of the No Action alternative renders this option impracticable. ~~With No Action, the current practice of disposing current-quality effluent via outfall into Wahiawā Reservoir would continue. The reservoir overflows into Kaukonahua Stream and eventually discharges into the ocean at Kaiaka Bay. Improvements recently completed at the Wahiawā WWTP allow the facility to generate R-1 quality effluent (although not DOH-certified as R-1 quality); however, this effluent disposal alternative may not be viable when the unresolved issues (refer to Section 1.5) are eventually resolved. Anticipated limited viability of the No Action alternative renders this option impracticable.~~

3.5 The Preferred Alternatives

Since the “action” to be discussed in this EIS consists of improvements to an existing wastewater collection, treatment, and disposal system, many alternatives were proposed and assessed in the COWFP. The twenty-four alternatives presented in the COWFP were briefly described and evaluated in the preceding sections. Of these twenty-four alternatives, nine were eliminated from further consideration in this EIS. Table 1 summarizes the results of this elimination process. The remaining fifteen alternatives constitute the set of Preferred Alternatives which will be evaluated in this EIS as the Proposed Action.

Table 1. Alternative Analysis Summary

Alternative		*Cost*	*Status after Initial Analysis*
WASTEWATER **COLLECTION**			
1.1	Seal Manholes	$300,000	Preferred Alternative
1.2	Public Education and Enforcement of Plumbing Code	$300,000	Preferred Alternative
1.3	Maintain/Intensify Maintenance Program	$170,000	Preferred Alternative
1.4	Construct New Sewers and/or Rehabilitate/Upgrade Existing Sewers	$2,500,000	Preferred Alternative
1.5	Increase Capacity of Wastewater Pumping Stations	$400,000	Preferred Alternative
1.6	Rehabilitate Whitmore Village WWPTF	$100,000	Preferred Alternative
1.7	Construct Wet Weather Flow Storage Facilities		Eliminated from further consideration
1.8	Divert Preliminary Treated Wastewater to Honouliuli WWTP		Eliminated from further consideration
1.9	Utilize Onsite Graywater Disposal System		Eliminated from further consideration
1.10	Connect Unsewered Areas to the Sewer System	$22,000/ home	Preferred Alternative
WASTEWATER **TREATMENT**			
2.1	Preliminary Treatment System Modifications	To be determined in AAR	Preferred Alternative
2.2	Flow Equalization and Storage	To be determined in AAR	Preferred Alternative
2.3	Additional Primary Clarifier	To be determined in AAR	Preferred Alternative
2.4	Nutrient-Removal Upgrades		Eliminated from further consideration
2.5	Disinfection Improvements		Eliminated from further consideration (No Action)
2.6	Membrane Bioreactor	To be determined in AAR	Preferred Alternative
2.7	Public Education	Included with "Public Education and Enforcement of Plumbing Code" above.	Preferred Alternative
2.8	Solids Processing and Handling	To be determined in AAR	Preferred Alternative
2.9	Advanced Treatment at a New Constructed Wetlands Facility		Eliminated from further consideration
WASTEWATER **DISPOSAL** [1]			
3.1	Disposal Alternative 1: Discharge into Wahiawā Reservoir	$0	Preferred Alternative (Second or interim preferred disposal alternative)

Alternative		Cost	Status after Initial Analysis
3.2	Disposal Alternative 2: Transmission to DFC Irrigation Ditch	$3,689,000	Eliminated from further consideration
3.3	Disposal Alternative 3: Transmission to Waiāhole Ditch	$8,820,**000**	Eliminated from further consideration
3.4	Disposal Alternative 4: Transmission of Preliminary Treated Wastewater to Honouliuli WWTP	$65,737,000	Eliminated from further consideration
3.5	Disposal Alternative 5: Direct Reuse [2]	$**19**,000,000	Preferred Alternative (First preferred disposal alternative)

Notes:

1. For the various wastewater disposal alternatives, the table shows the total capital cost for Disposal Alternatives 1 through 5 without any of the associated WWTP improvements and/or modifications that would be required.
2. For "Disposal Alternative 5: Direct Reuse", these costs associated with the necessary recycled water distribution system infrastructure are assumed to be the responsibility of the water purveyor and, in association with the BWS's developed preliminary plan to implement this alternative, the preliminary capital cost estimate for the necessary distribution system infrastructure is approximately $**19** million.

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DISPOSAL ALTERNATIVE 1: DISCHARGE INTO WAHIAWA RESERVOIR

Central Oahu Wastewater Facilities Plan
Wahiawa, Oahu, Hawaii

EIS Figure

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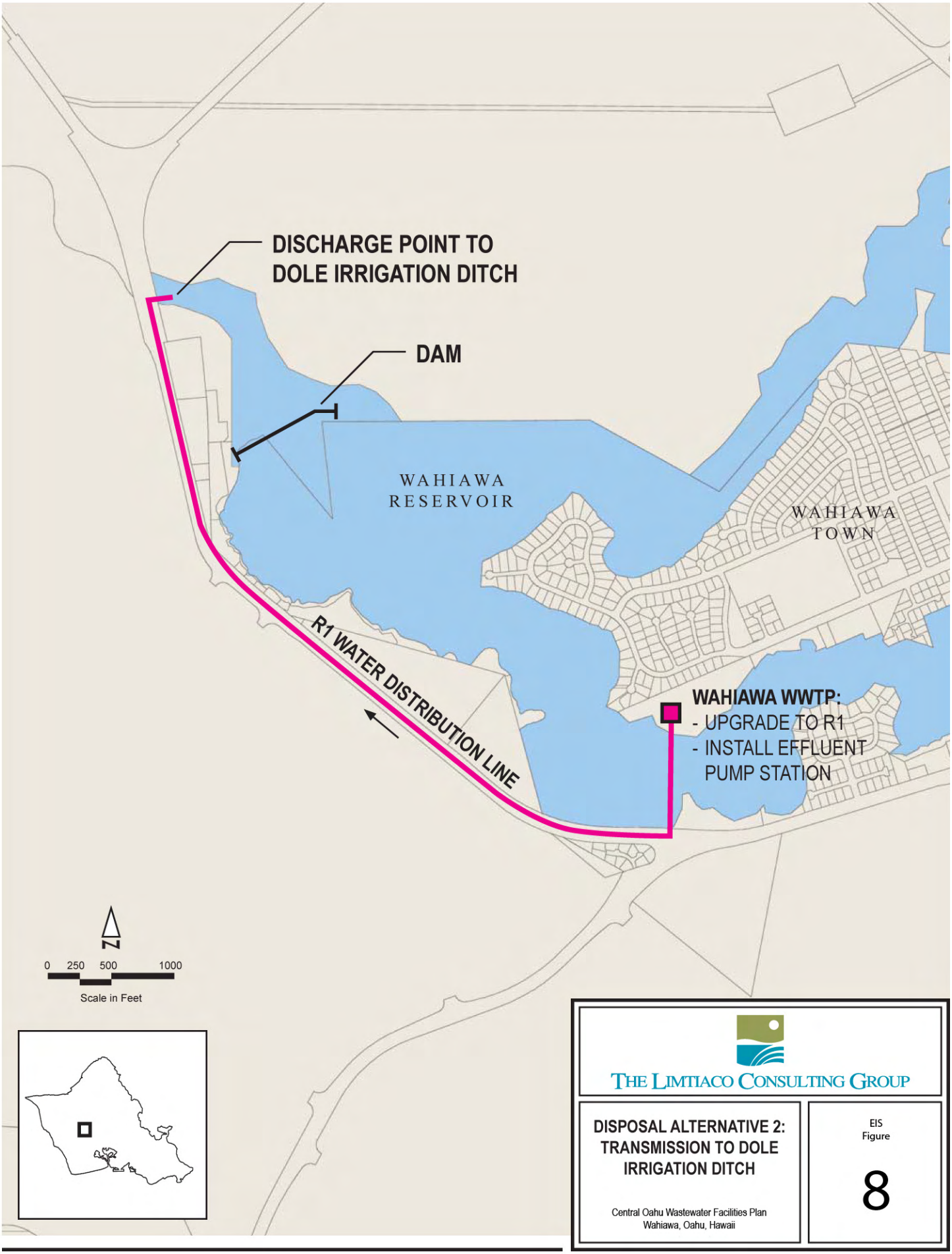

THE LIMTIACO CONSULTING GROUP

DISPOSAL ALTERNATIVE 2: TRANSMISSION TO DOLE IRRIGATION DITCH

Central Oahu Wastewater Facilities Plan
Wahiawa, Oahu, Hawaii

EIS
Figure
8

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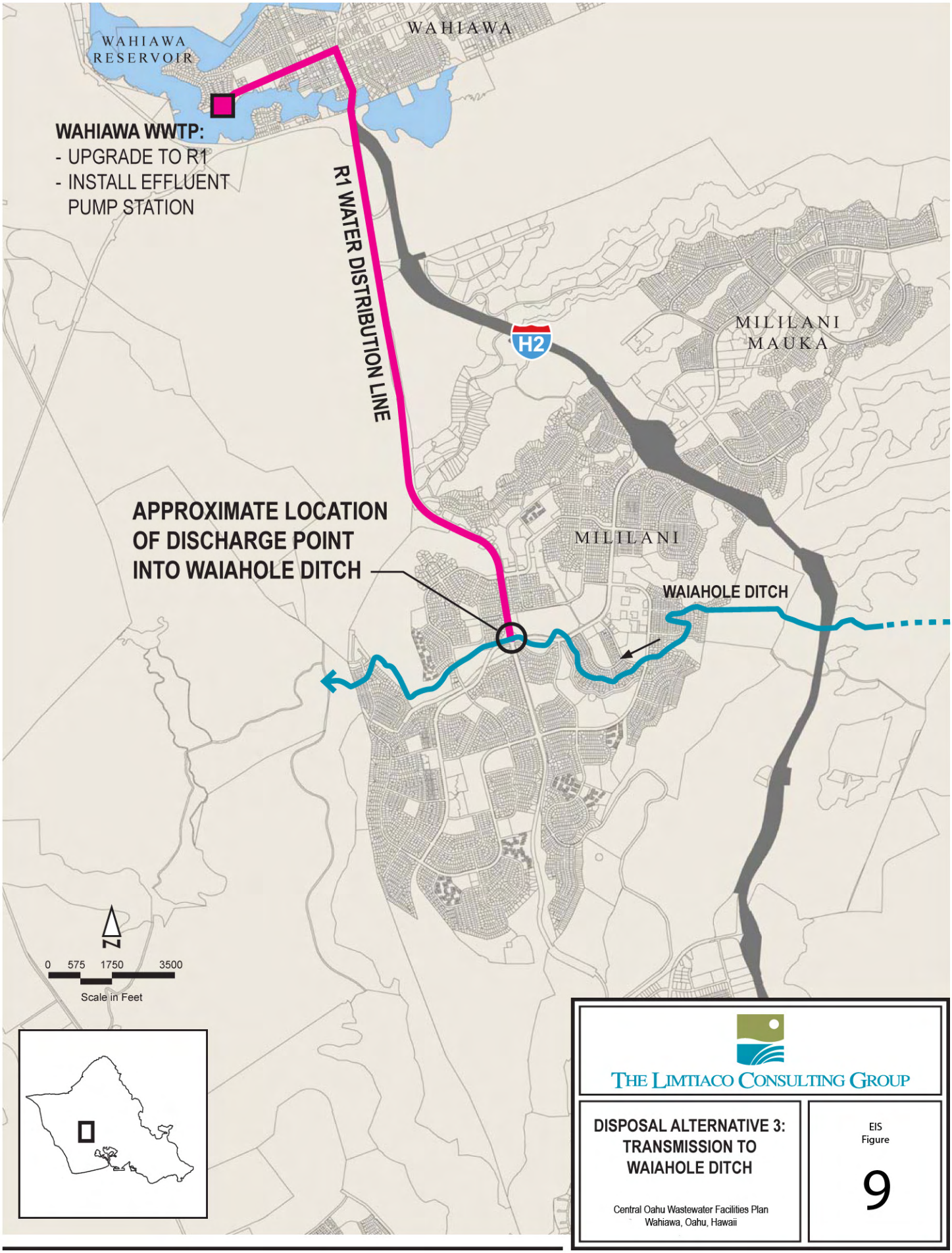

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DISPOSAL ALTERNATIVE 3: TRANSMISSION TO WAIAHOLE DITCH

Central Oahu Wastewater Facilities Plan
Wahiawa, Oahu, Hawaii

EIS Figure

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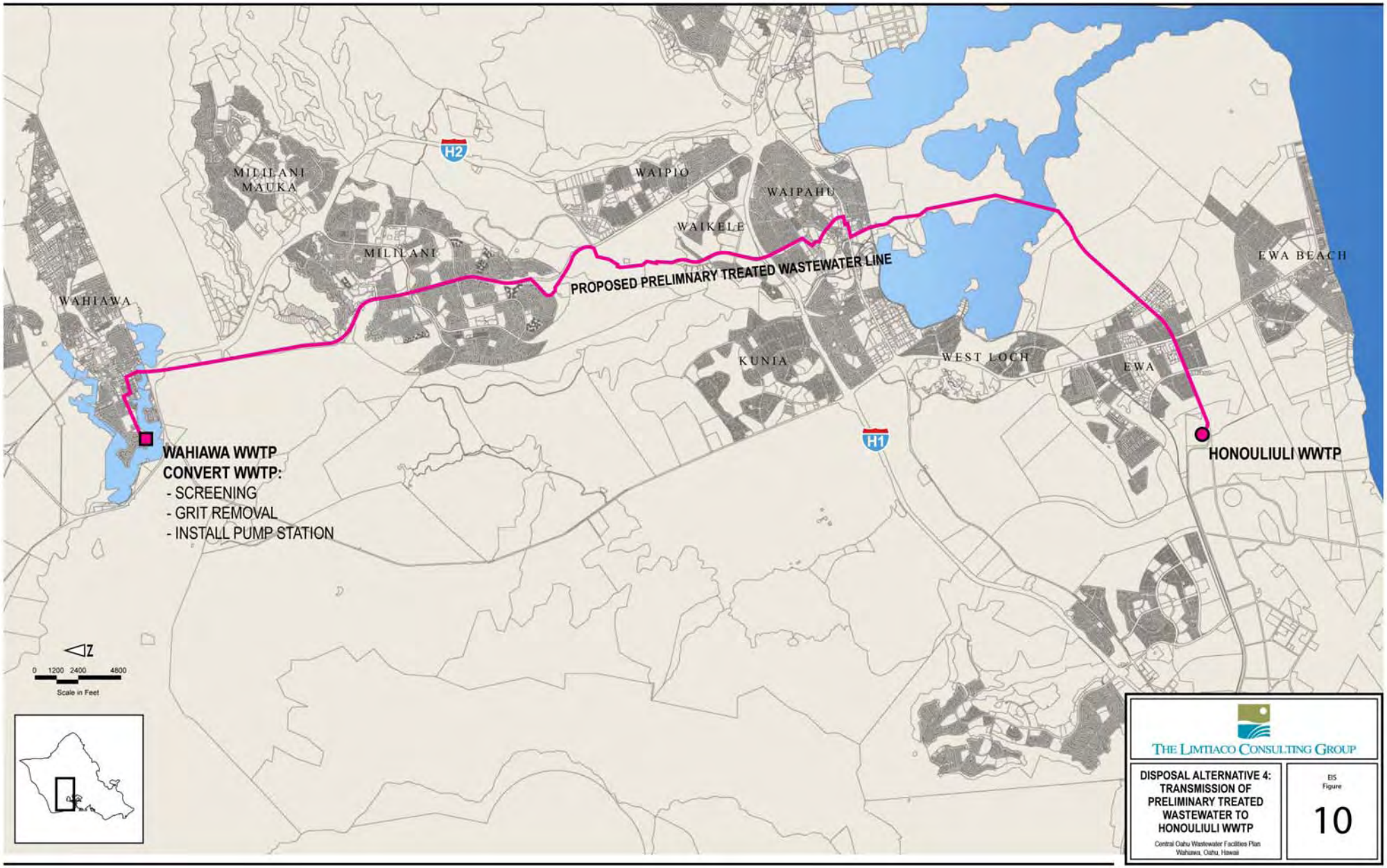

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DISPOSAL ALTERNATIVE 4: TRANSMISSION OF PRELIMINARY TREATED WASTEWATER TO HONOULIULI WWTP

Central Oahu Wastewater Facilities Plan
Wahiawa, Oahu, Hawaii

EIS Figure

10

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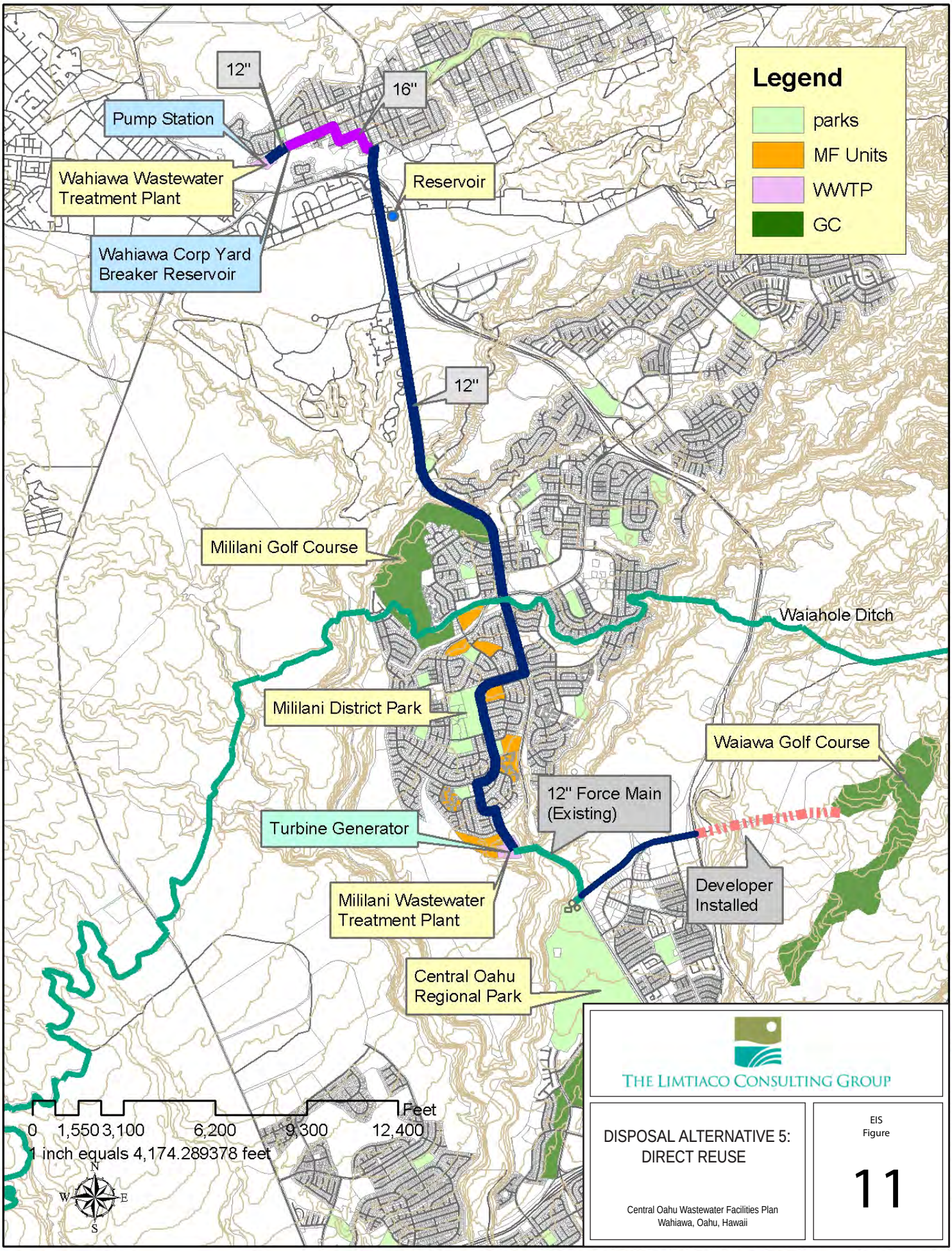
Legend
parks
MF Units
WWTP
GC
12"
16"
Pump Station
Wahiawa Wastewater Treatment Plant
Reservoir
Wahiawa Corp Yard Breaker Reservoir
12"
Mililani Golf Course
Waiahole Ditch
Mililani District Park
Waiawa Golf Course
12" Force Main (Existing)
Turbine Generator
Developer Installed
Mililani Wastewater Treatment Plant
Central Oahu Regional Park
0 1,550 3,100 6,200 9,300 12,400 Feet
1 inch equals 4,174.289378 feet
N
W
E
S
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DISPOSAL ALTERNATIVE 5: DIRECT REUSE
Central Oahu Wastewater Facilities Plan
Wahiawa, Oahu, Hawaii
EIS Figure
11

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4.0 AFFECTED ENVIRONMENT

This chapter presents the relevant resource components of the existing environment that would be affected by the Preferred Alternatives under consideration if they were implemented. In other words, this chapter describes the baseline environment. The discussions presented in this chapter are necessary to understand and evaluate the effects of each considered alternative (i.e., those that remain after initial analysis from Chapter 3.0).

A description of the existing Wahiawā wastewater system is hereby presented for informational purposes. The discussion focuses primarily on the Wahiawā WWTP and the Wahiawā Reservoir because these two sites would be most affected by a majority of Preferred Alternatives. Other wastewater systems or facilities and important features that are relevant to the discussion on the affected environment are also hereby summarized.

THE WAHIAWĀ WASTEWATER SYSTEM. This wastewater system is currently the fifth largest municipal system on O`ahu. In the year 2000, the Wahiawā wastewater system was estimated to serve a population of approximately 22,000 persons within a service area encompassing approximately 1,610 acres (Fukunaga and Associates, Inc., 1999). Components of the Wahiawā system include one (1) wastewater treatment plant, one (1) preliminary treatment facility, seven (7) wastewater pump stations and force mains, and 230,000 feet of gravity sewers (TLCG, w.i.p.).

The oldest features of the Wahiawā wastewater system were constructed in the late 1920's (Fukunaga and Associates, Inc., 1999). A majority of the wastewater pipe system for the Wahiawā Basin (or approximately 70 percent by length) was constructed between 1951 and 1980 ((Fukunaga and Associates, Inc., 1999). The pipe system for the Wahiawā Basin has the following characteristics: roughly 71 percent of the system consists of vitrified clay pipe; 22 percent is terra cotta pipe; 4 percent is reinforced concrete pipe (RCP); 2 percent is cast iron pipe; and less than 1 percent is polyvinyl chloride pipe (TLCG, w.i.p.). Pipes made of materials such as vitrified clay and plastic do not corrode (Fukunaga and Associates, Inc., 1999). Plastic lining in RCP protects the pipe from corrosion (Ibid). Pipe sizes within the Wahiawā service area range from 6 to 26 inches in diameter.

THE WAHIAWĀ WWTP. The Wahiawā WWTP is located on a 6.1-acre, City-owned parcel (TMK 7-3-007:002). It is situated along California Avenue in Wahiawā Town and is bordered by the Wahiawā Reservoir to its west and south, the City's Wahiawā Corporation Yard on the east, and single family residences to the north. Opposite the entrance to the WWTP property are the Olive United Methodist Church, Ka`ala Elementary School and some residences. The Wahiawā WWTP treats wastewater originating from Wahiawā Town, Whitmore Village, and NCTAMS PAC.

The Wahiawā WWTP has a design dry weather capacity of 2.5 mgd. Current average daily flow is 1.98 mgd, which represents approximately 80 percent of its design capacity. The WWTP was originally built as a primary treatment plant. When the WWTP was expanded in 1967, it was also upgraded to include secondary treatment using the activated sludge process. As part of the 2002 upgrades, tertiary treatment was added, as well as sand filtration and UV disinfection processes, and a new deep-water outfall into the Wahiawā Reservoir. From its inception in 1927, the Wahiawā WWTP has discharged its effluent into the reservoir. However, the 2002 upgrades diverted that discharge from the surface to the reservoir's deep waters.

The 2002 upgrades to the Wahiawā WWTP were to comply with the 1998 DOH Consent Degree. The design was intended to conform to the DOH Guidelines for the Treatment and Use of Reclaimed Water (November 22, 1993). Other 2002 upgrades include new secondary clarification, solid handling upgrades and a new operations building.

Principal unit operation and processes of the Wahiawā WWTP include the Headworks, Primary Sedimentation, Aeration, Secondary Clarification, Filtration, Disinfection, and Solids Handling. Primary sludge and waste activated sludge are thickened in the DAFT, then trucked to the Honouliuli WWTP in `Ewa for further treatment and disposal.

Specific information regarding the Wahiawā WWTP facility may be found in the *Final EA for the Wahiawa Wastewater Treatment Plant Modifications and Outfall Adjustment, Wahiawa, Oahu, Hawaii* (Calvin Kim and Associates, Inc. and Gerald Park Urban Planner, 1999) and the COWFP.

WAHIAWĀ RESERVOIR. Wahiawā Reservoir borders the town of Wahiawā in Central O`ahu and was constructed in 1905 and 1906 by the WSC (the former parent company of DFC). The privately-owned, man-made feature resulted from the damming of the confluence (or point of juncture) of the north and south forks of Kaukonahua Stream. The dam backs up water along the two forks of Kaukonahua Stream, thus forming the reservoir.

The Wahiawā Reservoir is the primary receiving water for the Wahiawā WWTP. The City has discharged treated effluent from the Wahiawā WWTP into the reservoir since the WWTP began operation in 1927. Today, this water feature is also used as a valuable recreational resource due to the advent in the 1950s of stocking freshwater game fish in the reservoir. Public benefits derived from the reservoir include recreational (the Wahiawā Public Fishing Area and the Wahiawā Freshwater Park), flood control, storm water drainage, and wastewater disposal.

The reservoir receives water from and overflows into Kaukonahua Stream, which outlets at Kaiaka Bay near Hale`iwa Town on Oahu's North Shore. Overflows

have become more common because of the reduced agricultural demands from the reservoir. DFC owns the Wahiawā Reservoir Dam, but ownership of the dam site is split between DFC and the Galbraith Trust Estates.

The DFC irrigation system receives treated effluent from the Schofield Barracks WWTP, **and** these inputs are ~~diluted~~ **combined** with the water entering the irrigation system from the Wahiawā Reservoir ~~as well as with groundwater from DFC wells~~.

4.1 Geology and Soils

The Schofield Plateau was formed when lava flows from the Ko`olau volcano banded against the eroded slope of the Wai`anae volcano. Colluvium eroded from the Wai`anae range inter-fingers with the Ko`olau lavas to form the gently sloping plateau. Once the eruptions ceased, eroded material from both the Ko`olau and Wai`anae volcanoes continued to fill in the area. Subsequently, the alluvium and colluvium was dissected by streams to form the deep gullies that bisect the Plateau.

GEOLOGY. The Schofield Plateau is composed of thick layers of weathered volcanic alluvium and colluvium comprised of materials resulting from erosion of the surrounding mountain ranges. Under the thick layers of unconsolidated sediments are aa and pahoehoe lavas and breccia from the Ko`olau volcanics inter-fingered with soil and gravel layers. Below that are the Wai`anae volcanics that consist of both aa and pahoehoe lava flows and breccia (Mcdonald & Peterson, 1983).

The interbedded layers of lava flows and gravel and soil layers create a highly permeable substrate. This allows for ground and surface waters to be readily absorbed and percolate underground. As this type of material weathers, it forms deep layers of fine textured subsoil (USGS, 2007).

SOILS. Soils in the area are of the Helemano-Wahiawā association (USDA-SCS, 1972). This association consists of well-drained and fine textured soils on the uplands of O`ahu. They are found on nearly level to moderately sloping areas that are dissected by very steeply eroded gulches and are formed as a result of weathering basalt. These soils are commonly found at elevations that range from 100 to 1,200 feet above mean sea level (MSL) and in areas that receive an annual precipitation of 25 to 50 inches.

<u>Helemano Series</u>
The Helemano series consists of well-drained soils on alluvial fans and colluvial slopes on the side of gulches. They develop from alluvium and colluvium derived from basalt. These soils are used for pasture, woodland and wildlife habitat. The natural vegetation that thrives on this soil type consists of Bermuda grass, Christmas Berry, eucalyptus, Formosa koa, guava, Japanese tea, Java plum and koa haole.

A typical profile of the surface layer is 10 inches thick and consists of a dark, reddish-brown silty clay. The subsoil is about 50 inches thick and consists of a dark reddish-brown and dark-red silty clay. The substrate is a soft weathered volcanic rock. Permeability is moderate to rapid, and runoff is medium to very rapid. This results in a severe to very severe erosion hazard.

Wahiawā Series

The Wahiawā series consists of well-drained soils that developed in residuum and old alluvium derived from basalt. They are found on level to steep slopes at elevations from 500 to 1,200 feet above MSL. These soils are used for sugarcane, pineapple, pastures and residential development. The natural vegetation that grows on this soil type consists of mudagrass, guava, honohono, koa haole, and lantana.

In a representative profile the surface layer is roughly 12 inches thick and consists of very dusky red silty clay. The subsoil is about 48 inches thick, and is a dark, reddish-brown silty clay. Below that is weathered lava rock. Permeability is moderately rapid. Runoff is slow and the erosion hazard is no more than slight.

4.2 Topography

The majority of the project area is located between the Ko`olau and Wai`anae mountain ranges on the Schofield Plateau. The plateau forms a broad saddle between the two mountain ranges. The area is characterized by gently sloping topography that is dissected by deep stream-cut gullies. Elevations in the project area range from approximately 400 to 1,250 feet above MSL (USGS, 2007).

Wahiawā Reservoir is at an approximate elevation of 840 feet above MSL. The water in the reservoir fills the gulches that were formed by the north and south forks of Kaukonahua Stream.

No significant topographical features exist at the Wahiawā WWTP. Topography at the site slopes generally from north to south in the direction of the Wahiawā Reservoir. Elevations at the Wahiawā WWTP range from 854 feet to 870 feet above MSL. Proposed alterations to the Central O`ahu wastewater facilities contained in the COWFP will avoid the deep gullies that bisect the plateau.

The remaining site-specific wastewater features identified in this EIS that lie within Wahiawā Town between elevations of 850 feet to approximately 1,250 feet above MSL include the Grandview and Uwalu WWPSs.

4.3 Climate

Overall, Hawai`i has a climate characterized by equable temperatures, moderate humidity, trade winds and sunshine. Climate is defined as the composite of the daily weather, including the extremes. Only two seasons were recognized by the early Hawaiians who named them. Kau is the warm season when the sun is almost directly overhead and the winds are reliably from the northeast. Ho`lilo is the season of cooler temperatures, a lower sun, more variable winds and extensive rains (Juvik and Juvik, 1998). By modern definition, summer is defined as the period from May through September and winter from October through April.

Mountainous topography makes Hawaii's climate spatially diverse ranging from alpine, wet tropical to desert. Rainfall, solar radiation, temperature, humidity, and wind exhibit spectacular changes over short distances. Changes in climate are noticeable on mountain slopes where the air cools as elevation increases.

Weather on the Schofield Plateau is influenced by topography. The surrounding mountains influence the amount of precipitation and temperature. As moist air blows up over the mountains it is forced to rise. As it rises the air masses cool and become more saturated creating clouds or increasing the size of existing clouds. This orographic uplift results in lower temperatures and more precipitation on the Schofield Plateau as compared to the coastal areas. Data recorded at the nearest monitoring station at Wheeler AAF (located at an elevation of 845 feet) indicates the mean low annual temperature ranges from 60° to 68°F and the mean high annual temperature ranges from 75° to 85°F (NWS, 1982(a) in Armstrong, et al., 1983, pg. 64). The average annual precipitation according to data recorded at the Wheeler AAF monitoring station is 38.46 inches (DBEDT, 2005, Table 5.36).

4.4 Hydrology

Hydrology involves the movement of water over and under the ground surface. It includes a variety of geomorphic, geochemical and biologic processes that depend upon the storage and movement of water (Dunne & Leopold, 1978).

Information pertaining to the topics discussed in this section is hereby summarized from previously published reports such as the *Final EA for the Wahiawa Treatment Plant Modifications and Outfall Adjustment, Wahiawa, Oahu, Hawaii* prepared in May 1999 by Calvin Kim and Associates, Inc. and Gerald Park Urban Planner and the *Final Environmental Impact Statement for the Schofield Barracks Wastewater Treatment Plant Effluent Treatment and Disposal, Oahu, Hawaii* prepared by Wilson Okamoto & Associates, Inc. in February 2000. Additional information is summarized from the *Biological and water quality considerations for the Central Oahu Wastewater Facilities Plan EIS* prepared in 2007 and revised in January 2008 by AECOS, Inc. which is appended to this EIS (Appendix A).

4.4.1 GROUNDWATER

Volcanic rocks ranging in age from Pliocene to Holocene, make up most of O`ahu and compose the most important aquifers. The Ko`olau basalt is overall the most important aquifer on O`ahu. Permeability ranges from low in the dike complexes to very high in dike-free lava flows. Groundwater generally moves from inland areas toward the ocean.

Regional groundwater movement to the northwest and southeast form the central drainage divide on the crest of the plateau to adjacent groundwater areas. Groundwater inflow to the area is from the adjacent Ko`olau and Wai`anae rift zones with supplemental recharge directly from the infiltration of rainfall. The mean annual predevelopment recharge has been estimated to have been about 79 mgd (USGS, 2007). Discharge from the area is primarily by ground water outflow down gradient to other ground water areas and some ground water is withdrawn by wells (Ibid).

The Wahiawā Aquifer System (formerly known as the Schofield High-Level Water Body) underlies Wahiawā Town (including the area containing the Wahiawā WWTP) and Wahiawā Reservoir (Calvin Kim & Associates, Inc. and Gerald Park Urban Planner, 1999). This aquifer system exists at approximately 280 feet above MSL and spans a trapezoidal area of approximately 69 square miles (Ibid). The aquifer receives recharge primarily from the adjacent Ko`olau and Wai`anae rift zones. The water flows from the higher levels in the rift zones to the slightly lower levels and recharges the down gradient areas that contain fresh water at various depths.

4.4.2 SURFACE WATERS

The Schofield Plateau was formed as magma from the Ko`olau volcanoes converged and overlapped the flows on the flanks of the Wai`anae volcanoes in the central part of O`ahu. The crest of the plateau runs from east to west through the center of Schofield Barracks and forms a natural surface water drainage divide. To the north of this divide, surface water flows northward and discharges into Kaiaka Bay near the town of Hale`iwa. To the south of this divide, surface water flows southward and discharges into the West Loch of Pearl Harbor (USGS, 2007).

Surface water is made up of all water bodies that are naturally open to the atmosphere. This includes rivers, streams, creeks, rills, lakes, reservoirs, ponds, impoundments, canals, estuaries and seas. Surface waters on the Schofield Plateau consist of the numerous streams that flow both to the north of the divide and which discharge into Kaiaka Bay, and to the south of the divide and discharges into the West Loch of Pearl Harbor and the Wahiawā Reservoir.

Narrow gulches dissect the Schofield Plateau where streams have eroded the land surface. Today, many of the streams in the region have been dammed or diverted for agricultural irrigation purposes. **The Wahiawā Irrigation System consists of three dams: The Wahiawā, Helemano 6, and Kemoo 5 Reservoir Dams. The State of**

Hawai`i DLNR and the USACE last conducted a visual safety inspection of the Wahiawā Reservoir Dam in May 2006. In their visual inspection report, they cited safety concerns over dam failure, flooding of Waialua and Haleiwa, and releases of the Wahiawā Reservoir spillway into Kaukonahua Stream during heavy storms. The hazard potential is based on the loss of life or economic loss to the community, industry, or agriculture.

No immediate threat to the Wahiawā dam structure was observed at the date of the DLNR/USACE inspection. However, the partial slope failure on the downstream slope needed repairs and surface runoff from the adjacent property needed to be channeled through the downstream slope and toe area. The other requirements cited in the report were maintaining documentation such as: construction plans, specifications, improvements, modifications, operations and maintenance manuals, and routine inspection logs; and executing the Emergency Action Plan during heavy rains.

Subsequently, the land-owner (DFC) began the process of repairing some the shortcomings listed in the report. These include: the Wahiawā Dam; Wahiawā Reservoir Outlet Tunnel; Helemano 6 and Kemoo 5 Reservoir Dams. For the Wahiawā Dam, DFC has drafted an operations and maintenance manual and updated the Emergency Action Plan. DFC was also in the process of conducting remediation work on the dam to meet the deficiencies cited. These efforts included the hiring of an engineering firm and irrigation contractor to carryout these efforts. (Element Environmental, 2007)

Kaukonahua Stream is a major surface water feature that crosses the project area in Central O`ahu. The town of Wahiawā lies on higher ground (an interfluve) between the north and south forks of Kaukonahua Stream. It is one of the longest streams in the State and one of the most highly modified stream systems (AECOS, Inc., 2008). The dam at Wahiawā Reservoir isolates the upper reaches of Kaukonahua Stream from the ocean. Because the dam retains water in the Wahiawā Reservoir, the lower sections of the stream are often dry (AECOS, Inc., 2008). Kaukonahua Stream and its two tributaries, the north and south fork, are considered by the Hawaii Stream Assessment as part of the Ki`iki`i Stream System (Hawaii Cooperative Park Service Unit, 1991 as cited in AECOS, Inc., 2008). ~~Poamoha~~ **Poamoho** Stream and its tributaries comprise the other major branch of the Ki`iki`i system (Ibid). The Ki`iki`i system is one of only four main streams that discharge to the ocean along Oahu's North Shore (Wilson Okamoto & Associates, Inc., 2000).

The entire watershed for the Ki`iki`i Stream System comprises an area of approximately 58.5 square miles (Geographic Decision Systems International and E.P. Dashiell, 1994 as cited in AECOS, Inc., 2008). Data recorded at USGS Station No. 16210500 indicates the drainage area for the watershed of Kaukonahua Stream is approximately 38.7 square miles (AECOS, Inc., 2008). The upper 44 percent of the Kaukonahua watershed is forested land that is designated as conservation, whereas the lower 55 percent includes 45 percent agricultural lands and 10 percent urban lands (USGS, 2002

as cited in AECOS, Inc., 2008). The Ki`iki`i watershed, which includes both the Kaukonahua and Poamoho Streams, consists of approximately 35 percent conservation, 58 percent agriculture, and 8 percent urban lands (Geographic Decision Systems International and E.P. Dashiell, 1994 as cited in AECOS, Inc., 2008).

Data recorded at USGS Station No. 16208000 on the south fork indicates the drainage area measured at this station is 4.04 square miles (AECOS, Inc., 2008). All of the south fork drainage area lies above the reservoir which has a spillway elevation of 842 feet (260 meters). The drainage area of the north fork (measured at USGS Station No. 16200000) is 4.90 square miles (Ibid). The south fork drainage area consists of approximately 99 percent forested land (zoned conservation) and 1 percent agricultural land, whereas the north fork drainage area is 100 percent forested land (zoned conservation) (Ibid).

The Wahiawā WWTP is located along the Wahiawā Reservoir, which was formed when an earthen rock-filled dam was built at the confluence of the north and south forks of Kaukonahua Stream. As a result of the dam, water in each fork of the stream backs up approximately .6 miles from the dam (Calvin Kim & Associates, Inc. and Gerald Park Urban Planner, 1999). The dam is approximately 88 feet high and 660 feet long (DBEDT, 2005, Table 5.21). The normal volume of water held by the dam is roughly 7,761 acre-feet (Ibid). Recharge for the reservoir occurs almost entirely from runoff from a 16.9 square mile drainage basin that extends to the base of the Ko`olau Range (Calvin Kim & Associates, Inc. and Gerald Park Urban Planner, 1999).

The Office of Hawaiian Affairs (OHA) has commented that they are supportive of DDC's efforts to improve wastewater facilities in Central O`ahu. OHA also appreciates that the implementation of new technologies associated with this project will upgrade the quality and/or reduce the amount of effluent discharged to Wahiawā Reservoir and will generally benefit the aquatic environment. OHA places special importance on Wahiawā Reservoir given that the treated wastewater effluent from Wahiawā WWTP is discharged via an outfall into the reservoir and the reservoir receives water from and overflows into Kaukonahua Stream, which outlets at Kaiaka Bay on the North Shore. Overflows from the reservoir have become more common with reduced agricultural water demands due to the demise of the cane sugar industry.

4.4.3 COASTAL WATERS.

The Central O`ahu wastewater facilities are located some distance from the ocean on either side of the Schofield Divide. From Wahiawā to Hale`iwa it is approximately 10 miles, and from Wahiawā to Pearl Harbor it is a little over 12 miles.

Although the project area containing the Wahiawā wastewater system does not extend to the coastline, irrigation systems that are supplied with water from the Wahiawā Reservoir convey and distribute this water to lands that span the area between Central O`ahu and the North Shore. Seepage of the water into the ground may deposit the

water into other hydrological systems that reach coastal waters. Additionally, the Wahiawā Reservoir receives water from and overflows into Kaukonahua Stream, which outlets at Kaiaka Bay on the North Shore.

4.4.4 WETLANDS.

Wetland resources may exist along the alignment of Kaukonahua Stream; however, any such existing resources are not known to be significant. Literature searches have found no reference to wetlands along the streams in the area (Calvin Kim & Associates, Inc. and Gerald Park Urban Planner, 1999; AECOS, Inc., 2008).

4.5 Water Quality

Overall, the State of Hawai`i has good surface and groundwater quality; however, due to the steeply sloping terrain and porous substrate, coastal, surface and groundwaters are vulnerable to point source and non-point source pollution. The following paragraphs illustrate the differences between the two categories of pollutant sources.

> POINT SOURCE POLLUTION: A point source is a stationary or fixed facility from which pollutants are discharged and make their way into streams or percolate into the ground water (EPA, 1997). Examples of point sources are pipes, ditches, ships, mines, and factories.
>
> A small number of point sources of industrial wastewater on O`ahu contribute pollutants that affect water quality, but these sources must comply with pollution control laws pertaining to wastewater disposal. The NPDES permit that allows the City to dispose wastewater from the Wahiawā WWTP into Wahiawā Reservoir is an example of one such pollution control mechanism. Domestic sewerage disposal via cesspools is another means by which point source pollutants may impact surface and ground water quality.
>
> NON-POINT SOURCE POLLUTION: Non-point sources are a source of pollution without a single point of origin (EPA, 1997). Generally these pollutants are transported by storm runoff. Common non-point sources are agriculture, forestry, mining, construction, dams, and automobile fluids that drip onto roadways. These pollutants are washed into streams via storm runoff where they eventually end up in the ocean. Non-point source pollutants can also wash on to the land where it percolates into the ground and through the porous bedrock where it eventually contaminates groundwater sources.
>
> In Wahiawā, non-point source pollutants include the chemicals applied in developed areas or sediments from eroding areas that are carried via runoff into streams, wetlands and coastal waters. The decline of plantation agriculture has in effect reduced non-point source inputs from soil erosion, pesticides, and fertilizers associated with this type of development. Currently, automobiles and chemicals applied in developed areas produce the majority of non-point source pollutants.

They continue to represent a potentially significant threat to surface and ground water quality.

4.5.1 GROUNDWATER QUALITY

Groundwater sources supply most of the drinking water in Hawai`i. Groundwater is susceptible to microbial and chemical contaminants through both point source and non-point source pollutants. This is due to the permeability of the sediments and volcanic bedrock which allows water to easily percolate into the aquifers.

Data from 1996 indicated that several wells located in Central O`ahu and the `Ewa plain were contaminated (Juvik and Juvik, 1998). DOH regulations require that all water to be distributed must meet the enforceable standards set forth by the EPA for contaminant levels in drinking water. As such, areal ground water is treated prior to distribution as drinking water.

4.5.2 SURFACE WATER QUALITY

KI`IKI`I STREAM SYSTEM. ~~Ki`iki`i Stream has been listed as an impaired water body on the DOH's CWA §303(d) Final 2004 List of Impaired Water in Hawai`i. It also is listed on the EPA Revised 1998 List (AECOS, Inc., 2008). The pollutants for which Ki'iki'i Stream System is listed are nutrients and turbidity. (Ibid).~~

~~The TMDL of pollutants for the Ki`iki`i Stream has yet to be developed. TMDL is the amount of pollutants that can be discharged into the water body without violating Hawaii's Water Quality Standards. The stream was assigned a medium priority ranking, which refers to how quickly a study will be conducted to determine the TMDL for that particular water body. Once the TMDL is determined, DOH may impose load reductions on any discharge permits (NPDES permits) and may request land owners to reduce non-point source pollutant loads to meet those requirements.~~

~~WAHIAWĀ RESERVOIR.~~ **The Wahiawā Reservoir is immediately adjacent to the project site. The reservoir receives water from the north and south forks of Kaukonahua Stream, and, since its construction in 1927, the Wahiawā WWTP has discharged its treated effluent into the reservoir. Wahiawā Reservoir is tributary to Kaukonahua Stream, which flows northward and joins Poamoho Stream to form Ki`iki`i Estuary. Ki`iki`i Estuary eventually drains and outlets to the ocean at Kaiaka Bay on Oahu's north shore. (Refer to Section 4.4 above for more information on hydrology.)**

The DOH announced in September 2007 the completion of the *2006 State of Hawaii Water Quality Monitoring and Assessment Report: Integrated Report to the U.S. Environmental Protection Agency and the U.S. Congress Pursuant to Sections §303(d) and §305(b), Clean Water Act (P.L. 97-117)*, herein referred to as the 2006 Integrated Report. The 2006 Report is the first effort by the DOH to

integrate both reporting requirements of the Clean Water Act Sections 305(b) and 303(d). Subsequently, the DOH submitted supplemental information with a final transmittal sent to the EPA in January 2008. On February 7, 2008, the EPA approved the 2006 Integrated Report. With this approval, the State's 2006 303(d) List of Impaired Waters (represented by those waterbodies assigned to Categories 4 and 5 in Chapter IV of the 2006 Integrated Report) is now in effect.

According to the 2006 Integrated Report, Kaiaka Bay and Ki`iki`i Estuary are currently included on the State's 303(d) List of Impaired Waters. The impairing pollutants of concern for which Kaiaka Bay is listed are: total nitrogen, nitrite, nitrate, total phosphorous, nutrients, total suspended solids, and turbidity (nearshore waters to 60 ft from Puaena Point to a point 1.5 miles west of Kaiaka Point); total nitrogen, nitrite, nitrate, ammonium, chlorophyll a, and turbidity (at Kaiaka Bay). The impairing pollutants off concern for Ki`iki`i Estuary are listed as unknown. Additionally, Kaukonahua Stream (lower and upper [north and south forks] reaches) and Wahiawā Reservoir are all listed as impaired waterbodies on the State's 303(d) List of Impaired Waters. The lower reach of Kaukonahua Stream has the following impairing pollutants of concern listed: total nitrogen, nitrite, nitrate, and turbidity (both dry and wet seasons). The 2006 Integrated Report separates the Wahiawā Reservoir from its downstream receiving segment and upstream tributary segments, and establishes the reservoir for TMDL development and other intensive monitoring and analysis purposes. The impairing pollutants of concern for which the reservoir is listed are: total nitrogen, nitrite, nitrate, total phosphorous, and turbidity. The impairing pollutants of concern for the upper (north and south forks) reaches of Kaukonahua Stream are the same as those listed for the Wahiawā Reservoir. Overall, the impaired status of these various waterbodies requires the DOH to develop and establish TMDL limits for each pollutant of these waterbodies suggesting the quantity by which pollutant loads, including load allocations for point and nonpoint source discharges into its tributaries, should be reduced in order to attain Hawaii's water quality standards.

Waterbodies have been prioritized as High, Medium, or Low for initiating TMDL development within the current monitoring and assessment cycle (through April 15, 2008) based on several factors, such as the number of pollutants listed, degree that levels of pollutants exceed the standard, and current and projected resource availability for completing the TMDL development process. Both Kaiaka Bay and Ki`iki`i Estuary are prioritized as Low for TMDL development. The lower reach of Kaukonahua Stream is prioritized as Medium for TMDL development. Whereas, the upper (north and south forks) reaches of Kaukonahua Stream and Wahiawā Reservoir are prioritized as High with "TMDL development in progress."

All of the abovementioned waterbodies are listed as impaired waterbodies and it should be noted that currently TMDL limits do not exist for any of these waterbodies. The 2006 Integrated Report states that TMDLs for the upper (north and south forks) reaches of Kaukonahua Stream are expected to be completed in

2008, with ongoing phased TMDL development in Kaukonahua receiving waters (i.e., Wahiawā Reservoir, lower reaches of Kaukonahua Stream, Ki`iki`i estuary, and Kaiaka Bay). In each case, TMDLs will be established for pollution by sediment, nutrients, and bacterial indicators.

WAHIAWĀ RESERVOIR. Wahiawā Reservoir is comprised of a pair of narrow gulches drowned by the construction of the Wahiawā dam in 1906 at the confluence of the north and south forks of Kaukonahua Stream. The reservoir was built by the predecessors of the WSC to irrigate sugarcane fields to the north. The town of Wahiawā lies on the high ground between the two forks of the Kaukonahua Stream, while Schofield Barracks and other military reservation lands extend to the west and south of the reservoir. Overflow from the dam enters Kaukonahua Stream which flows northward and joins Poamoho Stream to form Ki`iki`i Stream, which eventually enters the ocean at Kaiaka Bay.

Secondarily treated effluent from the Wahiawā WWTP has been discharged into the reservoir's south fork since 1927 (Lum and Young, 1976). In 1968 a second treatment facility, the Whitmore Village WWTP began discharging secondarily treated sewage into the reservoir's north fork. Effluents from the two treatment plants were combined and discharged into the surface waters at the Wahiawā WWTP discharge site beginning in 1994 (Loke, 1996 as cited in AECOS, Inc., 2008). At present, approximate average discharge from the WWTP is approximately 1.98 mgd (TLCG, w.i.p.).

Water quality impacts resulting from effluent discharge from the Wahiawā WWTP are not restricted to the Wahiawā Reservoir, but may also influence water quality in the downstream waters of Kaukonahua Stream due to direct overflow from the reservoir as well as irrigation tailwaters. Groundwater quality can also be influenced by percolation of irrigation waters.

In 2001 and 2002, numerous facility improvements at the Wahiawā WWTP were implemented including secondary clarification, UV disinfection, and effluent discharge via a deep-water outfall (TLCG, w.i.p.) as part of the tertiary treatment upgrade.

Numerous studies within the past 25 years have attempted to characterize the cause and effect relationships affecting water quality in Wahiawā Reservoir. The studies have examined topics such as the effects of sewage disposal on water quality, eutrophication potential of the sediments, fish toxicity, algal growth potential, and changes in sport fishery conditions (AECOS, Inc., 2008). The following discussion on water quality parameters in the Wahiawā Reservoir are taken from the *Biological and water quality considerations for the Central Oahu Wastewater Facilities Plan EIS* prepared in 2007 and revised in 2008 by AECOS, Inc. The discussion is intended to provide a brief summary of water quality conditions. Refer to the AECOS study, attached to this EIS as Appendix A, for a comprehensive discussion on the water quality at the Wahiawā Reservoir.

> *Eutrophication*. Eutrophication in lakes and reservoirs is both a natural and man-made phenomenon. Naturally, it is a slow process associated with the gradual

accumulation of organic material and sediments. This process is often accelerated in dammed river basins where nutrients accumulate and increase algae growth. Man-made eutrophication is caused by the introduction of nutrients via agricultural runoff, storm drainage and sewage effluents. It is often a rapid and irreversible process of nutrient enrichment with subsequent algal biomass production. Over time, plant and animals die and tissues settle to the bottom of the water body where the organic matter decays and recycles the nutrients into the water column or it is deposited as sediment on the bottom. This decomposition process uses oxygen suspended in the water and can lead to oxygen depletion in the water column, which may result in mass kills of fish and other aquatic life.

Wahiawā Reservoir is especially susceptible to eutrophication because it exhibits three prerequisite characteristics for this process: (1) continuous elevated nutrient input from the Wahiawā WWTP together with stream and runoff inputs; (2) year-round high ambient light intensity to sustain high primary productivity levels; and (3) warm-water temperatures throughout the year which aid in maintaining high plant growth rates. Wahiawā Reservoir was already in an advanced state of eutrophication when the first comprehensive water quality study in the reservoir was conducted in 1973.

Nutrients. Water quality assessments of natural waters examine nitrogen and phosphorus levels because these nutrients are typically present in pristine, unpolluted aquatic (oligotrophic) environments in amounts that regulate, or limit, plant growth. In other words, aquatic plant biomass remains relatively low as long as nitrogen and phosphorus are supplied to the system in small, growth-limiting quantities.

A shift over the past 25 years from nitrogen to phosphorus as the potentially limiting nutrient (or the nutrient that is presumably the key to slowing the rate of eutrophication in the water body) indicates the occurrence of a major shift in the relative inputs of total nitrogen (TN) and total phosphorous (TP) into the Wahiawā Reservoir system. An examination of the historical characteristics of the effluent from the Wahiawā WWTP shows several noteworthy trends. First, TP levels in the WWTP effluent dropped between 1974 and 1996 as a result of decreases in influent wastewater levels to the WWTP rather than any change in wastewater treatment within the plant. Secondly, the WWTP effluent flow rates increased between 1974 to today, whereby no change in TN levels in the effluent nevertheless resulted in an additional 23 kilograms (kg) (50 pounds [lbs]) of TN per day or an 18 percent increase in TN loading to the reservoir. At the same time, TP loading to the reservoir decreased by nearly 27 kg (60 lbs) or approximately 68 percent since 1974. As a result of these changes, the TN:TP ratio rose from 3.6 (potentially nitrogen limiting) in 1974 to 11.7 (potentially phosphorus limiting) in 1996.

Aside from the WWTP effluent, other sources of nutrients to the reservoir surface water include direct rainfall and storm runoff. Runoff is a non-point source input from buildings, streets agricultural and other land areas.

Chlorophyll α. High nutrient loading into sub-tropical impoundments, such as Wahiawā Reservoir, often generates an increase in phytoplankton standing crop. The phytoplankton is composed of single-celled primary producers (algae) that all contain chlorophyll α, an essential pigment for photosynthesis; therefore, this parameter is often used to estimate the relative biomass, or standing crop, in aquatic environments. The mean levels of chlorophyll α have changed little between 1973-74 and 1995-96, which suggest that the decrease in mean phosphorus concentrations over this same time period have had little or no effect on the phytoplankton standing crop in Wahiawā Reservoir. In other words, while phosphorus is the potentially limiting nutrient, it is presently supplied to the water system in quantities that do not limit phytoplankton biomass production in the reservoir. After the deep-water diversion, chlorophyll α levels have reduced noticeably. However, this is partially attributable to the *Salvinia* infestation.

Secchi Disk Depth. This parameter represents the depth at which a black and white disk being lowered through the water column is no longer visible from above the water surface; thus, it is a measure of water clarity and can be used to estimate light attenuation in the water column with a mathematical equation. Factors affecting clarity include turbidity, suspended solids, and color. A greater Secchi Disk Depth generally indicates better water quality characteristics.

Historical measurements reveal that there is little variation in Secchi disk depth in any section of reservoir. Furthermore, there has been little change in mean values over time. The mean Secchi disk depths in Wahiawā Reservoir are quite low (i.e., shallow) and indicate that net primary productivity in this impoundment is limited to the upper few meters of the water column. The significance of the findings for Wahiawā Reservoir is that the phytoplankton below a depth of 3 meters will consume more oxygen than they produce. This can lead to oxygen depletion in the lower portion of the water column, whereby serious consequences on the reservoir environment can occur.

Dissolved Oxygen (DO). DO is said to be one of the most important environmental parameters in lakes and reservoirs. DO is produced during the day in the upper lighted layers of the impoundment by phytoplankton primary production (photosynthesis) and is consumed by the respiration processes of all living matter in the impoundment (with the exception of certain bacteria) twenty-four hours a day. Net oxygen production is restricted to the upper few meters of the water column once the phytoplankton biomass becomes sufficiently large, thereby causing DO depletion that can result in anoxia and mass death in the system. Oxygen depletion has been implicated in a number of fish kills in Wahiawā Reservoir, especially when water levels are low due to irrigation drawdown.

The spatial distribution of DO in Wahiawā Reservoir exhibits relatively high DO concentrations in the surface waters and low levels in the lower portion of the water column. Factors affecting DO levels in the hypolimnic waters (deeper waters) of Wahiawā Reservoir are less well understood, but the depletion of DO in the hypolimnion is said to be influenced by (1) respiration by plants and animals; (2) decay of organic matter (principally phytoplankton and detritus) settling out of particulate matter (e.g. phytoplankton) from the euphotic zone; and (3) complex, little understood interactions with bottom sediments. Maintaining aerobic conditions in the hypolimnion is crucial to the ecological well-being of the reservoir. Oxygen depletion in the bottom layer (i.e., anaerobic conditions) restricts most plant and animal life to the upper few meters of the reservoir.

In 2002, effluent discharge was diverted from the surface to the bottom waters of the reservoir. A "post-diversion" study of the reservoir's water quality was conducted between 2002 and 2003; however, the study was not able to determine definitively what effect the diversion had on water quality. Because the study coincided with the *Salvinia* infestation (discussed further in Section 4.8.2), water quality conditions measured at the time were heavily influenced by its presence. The presence of *Salvinia* had the following effects: 1) reduced the surface water temperature, 2) reduced the DO levels in the surface water, 3) affected the Secchi depth, 4) contributed to the reduction pH in the surface water, 5) contributed changes in the concentration patterns of the nitrogen moieties, and 6) contributed to the decrease of chlorophyll α. Data from the 2002 – 2003 study can be found in the appended water quality study (Appendix A, AECOS, Inc., 2008).

<u>Odors</u>:
Odors emanating from Wahiawā Reservoir have been reported to DOH. Odors emanating from reservoirs, lakes, ditches or ponds are often symptomatic of environmental imbalances. Wahiawā Reservoir has a history of such imbalances resulting in fish kills and aquatic plant/algae blooms which could result in offensive odors.

Fish kills in Wahiawā Reservoir may result from various causes such as specific toxic substances in effluents or from origins unknown (illegal dumping, for example). Fish kills can also result from eutrophication, a process whereby excess nutrients promote algal and aquatic plant growth, resulting in unstable conditions in the water body with respect to dissolved oxygen and perhaps other properties. Excess plant growth can produce low oxygen in the water during the early morning hours, killing fish in the deeper lower portions of the water column. Dead and decaying plant matter following a "bloom" event, such as the Salvinia infestation in Wahiawā Reservoir in 2003, can sink, reducing DO and producing unpleasant odors.

Decay processes within bottom sediment are natural and these typically emit unpleasant odors as organic matter that has settled to the bottom is recycled. The

odors become evident when bottom sediments in the reservoir are exposed by lowering of water levels. (AECOS, Inc., 2008)

4.6 Air Quality

Air quality in Hawai`i generally meets federal Ambient Air Quality Standards (AAQS) and State environmental health standards. Some of Hawaii's air quality standards are more stringent than the federal standards. These include standards for carbon monoxide, nitrogen dioxide and ozone. Hawai`i also has a stringent standard for hydrogen sulfide, a common odorous pollutant commonly associated with wastewater treatment facilities (J.W. Morrow, 2007)

Hawaii's good air quality is due to the prevailing trade winds that prevent the accumulation of airborne pollutants. Strong winds aid in the dispersal of pollutants. They rapidly transport emissions from their source and spread them over a wide horizontal extent. Also, air does not always flow uniformly, rather it contains small swirling motions, called eddies that mix the air vertically and horizontally. Thus, strong winds disperse the pollutants over a wider area, but at lower concentrations.

The major sources of airborne pollutants in the State are electrical generation plants, incineration plants, aircraft, automobiles and the volcanoes on the island of Hawai`i. These pollutants become a problem only during periods of atmospheric stability, which occurs when there are no trade winds. This allows for a build up of pollutants in the atmosphere surrounding the islands. When the atmosphere is stable, air resists metrical displacement and this leads to higher concentrations of pollutants near the ground. Further, when it is warm and sunny and the atmosphere is stable the conditions are ripe for the formation of photochemical smog. The incoming energy from the sun interacts with pollutants to produce secondary pollutants in the atmosphere particularly ozone, nitrous oxide, formaldehyde and other gases.

An air quality impact report (AQIR) was prepared by J.W. Morrow (2007) for this EIS. The purpose of the report was to assess potential air quality impacts associated with the COWFP and its proposed actions. The AQIR discusses odors and odor control at existing facilities. As mentioned in the COWFP, the Grandview pump station had a "low flow" problem but "no major odors". No strong odors were observed at any of the wet wells during inspection visits to the seven pump stations in the Wahiawā system. At the Wahiawā WWTP, a mechanical climber-type bar screen in one of the influent channels in the preliminary treatment section of the plant is no longer used because of odor production from accumulated screenings that required frequent maintenance by plant personnel (J.W. Morrow, 2007).

Since there are residential dwellings in close proximity to the Wahiawā WWTP, there have been complaints about odor in the past. Odors experienced by residents may be exacerbated during periods of warm weather or when Kona winds (wind from the south) divert odors towards the residential area north of the facility. Calm conditions may

cause a stagnant plume of odors to remain in the vicinity of the Wahiawā WWTP. A principal cause of odor was identified in the truck loading area, specifically during loading operations. To counteract these odors, a small granular activated carbon system was installed in the truck-loading bay and the truck vents were equipped with carbon filters. To reduce offensive odors, an odor-masking agent is also employed (J.W. Morrow, 2007).

Despite the proximity of residences to the Wahiawā WWTP, one would expect fewer complaints of odors throughout the year because the prevailing trade winds would blow any odorous emissions away from these residences. The AQIR states that odorous gases and vapors will disperse downwind from their source and become diluted as they do so. Calculations using the EPA model SCREEN3 indicate a sharp decline in concentration and odor intensity with distance (i.e., a reduction of 94 percent or more within 100 meters). The closest homes downwind (west) of the plant should be far enough away (>300 meters) to benefit from the significant dilution effects (J.W. Morrow, 2007).

In the past, odors have been associated with the sludge storage tank and gravity thickeners, but these have been resolved by removing the units from use. Instead, DAFTs are used, and one of the DAFT tanks is used for the storage of sludge. A Phoenix activated carbon system is employed in the DAFT tanks for odor control (J.W. Morrow, 2007).

There are no known air quality concerns associated the wastewater pump stations or with the disposal of treated wastewater.

4.7 Noise Quality

Impacts of sound on the environment are determined by several factors including sound level (loudness), duration of exposure to noise, frequencies of the sound, and fluctuations in noise levels during exposure. Loudness is measured in decibels, but since the human ear is unable to perceive all sound frequencies equally, noise levels are adjusted to correspond to human hearing. This adjusted unit is known as the A-weighted decibel (dBA).

An acoustical study for the COWFP was performed by Y. Ebisu & Associates (2007). This study describes the existing background ambient noise levels at the wastewater facilities encompassed by the COWFP. All ambient background noise levels measured were approximately 60 dBA or less. Daytime noise levels ranged from 40 to 60 dBA and nighttime noise levels ranged from 35 to 55 dBA. Most of the wastewater facilities are located away from high volume roads in relatively quiet residential or rural areas.

Background ambient noise levels are influenced by the activities that occur in the immediate area where noise impacts are measured. In the project area, the background ambient noise levels reflect the residential and agricultural activities that

prevail in addition to the occasional sounds associated with military activities and equipment. Existing background ambient noise levels in the vicinities of the wastewater facilities that are the subject of this EIS are determined to be relatively low (Y. Ebisu & Associates, 2007, pg. 15). In other words, the wastewater facilities are exposed to relatively low noise impacts from nearby activities. Background noise levels are controlled by the sounds of operational equipment such as electrical motors, mechanical equipment, and sloshing liquids.

The following briefly describes the findings of the acoustical study in regards to current conditions at the various wastewater facilities covered in the COWFP. For detailed discussions of the results, refer to the study which is attached to this EIS as Appendix B.

WAHIAWĀ WWTP

The Wahiawā WWTP is located adjacent to single-family residences which are located along the north boundary of the property. Existing daytime and nighttime background ambient noise measurements were obtained at the Wahiawā WWTP during the month of October 2001 with and without the emergency generator in operation.

The Odor Control Fan was the loudest noise source at the station with measured noise level of 73 dBA at 26 feet from the center of the fan's enclosure. A noise level of 53 dBA measured along the station's north property line exceeds the DOH nighttime limit of 45 dBA.

Noise from the Reclamation Facilities Building emanated from the ventilation louvers on the west and south walls of the building. The measured noise level of 58 dBA along the west property line was associated with the noise from the Reclamation Facilities Building. Risks of noise complaints west and south of the facility are considered to be low due to the large buffer space provided by Wahiawā Reservoir to the west and south.

The measured noise level at three feet from the open windows along the east wall of the Blower Building was 69 dBA. Risks of noise complaints due to this noise source are considered to be low because of the large buffer distances to the residences north of the station.

GRANDVIEW WWPS

The Grandview WWPS is located adjacent to residences at the south and southeast of the station. Existing daytime background ambient noise measurements were obtained on October 24, 2001, with and without the emergency generator in operation. A noise level of 42 dBA obtained at the entrance driveway to the station represented the existing background ambient noise level with the generator off. Measurements obtained from three corners of the station while the generator operated without load ranged from 53 to 83 dBA. Existing noise levels during testing of the generator exceed the daytime limit of 55 dBA by approximately 8 dBA along the south boundary of the station which is adjacent to a single family residence.

UWALU WWPS

The Uwalu WWPS is located near multi-family residences, which are situated north of the station across Uwalu Circle at greater than 85 feet from the station's building. Single family residences are located northeast of the station at greater than 220 feet from the station's building. The immediately adjacent lands west, east, and south of the station are zoned for agriculture and are vacant. Existing daytime noise measurements were obtained on October 30, 2001, with and without the emergency generator operating.

With the emergency generator off, background ambient noise levels at the station ranged from 42 to 47 dBA. Across Uwalu Circle and at the property line of the 2-story apartments to the north, the measured noise level of the generator was 57 dBA which does not exceed the DOH daytime limit of 60 dBA for multi-family residential areas. At the closest single family residence, approximately 222 feet northeast of the station, the measured noise level from the generator was 48 dBA, which does not exceed the DOH daytime limit of 55 dBA for single family residential areas.

During daytime testing operations of the emergency generator, the Uwalu WWPS is in compliance with the DOH noise limits at the nearest multi-family and single family residences. During nighttime emergency generator operations, the existing generator noise levels will exceed the DOH nighttime noise limit of 50 dBA for multi-family residences across Uwalu Circle, and will also exceed the nighttime noise limit of 45 dBA at the closest single family residence toward the northeast.

WHITMORE VILLAGE WWPTF

Existing traffic and background noise were the predominate sources of noise at the Whitmore Village WWPTF. Existing traffic and background ambient noise levels at 48 feet from the centerline of Whitmore Avenue were obtained on October 24, 2001. The ambient noise level was 44 dBA during periods of no traffic. Noise levels increased according to the type and amount of traffic on the roads. Light vehicles ranged from 65 to 75 dBA, heavy trucks and buses ranged from 77 to 80 dBA. The average noise level from all of the vehicles measured during a one-hour period was 65 dBA.

WAHIAWĀ RESERVOIR

There are no known noise quality concerns associated with the disposal of treated effluent into Wahiawā Reservoir.

DISPOSAL CORRIDOR

Along the Direct Reuse alternative disposal corridor, background ambient noise consists mainly of vehicular traffic, agricultural activities and occasional military-related activities. As the corridor passes through the largely residential areas within Mililani, background ambient noise levels are typical for residential areas, which is generally fairly quiet.

4.8 Flora

4.8.1 TERRESTRIAL COMMUNITIES

Lands that have been altered by man for urban development (including agricultural uses) are often characterized by vegetative communities dominated by introduced, non-native species. Candidate, proposed or listed threatened or endangered species as set forth in the Endangered Species Act of 1973, as amended (16 USC 1531et seq.) are generally not expected to be found within these developed areas.

The primary natural vegetation in Central O`ahu includes dry scrub and mixed lowland vegetation; however, during the plantation era, most areas that could be cultivated were planted with sugarcane. With the decline of sugar, other agricultural crops such as coffee, papaya, banana, grass, and lettuce are being cultivated (Wilson Okamoto & Associates, Inc., 2000).

The grounds of the Wahiawā WWTP have been landscaped with ornamentals and fruit trees including gardenia ***(Gardenia sp.)***, bird-of-paradise ***(Strelitzia reginae)***, croton ***(Mallotus sp.)*****,** ti ***(Cordyline fruticosa)*****,** plumeria ***(Plumeria sp.)*****,** banana ***(Musa sp.)*****,** and papaya ***(Carcia papaya* L.*)*.** None of these species are designated as threatened, endangered, or are candidates for threatened or endangered species status. The vegetative community in the area between the Wahiawā WWTP fence and the Wahiawā Reservoir is referred to as "Reforested Lakeside Vegetation" (Funk for GMP Associates, Inc., 1995 as cited in Calvin Kim & Associates, Inc. and Gerald Park Urban Planner, 1999, pg. 2-6). Trees include species such as Lemon scented gum ***(Corymbia citriodora)***, ironwood ***(Casuarina equisetifolia* L.*)***, African tulip ***(Spathodea campanulata* P.Beauv.)**, Formosan koa ***(Acacia confusa)***, and octopus tree ***(Schefflera actinophylla*(Endl.) Harms*)*.** The under-story includes garden varieties such as banana tree ***(Musa sp.)*****,,** ti ***(Cordyline fruticosa)*****,** `ape ***(Alocasia macrorrhiza)*****,** Syngonium **(Arrowhead Plant),** and philodendron ***(Araceae sp.)***; weeds such as sedge McCoy grass ***(Cyperus gracilis)***, white shrimp plant ***(Justicia betonica)***, Guinea grass ***(Urochloa maximum* (Jacq.)*)*),** and wire grass ***(Eleusine indica* (L.) Gaertn*)***; wetland varieties include water hyacinth ***(Eichhornia crassipes)*** and California grass ***(Brachiaria mutica)*** (Funk for GMP Associates, Inc., 1995 as cited in Calvin Kim & Associates, Inc. and Gerald Park Urban Planner, 1999).

4.8.2 AQUATIC COMMUNITIES

Aquatic vegetation at the Wahiawā Reservoir primarily consists of the water hyacinth (*Eichhornia crassipes*). This species was introduced to the Hawaiian Islands in the late 1800s; how and when this species was introduced to the Wahiawā Reservoir is not known (Funk for GMP Associates, Inc., 1995 as cited in Calvin Kim & Associates, Inc. and Gerald Park Urban Planner, 1999).

The water hyacinth ***(Eichhornia crassipes)*** is a wetland plant that is mentioned in the *Biological and water quality considerations for the Central Oahu Wastewater Facilities*

Plan EIS (AECOS, Inc., 2008) for its ability to "treat" water. Hyacinth may be used in a tertiary wastewater treatment system to remove nutrients, or in an integrated secondary and tertiary treatment system for biochemical oxygen demand reduction and nutrient removal (Ibid). Organic matter in the waste stream adheres to the roots of the plant, and periodic harvesting of the plants aids in nutrient removal from the system.

The benefits associated with a population of water hyacinth may be offset by the negative impacts associated with required periodic removal of excess growths. When large surface areas of the water body become covered with mats of water hyacinth, the use of the water body by water birds or fishermen becomes limited. Large, dense, floating mats of hyacinth can also cause negative impacts (i.e., a decline in DO levels) affecting the normal function of the aquatic ecosystem. Dense mats of water hyacinth composed of plants interwoven by their bodies can weigh up to 200 tons per acre whereby manual removal using knives, ropes, etc. to cut mats and drag them away becomes arduous work that is impractical even where manpower is plentiful and cheap (Harly, Julien, and Wright, 1997 as cited in AECOS, Inc., 2008). Other means of hyacinth control include the application of chemicals (e.g., herbicides) or the use of a biological species (e.g., insects or fungi) to reduce the density of the hyacinth infestation. It is almost impossible to successfully eradicate large water hyacinth infestations with herbicides over the long-term, but herbicides can be effective at controlling small infestations. Although heavy hyacinth infestations in central Africa and Asia have been successfully controlled using biological agents, this approach is not recommended in Hawai`i because the introduction of exotic control species is a long and expensive process that could negatively affect commercial crops.

In April 1999 small infestations of giant salvinia (*salvinia molesta*), an invasive aquatic fern found to double in volume every two to four days, were found in Wahiawā Reservoir. By January 2003, giant salvinia had covered approximately 90 percent of the reservoir's surface water area and posed the threat of a massive fish kill and a potential public health disaster. The DLNR was designated as the lead agency in addressing the infestation at the reservoir. In a cooperative effort between various City, State and Federal agencies, 50,000 cubic yards of giant salvinia was cleared from the reservoir. In August 2004, after successfully controlling the infestation, the reservoir was reported as remaining almost completely free of giant salvinia and DLNR's Division of Aquatic Resources (DAR) was performing monthly monitoring of the reservoir. There is no knowledge of reports of fish kills in association with the giant salvinia infestation at Wahiawā Reservoir.

4.9 Fauna

4.9.1 TERRESTRIAL COMMUNITIES

Lands that have been altered by man for urban development (including agricultural uses) are often characterized by faunal communities dominated by introduced, non-native species. Candidate, proposed or listed threatened or endangered species as set

forth in the Endangered Species Act of 1973, as amended (16 USC 1531 et seq.) are generally not expected to be found within these developed areas because developed areas often lack the necessary habitats to support or attract these species.

The grounds of the Wahiawā WWTP are mostly developed with physical structures that prevent the establishment of habitats that support faunal communities. Some introduced rodent and introduced avifauna (bird) species common to urban areas may occasionally frequent the site.

Introduced species such as Northern cardinals ***(Cardinalis cardinalias)*** and House sparrows ***(Passer domesticus)*** were observed in trees near the Wahiawā Reservoir (Funk for GMP Associates, Inc., 1995 as cited in Calvin Kim & Associates, Inc. and Gerald Park Urban Planner, 1999). Night herons ***(Nycticorax nycticorax)*** (which are native to Hawai`i, but not endangered) and pigs ***(Sus scrofa)*** (probably domesticated) were also observed in this area (Ibid). It is presumed that the House mouse *(Mus* ***musculus)*** and Black rat ***(Rattus rattus)*** also frequent the area around the reservoir (Ibid).

In a letter received by the DDC on October 5, 2000, the United States Department of the Interior, Fish and Wildlife Service (USFWS) noted the following information pertaining to terrestrial species: Wahiawā Reservoir provides habitat that is occasionally utilized by endangered waterbirds including the Hawaiian duck (*Anas wyvilliana*), the Hawaiian coot (*Fulicia alai*), and the Hawaiian moorhen (*Gallinula chloropus sandwicensis*) (USFWS, 2000).

4.9.2 AQUATIC COMMUNITIES

A portion of Wahiawā Reservoir comprising approximately 300 acres of fishable water is designated the Wahiawā Public Fishing Area (AECOS, Inc., 2008). In the 1950s, DLNR began stocking freshwater sport fish in Wahiawā Reservoir. Introduced game fish include large and smallmouth bass ***(Micropterus salmoides and Micropterus dolomieu)***, bluegill **(*Lepomis macrochirus)***, threadfin shad ***(Dorosoma pentenense*)**, channel catfish ***(Ictalurus punctatus)*,** two species of tilapia (*Tilapia mossambiaca* and *T. macrochir*), snakehead ***(Ophicephalus striatus)***, carp ***(Cyprinus carpio)***, Chinese catfish ***(Clarias fuscus)***, tucunare ***(Chichla ocellaris)***, and oscar ***(Astronotus ocellatus)*** (DLNR, 1963 as cited in Calvin Kim & Associates, Inc. and Gerald Park Urban Planner, 1999). Several other freshwater species have been caught and are therefore known to have been accidentally introduced. These species include goldfish ***(Carassius auratus)***, swordtail ***(Xiphophorus helleri)*,** tilapia (*Tilapia melanotheron*), angelfish ***(Pterophyllum sp.)*,** armored catfish ***(Pterygoplichthys multiradiatus)*,** pacu ***(Colossoma macropomum)*,** stickfish ***(Xenentodon cancila)*,** red piranha ***(Pygocentrus nattereri)*,** and jewel cichlid (*Hemichromis fasciatus*). Both stickfish *(Xenentodon cancila)* and the jewel cichlid **(*Hemichromis fasciatus*)** are considered to be aggressive predators that are a threat to juveniles of the more desirable game fishes.

The letter received by the DDC on October 5, 2000 from the USFWS indicated that no native aquatic vertebrate or larger invertebrate species are expected to occur in Wahiawā Reservoir because of the Wahiawā Dam and extensive hydrologic modifications of the Kaukonahua Stream Watershed; however, it is likely that native aquatic insects and other invertebrate are found in the reservoir (USFWS, 2000, pg. 3).

An investigation by DLNR-DAR documented the in-stream resources of the Ki`iki`i Stream system and assigned it a ranking of "M" or moderate (Hawaii Cooperative Park Service Unit, 1990 as cited in AECOS, Inc., 2008). In 1989, observations of the following native aquatic macrofauna were noted: *Awaous guamensis* ***(`o`opu akupa)*** was observed to be abundant in the north fork, and *Stenogobius hawaiiensis* ***(`o`opu naniha)*** and *Eleotris sandwicensis* ***(`O`opu)*** were present in Kaukonahua Stream. Listings of all native and introduced species observed in the Ki`iki`i Stream system by DAR and of aquatic macrofauna observed in Kaukonahua Stream by The Nature Conservancy in 1997 are included in the *Biological and water quality considerations for the Central Oahu Facilities Management Plan EIS,* attached as Appendix A, along with additional discussions pertaining to aquatic resources.

4.10 Historic, Archaeological and Cultural Resources

Historic and archaeological information discussed in this section comes largely from *An Archaeological Inventory Survey for the Central O`ahu Facilities Plan* (Pacific Legacy, Inc., 2007a) which is attached as Appendix C of this EIS. Information on cultural resources is from the *Cultural Impact Assessment for the Central O`ahu Facilities Plan*, also prepared by Pacific Legacy, Inc. in 2007 and attached as Appendix D.

4.10.1 HISTORIC AND ARCHAEOLOGICAL RESOURCES

The archaeological inventory survey reviewed previous archaeological investigations for areas within Central O`ahu. A field survey of the project area was also conducted to determine if any significant or potentially significant archaeological resources were present. The findings of previous investigations indicated that lands in the project area have been extensively modified or disturbed by large-scale agricultural (e.g., pineapple) plantation activities, urban development and human incursion. Archaeological sites that may have once existed on the upland plateau that is Central O`ahu were undoubtedly destroyed by these plantation activities. Very few of the archaeological sites recorded in the 1930s by Gilbert McAllister of the Bishop Museum survive to this day, and more recent archaeological surveys have revealed only relatively recent historic sites. Discoveries of prehistoric sites have only occurred in gulch areas where pineapple plantation cultivation did not occur (Pacific Legacy, Inc., 2007a).

The following paragraphs briefly describe known archaeological sites in Wahiawā, Whitmore Village, and NCTAMS PAC as summarized in the archaeological inventory survey report prepared by Pacific Legacy, Inc. in September 2007 and in previously published documents as noted. The archaeological inventory survey contains additional

discussions pertaining to the historical and archaeological resources that exist in the remaining areas of Central O`ahu.

WAHIAWĀ

Two sites were previously recorded in the Wahiawā area (Sites 50-80-04-00218 and 50-80-04-0219); however, only Site 50-80-04-00218 (Kukaniloko) remains to this day. Kukaniloko is a cultural feature situated approximately 1,000 feet north of the north fork of Kaukonahua Stream. The entire 100-square foot site has cultural importance because it was reportedly a birthplace for chiefs (Paul H. Rosendahl, Ph.D., Inc., 1992 as cited in Calvin Kim & Associates, Inc. and Gerald Park Urban Planner, 1999). Half-buried boulders are scattered across the site. The most prominent stone feature (perhaps a birthing platform) is approximately five feet high by two feet wide (Ibid).

Other notable sites in the Wahiawā region include the Wahiawā Healing Stone (Site 50-80-05-1330), the James D. Dole Plantation Homestead (Site No. 50-80-05-1330), and the O`ahunui Stone (Site 50-80-05-0204). The town of Wahiawā essentially sprang from homestead lots developed in the 1890s; therefore this area has few, if any, signs of archaeological evidence as a result of more than 100 years of modern agricultural impacts, urban development and human incursion that has completely altered the area.

WHITMORE VILLAGE

This area was originally developed in 1947 by Hawaiian Pineapple Company as a consolidated worker camp of 120 dwellings, a playground, and a community center on 77 acres. The high degree of human incursion within the Whitmore Village area altered the area such that no significant archaeological resources have been recorded. The area north of Whitmore Village, in the vicinity of Helemano Military Reservation, contains three previously recorded sites (50-80-05-1968, 50-80-05-1969, 50-80-05-1970) consisting of two rock piles, one historic concrete foundation, and one stacked-stone retaining wall with concrete blocks and barbed wire.

NCTAMS PAC

A survey of 685 acres in Central O`ahu conducted in 1997 by Ogden Environmental and Energy Services, Co. determined that NCTAMS PAC contains no known traditional Hawaiian cultural resources (Landrum, Drolet, and Shideler, 1997 as cited in Pacific Legacy, Inc., 2007); however, the un-surveyed gulch that bisects NCTAMS PAC contains moderate potential for archaeological resources to exist (Pacific Legacy, Inc., 2007a). A survey of 81 structures within NCTAMS PAC dating from 1941 to 1943 and 1950 revealed 11 historic building types of which only one structure (a Quonset hut reconstructed in 1950 from a World War II structure) was determined to be a Category I resource, which represents outstanding, historical, architectural, archaeological, engineering, or cultural significance (Landrum, Drolet, and Shideler, 1997 as cited in Pacific Legacy, Inc., 2007a). Archaeological resources that are proximal to, but not on NCTAMS PAC include heiau, Kolokole rock, akua stone, Kukaniloko birthing stone, three burial caves, a former location of a cache of worked stones, a habitation complex, and an isolated housing site (Ibid).

OHA requires that if iwi kūpuna or other cultural deposits are encountered during construction or installation activities conducted in association with the proposed wastewater improvement projects, work will cease in the immediate vicinity and the State Historic Preservation Division shall be contacted.

4.10.2 CULTURAL RESOURCES

A Cultural Impact Assessment (CIA) was conducted for the proposed action in compliance with Act 50, signed into law on April 26, 2000 (see Appendix D). Areas studied for the CIA include the existing facilities and proposed corridors related to the facility improvements covered by the COWFP. The following is a brief discussion of the sites where significant cultural activities may occur.

KUKANILOKO BIRTHSTONES STATE MONUMENT

The name Kukaniloko means "to anchor the cry from within". The site consists of a series of stones. One stone, Kukaniloko, is the stone on which the chiefess would give birth. A child born at Kukaniloko was said to be a divine chief (Thrum, 1912 as cited in Pacific Legacy, Inc., 2007b). Kukaniloko dates back to the 11th century and is listed on the Hawai`i Register of Historic Places.

Today five acres surrounding the stones make up the State Monument, which is located approximately one mile northwest of Wahiawā Town, off of Kamehameha Highway. The parcel was part of the Galbraith Trust Lands and has been acquired by the State. It is surrounded by 2,100 acres of Galbraith Trust Lands.

WAHIAWĀ HEALING STONE

This site is located on California Avenue directly across from the entrance to the Wahiawā WWTP. In the early 1900s the stone was found in Kaukonahua Gulch by George Galbraith, who moved the stone to the area of Kukaniloko to mark what was thought to be the burial ground for an old Hawaiian chief (Sterling & Summers, 1978 as cited in Pacific Legacy, Inc., 2007b). Over time the rock acquired a reputation for having healing powers. People began to flock to the stone in large numbers. In 1927 the stone was moved to the Wahiawā Cemetery on California Avenue where it attracted thousands of people. Subsequent to its relocation to the cemetery, interest in the Healing Stone decreased.

In the mid 1980s interest in the stone grew again when a group of Hindus began to gather at the stone believing that it is the earthly representation of the god Shiva. Today, the stone is cared for by a Hawaiian organization and Hindus. Both Hindus and Hawaiians worship and practice their beliefs at the stone.

OTHER AREAS

Surrounding areas which include the proposed disposal corridors encompassed by the COWFP were also assessed for ongoing cultural practices. Proposed corridors are for the most part aligned within existing roadways and right-of-ways. These areas include the land areas in the vicinity of Wahiawā, Mililani, Waipi`o and Waiawa. All of these

areas were developed by either the U.S. Military or for agricultural uses since the late 1800s. Some areas have stories and accounts of historic events, but no specific areas are identified.

4.11 Natural Hazards

Natural hazards that pose potential risk to the entire island of O`ahu include earthquakes, tropical cyclones, and floods. The risks from tsunamis are typically of lesser concern because Central O`ahu is located a considerable distance from the coastline.

4.11.1 EARTHQUAKES

Hawai`i experiences seismic activity that is caused by different geologic processes. Most relate the numerous small earthquakes with the volcanic activity on the island of Hawai`i, which are caused by the movement of magma underground. Other earthquakes are caused be tectonic activity (movement of the plates that make up the earth's crust) in the major seafloor fracture zones that surround the islands and extend great distances across the Pacific Ocean floor. Recorded earthquakes in Hawai`i range in magnitude from 1.0 to 8.1 on the Richter scale.

The entire island of O`ahu lies within an earthquake zone classified as Seismic Zone 2A; Zone 0 refers to areas with least seismic activity whereas Zone 4 denotes an area with greatest seismic activity. Public and certain types of private buildings must conform to structural design standards for earthquake resistance per the Uniform Building Code Requirements for Seismic Zone 2A.

Although the entirety of the island of O`ahu is designated Zone 2A, within a smaller defined area the earthquake hazard may vary from this designation. Ground-shaking during an earthquake varies within a small area depending upon the nature of the underlying ground (Fletcher, Grossman, Richmond & Gibbs, 2002). Bedrock tends to have more stability than unconsolidated sediments such as alluvium, colluvium and marine sediments. Topography also affects seismic hazards. For example, steep slopes composed of loose material or fractured rock may produce large landslides. To determine any seismic hazard the geology and types of construction must also be used to determine the risk of damage to a property.

4.11.2 TROPICAL CYCLONES

Tropical cyclones consist of hurricanes, tropical storms and tropical depressions, and their prevalence is seasonal. From June to October they form in the western Pacific in the warm equatorial waters off the coast of Central America. Yearly, an average of 16 tropical cyclones develop hurricane force winds. Most of the tropical cyclones that reach hurricane force either turn north and impact North America or lose energy as they move over colder water (Aguado & Burt, 1999). Occasionally, one may move northwest across the equatorial Pacific and reach Hawai`i.

The extreme damage and economic loss associated with tropical cyclones have increased the public awareness of their threat in Hawai`i. The damage and injury associated with these meteorological phenomena results from high winds, marine over wash, heavy rains, flooding and intense winds. In the 31 years from 1970 to 2000 Hawai`i experienced 138 tropical cyclones, of which only a few were fully developed hurricanes (Fletcher, Grossman, Richmond & Gibbs, 2002).

4.11.3 FLOODS

Floods caused by heavy rainfall normally occur during the winter months with January typically being the most frequent period. Heavy precipitation can also be associated with tropical storms and hurricane season between the months of June and October. Areas that typically flood are low lying areas near streams and other depressions where runoff can accumulate.

The Wahiawā WWTP is located on well-drained soils and there have been no reports of significant on-site flooding from surface runoff. Runoff from the Wahiawā WWTP and surrounding areas generally flows into the reservoir. The Federal Emergency Management Agency (FEMA) designates the entire Wahiawā WWTP site as Zone D (DBEDT-GIS, 2003). Zone D designates areas in which flood hazards are undetermined, but possible.

The Wahiawā Reservoir itself poses a flood hazard if waters in the reservoir reach 82 feet, or 2 feet above the spillway. The Civil Defense Agency has a flood response plan that addresses the hazard posed by the Wahiawā Dam and reservoir. If waters in the reservoir reach 85 feet, the towns of Waialua and Wahiawā would be evacuated. To date, this type of event has not occurred (Eveleth, 1994 as cited in Wilson Okamoto & Associates, Inc., 2000, pg. 3-75).

4.11.4 TSUNAMIS

Tsunamis are caused by a sudden movement of the sea floor which generates a series of waves that travel across the ocean until they reach a coast. Seafloor movement may include faulting, land sliding or submarine volcanic eruptions. The geographic orientation of Hawaii's many coastlines have historically been subject to severe tsunami impact.

4.12 Surrounding Land Use

The Wahiawā wastewater service area covers approximately 1,610 acres. Included within the service area are the Central O`ahu population centers of Wahiawā Town, Whitmore Village and NCTAMS PAC.

Wahiawā Town is a historical plantation community located between the more urbanized growth of Central O`ahu and the agricultural and rural areas of the North Shore. Wahiawā Town service area covers approximately 610 acres and includes residential and low density apartment use, a regional town center with commercial and community services land uses, parks, and preservation land. Commercial and retail activity in Wahiawā Town is congregated along portions of Kamehameha Highway, Wilikina Drive and California Avenue. Medium density apartments are located along portions of the shoreline of Wahiawā Reservoir and near commercial areas. The remainder of Wahiawā Town is characterized by older, single family homes.

Whitmore Village is a small residential community north of Wahiawā Town. The Village encompasses approximately 393 acres and its major land use is residential.

NCTAMS PAC is a military facility located approximately one mile east of Whitmore Village. The NCTAMS PAC facility occupies approximately 694 acres and serves as part of the global communications network for the U.S. Navy. In addition to communications facilities, NCTAMS PAC has military housing units, enlisted personnel barracks, and community support facilities. The Hawaii Regional Security Operations Center (HRSOC) project involves the construction of a new security operations building at NCTAMS PAC. The new facility, which will center around a large two-story building, is expected to employ approximately 2,800 personnel beginning in 2010. The projected future equivalent population of NCTAMS PAC in 2010 is expected to increase to 2,350 persons as a result of the HRSOC project and other projects at the complex. (TLCG, w.i.p.)

Surrounding land uses in the immediate vicinity of the Wahiawā WWTP and Wahiawā Reservoir are primarily residential with some commercial. Several public facilities also are located within close proximity of the WWTP and reservoir. Ka`ala Elementary School lies within 0.5 miles of the WWTP. Four WWPS are located within a 0.75-mile radius from the Wahiawā WWTP: Kemoo Farms, Homelani, Lakeview, and Ohai. The Grandview WWPS, Nakula WWPS, Uwalu WWPS and Whitmore Village WWPTF are located within or near residential neighborhoods.

The disposal corridor associated with the Direct Reuse alternative extends from the Wahiawā WWTP in Wahiawā Town down Kamehameha Highway, through Mililani to the Mililani WWTP. From the Mililani WWTP, the corridor continues along Ka Uka Boulevard in Waipi`o where eventually a developer-installed extension could connect the transmission line to Waiawa to irrigate planned golf courses. Adjacent land uses along the disposal corridor consist largely of military reservations, agricultural areas, residences, and commercial and recreational uses. The stretch of Kamehameha Highway between Wahiawā and Mililani is bounded on one side by Wheeler AAF and agricultural lands on the other. Residential, commercial and recreational uses along the disposal corridor are located primarily in the towns of Mililani and Waipi`o.

4.13 Aesthetic Considerations

Aesthetic considerations at the various WWPSs and the Whitmore Village WWPTF are unremarkable, as well as along the proposed disposal corridor. Landscaping is provided on the grounds of the Wahiawā WWTP. As previously indicated in Section 4.8.1, the observed vegetation includes introduced ornamental species and fruit trees. Both recent and planned improvements at the Wahiawā WWTP have or will result in more structures at this site. The character of Wahiawā Reservoir is scenic, and tall trees border the area. Surrounding detached homes and commercial structures are primarily one-story.

4.14 Public Services and Facilities

4.14.1 WATER SYSTEM

Existing BWS potable water system facilities in the project area, which includes the towns of Wahiawā, Mililani and Waipi`o, generally follow the alignment of roadways. For example, water lines, mains and structures are located along main roadways such as California Avenue, Kilani Avenue, Glen Avenue, Wilikina Drive, and a portion of Whitmore Avenue in Wahiawā. Along the Direct Reuse alternative disposal corridor, water lines are located along portions of Kamehameha Highway southward to the northern end of Mililani Town. In the towns of Mililani and Waipi`o, water lines are located along major roadways such as Lanikuhana Avenue and Ka Uka Boulevard and along the minor residential streets. Within Mililani Town, there are a few instances where water lines may cross Kamehameha Highway to traverse from one side of Mililani to the other.

4.14.2 WASTEWATER SYSTEM

City sewer line facilities in the vicinity of the project sites generally follow the alignment of roadways. Sewer lines and mains nearest to the Wahiawā WWTP are along California Avenue; those nearest to the Wahiawā Reservoir are along Wilikina Drive

The Wahiawā WWTP treats wastewater from Wahiawā Town, Whitmore Village, and NCTAMS PAC. The facility is currently designed to treat an average dry weather flow of 2.5 million gallons per day (mgd). The Wahiawā WWTP is operating at approximately 80 percent of its design capacity with an average flow during the latter part of the 1999 calendar year ranging between 1.9 and 2.0 mgd (Calvin Kim and Associates, Inc. and Gerald Park Urban Planner, 1999).

Along the Direct Reuse alternative disposal corridor, City wastewater facilities (e.g., sewer lines and manholes) generally are located along roadway alignments including major thoroughfares such as Kamehameha Highway, Lanikuhana Avenue and Ka Uka Boulevard in Mililani and Waipi`o. There are no city wastewater facilities along the disposal corridor for the portion of Kamehameha Highway that begins at the southern

end of Wahiawā Town and ends at the northern end of Mililani Town. Along the stretch of the proposed corridor from the Mililani WWTP to Waipi`o, there is an existing 12-inch force main along Kamehameha Highway.

4.14.3 DRAINAGE SYSTEM.

The City's storm drainage system in the vicinity of the Wahiawā WWTP includes drain inlets and underground pipes located along California Avenue, Kilani Avenue and associated side streets (DPP, n.d.(a) and DPP, n.d.(b)). Storm water in the immediate vicinity of the Wahiawā WWTP discharges into Wahiawā Reservoir (Ibid.).

Along the Direct Reuse alternative disposal corridor, existing City storm drainage facilities include drain inlets and underground pipes typically aligned along/within roadways and right-of-ways in the towns of Mililani and Waipi`o.

4.14.4 ELECTRICAL, GAS AND COMMUNICATION SYSTEMS.

Within Wahiawā Town, existing Hawaiian Electric Company (HECO) power lines, Hawaiian Telcom telephone lines, and Oceanic Time Warner Cable transmissions lines are primarily overhead. Oceanic Time Warner Cable does have some underground transmission lines within Wahiawā along California Avenue and Kamehameha Highway south until the area near Lehua Road. These overhead and underground lines and facilities generally follow the alignment of existing roadways. The Gas Company also has existing supply lines, located generally within roadways.

Along the Direct Reuse alternative disposal corridor in the towns of Mililani and Waipi`o, underground electrical and communication systems generally are located along the alignments of existing roadways. In Mililani, Oceanic Time Warner Cable has indicated underground transmission lines are located along Kamehameha Highway beginning near Waikalani Drive and continuing southward along portions of the relevant roadways towards the Mililani WWTP.

HECO has existing 138V and 46kv overhead facilities and 12kv overhead and underground facilities along the proposed alignment. As the disposal route becomes more definitive, HECO can provide additional site-specific information regarding their facilities along the route.

4.14.5 ROADWAY SYSTEMS.

Kamehameha Highway and Wilikina Drive provide primary access to Wahiawā Town. Wilikina Drive in the vicinity of Funston Gate (Schofield Barracks) is a four-lane divided highway generally oriented in a north-south direction. Wilikina Drive joins Kaukonahua Road north of Schofield Barracks. The described roadway system links Wahiawā with the communities of Waialua and Hale`iwa. Kilani Avenue and California Avenue are the two main east-west roadways within the town of Wahiawā and are bisected by Kamehameha Highway which is the primary north-south road through the town.

The Direct Reuse alternative disposal corridor, as currently proposed, follows Kamehameha Highway southward as it exits Wahiawā Town. Along this stretch, Kamehameha Highway becomes a divided bi-directional, four-lane roadway. The corridor continues along Kamehameha Highway through Mililani until it intersects with Lanikuhana Avenue, where it heads west and follows Lanikuhana south until it intersects Makohilani Street. Lanikuhana Avenue is a divided roadway and is one of the major thoroughfares through the residential area of Mililani. At Makohilani Street, the proposed corridor will continue along this street until it intersects with Makapipipi, where it continues until the Mililani WWTP. From the Mililani WWTP, the proposed corridor again rejoins Kamehameha Highway until the northern edge of Waipi`o Town, where it then follows Ka Uka Boulevard eastward. Ka Uka Boulevard is the major thoroughfare through the light-industrial/commercial area of Waipi`o.

4.14.6 SOLID WASTE DISPOSAL.

As previously mentioned, the Wahiawā WWTP has a biosolids waste disposal requirement. Biosolids are hauled by truck from Wahiawā WWTP to the Honouliuli WWTP for treatment. Once treated and thickened, the waste is disposed at a landfill or taken to the Navy's Barbers Point Composting Facility. The Wahiawā Reservoir also has a solid waste disposal requirement from its various areas that are utilized by the public for recreation.

4.14.7 RECREATIONAL RESOURCES.

The grounds of the Grandview WWPS, Homelani WWPS, Kemoo Farm WWPS, Lakeview WWPS, Nakula WWPS, ‘Ōhai WWPS, Uwalu WWPS, Wahiawa WWTP, and Whitmore Village WWPTF are not utilized for recreation.

Wahiawā Reservoir is considered a valuable recreational resource comprised of both the Wahiawā Public Fishing Area and the Wahiawā Freshwater Park. Since the 1950s the reservoir has been stocked with introduced freshwater game fish. The Wahiawā Public Fishing Area is the larger of the two areas and consists of a shoreline area that is over 20 miles long, making it one of the largest freshwater bodies and one of the most heavily fished freshwater resources in the state (Keobig & Keobig Hawaii, 1975 as cited in Calvin Kim and Associates, Inc. and Gerald Park Urban Planner, 1999, pg. 2-7). The Wahiawā Freshwater Park consists of the area along the north shore of the south fork of the reservoir. Facilities in the park include a boat launching ramp and vehicle trailer parking areas.

Along the Direct Reuse alternative disposal corridor recreational resources include the Mililani Golf Club along Kamehameha Highway; the Mililani District Park and the Kuahelani Neighborhood Park in Mililani Town; and the CORP. There are no recreational resources along the Ka Uka Boulevard branch of the disposal route.

4.15 Socio-Economic Conditions

Over the past 20 years, population growth in the Wahiawā area has been fairly stable due largely to limited new development in the area. According to the Sustainable Community Plan's vision statement for Central O`ahu, the population of this region is expected to grow from approximately 149,000 persons in 2000 to approximately 173,000 by 2025 (DPP, 2002). During this same period, approximately 11,000 new housing units would be built in master-planned communities (Ibid). It is primarily the master-planned communities such as Mililani Mauka, Royal Kunia, Koa Ridge, Waiawa, and Waikele that will experience this growth (DPP, 2002).

Job growth in Central O`ahu is also anticipated, with an increase from over 39,000 jobs in 2000 to 65,000 in 2025 (DPP, 2002). Approximately 70 percent of the private, non-construction job growth is expected to be in services, retail, or transportation / communications / utilities; another 20 percent is expected to be in industrial occupations (Ibid).

The plantation heritage and rural, small-town atmosphere of Wahiawā Town is expected to be maintained due to the policies and land use controls that are in place for this area. The *Central O`ahu Sustainable Communities Plan* lists the long-term protection for agricultural and preservation lands as one of the vision statements for this area (DPP, 2002). Consequently, the town of Wahiawā is expected to remain small-scale with the majority of low-rise, mixed-use centers of commerce and community concentrated along street frontages.

Role of the Military.
Both Schofield Barracks and Wheeler Army Airfield are in the vicinity of Wahiawā. The Army is in the process of modernization, modular conversion, rebalancing of active and reserve components, and is a force generation model that provides for continuous operations. This policy is commonly referred to as the "Grow the Army Plan." It is difficult to precisely forecast how troop deployment and rotation schedules will affect Central O`ahu in both the short and long-term. According to U.S. Army deployment schemes, ideally, Active Duty Units will deploy once every three years, Army Reserves Units once every five years, and National Guard Units once every six years. Often the families of these military personnel will remain during overseas deployment; however, in general military families are transient in nature.

Planned military build-up at Schofield Barracks includes the Stryker Brigade (roughly 3,900 combat personnel and their dependents). In addition, the U.S. Army is embarking on a $40 billion plan on quality-of-life improvements for military families throughout military installations nationwide and overseas. Improvements that affect Central O`ahu include a public/private venture to build 5,388 new homes, renovate 2,506 existing homes, and upgrade barracks through the year 2011. Since Schofield Barracks has its own WWTP, the planned housing expansion should have no direct impact on the Wahiawā WWTP.

5.0 ENVIRONMENTAL CONSEQUENCES

This section addresses the envisioned actions with respect to the effects that these actions may have on the environment. Overall, the purpose of the improvements is to provide more efficient wastewater treatment that produces a high quality effluent that can be used for irrigation.

Section 3 of this EIS evaluated all of the alternatives considered in the COWFP and eliminated those that were deemed to be unviable. Those that remained—the Preferred Alternatives—are analyzed in the EIS for their potential environmental impacts. The Preferred Alternatives can be grouped into three broad categories—Collection, Treatment, and Disposal.

> COLLECTION. There are seven Wastewater Collection alternatives, each with specific objectives. Collection alternatives include the following: 1) seal manholes, 2) public education and enforcement of Plumbing Code, 3) maintain/intensify maintenance program, 4) construct new sewers and/or rehabilitate/upgrade existing sewers, 5) increase capacity of wastewater pumping stations, 6) rehabilitate the Whitmore Village WWPTF, and 7) connect unsewered areas to the sewer system.
>
> TREATMENT. The Wastewater Treatment includes six alternatives. They are as follows: 1) preliminary treatment system modifications, 2) flow equalization and storage, 3) additional primary clarifier, 4) membrane bioreactor, 5) public education, and 6) solids processing and handling.
>
> DISPOSAL. Wastewater disposal includes two alternatives: 1) discharge into Wahiawā Reservoir, and 2) direct reuse.

Of the 15 Preferred Alternatives, the City may opt to pick and choose a package to implement from amongst the various alternatives. To aid in discussion and readability, each alternative will not be addressed individually, unless impacts specific to that alternative are significant enough to warrant a separate discussion. Discussion of impacts will be combined based upon the types of impacts they are anticipated to have on the environment.

The No Action Alternative—continuation of current maintenance practices and wastewater facility repairs as needed, and continuation of current-quality effluent discharge into Wahiawā Reservoir—is deemed unviable (refer to discussions in Chapter 3 of this EIS). However, the No Action Alternative is included in the impact analyses for comparative purposes.

Table 3 (in Chapter 6 of this EIS) provides a summary of the Preferred Alternatives and the anticipated impacts that they may have on the environment. The major issues with

all of the Preferred Alternatives are with the impacts related to construction activities. Other issues will be impacts on public services and cost.

In assessing the environmental consequences on the various resources both positive and negative impacts were considered. For the purposes of this EIS the following definitions are used in the analysis of impacts.

ACTION: Any program or project to be initiated by an agency or applicant, in this case, the COWFP. The action is composed of a set of 15 preferred alternatives.

IMPACT OR EFFECT: Impacts or effects may include ecological effects (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic effects, historic effects, cultural effects, economic effects, social effects, or health effects, whether primary, secondary, or cumulative (HAR-11-200).

ADVERSE OR NEGATIVE IMPACT: Impacts that create a negative effect on the resource.

BENEFICIAL OR POSITIVE IMPACT: Impact that creates a positive benefit for the resource.

CUMULATIVE IMPACT: The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (HAR 11-200).

NO IMPACT: No impact is anticipated when subject resources are not present or actions are not expected to affect those resources that are present.

DIRECT OR PRIMARY IMPACT: Impact which is caused by the action and occurs at the same time and place, in this case an impact that occurs during the construction process only. Direct impacts are temporary and can be mitigated.

INDIRECT OR SECONDARY IMPACT: Impact which is caused by the action and is later in time or farther removed in distance, but is still reasonably foreseeable. Indirect impacts may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. In this case an indirect impact is one that continues following project construction.

SIGNIFICANT IMPACT OR EFFECT: The sum of effects on the quality of the environment, including actions that irrevocably commit a natural resource, curtail the range of beneficial uses of the environment, are contrary to the state's

environmental policies or long-term environmental goals and guidelines as established by law, or adversely affect the economic or social welfare (HAR 11-200).

Discussions and evaluations of the environmental consequences for the alternatives deemed unviable are not evaluated in this EIS because those alternatives were eliminated from further consideration. Except, as mentioned above, the No Action alternative is included in the impact analyses for comparative purposes.

5.1 Geology and Soils

SIGNIFICANCE CRITERIA. Project actions are determined to have a significant adverse environmental impact if increased soil erosion and resulting sedimentation would cause significant impacts to water quality or aquatic habitats. The potential for erosion is discussed below; possible water quality impacts are discussed in Section 5.5 Water Quality.

5.1.1 PREFERRED ALTERNATIVES

POTENTIAL IMPACTS. It is highly unlikely that any of the Preferred Alternatives will result in any significant impacts to regional geology. Localized alterations to geology may occur as a result of land-disturbing activities related to construction. However, any geological alterations are expected to be less than significant and no mitigation is warranted or proposed.

Direct impacts to soils through erosion and sedimentation could result from implementing some of the Preferred Alternatives. Erosion and sedimentation could occur as a result of construction activities. All construction activities impact soils. Impacts are caused by land disturbing activities such as clearing, excavating, grading and filling. Exposed soils are susceptible to erosion, especially if it rains heavily during site work periods. Wind erosion may result in some unavoidable soil loss, and silt runoff also is a potential impact.

No significant long-term adverse impacts to geology and soil are anticipated as a result of implementing any of the Preferred Alternatives. In the long-term, the creation of impermeable surface area (i.e., paved surfaces) minimizes erosion and sediment transport. With appropriate mitigation measures, any impacts resulting from construction activities are expected to be less than significant.

MITIGATION. Appropriate temporary and permanent erosion and sedimentation control measures shall be implemented as warranted to insure compliance with applicable federal, state and county regulations. Typical erosion control measures applied may include the use of berms, cut-off ditches, ground cover vegetation, and the application of water and/or soil stabilization and protection materials. If necessary, silt fences shall be erected during construction and continuously inspected and repaired to prevent silt

runoff from the construction sites. Further, required permits, such as grading, trenching, stockpiling and NPDES permits, shall be acquired which may impose specific conditions on the construction contractor to mitigate any potential impacts. Landscaping, where applicable, and continued property management would contribute to erosion control in the long-term.

5.1.2 NO ACTION

POTENTIAL IMPACTS. Under the No Action alternative, no new construction of facilities would occur and the current practice of maintaining existing facilities and repairing deteriorated facilities as needed would continue. Therefore, no impacts to geology and soils would result under the No Action alternative.

5.2 Topography

SIGNIFICANCE CRITERIA. Project actions are determined to have a significant adverse environmental impact if significant changes are made to the topography as a result of repair or replacement activities, demolition, or new construction. Significant topographical changes are those of such a degree that adversely impacts on-site or adjacent land uses, infrastructure, or drainage patterns.

5.2.1 PREFERRED ALTERNATIVES

POTENTIAL IMPACTS. Proposed improvements to wastewater facilities may result in localized alterations to the topography. Topography within project areas could experience direct impacts resulting from construction activities such as grading and excavation. However, most of the construction activities would occur in areas where the physiographic features have previously been disturbed and modified for previous or existing uses. For example existing wastewater plants or existing road corridors where new sewerlines may be emplaced. These topographical modifications are expected to be less than significant at project locations. As stated in Section 4.2, no significant topographical features exist at current wastewater facilities.

MITIGATION. Standard Best Management Practices (BMPs) shall be employed during construction to minimize erosion and sedimentation that could result from any topographical modifications. Such practices shall include appropriate temporary and permanent erosion and sedimentation control measures, as warranted to insure compliance with applicable federal, state and county regulations. Typical erosion control measures applied may include the use of berms, cut-off ditches, ground cover vegetation, and the application of water and/or soil stabilization and protection materials. If necessary, silt fences shall be erected during the construction and continuously inspected and repaired to prevent silt runoff from the construction sites. Further, required permits, such as grading, trenching, stockpiling and NPDES permits, shall be acquired which may impose specific conditions on the construction contractor to mitigate any potential impacts. Landscaping, where applicable, and continued property management would contribute to erosion control in the long-term.

5.2.2 NO ACTION ALTERNATIVE

POTENTIAL IMPACTS. Under the No Action alternative, no new construction of facilities would occur and the current practice of maintaining existing facilities and repairing deteriorated facilities as needed would continue. Therefore, no impacts to topography would result under the No Action alternative.

5.3 Climate

SIGNIFICANCE CRITERIA. Project actions are determined to have a significant adverse environmental impact if noticeable climatic changes occur and are attributable to repair or replacement activities, demolition, new construction, or operation of proposed wastewater facilities.

5.3.1 PREFERRED ALTERNATIVES

POTENTIAL IMPACTS. Construction of proposed wastewater facilities and subsequent operation of those facilities is not expected to result in any measurable impacts to the climate within project areas or that of O`ahu and the state as a whole.

MITIGATION. No mitigation is warranted or proposed.

5.3.2 NO ACTION ALTERNATIVE

POTENTIAL IMPACTS. Under the No Action alternative there will be no impacts to climate.

5.4 Hydrology

SIGNIFICANCE CRITERIA. Environmental consequences related to hydrology include alterations in land use, drainage patterns, and changes in volumes and rates of runoff entering nearby surface water bodies. Project actions are determined to have a significant adverse environmental impact if the following consequences occur: the basic functions of groundwater systems, streams, coastal waters, and wetlands are altered; or area available for groundwater recharge is reduced. Specific actions that could be considered significant impacts include the placement of structures and the alteration of a site's existing drainage patterns such that an increase in the amount of short- or long-term erosion or siltation on- or off-site could occur, an increase in the rate or amount of surface runoff that would exceed the capacity of existing or planned stormwater drainage systems, and an increase in the potential for flooding on- or off-site. The potential effects of project actions on water quality are discussed separately in Section 5.5 Water Quality.

5.4.1 PREFERRED ALTERNATIVES

Groundwater

POTENTIAL IMPACTS. Groundwater supplies are mainly recharged along the volcanic dyke structures in both the Ko`olau and Wai`anae mountain ranges. A much smaller amount of water reaches the aquifers by percolating through the thick layers of sediments that make up the Schofield Plateau. No actions related to the Preferred Alternatives are proposed that will adversely alter the groundwater supplies.

Direct reuse of effluent would result in beneficial impacts to groundwater supplies. Reuse of R-1 effluent for non-potable use such as irrigation of agricultural crops, golf courses and parks would lessen the amount of potable water utilized. If the entirety of the Wahiawā WWTP's daily production of effluent can be utilized for reuse, that could translate to approximately 2.5 mgd/day, at full design capacity (current average daily flow at the WWTP is 1.98 mgd), less demand for potable water which comes from groundwater aquifers. Section 5.5 below contains a more detailed discussion on water quality.

MITIGATION. No mitigation is warranted or proposed.

Surface Waters

POTENTIAL IMPACTS. None of the surface water features such as streams or the Wahiawā Reservoir will be changed or altered physically by any actions that will take place to implement the proposed changes to the Central O`ahu wastewater facilities.

In the short-term, construction activities could pose the potential for temporary direct impacts to surface waters due to erosion and sedimentation. However, in the long-term, implementation of any of the Preferred Alternatives is not expected to result in significant adverse impacts.

Implementation of the Preferred Alternatives will result in beneficial impacts to surface waters. Upgrades, rehabilitation and construction of new sewer lines and other facilities would reduce the potential for sewer line breaks and subsequent spills, which could flow into nearby surface waters. Under the Direct Reuse alternative, the amount of effluent discharged into Wahiawā Reservoir will be reduced or eliminated entirely, which conceivably would result in decreased flow into the reservoir, improved water quality, and an improved recreational area.

MITIGATION. To mitigate potential short-term direct impacts, appropriate temporary and permanent erosion and sedimentation control measures shall be implemented as warranted to ensure compliance with applicable federal, state and county regulations. Typical erosion control measures applied may include the use of berms, cut-off ditches, ground cover vegetation, and the application of water and/or soil stabilization and protection materials. If necessary, silt fences shall be erected during the construction and continuously inspected and repaired to prevent silt runoff from the construction sites. Further, required permits, such as grading, trenching, stockpiling and NPDES

permits, shall be acquired which may impose specific conditions on the construction contractor to mitigate any potential impacts. Landscaping, where applicable, and continued property management would contribute to erosion control in the long-term.

Coastal Waters

POTENTIAL IMPACTS. Effluent from the Wahiawā WWTP is released into the Wahiawā Reservoir where it mixes with waters from the two tributaries of Kaukonahua Stream. From there it flows out of the reservoir into Kaukonahua stream and becomes a part of the Ki`iki`i Stream. The Ki`iki`i Stream system discharges into Kaiaka Bay between Hale`iwa and Waialua on Oahu's North Shore.

The Central O`ahu wastewater facilities are approximately 10 to 13 miles from the ocean on either side of the Schofield Divide. Since the overall purpose of the Preferred Alternatives is to improve the quality of the effluent released by the WWTP, it is unlikely that any of the Preferred Alternatives would directly impact coastal waters.

As none of the project areas are proximal to the coast, construction-related impacts such as erosion and run-off will not result in any direct adverse impacts to coastal waters. However, indirect impacts could occur if construction-related erosion and sedimentation or other construction-related debris or chemicals reaches surface waters that eventually discharge into coastal waters.

MITIGATION. Standard BMPs shall be employed during construction to minimize erosion and sedimentation that could result from any topographical modifications and earthwork. Such practices shall include appropriate temporary and permanent erosion and sedimentation control measures, as warranted to insure compliance with applicable federal, state and county regulations. Typical erosion control measures applied may include the use of berms, cut-off ditches, ground cover vegetation, and the application of water and/or soil stabilization and protection materials. If necessary, silt fences shall be erected during the construction and continuously inspected and repaired to prevent silt runoff from the construction sites. Further, required permits, such as grading, trenching, stockpiling and NPDES permits, shall be acquired which may impose specific conditions on the construction contractor to mitigate any potential impacts. Landscaping, where applicable, and continued property management would contribute to erosion control in the long-term.

Wetlands

POTENTIAL IMPACTS. No significant wetlands have been found along the alignment of Kaukonahua Stream. Also, literature searches have found no reference to wetlands along the other streams in the area (Calvin Kim and Associates, Inc. and Gerald Park, 1999 as cited in AECOS, Inc., 2008). Due to the absence of significant wetlands in the vicinity of project actions, significant adverse impacts are not expected.

MITIGATION. No mitigation is warranted or proposed.

5.4.2 NO ACTION ALTERNATIVE

POTENTIAL IMPACTS. In the short run, No Action would mean continued current-quality effluent discharge into Wahiawā Reservoir. This will not change current conditions in any of the water resources in the project area.

In the long-term, as wastewater systems continue to deteriorate, there is an increased potential for system failures that could result in unintended discharge of sewage into nearby surface waters. Indirect impacts may also result as sewage spills could impact surface waters further downstream and the marine waters where these streams ultimately flow. Mitigation for the long-term impact on hydrology due to the No Action alternative would be to implement one or more of the Preferred Alternatives to improve the Central O`ahu wastewater system.

5.5 Water Quality

SIGNIFCANCE CRITERIA. For the purposes of the EIS, water quality impacts would be considered significant if a project:

- Violates Federal, or State water quality standards or objectives;
- Increases contaminant levels in sediments, water column, or biota to levels shown to have the potential to harm aquatic organisms, even if the levels do not exceed the formal water quality criteria; and
- Changes background levels of chemical and physical constituents or causes elevated turbidity that could produce long-term changes in the receiving environment of the site, area, or region that would impair the beneficial uses of the receiving water.

5.5.1 PREFERRED ALTERNATIVES

POTENTIAL IMPACTS.
Similar to Hydrology, the temporary direct impacts due to construction would apply to water quality. Erosion and sedimentation may impact water quality. See Sections 5.1 and 5.4 above for a detailed description of these impacts and mitigation. The actions or alternatives themselves would have no significant impact on water quality as discussed below.

Wastewater Collection
Envisioned activities to correct the deficiencies in the wastewater collection system for the purpose of minimizing sanitary sewer overflows (i.e., spills) and reducing the illicit discharges of toxic materials to the sewer system have the potential to improve the quality of the receiving waters.

- Seal Manholes. There would be no significant impact on water quality of the receiving waters, since there will be no change in effluent characteristics.

- Public Education and Enforcement of Plumbing Code. These actions may reduce illicit connection of roof and outdoor floor drains, and disposal of grease and extraneous non-biodegradable materials which can cause spills and backups, which in turn can cause a reduction in water quality in the receiving water bodies.

- Maintain/Intensify Maintenance Program. There would be no significant impact on water quality of the receiving waters, since there will be no change in effluent characteristics.

- Construct New Sewers and/or Rehabilitate/Upgrade Existing Sewers. There would be no significant **negative** impact on water quality of the receiving waters, since there will be no change in effluent characteristics. **New and repaired sewers may, in fact, benefit receiving waters by keeping sewage from leaching into streams. This may not be a significant beneficial impact on a daily basis, but if it prevents catastrophic failure of the sewer lines it could have a very significant beneficial impact on the receiving waters.**

- Increase Capacity of WWPSs. There would be no significant impact on water quality of the receiving waters, since there will be no change in effluent characteristics.

- Rehabilitate Whitmore Village WWPTF. There would be no significant impact on water quality of the receiving waters, since there will be no change in effluent characteristics.

- Connect Unsewered Areas to the Sewer System. ~~This would result in increased nutrient loading to the reservoir.~~ **If direct reuse of wastewater is implemented (Disposal Alternative 5), then an increase in the number of homes connected to the sewer system would not have a negative impact on water quality in the reservoir, as long as the capacity of the facility is not exceeded. Only if the discharge were to continue flowing into the reservoir would hooking up more homes lead to increases to the nutrient load.** Further study would be required to determine whether this would significantly degrade water quality in the receiving waters.

Wastewater Treatment

The preferred treatment alternatives would accomplish many of the recommended wastewater treatment improvements. These alternatives would involve more new construction at the Wahiawā WWTP as compared to Wastewater Treatment - No Action. Actions that strive to improve wastewater treatment for R-1 reclaimed water production and reuse would generate no adverse impacts to water quality of the receiving waters. Rather, water quality ~~may~~ **would** be improved or enhanced as a result of enhanced treatment for R-1 water **(i.e., the quality of the water that would potentially be discharge to the reservoir would be of higher quality than under**

current conditions). Also, the utilization of new wet-weather flow storage facilities that facilitate a more complete treatment of high-flow wastes may further enhance water quality in the receiving waters **(e.g., by minimizing sanitary sewer overflows)**. Resulting lower nutrient concentrations in the effluent would result in significantly improved water quality conditions such as lower nutrient concentrations, lower plant biomass levels, lower particulate levels, and improved water clarity in receiving waters (AECOS, Inc., 2008).

- Preliminary Treatment System Modifications. There would be no significant impacts to water quality of the receiving waters anticipated, since there will be no change in effluent characteristics.

- Flow Equalization and Storage. There would be no significant impacts to water quality of the receiving waters anticipated, since there will be no change in effluent characteristics. Flow equalization should result in fewer spills, which is a benefit.

- Additional Primary Clarifier. Since the purpose of the additional primary clarifier is to enhance the overall reliability of the WWTP, there should be an improvement in water quality in the receiving waters commensurate with the improvement in WWTP reliability. This improvement would likely be a reduction in turbidity and total suspended solids (TSS) levels.

- Membrane Bioreactor. MBR is a new technology that combines primary, secondary, and tertiary treatment. It is especially useful in new and existing plants that can benefit from the production of high-quality effluent. This would likely improve water quality in the receiving waters.

- Public Education. These actions may reduce the illicit dumping of toxic and/or high strength wastes which have been implicated with fish kills in Wahiawā Reservoir, thus improving water quality.

- Solids Processing and Handling. If this procedure results in lower concentrations of particulates in effluent, then water quality in the receiving waters will be improved (i.e., particulate levels [TSS and turbidity] will be lowered), resulting in increased water clarity and possibly lower nutrient concentrations as well.

Wastewater Disposal

- Direct Reuse. This alternative is the first preferred disposal alternative which will be explained in the detailed discussion below.

- Discharge into Wahiawā Reservoir. This alternative is the second or interim preferred disposal alternative. Since ~~it will produce~~ higher improved-quality effluent **will be produced in association with this disposal alternative** than the No Action alternative, it is not likely to have negative impact on water quality

(i.e., the quality of the water that would potentially be discharged to the reservoir would be of higher quality than under current conditions).

The Direct Reuse alternative involves more new construction associated with developing a distribution system throughout Central O`ahu for the reuse of R-1 reclaimed water. The **second or interim preferred** ~~backup~~ disposal method for this option would be to discharge excess effluent into Wahiawā Reservoir. As described in Section 3.3.5, this alternative would involve intermittent and interim discharge of any unused tertiary effluent from the WWTP into Wahiawā Reservoir. This would occur during wet weather conditions when recycled water demands decrease and until such time that the direct reuse recycled water distribution system connects to potential users as much as necessary. **Overall, a significant decrease in effluent discharges to the reservoir would occur under the preferred disposal alternatives.**

Envisioned activities that strive to promote resource conservation through wastewater reclamation and facilitate the distribution of R-1 water to multiple reuse sites within the Wahiawā-Whitmore Village area and southward to Mililani, Kunia, Waipi`o, Waikele and/or the proposed development in Waiawa would result in a number of water quality related improvements to Wahiawā Reservoir that may offset periods of degraded water quality during backup disposal. For example, nutrient concentrations would be reduced, phytoplankton biomass (chlorophyll α) and particulate levels (turbidity and TSS) in the hypolimnion would also be reduced, and DO levels in the hypolimnic waters of the reservoir should increase significantly (AECOS, Inc., 2008).

Recycled water from the Wahiawā WWTP can be a valuable resource that will reduce Central Oahu's dependence on potable groundwater for irrigation purposes. Disposal Alternative 5: Direct Reuse requires the production of R-1 water at the Wahiawā WWTP. The DOH has set requirements for R-1 water in the 2002 water reuse guidelines. The guidelines have the following objectives:

- Protect public health and avoid public nuisances;
- Prevent environmental degradation of aquifers and/or surface waters;
- Delineate specified recycled water application with recycled water quality treatment;
- Facilitate the use of recycled water in greater amounts, by more readily available knowledge of the conditions under which DOH can attest to the safety of use of recycled water use; and
- Facilitate acceleration of planning, design, permitting, and implementation of water reclamation projects.

The guidelines identify stringent treatment and quality standards for reuse of treated R-1 water. R-1 water is defined as water that is oxidized, filtered, and disinfected to achieve a substantial decrease in viral and bacterial pathogens (Gray, Hong, Nojima & Associates, Inc., 2005). R-1 production involves both filtration and disinfection. The requirements for R-1 water are:

Filtration

- Continuous turbidity monitoring and recording upstream and downstream of the filtration process.
- For granular media filtration units, the effluent turbidity shall not exceed 2.0 Nephelometric Turbidity Units.
- For membrane filtration units, the effluent turbidity limitations shall be determined by the DOH on a case-by-case basis.

Disinfection

- For chlorine disinfection processes—a minimum CT value of 450 mg-min/L at all times, and a minimum modal contact time of 90 minutes based on peak dry weather design flow.
- For non-chlorine disinfection processes—demonstrate the inactivation and removal of 99.999 percent of the plaque forming units of F-specific bacteriophage MS2 or polio virus in the wastewater.
- Effluent fecal coliform limits (TLCG, w.i.p.)

In comparison with drinking water, R-1 water is permitted to have a small number of coliform and viruses. For example, drinking water is not permitted to contain total or fecal coliform, whereas R-1 can have an average of 2.2 fecal coliform per 100 milliliters. However, even this is a relatively small fraction compared to what might occur in typical stream flows or storm water runoff.

Direct reuse of R-1 water may pose potential human health impacts. The presence of the following chemicals and pollutants are of concern in the use of R-1 water:

- Microbial pathogens
- Nutrients
- Trace metals and minerals
- Disinfection by-products
- Total organic carbon and naturally occurring organic matter
- Man-made organic chemicals
- N-nitrosodimethylamine—a carcinogen produced during the disinfection process
- Pharmaceutical and personal care products
- Trace organics
- Endocrine system disrupting compounds

Under the Direct Reuse wastewater disposal alternative, the R-1 water would be used primarily for landscape irrigation in the following applications approved by the DOH's 2002 water reuse guidelines: golf courses, parks, school yards, and athletic fields. The complete list of DOH-approved R-1 uses includes these irrigation applications as well as many others (including irrigation for edible food crops) and is provided in the 2002 water reuse guidelines. It can be seen from these approved uses that dermal exposure and the ingestion of food crops are safe. Public health and safety should not be compromised with increased usage of R-1 water. The use of recycled water is commonplace in Hawai`i. According to the *Final 2004 Water Reuse Survey and Report*

(TLCG, 2005), there are close to 70 active water reuse projects in operation (TLCG, 2005). R-1 water is increasingly being used for irrigation in Hawaii's urban setting. Kihei, Maui has numerous commercial properties that are irrigated with R-1 water. These properties include schools, parks, a shopping center, condominiums, a church, and a senior citizens housing complex.

Specific to groundwater water quality, a field research/demonstration project in the CORP was conducted in June 2003 through May 2004 to investigate and examine the ability of Hawaiian soils to polish applied R-1 wastewater effluent using typical irrigation practices. A soil analysis report was performed to ensure that ground retention, absorption and percolation rates and soil carbon levels were safe and did not pose a threat to contiguous potable water aquifers. These field studies concluded that the soil in Central O`ahu was compatible with the use of recycled waters. (Brown and Caldwell, 2005)

Recycled water is a drought proof water resource. The benefits of utilizing recycled water are numerous and include:

- Preservation of potable water resources.
- Recycling of nutrients that are present in recycled water.
- Reducing the amount of chemical fertilizers used.
- Reducing the impact on the environment caused by traditional discharges of wastewater effluent.
- Stimulation of local economies; the availability of recycled water has attracted businesses to Hawai`i thus creating jobs and other business activity.

Under the second or interim wastewater disposal alternative (i.e., intermittent and interim discharge of excess effluent into Wahiawā Reservoir), according to the DOH 2002 water reuse guidelines (and the 2004 revisions to HAR 11-62), R-1 water can be used for irrigation of all crops including spray, drip and surface, and subsurface watering. As such, use of R-1 water for agricultural reuse would allow for the most liberal applications for irrigation. Suitable irrigation uses for the three categories of recycled water established by the DOH Wastewater Branch are shown in the following Table 2.

Table 2. Summary of Suitable Irrigation Uses For Recycled Water

Suitable uses of Recycled Water	Recycled Water Quality		
	R-1	R-2	R-3
Golf course landscapes	A	U/B	N
Freeway and cemetery landscapes	A	A	N
Food crops where recycled water contacts the edible portion of the crop, including all root crops	A*	N	N
Parks, elementary schoolyards, athletic fields, and landscapes around some residential property	A	U	N
Roadside and median landscapes	A	U/B	N
Nonedible vegetation in areas with limited public exposure	A	AB	U
Sod farms	A	AB	N
Ornamental plants for commercial use	A	AB	N
Food crops above ground and not contacted by irrigation	A	U	N
Pastures for milking and other animals	A	U	N
Fodder, fiber, and seed crops not eaten by humans	A	AB	DU
Orchards and vineyards bearing food crops	A	D/U	DU
Orchards and vineyards not bearing food crops during irrigation	A	AB	DU
Timber and trees not bearing food crops	A	AB	DU
Food crops undergoing commercial pathogen destroying process before consumption	A	AB	DU

Abbreviations:
S = Spray; D = Drip and surface; U = Subsurface; A = All (S, D, U)
B = Spray with buffer; N = Not allowed; / = Or

Source: State of Hawaii, Department of Health, Wastewater Branch. *Guidelines for the Treatment and Use of Recycled Water.* May 15, 2002 (Replaces November 22, 1993 Version).

Potential impacts of continued effluent discharge into Wahiawā Reservoir under Disposal Alternative 1 would be during prolonged wet weather events when agricultural fields fed by the reservoir are saturated and cannot accept additional water, excess reservoir flows would need to be diverted into Kaukonahua Stream to minimize risk associated with potentially high reservoir levels.

MITIGATION. Mitigation for the potential human health impacts of R-1 water is to properly maintain and monitor the production of R-1 water, which will decrease the risk of public

exposure of these potential toxins. Additionally, to protect the public from undue exposure to R-1 water, established and approved BMPs should be followed. These BMPs include irrigation plans, management plans, public education plans, employee training plans and vector control plans.

Irrigation plans would address methods to be used to limit runoff and ponding. Information from the irrigation plan is provided to ensure that health hazards are prevented. These include: delineated boundaries; amount of water used; location of transmission lines from treatment facility to user; storage reservoirs; distribution networks; methods of irrigation; the location of drinking fountains and methods to mitigate runoff.

A management plan would be part of a larger Engineering and Design plan which establishes an operation and maintenance process for the reuse water system. It will also address procedures and restrictions to be followed by the distributors and the end-users.

The proper management of recycled water greatly reduces the risks associated with its use. The many benefits associated with the direct reuse of recycled water result in long-term environmental benefits that make the potential risks typically associated with its use acceptable.

The potentially adverse effects of excess crop irrigation with R-1 reclaimed water drawn from the deeper layers of Wahiawā Reservoir cannot be assessed within the context of appropriate water quality parameters because the TMDL limits have not yet been established; therefore, suitable mitigation to ameliorate potentially adverse conditions cannot be proposed at this time.

DOH REQUIREMENTS: Discharge permits will be required for the proposed action under the federal Clean Water Act, Section 402 which requires that discharges of pollutants into surface waters are controlled by the NPDES permitting program. The NPDES program requires a permit for any discharge of pollutants from a point source into waters of the U.S.

The corresponding State of Hawai`i regulation mandating NPDES permits is HAR 11-55, Water Pollution Control. In Hawai`i, the NPDES program is administered by the DOH-Clean Water Branch (CWB). DOH-CWB has commented that in addition to an NPDES permit for discharge of effluent from the WWTP, the City must obtain NPDES permit coverage for discharges of other wastewater, including storm water runoff, into State surface waters. For the following types of discharges into Class A or Class 2 State waters, the City may apply for NPDES general permit coverage by submitting a Notice of Intent (NOI) form:

a. Storm water associated with construction activities, including clearing, grading, and excavation, that result in the disturbance of equal to or greater than one (1) acre of total land area. The total land area includes a contiguous area where

multiple separate and distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale. An NPDES permit is required before the start of the construction activities.

b. Hydrotesting water.
c. Construction dewatering effluent.
d. Occasional or unintentional discharges from recycled water systems.

The City must submit a separate NOI form for each type of discharge at least 30 calendar days prior to the start of the discharge activity, except when applying for coverage for discharges of storm water associated with construction activity. For this type of discharge, the NOI must be submitted 30 calendar days before the start of construction activities. (See Appendix F: EISPN Correspondence)

Any project and its potential impacts to State waters must meet the following criteria:

a. Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.
b. Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.
c. Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).

After the improvements are completed, the City must revise their Storm Water Pollution Control Plan for the Wahiawā WWTP to include additional Best Management Practices that may be required for the facility.

All discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 Water Quality Certification are required, must comply with the State's Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of $25,000 per day per violation.

Mitigation for potential impacts of continued effluent discharge into Wahiawā Reservoir under Disposal Alternative 1 would be as follows:

The COWFP proposes upgrading wastewater treatment to provide appropriate treatment and storage of wet weather flow. With the proposed reduction of the City's discharge to the reservoir, whatever effect this discharge is determined to have on inundation and flooding at the reservoir would be diminished. As stated in EIS Section 3.2.2 (Flow Equalization and Storage), a concurrent City project calls for the planning and design of flow equalization facilities and accompanying wastewater treatment upgrades to minimize sanitary sewer overflows and improve reliability at the Wahiawā WWTP. This concurrent City project (referred to as the Wahiawā WWTP IPS Upgrade and Equalization Facility project or

Wahiawā WWTP Modifications project) involves an engineering AAR and environmental review process.

In addition, the following preferred alternatives in this COWFP EIS also address wastewater flow reduction in connection with the sewer system and WWTP:

- **The nature of the wastewater collection system allows for some wet-weather storage.**
- **"Seal Manholes" is a collection system preferred alternative, discussed in Section 3.1.1 of this COWFP EIS, which would help to alleviate I/I into the sewer system.**
- **"Construct New Sewers and or/Rehabilitate/Upgrade Existing Sewers" is a collection system preferred alternative, discussed in Section 3.1.4 of this COWFP EIS, which would help to alleviate I/I into the sewer system.**

5.5.2 NO ACTION ALTERNATIVE

POTENTIAL IMPACTS. Under the No Action alternative, the following impacts are anticipated to occur.

Wastewater Collection.

In general, the No Action alternative refers to the performance of maintenance actions at current levels and frequencies. Specific types of actions that would be maintained are listed below.

- Accomplish manhole work as problems are discovered by direct observation;
- Repair various sewer deficiencies as problems arise;
- Continue to perform routine maintenance of sewers;
- Continue to allow individual wastewater systems to operate; and
- Repair or replace force mains as problems arise.

No Action involves relatively no change to current practices of performing repairs or improvements as problems manifest themselves as ruptures or force main overflows (i.e., spills) or are otherwise discovered by direct observation. The No Action alternative would not address deficiencies in the collection system in a timely manner, since problems would primarily be corrected only as they occur. The potential risks to public health and the severity of environmental concerns resulting from deficiencies in the wastewater collection system would correspond to the frequency of overflows or other related problems in the system.

Wastewater Treatment:

No Action involves a continuation of the current program for wastewater treatment in Central O`ahu that was promulgated by the 1998 DOH Consent Decree. With no action, improvements currently underway to address regulatory considerations would continue as planned and programmed.

Required improvements to upgrade the Wahiawā WWTP for R-1 quality treatment were completed in year 2002. R-1 upgrades included the conversion from chlorine to UV disinfection. At present, the UV disinfection system has yet to be certified to be in compliance with the 2002 guidelines for UV design criteria. Also power anomalies have caused the UV bulbs to flicker and restart. In one instance, malfunction of the UV disinfection system caused approximately 45,000 gallons of not fully disinfected effluent to be discharged into the Wahiawā Reservoir. The current program involves the following specific actions:

- Modification of the IPS to enable bypassing of excess flows and to receive return flows from storage;
- Demolition of the abandoned FC No. 2 to accommodate construction of a new 368,000-gallon storage tank equipped with return flow pumps;
- Expansion of the IPS capacity to approximately 7.0 mgd; and
- Installation of piping and appurtenances between the new storage tank and IPS.

The WWTP improvements are currently in the planning phase; therefore, it is not known whether planned improvements are still appropriate to accomplish both current and future wastewater treatment objectives. An additional separate environmental document in support of these improvements will be prepared to assist in the determination of the recommended configuration of new storage facilities. Furthermore, the NPDES permit application is currently being processed by the DOH. Additional programmed improvements are not required.

Wastewater Disposal.

As a result of completed year 2002 improvements, the discharge of effluent from the Wahiawā WWTP has been diverted from the warmer surface layer to cooler, deeper water in the bottom layer of Wahiawā Reservoir. Under the No Action alternative, this practice of effluent discharge into the reservoir would continue. The deep-water diversion reduces nutrient loading in the epilimnic (surface) waters of the reservoir providing that the effluent remains below the thermocline (a horizontal layer between the warmer surface layer and cooler bottom layer that acts as a barrier to the transfer of physical and chemical properties between the two water masses). (AECOS, Inc., 2008).

5.6 Air Quality

SIGNIFICANCE CRITERIA. Project actions are determined to have a significant adverse environmental impact on air quality if the following consequences occur: potential air emission concentrations predicted to occur from the implementation of a proposed project combined with the ambient concentrations for criteria pollutants exceed State or Federal AAQS or exposes the public (especially schools, day care centers, hospitals,

retirement homes, convalescence facilities, and residences) to substantial pollutant concentrations that are above acceptable health effects levels.

Ambient air pollution concentrations are regulated under federal Clean Air Act (CAA) regulations found in 40 CFR Part 50, and under the State of Hawai`i AAQS found in HAR Chapter 11-59. Federal AAQS are divided into primary and secondary standards. The primary standards are intended to protect public health with an adequate margin of safety, while secondary standards are intended to protect public welfare through the prevention of damage to soils, water, vegetation, animals, wildlife, man-made materials, visibility climate and economic values. State AAQS are intended to "protect public health and welfare and to prevent the significant deterioration of air quality." Additionally, the State's Air Pollution Control Regulations found in HAR, Chapter 11-60, prohibit visible emissions at the property line of fugitive dust from construction activities.

5.6.1 PREFERRED ALTERNATIVES

POTENTIAL IMPACTS. Short-term, temporary impacts can be expected as a result of implementing any of the Preferred Alternatives that have a construction component, and particularly so if project construction involves earth moving activities. Potential construction-related impacts to air quality include fugitive dust and particulate emissions resulting in increased particulate matter levels and increased automotive pollutant concentrations from construction vehicles. Air quality impacts can be expected to occur within the vicinity of project areas and along road corridors affected by the movement of construction vehicles and equipment.

Indirect, off-site, construction-related impacts could result from the operation of concrete and asphalt batching plants which provide construction and paving materials. These plants emit particulate matter and gaseous pollutants. The batch plants producing asphalt and concrete must be permitted by the DOH Clean Air Branch under State regulations.

Operational impacts to air quality could include emission from the burning of fossil fuels to operate emergency generators at pumping stations and the WWTP. Odor impacts also can be expected, particularly during periods of warm weather or when calm conditions cause stagnant odors to remain in the vicinity of the Wahiawā WWTP. The affects of odors are dependant on area residents and their individual sensitivity to smells and their tolerance to this type of stimuli. An odor control system was installed at the Wahiawā WWTP in response to specific complaints. WWTP improvements included in the Preferred Alternatives could potentially have a positive influence on odors emanating from the facility

MITIGATION. The implementation of dust control measures such as erecting dust screens around construction sites during the construction period and frequent watering of exposed soils can help control on-site dust control, thus reducing fugitive dust. The EPA estimates that twice daily watering can reduce fugitive dust emissions by as much as 50 percent (EPA, 1996). Dust can be further minimized by paving and/or

landscaping bare earth areas as soon as practicable. Construction equipment also should be properly maintained to control motor vehicular emissions.

Off-site concrete and asphalt batching plants require DOH permits pursuant to State regulations. Issuance of necessary permits is contingent upon the ability of the batching plants to continuously comply with both emissions and ambient air quality standards.

Operational impacts to air quality from emergency generators can be addressed by replacing older equipment with more fuel efficient units that have lower emission ratings. It is recommended that the City monitor the impact of odors of primarily hydrogen sulfide and various organic compounds emanating from the facility to better address odor concerns and respond to specific complaints.

5.6.2 NO ACTION ALTERNATIVE

POTENTIAL IMPACTS. The No Action alternative involves relatively no change to the current practices of performing maintenance actions or repairs to the wastewater collection system as problems arise. Maintenance and repair actions could result in construction-related impacts to air quality. Further, under the No Action alternative, the current intermittent odor problems at Wahiawā WWTP would continue to occur.

5.7 Noise Quality

SIGNICANCE CRITERIA. The impacts of sound on the environment are determined by several factors including, sound level (loudness), the duration of exposure to the noise, the frequencies involved, and the variation or fluctuations in noise levels during exposure. Loudness is measured in units called decibels (dB). Since the human ear is unable to perceive all sound frequencies equally, noise levels are adjusted to correspond to human hearing. This adjusted unit is known as the A-weighted decibel, or dBA. A Day-Night Average Sound Level (DNL) of 55 dBA or less are typical of quiet rural or suburban areas. DNL levels of 55 to 65 dBA are typical of urbanized areas with medium to high levels of activity and street noise.

The following decibel thresholds and related noise environment impacts provide a guide by which to compare noise level measurements.

> 100dBa	Noisy (dangerous)
> 71 dBA and < 100 dBA	Annoying (potentially dangerous)
> 51 dBA and < 70 dBA	Annoying
> 21 dBA and < 50 dBA	Not annoying
< 20 dBA	Silent

Project actions are determined to have a significant adverse environmental impact on noise quality if construction-related and on-site operational noise levels exceed the DOH limits at the property line relevant to the particular land use. For example the DOH daytime limit for single family areas is 55 dBA and 45 dBA at night.

5.7.1 PREFERRED ALTERNATIVES

POTENTIAL IMPACTS. Short-term, temporary impacts to noise quality can be expected as a result of implementing any of the Preferred Alternatives that have a construction component. Construction-related noise is unavoidable and mitigation to inaudible levels is not practical, particularly given the intensity of construction noises and the exterior nature of the work. Construction-related noise impacts are not considered to be significant due to the temporary nature of the work, and which will be limited to the degradation of the acoustical environment in the immediate vicinity of the project sites. During the construction period, traffic-related noise impacts can also be expected from the movement of construction vehicles. Traffic-related impacts to noise quality also will be short-term and temporary.

Over the long-term, proposed facility improvements could result in the addition of new noise sources. For the Direct Reuse disposal alternative, it may be necessary to install/construct sump and pump stations at the Wahiawā WWTP, a booster pump station at the CORP, storage reservoirs, and a turbine generator at Mililani WWTP. Short-term, temporary impacts would occur with the construction of these facilities. During operation, the reuse distribution system itself is not likely to have significant impacts to noise quality; however, the booster pump and turbine generator buildings could have noise impacts for which mitigation is recommended or required.

With the application of appropriate mitigation measures during the short-term construction period and over the long-term operation period, impacts to noise quality can be reduced to less than significant levels.

MITIGATION. Generally accepted BMPs during construction, such as the use of properly muffled construction equipment, will aid in the reduction of impacts to noise quality. Compliance with construction curfew periods as mandated by DOH regulations will also aid in controlling noise impacts.

Noise mitigation recommendations discussed below are taken from the acoustic study (Y. Ebisu & Associates, 2007) conducted as part of the preparation of this EIS. The study is attached to this EIS as Appendix B and should be referred to for specifics on mitigation measures.

> *Grandview WWPS and Uwalu WWPS*. The noise level of the existing Grandview generator currently exceeds the DOH daytime and nighttime noise limits for single family residential areas and the Uwalu generator exceeds the nighttime noise limits for multi-family and single family residential areas. Upgrades at the Grandview WWPS and Uwalu WWPS included as part of the Preferred Alternatives could provide the opportunity to install new noise attenuation devices and to reduce existing emergency generator noise levels at both facilities, thus bringing the facilities into compliance with DOH requirements. Modifications to the existing ventilation openings of the Generator Rooms (i.e., replacement of

window louvers with duct silencers) are expected to be required at both pump stations along with replacement of the generator exhaust systems and Generator Room doors. The risks of adverse noise impacts at the Grandview WWPS and Uwalu WWPS can be effectively reduced to acceptable levels by achieving compliance with the DOH noise limits in conjunction with future upgrades.

Wahiawā WWTP. Existing noise levels from the Odor Control fan exceed the DOH nighttime noise limit for residential areas along the north boundary WWTP. Again, proposed improvements to the WWTP could provide the opportunity to mitigate existing noise impacts. Sound attenuation enclosures with acoustically treated ventilation openings are also expected to be required around the existing Odor Control Fan and any new units to reduce noise levels to 45 dBA along the north station boundary line. Enclosures around new electric motors and pumps located in the IPS are expected to be required to achieve compliance with the DOH noise limits along the north station boundary line.

Direct Reuse Alternative. Under the Direct Reuse disposal alternative, operational noise from the distribution system should be insignificant and therefore require no mitigation. However, sound attenuation treatments may be required for the booster pump station and the turbine generator buildings.

5.7.2 NO ACTION ALTERNATIVE

POTENTIAL IMPACTS. Under the No Action alternative, current maintenance and repair practices would continue. Occasional construction-related impacts could result during maintenance and repair work such as fixing of broken sewer lines. Under the No Action alternative no significant improvements would occur at the Wahiawā WWTP and the Grandview and Uwalu WWPS facilities, thereby potentially missing the opportunity to concurrently correct existing noise impacts generated by these facilities and bring them into compliance with DOH standards. Further, as wastewater system facilities age and deteriorate under the No Action alternative, operational noise may increase over time.

5.8 Flora

SIGNIFICANCE CRITERIA. Project actions are determined to have a significant adverse environmental impact on the flora environment if there are any disturbances to or removal of native vegetation, threatened or endangered species, or trees included on the City's "Exceptional Tree List." In addition, the aquatic environment will be deemed to be adversely impacted by project actions if there is a disturbance to riparian resources within the Wahiawā watershed. Because the impacts on native terrestrial-based vegetation from actions proposed in the COWFP are limited at best, this section will focus on the aquatic resources and the mitigation factors that are proposed.

A biological and water quality report titled *Biological and water quality considerations for the Central Oahu Wastewater Facilities Plan EIS* was prepared for this EIS (AECOS, Inc., 2008). This report is attached to this EIS as Appendix A.

5.8.1 PREFERRED ALTERNATIVES

POTENTIAL IMPACTS

Terrestrial Communities

Land that has been altered by man for urban development (including agricultural uses) are often characterized by vegetative communities dominated by introduced, non-native species. Candidate, proposed or listed threatened or endangered species as set forth in the Endangered Species Act of 1973, as amended (16 USC 1531 et seq.) are generally not expected to be found within these developed areas.

Implementing any of the Preferred Alternatives is not expected to result in any adverse impacts to terrestrial flora. Potential impacts on terrestrial flora may result from construction activities and expansion and improvements to wastewater facilities. As stated earlier, sensitive species or habitat are not expected to occur within project areas. During construction, vegetation adjacent to construction areas and equipment staging areas may be negatively affected. However, as most construction activities would occur in already developed areas such as existing wastewater facilities or within road corridors no impacts to sensitive terrestrial flora communities are expected.

Aquatic Communities

There are no threatened, endangered, or candidate threatened or endangered aquatic flora that could be affected by envisioned activities. Aquatic plant-life in the Wahiawā Reservoir includes such species as Water Hyacinth, a wetland plant introduced to the area in the 1880s, and *salvinia molesta* an invasive non-native aquarium water moss. The DLNR-DAR conducts periodic monitoring of the reservoir to control *salvinia molesta* growth.

Implementation of the Preferred Alternatives is not anticipated to affect threatened, endangered, or candidate threatened or endangered terrestrial or aquatic flora since no such resources are known to exist in the areas where project actions would occur. Further, Preferred Alternatives that strive to minimize sanitary sewer overflows (i.e., spills) and reduce the illicit discharges of toxic materials to the sewer system (through public education and other means) have the potential to improve water quality which may also result in long-term beneficial impacts to aquatic flora in receiving waters.

As one of the major goals of the COWFP is to improve effluent quality and to reduce/eliminate effluent discharge into the reservoir, implementation of the Preferred Alternatives should result in long-term beneficial impacts to aquatic communities in the reservoir and the surface water bodies into which the reservoir outflows. Envisioned activities that strive to improve wastewater treatment for R-1 reclaimed water production and reuse, and the utilization of new wet-weather flow storage facilities that facilitate a more complete treatment of high-flow wastes may improve or enhance water quality in

the receiving waters; therefore, beneficial impacts on aquatic flora in receiving waters may also occur.

Short-term construction-related impacts to aquatic communities could occur with implementation of Preferred Alternatives that have construction component. Erosion and sedimentation could occur as a result of construction activities. Impacts are caused by land disturbing activities such as clearing, excavating, grading and filling. Exposed soils are susceptible to erosion, especially if it rains heavily during site work periods.

MITIGATION. Mitigation measures discussed in Section 5.1 to address erosion and sedimentation during construction periods shall be implemented.

5.8.2 NO ACTION ALTERNATIVE

POTENTIAL IMPACTS. Under the No Action alternative, there will be no adverse impacts to terrestrial flora. However, the aquatic environment may be negatively influenced if wastewater facilities are allowed to degrade. Further, the potential for actions such as sewer line breaks and emergency discharges into streams and the reservoir could increase without the proposed upgrades to wastewater facilities. Such actions could have significant adverse impacts to the aquatic environment and the species that inhabit that environment.

5.9 Fauna

SIGNIFICANCE CRITERIA. In determining the extent of impacts to wildlife species criteria such as: 1) the extent of habitat loss or gain; and 2) the presence or absence of threatened, endangered or protection species including migratory avifauna are used. The loss of sensitive habitat is indicative of significant impacts, whereas minor relocation and/or modification of habitats are indicative of adverse but not significant impacts.

5.9.1 PREFERRED ALTERNATIVES

POTENTIAL IMPACTS

Terrestrial Communities

Land that has been altered by man for urban development (including agricultural uses) is often characterized by faunal communities dominated by introduced, non-native species. Candidate, proposed or listed threatened or endangered species as set forth in the Endangered Species Act of 1973, as amended (16 USC 1531 et seq.) are generally not expected to be found within these developed areas because developed areas often lack the necessary habitats to support or attract these species.

No threatened, endangered, or candidate threatened or endangered terrestrial fauna are known to frequent the grounds of the Wahiawā WWTP and the Whitmore Village WWPTF, and other existing wastewater facilities and pump stations in the Central

O`ahu wastewater system. Potential adverse impacts to terrestrial biota are considered less than significant because habitat quality is generally low and limited due to the urbanization and commercial activity near the site.

Aquatic Communities

USFWS indicates that no native aquatic vertebrate or larger invertebrate species are expected to occur in Wahiawā Reservoir because of the Wahiawā Dam and extensive hydrologic modifications of the Kaukonahua Stream Watershed; however, it is likely that native aquatic insects and other invertebrate are found in the reservoir.

Environmental conditions (such as water quality) affecting Wahiawā Reservoir have the potential to affect populations of native aquatic macrofaunal species (including mollusks, shrimp, and fishes). Despite the presence of an artificial reservoir filled with non-native predatory fish, native fishes and crustaceans living in the upper reaches of Kaukonahua Stream in their post-larval stages traverse the downstream sections to reach suitable habitat in the mountains to carry out their life cycle. Very little is known about the migration of the juveniles; but it seems likely (although by no means certain) that good water quality is important to the life cycle process of native species (AECOS, Inc., 2008).

Preferred Alternatives that strive to minimize sanitary sewer overflows (i.e., spills) and reduce the illicit discharges of toxic materials to the sewer system have the potential to improve water quality, which should result in beneficial impacts on aquatic fauna in receiving waters. Further, as one of the major goals of the COWFP is to improve the effluent quality and to reduce/eliminate effluent discharge into the reservoir, implementation of the Preferred Alternatives should result in long-term beneficial impacts to aquatic faunal communities in the reservoir and the surface water bodies into which the reservoir outflows. Envisioned activities that strive to improve wastewater treatment for R-1 reclaimed water production and reuse, and the utilization of new wet-weather flow storage facilities that facilitate a more complete treatment of high-flow wastes may improve or enhance water quality in the receiving waters; therefore, beneficial impacts on aquatic fauna in receiving waters may also occur.

Short-term construction-related impacts to aquatic faunal communities could occur with implementation of Preferred Alternatives that have construction components. Erosion and sedimentation could occur as a result of construction activities. Impacts are caused by land disturbing activities such as clearing, excavating, grading and filling. Exposed soils are susceptible to erosion, especially if it rains heavily during site work periods. Sediments could be carried in runoff to surface body waters, thus adversely impacting water quality and the environment for aquatic faunal communities.

MITIGATION. Mitigation measures discussed in Section 5.1 to address erosion and sedimentation during construction periods shall be implemented.

5.9.2 NO ACTION ALTERNATIVE

POTENTIAL IMPACTS. Under the No Action alternative, there will be no adverse impacts to terrestrial fauna. However, the aquatic environment may be negatively influenced if the wastewater facilities are allowed to degrade. Further, the potential for actions such as sewer line breaks and emergency discharges into streams and the reservoir could increase without the proposed upgrades to wastewater facilities. Such actions could have significant adverse impacts to the aquatic environment and the species that inhabit that environment. Aquatic biota could be impacted due to the current-quality effluent discharge into the Wahiawā Reservoir and nearby streams.

5.10 Historical and Archaeological Resources

SIGNIFICANCE CRITERIA. Project actions are determined to have a significant adverse environmental impact if significant historical or archaeological resources are disturbed or destroyed as a result of repair or replacement activities, demolition, or new construction. Specifically, significant adverse impacts can occur if project actions violate any State agency's cultural resource standards or objectives, alters characteristics of resources listed or determined eligible for listing on the State or National Registers of Historic Places, causes a substantial adverse change in the significance of an historical or archaeological resource, directly or indirectly destroys a unique historical or archaeological resource or site, results in the elimination or substantial reduction of a traditional cultural resource area or practice, and disturbs any human remains, including those interred outside of formal cemeteries.

5.10.1 PREFERRED ALTERNATIVES

POTENTIAL IMPACTS

Historic and Archaeological Resources

An archaeological survey (Pacific Legacy, Inc., 2007a) conducted as part of this EIS preparation is attached as Appendix C. The survey concluded that due to the paucity of archaeological sites within the project area, no encounters with historical resources are expected. The study indicated that whatever historical artifacts existed in the past have long since been removed or destroyed due to human activity. Further, much of the areas where proposed project actions would take place are within existing facilities or are located within existing roadways and rights-of-way that have been previously disturbed. Nevertheless, there always exists the potential that human burials or other potentially significant subsurface archaeological resources could be encountered during ground-disturbing activities such as excavating, grading, grubbing, and related construction activities.

Therefore, implementing any of the Preferred Alternatives, specifically those with construction components that include land disturbing activities have the potential to impact historic and archaeological resources. However, implementation of appropriate mitigation measures will reduce the potential for impacts.

Cultural Resources

As part of the preparation of this EIS, a CIA was conducted (Pacific Legacy, Inc., 2007b) and is attached as Appendix D. The CIA conducted interviews with knowledgeable cultural practitioners to identify what impacts proposed project actions could have on cultural resources and practices. Results of the assessment concluded that cultural activities in the project area are limited and that implementing any of the Preferred Alternatives would have no impact to those cultural activities.

MITIGATION. If subsurface archaeological resources are encountered during any construction or installation of upgraded wastewater facilities, such as new sewer lines or new storage tanks, construction activity shall be halted and the SHPD should be contacted immediately.

5.10.2 NO ACTION ALTERNATIVE

POTENTIAL IMPACTS. Under the No Action alternative, no significant impacts to historic, archaeological or cultural resource are expected. Essentially, the status quo will be maintained. However, current repair and maintenance practices, such as fixing sewer line breaks, could involve earth-disturbing activities, which always come with the potential for uncovering previously undiscovered and historical remnants or human remains.

5.11 Natural Hazards

SIGNIFICANCE CRITERIA. Project actions are determined to have a significant adverse environmental impact if people or properties are exposed to hazards such as earthquakes, floods, or tsunamis as a result of repair or replacement activities, demolition, or new construction. It is important to note that the threat from these hazards always exists because humans have little control over the frequency and intensity of an unpredictable event.

5.11.1 PREFERRED ALTERNATIVES

POTENTIAL IMPACTS

Earthquakes

Implementing any of the Preferred Alternatives would result in no increase to the risk of earthquakes. Nevertheless, construction contractors shall adhere to the appropriate Uniform Building Code requirements, which include structural design standards for earthquake resistance, with respect to buildings and structures constructed to implement any of the Preferred Alternatives. Following O`ahu Civil Defense evacuation procedures in the event of emergencies would further minimize the damage to public life and safety.

Tropical Cyclones

Implementing any of the Preferred Alternatives would result in no increase to the risk of tropical cyclones. Nevertheless, construction contractors shall adhere to the appropriate Uniform Building code requirements, which include standards for wind design, with respect to buildings and structures constructed to implement any of the Preferred Alternatives. Following O`ahu Civil Defense evacuation procedures in the event of emergencies would further minimize the damage to public life and safety.

Floods

Implementing any of the Preferred Alternatives would result in no increase to the risk of floods. FEMA designates the entire area encompassed by the Preferred Alternatives as Zone D. Zone D indicates an area in which flood hazards are undetermined, but possible. Further, the Wahiawā WWTP is located on well-drained soils and there have been no reports of significant on-site flooding from surface runoff. Runoff from the WWTP and surrounding areas generally flows into the reservoir. Following O`ahu Civil Defense evacuation procedures in the event of emergencies would further minimize the damage to public life and safety.

Tsunamis

Implementing any of the Preferred Alternatives would result in no increase to the risk of tsunamis. Actions encompassed by the Preferred Alternatives are located a significant distance from coastal areas, generally beyond the reach of a potential tsunami. Following O`ahu Civil Defense evacuation procedures in the event of emergencies would further minimize the damage to public life and safety.

MITIGATION. No mitigation is warranted or proposed. However, as stated all new construction shall adhere to the appropriate building code requirements for earthquake resistance and wind shear.

5.11.2 NO ACTION ALTERNATIVE

POTENTIAL IMPACTS. Under the No Action alternative, the continued maintenance and repairs of the existing wastewater facilities would result in no impacts to natural hazards.

5.12 Surrounding Land Use

SIGNIFICANCE CRITERIA. Project actions are determined to have a significant adverse environmental impact if consistency with surrounding land uses is not achieved.

5.12.1 PREFERRED ALTERNATIVES

POTENTIAL IMPACTS. Implementation of the Preferred Alternatives which have a construction component may result in short-term temporary construction-related impacts on adjacent land uses. Temporary construction-related impacts to noise and air quality

would affect the surrounding area. Since the surroundings are generally open unoccupied areas, temporary impacts to human activity would be less than significant. These unavoidable impacts however, will be short-term and temporary.

In the long-term, implementation of the Preferred Alternatives should have no impacts to surrounding land uses. Proposed facility improvements will occur primarily at existing facilities or within existing road corridors. Further, upgrades to existing wastewater facilities generally are not considered a growth-inducing factor. As such, implementing any of the Preferred Alternatives should have no long-term adverse impacts on population growth and its attendant housing demand and commercial growth. Future commercial, industrial and residential growth patterns are expected to continue at a similar rate and pattern as that which has occurred in Wahiawā in the recent past. This future growth, is anticipated to encourage direct and induced, or secondary, alterations to existing land use patterns and continue the trend of converting undeveloped land to a variety of other uses. Because of the anticipated continued growth, areas adjacent to, proximal to, or with immediate access to roadways would likely experience more rapid growth and conversion of land use. These areas are likely to provide supporting commercial and business uses for the growing residential areas, and larger vacant tracts are likely to convert to industrial land uses based on proximity to limited-access highways. Other large tracts farther from limited-access roadways are likely to convert to suburban residential land uses to provide for the housing demand.

The Preferred Alternatives therefore, are not anticipated to result in long-term adverse affects to the surrounding land uses in the area

MITIGATION. No mitigation is warranted or proposed. However, public involvement in the planning process is expected to result in an informed community such that conflicts may be avoided or minimized before any proposed buildings/structures are sited and/or constructed. Construction-related impacts to noise and air quality on adjacent land uses can be mitigated by applying the measures discussed in Sections 5.6 and 5.7 of this EIS.

5.12.2 NO ACTION ALTERNATIVE

POTENTIAL IMPACTS. The project involves no changes to existing land uses at affected sites; therefore, consistency with surrounding land uses would be maintained. In addition, public involvement in the planning process is expected to result in an informed community such that conflicts may be avoided or minimized before buildings are sited and/or constructed.

5.13 Aesthetic Considerations

SIGNIFICANCE CRITERIA. For the purposes of this EIS, aesthetic/visual impacts would be considered significant if a project would:

- Substantially degrade the character of the area, degrade existing viewsheds or scenic vistas, or alter the character of the viewshed by the introduction of anomalous structures or elements.
- Substantially damage scenic resources including, but not limited to, trees, rock outcroppings, and historic buildings within a scenic highway.
- Creates a new source of substantial light or glare, which would adversely affect night views from or to the shoreline and other areas.

The viewshed is slowly altered by the continued and incremental growth and development in Central O`ahu which results in aesthetic changes and localized increases in ambient light levels and nightglow characteristics. The density and type of future development would contribute to the overall change in the visual character, aesthetic resources and viewsheds.

5.13.1 PREFERRED ALTERNATIVES

POTENTIAL IMPACTS. Implementing most of the Preferred Alternatives is not expected to result in any significant long-term impacts to aesthetic resources. Implementation of improvement projects would not result in changes to land use, and hence the aesthetic landscape or viewshed, as most of the proposed actions will take place on lands that are already in use by existing wastewater facilities and no changes in the ambient light levels and night glow are part of any of the Preferred Alternatives. Project actions are not expected to generate negative impacts pertaining to aesthetic considerations such as view obstructions either within projects sites or from without.

The exception is reservoirs and large tanks and other facilities required to implement Disposal Alternative 5 – Direct Reuse may affect the aesthetics of the surrounding community.

Short-term temporary impacts to aesthetic resources can be expected during construction periods by the presence of unsightly construction vehicles and equipment. Further, some landscaping in construction area may be removed to facilitate construction activities. For example trenching activities for emplacement of sewer pipeline will be temporally unsightly.

MITIGATION. Landscaping will be provided at project sites as soon as practicable to replace existing landscaping that is removed as a result of project actions. Landscaping, berms, fencing and painting may be required to mitigate the aesthetics for reservoirs, large tanks and other facilities required to implement Disposal Alternative 5 - Direct Reuse.

OHA suggests that affected areas be landscaped with native or indigenous species and that invasive species should be removed. OHA asserts that native landscaping would serve as practical water-saving landscaping practices, serve to further the traditional Hawaiian concept of mālama `āina, and create a more Hawaiian sense of place. For those locations where landscaping is affected and/or is a component of the proposed

wastewater improvement projects, the use of native or indigenous species and/or removal of invasive species for landscaping purposes will be evaluated more fully and considered during the design phase of the proposed wastewater improvement projects.

5.13.2 NO ACTION ALTERNATIVE

POTENTIAL IMPACTS. The No Action alternative is the continuation of programmed improvements and the continued maintenance and repair of existing wastewater facilities. The No Action alternative would have no long-term impacts to aesthetic resources. Short-term impacts could result from construction activities and associated landscape removal. Landscaping would be provided at the Wahiawā WWTP as practicable to replace existing landscaping that is removed as a result of project actions. Envisioned activities would generate no negative impacts pertaining to aesthetic considerations such as view obstructions either within the site or from without.

5.14 Public Services and Facilities

SIGNIFICANCE CRITERIA. Impacts to infrastructure and utilities would be considered significant if they induce a substantial increase in short- or long-term demand for public utilities in excess of existing and projected capacities. Impacts to recreational resources would be considered significant if the project construction or operations:

- Conflict with existing or future area-wide or local recreational policies or plans,
- Create incompatible adjacent land uses,
- Permanently alter or eliminate a recreational resource, and
- Substantially reduces the quality of the recreational experience (e.g., routine operations degrade the character of a recreational area).

5.14.1 PREFERRED ALTERNATIVES

POTENTIAL IMPACTS

Water System

Project actions are determined to have a significant adverse environmental impact if the water demand generated by the project exceeds the capacity of water distribution systems and/or water supplies. Implementing the Preferred Alternatives could result in adverse short-term, impacts if temporary relocation of existing distribution lines during construction periods is required. These impacts however would be considered insignificant. All of the Preferred Alternatives proposed for improvements to the Central O`ahu wastewater facilities will not increase the demand on potable water supplies or the potable water distribution system in Central O`ahu. No long-term impacts to the water system are anticipated as a result of implementing any of the Preferred Alternatives.

MITIGATION. No mitigation is warranted or proposed. However, coordination will be required for the Direct Reuse alternative because a partnership will be formed and BWS will assume responsibility for the water supply/distribution facilities.

The Honolulu Fire Department has commented that for the proposed action, water supply be provided, approved by the county, capable of supplying the required fire flow for fire protection to all premises upon which facilities or buildings are constructed within the county. On-site fire hydrants and mains capable of supplying the required fire flow shall be provided when the facility or building is in excess of 150 feet from a water supply on a fire apparatus road, as measured by an approved route around the exterior of the facility or building (1997 Uniform Fire Code, Section 903.2, as amended.) See Appendix F: EISPN Correspondence.

Wastewater System

Project actions are determined to have a significant adverse environmental impact if wastewater generated by the project exceeds the capacity of wastewater treatment facilities operated by the City. Adverse but insignificant impacts are associated with major expansion of existing distribution lines and facilities or existing collection lines. Adverse, short-term, insignificant impacts are associated with the relocation of existing collection lines during proposed work.

As one of the goals of the COWFP is to improve efficiency of the Central O`ahu wastewater system, implementation of the Preferred Alternatives is expected to result in improved efficiency and waste handling capacity, including the distribution and improved quality of effluent. Thus implementing any of the Preferred Alternatives would have a long-term beneficial impact on the wastewater system.

Short term impacts will occur during the construction phases of the project when different parts of the wastewater system are being upgraded. During the construction phase the potential for spills and the disruption of services greatly increases.

Taken in the larger context, implementation of the Preferred Alternatives can be considered as mitigation measures for potential failures and/or deficiencies associated with the entire wastewater system. Non-implementation of these mitigation measures could result in adverse environmental impacts to the reservoir and other surface water bodies.

MITIGATION. No mitigation is warranted or proposed for the long-term. For the short-term, mitigation should consist of careful planning and project phasing to avoid/minimize service disruptions. Possibly temporary pipelines and storage facilities may have to be provided during the construction phases.

Drainage System

Project actions are determined to have a significant adverse environmental impact if drainage patterns and/or surface runoff volumes and velocities are changed such that they exceed existing drainage system capacities. While there exists the potential for

short- and long-term impacts to the drainage system if project actions affect drainage patterns or surface runoff volumes/velocities, these impacts are not expected to occur due to the application of BMPs during construction activities and good site planning and engineering design for facility improvements. Therefore, implementation of the Preferred Alternatives is not expected to generate noticeable changes to drainage patterns or surface runoff volumes and velocities, and thus will have no impacts to area drainage systems.

MITIGATION. Mitigation measures contained in Sections 5.2 and 5.4 shall be employed to address potential impacts to area drainage systems.

Electrical and Communication Systems

Project actions would not be significant unless the utility is unable to accommodate the projected consumption demand. Service disruptions during the construction periods or the installation of additional power or communication lines are considered to be short-term, adverse but insignificant impacts. Short-term temporary impacts to electrical and communication systems could occur as temporary outages if any system lines are accidentally damaged during construction activities. However, application of appropriate mitigation measures should render those impacts insignificant. No long-term adverse impacts to the region's electrical and communication systems is expected as a result from implementing any of the Preferred Alternatives. It is conceivable that facility upgrades at the Wahiawā WWTP or the various WWPS could require additional consumption of electrical power; however, it is fully expected the HECO could accommodate the increased demand.

Oceanic Time Warner Cable has underground lines along the various alternative wastewater disposal routes which may conflict with the installation and construction of proposed new wastewater supply lines

MITIGATION. No mitigation is warranted or proposed. However, consultation and coordination with the HECO, Oceanic Time Warner Cable, The Gas Company and Hawaiian Telcom shall be undertaken prior to any construction activities to reduce the potential for conflicts with electrical and communication system components.

As detailed implementation plans develop for the proposed wastewater disposal system, Oceanic Time Warner Cable and other utility companies will be notified of the construction schedule and coordination activities will be executed as appropriate throughout the design phase in order to avoid potential conflicts between other utility underground lines and wastewater lines.

The Gas Company

The Gas Company, LLC maintains underground gas mains in the project vicinity, which serve commercial and residential customers in the area.

MITIGATION. The City will take into consideration the location of the Gas Company's gas mains during the project planning and design process in order to minimize any potential

conflicts with the existing gas facilities within the vicinity of the project area. The Gas Company's utility lines will be identified during the design phase of the proposed wastewater improvement projects and any infrastructure conflicts with the gas distribution system will be minimized. Additionally, The Gas Company will be notified of the construction schedule and coordination activities will be executed as appropriate throughout the design phase of the proposed wastewater improvement projects.

Roadway Systems

Project actions are determined to have a significant adverse impact if the project results in a traffic increase that is substantial in relation to the existing traffic load and capacity of the relevant street systems.

Implementation of the Preferred Alternatives will not result in long-term impacts to roadway systems. Trucks entering and exiting the Wahiawā WWTP to transport sludge from the WWTP to Honouliuli for disposal has been and will continue to be an issue. Future improvements at the WWTP will ensure that areas (east of the sludge loading station) for truck turn-around will remain available.

The Department of Transportation (DOT) is concerned that the project will impact State DOT highway facilities at locations where the wastewater collection system transmission lines will cross or abut any DOT highway right-of-ways (see Appendix F: EISPN Correspondence).

Short-term temporary impacts during the construction phases could adversely affect traffic flow and patterns in the vicinity of project areas. Construction activities within existing roadways and right-of-ways may require lane closures or rerouting to avoid construction areas. To rehabilitate, upgrade or install new wastewater lines it may be necessary to employ open-trench construction within street right-of-ways.

MITIGATION. Potential short-term traffic and circulation impacts during construction could be alleviated with detouring, lane closures, flagging operations, and construction scheduling to minimize disruptions to normal traffic flow and patterns. The implementation of safety precautions during all construction activities will help to maintain safe access for residents and pedestrians near construction activities. Procedures shall be emplaced to maintain adequate ingress and egress to properties in the immediate vicinity of construction areas. Development and implementation of a comprehensive traffic management plan for construction areas could also serve to mitigate potential impacts to road way systems.

To mitigate impact on DOT highway right-of-ways during construction, the City will provide advance review of project plans and construction coordination with the DOT Highways Division.

To lessen impact on roadways, open-trench construction will be kept to a minimum where less destructive methods may be feasible. A problem inherent with open-trench construction is adequate compaction of the backfill. The Department of Facilities

Management recommends that flowable fill or Controlled Low Strength Material be evaluated or considered for use as backfill material (see Appendix F: EISPN Correspondence).

The Honolulu Fire Department has also commented that a fire apparatus access road for every facility or building must be provided, when any portion of the facility is located more than 150 feet (45 720 mm) from a fire apparatus access road as measured by an approved route around the exterior of the building or facility. (1997 Uniform Fire Code, Section 902.2.1). **The Honolulu Fire Department would also like to maintain fire apparatus access throughout the construction site and maintain access to fire hydrants. For any interruption of the existing fire hydrant system, the Fire Communication Center should be contacted at 523-4411.**

Solid Waste Disposal

Project actions are determined to have a significant impact if the operational contribution to the waste stream exceeds the capacity of the City landfill or other waste disposal method. Otherwise, the effects to the solid waste system are considered to be negligible.

Implementation of the Preferred Alternatives would generate no change in solid waste and therefore would have no impacts to solid waste disposal. Only one alternative has the potential to impact solid waste processing and handling. Currently two to six truckloads per day transport sludge from the Wahiawā WWTP to the Honouliuli WWTP for processing. Sludge from Honouliuli WWTP is either transported to a municipal solid waste landfill or to the U.S. Navy's Barbers Point Composting Facility where it is composted with green waste and converted to a valuable soil amendment. Currently, the majority of the City's sludge is hauled to a sanitary land fill for disposal. One of the goals of the various alternatives is to reduce the volume of sludge produced at the Wahiawā WWTP. It is anticipated that the implementation of the alternatives will not affect Oahu's solid waste disposal facilities.

MITIGATION. No mitigation is warranted or proposed.

Recreational Resources

Significant impacts to recreation resources would be an increased demand beyond the capacity of facilities to adequately respond to the demand or restrictions that limit or prevent the use of the recreational resource.

Implementation of the Preferred Alternatives is not expected to have any short- or long-term adverse impacts to recreational resources. Envisioned activities (such as repair or replacement of system facilities when necessary) would not limit or prevent the use of recreational resources in the project area. Rather, in the long-term, implementation of the Preferred Alternatives could have beneficial impacts to Central O`ahu recreational resources such as the Wahiawā Public Fishing Area and the Wahiawā Freshwater Park. As one of the major goals of the COWFP is to improve effluent quality and to reduce/eliminate effluent discharge into the Wahiawā Reservoir, improved water quality

of the reservoir should result from implementation of the Preferred Alternatives, thereby improving those recreational resources.

MITIGATION. No mitigation is warranted or proposed.

5.14.2 NO ACTION ALTERNATIVE

POTENTIAL IMPACTS. Under the No Action alternative, already programmed improvements would continue as well as required maintenance and repair work on wastewater facilities. Under this alternative, it is expected that existing systems would continue to deteriorate thereby increasing the potential for accidental spills and disruption of service.

Under the No Action alternative, impacts to water systems, drainage systems, electrical and communication systems, and solid waste disposal are not expected to occur.

5.15 Socio-Economic Conditions

SIGNIFICANCE CRITERIA. Project actions may have either a beneficial or detrimental social and economic impact as determined by the changes to population, housing demand, employment, local business, and quality of life. Population, housing, and employment projections indicate that the Central O`ahu region would grow primarily in the master-planned communities of Mililani Mauka, Royal Kunia, Koa Ridge, Waiawa, and Waikele. In contrast, no significant population changes are projected for the Wahiawā service area in the next 20 years (TLCG, w.i.p.), whereby the plantation heritage and rural, small-town atmosphere of Wahiawā Town would be maintained. Project actions that resolve the long term permitting issues of the Wahiawā WWTP will help avoid future restrictions on new sewer connections, and thus will assist the DOH with its effort to eliminate septic tanks and cesspools that have potentially harmful impacts on the environment.

5.15.1 PREFERRED ALTERNATIVES

POTENTIAL IMPACTS. Implementation of any of the Preferred Alternatives is not anticipated to result in any long-term adverse impacts to socio-economic conditions. As the overall goal of the COWFP is to improve the Central O`ahu wastewater system, implementation of any of the Preferred Alternatives should have beneficial socio-economic impacts. Improvements to an existing wastewater system are generally not considered a growth-inducing factor. As such, implementing any of the Preferred Alternatives should have no long-term adverse impacts on population, housing demand, employment, local businesses, and quality of life.

However, in the short-term, implementing any of the Preferred Alternatives that have a construction component could result in temporary impacts to local businesses and the quality of life during the construction period. Potential consequences include impacts to

air quality from fugitive dust and emissions from construction vehicles; impacts to the noise environment from construction vehicles and equipment; and impacts to traffic.

In the short-term, implementation of the Preferred Alternatives is expected to result in beneficial impacts from design and construction-related employment opportunities and the local purchase of goods and services. In the long-term, implementation of the wastewater system improvements and/or modifications would reduce the amount of expenses that the City could incur as financial penalties resulting from spills or other discharges, which is a beneficial impact. Further, improving effluent quality **and** minimizing/eliminating the need to discharge effluent into the Wahiawā **Reservoir**, as is proposed under the Direct Reuse alternative, is expected to address the concerns expressed by the users of the Wahiawā Reservoir **and its waters (e.g.,** such that more recreational enjoyment of this natural freshwater resource ensues **and agricultural reuse application restrictions would be more lenient).**

As can be seen in Table 1, some people could consider the infrastructure costs of the proposed wastewater system improvements to be a negative impact to the socio-economic environment, particularly when viewed in relation to the multitude of other urgent community needs that must also be allocated from public funds.

MITIGATION. No mitigation is warranted or proposed. However, during any construction appropriate measures to mitigate potential impacts to air quality, noise and traffic shall be undertaken as discussed in the relevant sections of this EIS.

In order to fairly view cost as an impact, one must also consider the benefits that will be derived from this public expenditure. An efficient and well operated wastewater system is essential for human health and the well being of the community; thus, any expenditure to improve the system can be seen as a benefit to the public. In particular regard to Disposal Alternative 5 – Direct Reuse, the public benefit of saving on precious potable water for irrigation and the distribution of a marketable commodity weigh favorably against the large expenditure to implement the effluent reuse system.

5.15.2 NO ACTION ALTERNATIVE

POTENTIAL IMPACTS. Under the No Action alternative, no impacts either positive or negative are expected to result in the short-term. Current maintenance practices would continue as current. However, the No Action alternative may have long-term adverse impacts to the quality of life in the Wahiawā area. Continued deterioration of existing facilities could lead to increased potential for system clogging, leaks and breakages, thus elevating the risk for sewage spills.

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6.0 SUMMARY OF IMPACTS AND CUMULATIVE IMPACTS

6.1 Summary of Impacts

The potential impacts on the natural and man-made environment and suggested mitigation measures were discussed in Section 5.0 above for the various resource categories. Table ~~2~~ 3 below summarizes these impacts for the 15 preferred alternatives analyzed in this EIS. There were no significant long-term impacts that cannot be mitigated found through the impact analysis process. Temporary impacts due to construction activities were discussed where they occur and mitigation measures were proposed. Since each of the preferred alternatives contributes some improvement to the existing wastewater system (even though they may cause temporary negative impact due to construction), they are considered to have long-term beneficial impact to Public Services and Facilities and Socio-Economic Conditions. Table ~~3~~ 4 summarizes the mitigation measures proposed for each of the 15 preferred alternatives.

6.2 Cumulative Impacts

Cumulative impacts may be defined as impacts on the environment that result from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. The impacts discussed in Chapter 5.0 of this document constitute the incremental impact of this project when added to other actions in the past and present.

Information regarding future projects is not readily available at this time; therefore, no specific projects have been considered in the discussion of Future Conditions With the Proposed Action. Nevertheless, it is anticipated that the Central O`ahu communities of Mililani Mauka, Royal Kunia, Koa Ridge, Waiawa, and Waikele will grow.

<u>Future Conditions Without the Proposed Action</u>

In the absence of the proposed project, the City would still require a long-term reliable solution for effluent disposal from the Wahiawā WWTP and a means to improve water quality in the Wahiawā Reservoir. The continuation of current practices with respect to wastewater treatment and disposal in Central O`ahu will not remain viable in the future due to regulatory considerations and financial penalties associated with regulatory noncompliance. The continuation of existing wastewater treatment and disposal would perpetuate public health concerns associated with wastewater spills and inefficient treatment. The continued use of potable water for irrigation of parks and golf courses in Central O`ahu would not conform to the State and City's goal of conserving valuable potable water resources.

Future Conditions With the Proposed Action

The impacts discussed in Section 5.0 suggest that effluent water quality would be improved or enhanced as a result of project actions, and the environmental effects of wastewater disposal on the environment would lessen. It is anticipated that implementation of new technologies at Central O`ahu wastewater facilities and completion of proposed actions that would upgrade the quality and/or eliminate/reduce the amount of effluent discharged to Wahiawā Reservoir will generally result in a positive benefit to the aquatic environment and entire community that uses this recreation area. Additionally, project actions that allow for and result in direct reuse of R-1 quality water could reduce Central Oahu's dependence on potable water for irrigation of parks and golf courses, thereby conserving valuable water resources on the island.

It is possible that the beneficial environmental impacts associated with proposed project actions could be offset by anticipated growth in the Central O`ahu region; however, established controls that require developers to consider and manage the undesirable effects attributed to their project should effectively limit and mitigate foreseeable long-term impacts. For example, anticipated potable water requirements and proposed potable water systems for each project must be coordinated with the BWS and the State Commission on Water Resource Management to ensure that water resources are available. Wastewater disposal systems must meet the DOH requirements to prevent unintended effects to affected water bodies or water resources. Runoff concerns must be addressed with on-site controls in accordance with the DPP construction permits. Compliance with and adherence to established controls are expected to help lessen the impact on natural resources, and achieve lasting effects in resource protection and conservation.

The man-made environment would be impacted as a result of the proposed project combined with the anticipated impacts from future projects not yet identified; however, the developers must abide by established controls and provide appropriate mitigation for project-generated effects on relevant resources including (but not limited to) geologic conditions, topography, climate, water resources, water quality, air quality, noise quality, flora, fauna, historical and archaeological resources, natural hazards, surrounding land use, aesthetic considerations, and socio-economic conditions. Demands for public services and facilities such as water, wastewater, solid waste disposal, electrical power and communications, etc. need to be coordinated with utility providers to ensure adequate service. For economic reasons and as a function of good policy, projects are encouraged to be designed with energy-efficient and energy conservation features. Projects are also encouraged to support State of Hawai`i waste reduction goals.

Socio-economic impacts identified in the previous section resulting from the proposed project in addition to the foreseeable future actions are generally expected to be beneficial. Construction would generate employment and tax revenue to the State of Hawai`i. Significant population shifts are not anticipated to occur as a result of the proposed project because projects of this nature (i.e., wastewater system improvement projects) typically are not an impetus for significant population growth as compared to large-scale housing developments which do stimulate population growth.

Table 3. Summary of Impacts

ALTERNATIVE

○ No long-term significant or adverse impact anticipated
- Short-term adverse impact (construction) that may require mitigation
+ Long-term beneficial impact

ALTERNATIVE	AREA OF POTENTIAL IMPACT	Cumulative Impacts	Geology & Soils	Topography	Climate	Hydrology	Water Quality	Air Quality	Noise Quality	Flora	Fauna	Historical and Archaeological	Natural Hazards	Surrounding Land Use	Aesthetic Considerations	Public Services and Facilities	Socio-Economic Conditions
WASTEWATER COLLECTION ALTERNATIVES																	
1.1 Seal Manholes	Service Area	+	○	○	○	+	+	○	○	○	○	○	○	○	○	+	+
1.2 Public Education and Enforcement of Plumbing Code	Service Area	+	○	○	○	+	+	○	○	○	○	○	○	○	○	+	+
1.3 Maintain/Intensify Maintenance Program	Service Area	+	○	○	○	○	○	○	○	○	○	○	○	○	○	+	+
1.4 Construct New Sewers and/or Rehabilitate/Upgrade Existing Sewers	Service Area	+	-	-	○	-	-	-	-	○	○	○	○	○	-	+	+
1.5 Increase Capacity of Wastewater Pumping Stations	WWPSs	+	-	-	○	-	-	-	-	○	○	○	○	○	-	+	+
1.6 Rehabilitate Whitmore Village WWPTF	WWPTF	+	○	○	○	○	○	○	○	○	○	○	○	○	○	+	+
1.10 Connect Unsewered Areas to the Sewer System	Service Area	+	-	-	○	-	-	-	-	○	○	○	○	○	-	+	+
WASTEWATER TREATMENT ALTERNATIVES																	
2.1 Preliminary Treatment System Modifications	WWTP	+	○	○	○	○	○	○	○	○	○	○	○	○	○	+	+
2.2 Flow Equalization and Storage	WWTP	+	○	○	○	○	○	○	○	○	○	○	○	○	○	+	+
2.3 Additional Primary Clarifier	WWTP	+	-	-	○	-	-	-	-	○	○	○	○	○	-	+	+
2.6 Membrane Bioreactor	WWTP	+	○	○	○	○	○	○	○	○	○	○	○	○	○	+	+
2.7 Public Education	Service Area	+	○	○	○	○	+	○	○	○	○	○	○	○	○	+	+
2.8 Solids Processing and Handling	WWTP	+	○	○	○	○	+	○	○	○	○	○	○	○	○	+	+

ALTERNATIVE ○ No long-term significant or adverse impact anticipated - Short-term adverse impact (construction) that may require mitigation + Long-term beneficial impact	AREA OF POTENTIAL IMPACT	Cumulative Impacts	Geology & Soils	Topography	Climate	Hydrology	Water Quality	Air Quality	Noise Quality	Flora	Fauna	Historical and Archaeological	Natural Hazards	Surrounding Land Use	Aesthetic Considerations	Public Services and Facilities	Socio-Economic Conditions
WASTEWATER DISPOSAL ALTERNATIVES																	
3.1 Disposal Alternative 1: Discharge into Wahiawā Reservoir	Wahiawā Reservoir	○	○	○	○	○	+	○	○	○	○	○	○	○	○	+	+
3.5 Disposal Alternative 5: Direct Reuse	Central O`ahu	+	-	-	○	-	-	-	-	○	○	○	○	○	-	+	+
NO ACTION ALTERNATIVE	Service Area	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Table 4. Summary of Recommended Mitigation Measures

Environmental Resource	*Potential Impacts*	*Mitigation Measures*
Geology & Soils	Direct (temporary) impacts from erosion and sedimentation due to construction. No significant long-term adverse impacts due to project actions.	Implement temporary and permanent erosion and sedimentation control measures to ensure compliance with applicable federal, state and county regulations. Required permits (grading, trenching, stockpiling and NPDES permits), may impose conditions to mitigate any potential impacts. Long-term mitigation provided by landscaping and property management.
Topography	Direct (temporary) impacts from erosion and sedimentation due to construction. No significant long-term adverse impacts due to project actions.	Implement temporary and permanent erosion and sedimentation control measures to ensure compliance with applicable federal, state and county regulations. Required permits (grading, trenching, stockpiling and NPDES permits), may impose conditions to mitigate any potential impacts. Long-term mitigation provided by landscaping and property management.
Climate	No significant long-term adverse impacts due to project actions.	No mitigation is warranted or proposed.
Hydrology	Direct (temporary) impacts from erosion and sedimentation due to construction. No significant long-term adverse impacts due to project actions.	Implement temporary and permanent erosion and sedimentation control measures to ensure compliance with applicable federal, state and county regulations. Required permits (grading, trenching, stockpiling and NPDES permits), may impose conditions to mitigate any potential impacts. Long-term mitigation provided by landscaping and property management.
Water Quality	Direct (temporary) impacts from erosion and sedimentation due to construction. No significant long-term adverse impacts due to project actions. **Potential impacts of continued effluent discharge into Wahiawā Reservoir under Disposal Alternative 1 would be during prolonged wet weather events when**	Implement temporary and permanent erosion and sedimentation control measures to ensure compliance with applicable federal, state and county regulations. Required permits (grading, trenching, stockpiling and NPDES permits), may impose conditions to mitigate any potential impacts. Long-term mitigation provided by landscaping and property management. **The COWFP proposes upgrading wastewater treatment to provide appropriate treatment and storage of wet weather flow. With the proposed reduction of the City's discharge to the reservoir, whatever effect this discharge is determined to have**

Environmental Resource	Potential Impacts	Mitigation Measures
	agricultural fields fed by the reservoir are saturated and cannot accept additional water, excess reservoir flows would need to be diverted into Kaukonahua Stream to minimize risk associated with potentially high reservoir levels.	**on inundation and flooding at the reservoir would be diminished. As stated in EIS Section 3.2.2 (Flow Equalization and Storage), a concurrent City project calls for the planning and design of flow equalization facilities and accompanying wastewater treatment upgrades to minimize sanitary sewer overflows and improve reliability at the Wahiawā WWTP. This concurrent City project (referred to as the Wahiawā WWTP IPS Upgrade and Equalization Facility project or Wahiawā WWTP Modifications project) involves an engineering AAR and environmental review process.** **In addition, the following preferred alternatives in this COWFP EIS also address wastewater flow reduction in connection with the sewer system and WWTP:** • **The nature of the wastewater collection system allows for some wet-weather storage.** • **"Seal Manholes" is a collection system preferred alternative, discussed in Section 3.1.1 of this COWFP EIS, which would help to alleviate I/I into the sewer system.** • **"Construct New Sewers and or/Rehabilitate/Upgrade Existing Sewers" is a collection system preferred alternative, discussed in Section 3.1.4 of this COWFP EIS, which would help to alleviate I/I into the sewer system.**
Air Quality	Direct (temporary) impacts to air quality due to construction. Indirect, off-site, construction-related impacts to air quality could result from the operation of concrete and asphalt batching plants which provide construction and paving materials.	Implementation of dust control measures during the construction period and the establishment of a watering system to reduce dust and particulate matter, erection of dust screens, etc. All construction vehicles should be properly maintained to control motor vehicle emissions. Off-site concrete and asphalt batching plants require DOH permits pursuant to state regulations. Issuance of necessary permits is contingent upon the ability of the batching plants to continuously comply with both emissions and ambient air quality standards.

Environmental Resource	Potential Impacts	Mitigation Measures
	These plants emit particulate matter and gaseous pollutants. Indirect operational impacts to air quality could include emission from the burning of fossil fuels to operate emergency generators at pumping stations and the WWTP. No significant long-term adverse impacts due to project actions.	Operational impacts to air quality from emergency generators can be addressed by replacing older equipment with more fuel efficient units that have a lower emissions rating. An odor control system was installed at the Wahiawā WWTP in response to specific complaints. It is recommended that the City monitor the impact of odors of primarily hydrogen sulfide and various organic compounds emanating from the facility to better address odor concerns and respond to specific complaints.
Noise Quality	Direct (temporary) noise quality impacts due to construction. No significant long-term adverse impacts due to project actions.	Use muffled construction equipment and restrict work within the normally permitted hours of construction. Noisy construction activities are restricted on Sundays and holidays and during the early morning, and at night under DOH permit procedures. Operational noise requires modifications to existing ventilation openings with duct silencers, replacement of generator exhaust systems and other structural modifications. Buildings should be soundproofed to comply with state DOH noise limits.
Flora	Direct (temporary) impacts from erosion and sedimentation due to construction. No significant long-term adverse impacts due to project actions.	Implement temporary and permanent erosion and sedimentation control measures to ensure compliance with applicable federal, state and county regulations. Required permits (grading, trenching, stockpiling and NPDES permits), may impose conditions to mitigate any potential impacts. Long-term mitigation provided by landscaping and property management.
Fauna	Direct (temporary) impacts from erosion and sedimentation due to construction. No significant long-term adverse impacts due to project actions.	Implement temporary and permanent erosion and sedimentation control measures to ensure compliance with applicable federal, state and county regulations. Required permits (grading, trenching, stockpiling and NPDES permits), may impose conditions to mitigate any potential impacts. Long-term mitigation provided by landscaping and property management.
Historical & Archaeology	No significant long-term adverse impacts due to	If subsurface archaeological resources are encountered during any construction or installation of upgraded wastewater facilities, such

Environmental Resource	Potential Impacts	Mitigation Measures
	project actions.	as new sewer lines or new storage tanks, construction activity shall be halted and the SHPD should be contacted immediately.
Natural Hazards	No significant long-term adverse impacts due to project actions.	Humans have little control over natural hazards; however, compliance with the Uniform Building Code requirements for earthquake shear and wind resistance is recommended. Follow O`ahu Civil defense procedures in the event of emergencies.
Surrounding Lane Use	Direct (temporary) impacts from erosion and sedimentation due to construction.	Implement temporary and permanent erosion and sedimentation control measures to ensure compliance with applicable federal, state and county regulations. Required permits (grading, trenching, stockpiling and NPDES permits), may impose conditions to mitigate any potential impacts. Long-term mitigation provided by landscaping and property management.
	Direct (temporary) impacts to air quality due to construction.	Implementation of dust control measures during the construction period and the establishment of a watering system to reduce dust and particulate matter, erection of dust screens, etc. All construction vehicles should be properly maintained to control motor vehicle emissions.
	Direct (temporary) impacts to noise quality due to construction.	Construction noise mitigation includes the use of muffled construction equipment and restricting work within the normally permitted hours of construction.
	No significant long-term adverse impacts due to project actions.	
Aesthetic Considerations	Direct (temporary) impacts to aesthetics due to construction.	Temporary unsightly areas may be created resulting from construction activities. Contractor clean-up activities will be required at the end of construction activities.
	Indirect impacts from reservoirs and large tanks and other facilities required to implement Disposal Alternative 5 – Direct Reuse may affect the aesthetics of the surrounding community.	Landscaping, berms, fencing and painting may be required to mitigate for the aesthetics of reservoirs, large tanks and other facilities required to implement Disposal Alternative 5 - Direct Reuse.

Environmental Resource	Potential Impacts	Mitigation Measures
	No significant long-term adverse impacts due to project actions.	
Public Services	Direct (temporary) impacts to public services due to construction. No significant long-term adverse impacts due to project actions.	Temporary impacts may include temporary accidental outages of utilities and communication services during construction. Roads may be partially blocked by construction activities. Mitigation includes efforts to be aware of the locations of utility lines and a public awareness program to inform the public of diversions and detours to be implemented. Develop and implement traffic management plans as warranted.
Socio-Economic Conditions	**The infrastructure costs of the proposed wastewater system are high. Some would consider cost to be a negative impact to the socio-economic environment, particularly when viewed in relation to the multitude of other urgent community needs that must also be allocated from public funds.**	**In order to fairly view cost as an impact, one must also consider the benefits that will be derived from this public expenditure. An efficient and well operated wastewater system is essential for human health and the well being of the community, thus any expenditure to improve the system can be seen as a benefit to the public. In particular regard to Disposal Alternative 5-Direct Reuse, the public benefit of saving on precious potable water for irrigation weighs favorably against the large expenditure to implement the effluent reuse system.**

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7.0 RELATIONSHIP TO LAND USE PLANS, POLICIES, AND CONTROLS

7.1 Federal Land Use Plans and Policies

Section 404, Clean Water Act – Corps of Engineers Permit.
All construction activities near U.S. waters require the consent of the Department of the Army - Chief of Engineers. Any activities that involve dredged or fill materials within nearshore waters including rivers, streams, wetlands, ocean and coastal waters, inland and tidal waters, tidal ponds, and fishponds may require USACE authorization and certification. In the Pacific region, this permit is administered by the USACE, Honolulu District per Section 10 of the Rivers and Harbors Act (33 USC 403), Section 404 of the CWA (33 USC 1344), and Section 103 of the Marine Protection, Research and Sanitation Act (33 USC 1413).

Section 401, Clean Water Act – Water Quality Certification.
The CWA also stipulates that in conjunction with the Section 404 permit requirements, applicants must obtain a water quality certification from a state approving agency to ensure that project actions will meet water quality standards set forth in its guidelines. The DOH is responsible for establishing and administering the State certification system pursuant to Section 401 of the CWA (33 USC 1341) and Section 342D-6 of the HRS. Any applicant who files for a Federal license or permit to conduct any activity that may result in any discharge into U.S. waters must acquire the DOH water quality certification.

Section 402, Clean Water Act – NPDES Permit.
Section 402 of the CWA prohibits point-source discharges into waters of the U.S. unless these are permitted. The NPDES requirements for issuing permits pursuant to Section 402 are codified in HAR Title 11, DOH, Chapter 55, Water Pollution Control. The DOH, Environmental Management Division, Clean Water Branch administers the NPDES permit.

Project actions that involve storm water discharges from construction activities that result in disturbance of one or more acres of total land area require a NPDES General Permit for Storm Water Associated with Construction Activity. Permit requirements include compliance with a BMP Plan in accordance with City ordinances pertaining to grading, grubbing, stockpiling, soil erosion, and sedimentation.

Project actions that involve discharging dewatering effluent into City drainage systems and waters of the U.S. require a NPDES General Permit for Construction Dewatering. Permit requirements include compliance with a BMP Plan that typically includes applicable and/or appropriate structural or non-structural methods to reduce and control the discharge from dewatering activities. Structural controls include devices such as interceptor trenches or diversion dikes; non-structural controls include locating potential polluting sources away from areas that drain directly into waterways.

Executive Order (E.O.) 11990, Protection of Wetlands.
Wetland resources may exist along the alignment of Kaukonahua Stream; however, any such existing resources are not known to be significant. Literature searches have found no references to wetlands along the streams in the area.

Additional plans and policies (e.g., the National Environmental Policy Act and the National Historic Preservation Act of 1966, as amended) may apply to project actions particularly if a Joint-Agency alternative emerges as a recommended alternative.

7.2 State Land Use Plans and Policies

Hawai`i State Plan.
The Hawai`i State Plan, Chapter 226, HRS, as amended, was developed as a guideline for the future growth of the State of Hawai`i. The State Plan identifies goals, objectives, policies, and priorities for the development and growth of the State. It provides a basis for prioritizing and allocating the limited resources such as public funds, services, human resources, land, energy, and water. The State Plan establishes a system for the formulation and program coordination of State and County plans, policies, programs, projects, and regulatory activities. The State Plan also facilitates the integration of all major State and county activities.

Sections of the State Plan that describe overall themes, goals, objectives, and policies that relate to project actions are presented in the following paragraphs.

PART I - GOALS, OBJECTIVES, AND POLICIES

SEC. 226-13 Objective and policies for physical development – land, air and water quality.

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

By improving the quality of effluent and advocating the reuse of wastewater for irrigation and agricultural purposes, the COWFP contributes to the quality of Hawaii's waters.

SEC. 226-15 Objective and policies for facility systems – solid and liquid wastes.

(a)(1) Maintenance of basic public health and sanitation standards relating to treatment and disposal of solid and liquid wastes.

By reducing the amount of spillage and improving treatment of wastewater, the COWFP contributes to the objective of maintaining basic health and sanitation standards in its service area.

(a)(2) Provision of adequate sewerage facilities for physical and economic activities that alleviate problems in housing, employment, mobility, and other areas.

The COWFP updates and improves wastewater facilities and considers future wastewater needs of its service area, thereby contributing to the alleviation of problems in housing, employment and mobility, and other areas.

(b)(1) Encourage the adequate development of sewerage facilities that complement planned growth.

The COWFP considers planned growth and the provision of adequate sewerage facilities for its service area.

(b)(2) Promote re-use and recycling to reduce solid and liquid wastes and employ a conservation ethic.

The COWFP advocates reuse of treated wastewater for the agriculture and irrigation needs of Central Oahu which contributes to a conservation ethic

(b)(3) Promote research to develop more efficient and economic treatment and disposals of solid and liquid wastes.

The COWFP is based on research to develop more efficient and economic treatment and disposal of liquid wastes.

SEC. 226-16 Objective and policies for facility systems - water.

(b)(3) Reclaim and encourage the productive use of runoff water and waste water discharges.

The COWFP advocates reuse of treated wastewater for the agriculture and irrigation needs of Central O`ahu which is a productive use of wastewater discharges.

PART III – PRIORITY GUIDELINES

SEC. 226-103 Economic Priority Guidelines.

(e)(2) Encourage the improvement of irrigation technology and promote the use of non-potable water for agricultural and landscaping purposes.

Through the reuse of treated wastewater (Disposal Alternative 5) the COWFP encourages the improvement of irrigation technology and promotes the use of non-potable water for agricultural and landscaping purposes for those who wish to use it.

State Functional Plans.

State Functional Plans are the primary guidelines for implementing the Hawai`i State Plan. In summary, the Hawai`i State Plan establishes long-term objectives whereby the State Functional Plans serve to establish objectives for shorter-term actions.

Described below are specific sections of State Functional Plans that contain overall themes, goals, objectives, and policies that relate to project actions, particularly the reuse alternatives.

STATE AGRICULTURAL FUNCTIONAL PLAN

The objective of this functional plan is to specify the objectives, policies, and high priority implementing actions that the State's agricultural community will follow. Objectives and policies that relate to project actions are presented below.

Objective I:	*Achievement of Effluent and Equitable Provision of Adequate Water for Agricultural Use.*
Policy I(1):	*Expand agricultural water resources statewide.*
Action I(1)(b):	*Monitor, evaluate, and increase efforts to use non-potable water for agricultural irrigation*

The COWFP will contribute to the State's agricultural community by increasing the amount of non-potable treated water available for irrigation to farmers who wish to use it.

State of Hawai`i Land Use Law.
Chapter 205, HRS, as amended, promulgates the State Land Use Law. This law is intended to preserve, protect, and encourage the development of lands in the State of Hawai`i for uses that are best suited to the public health and welfare of its people. The State of Hawai`i Land Use Commission (LUC) classifies all land into four districts: Urban, Conservation, Agriculture, and Rural. The entire town of Wahiawā lies within the Urban designation. Wastewater facilities are consistent and compatible with this land use designation.

The Wahiawā Reservoir is designated Conservation by the LUC. Four subzones of conservation lands are defined: Protective, Limited, Resource, or General. The reservoir is classified as a Resource subzone or an area that is to be developed with proper management in order to ensure the sustained use of the natural resources in the area. Developable areas include lands suitable for outdoor recreational uses such as hunting, fishing, camping and picnicking.

The COWFP's first preferred disposal alternative (Reuse) would provide an alternative to the current disposal of treated effluent into Wahiawā Reservoir, thereby increasing the value of this inland body of water for recreational uses.

Coastal Zone Management (CZM) Program.
The CZM Program is promulgated by Chapter 205A, HRS, as amended. The objectives and policies of the program are administered by the Office of State Planning. Through the CZM Program, each county is required to establish Special Management Areas and shoreline setbacks within which permits are required for development.

Agricultural Lands of Importance in the State of Hawai`i (ALISH) System.
The ALISH system categorizes lands according to soil quality and ability to produce crops. At this time, no lands envisioned for project actions are included in the ALISH system.

Permits for Stream Alteration and Diversion Works.
Project actions involving the withdrawal of groundwater in designated parts of Hawai`i as well as alterations to streams are subject to permits and approvals from the Commission on Water Resources Management. The Commission is granted this authority pursuant to Chapter 174C, HRS, as amended.

The proposed action does not involve the withdrawal of groundwater since its primary emphasis is the improvement of collection, treatment and disposal of wastewater. However, groundwater quality may be in question due to the use of R-1 water for irrigation. A field research/demonstration project in the CORP was conducted in June 2003 through May 2004 to investigate and examine the ability of Hawaiian soils to polish applied R-1 wastewater effluent using typical irrigation practices. A soil analysis report was performed to ensure that ground retention, absorption and percolation rates and soil carbon levels were safe and did not pose a threat to contiguous potable water aquifers. These field studies concluded that the soil in Central O`ahu was compatible with the use of recycled waters. (Brown and Caldwell, 2005)

7.3 County Land Use Plans and Policies

General Plan.
The General Plan for the City presents the long-range social, economic, environmental and design objectives for the general welfare and prosperity of the people of O`ahu. The plan was originally adopted in 1977 and has been amended several times over the years, with the latest amendments occurring in 2002. The objectives and policies that pertain to project actions are listed below.

II. ECONOMIC ACTIVITY
Objective C: *To maintain the viability of agriculture on Oahu.*
Policy 8: *Encourage the more efficient use of non-potable water for agricultural use.*

The more efficient use of non-potable water for agriculture and irrigation usage is implicit in the COWFP's first preferred wastewater disposal alternative (Disposal Alternative 5). Under this alternative treated effluent which is now being released into Wahiawā Reservoir, would instead be transported through new supply lines to parks and golf courses between the Wahiawā WWTP and the CORP and to agricultural fields of farmer's who wish to use treated wastewater (DOH certified R-1 water) to irrigate their fields.

V. TRANSPORTATION AND UTILITIES
Objective B *To meet the needs of the people of Oahu for an adequate supply of water and for environmentally sound systems of waste disposal.*
Policy 5: *Provide safe, efficient, and environmentally sensitive waste-collection and waste disposal services.*

The COWFP proposes nine improvements to the waste-collection system, six of which have been deemed feasible and "preferred" in this EIS. These include sealing manholes to reduce the inflow of storm runoff; public education and enforcement of the Plumbing Code; maintaining/intensifying the collection system maintenance program; constructing new sewers and/or rehabilitating/upgrading existing sewers; increasing capacity of wastewater pumping stations and rehabilitating Whitmore Village WWPTF. The City will choose and implement one or all of these alternatives as funds and resources become available. The overall result will be to provide the Wahiawā WWTP service area with a safe, efficient and environmentally sensitive waste-collection system.

Disposal Alternative 5: Reuse is the first preferred wastewater disposal alternative proposed by the COWFP. The implementation of Disposal Alternative 5 is the long-range objective of the wastewater disposal policy. However, obtaining the multi-agency agreements required and the construction of supply lines to the various end users of recycled wastewater will take some time to complete. In the interim, Disposal Alternative 1 Disposal of high-quality treated effluent into Wahiawā Reservoir will be implemented.

Policy 6: *Support programs to recover resources from solid-waste and recycle wastewater.*

The many improvements proposed for the existing wastewater system in the Wahiawā service area will provide an environmentally sound system of waste disposal. Disposal Alternative 5: Reuse will provide a program to recover resources from wastewater for irrigation, thus reducing dependence on the island's precious potable water resources.

Central O`ahu Sustainable Communities Plan.
The *Central O`ahu Sustainable Communities Plan* is intended to support the General Plan policies and also serves as a guideline for public policy, investment, and decision-making through next 25 years (from 2002).

The policies of the *Central O`ahu Sustainable Communities Plan* pertaining to Wahiawa focus on maintaining and enhancing the existing residential neighborhoods, civic buildings, commercial areas, and natural forest and reservoir features. No significant land use changes or new residential developments are planned for the area. Additionally, based on an evaluation of proposed future development and population projections conducted for the Central Oahu Wastewater Facilities Plan and per the City's direction in terms of wastewater planning, there is no new development projected to year 2020 that would significantly contribute flows to the wastewater system. The preferred alternatives selected for proposal in this EIS will collectively make the existing wastewater system more efficient and environmentally safe to serve the existing community and will fulfill the vision of providing adequate infrastructure to the needs of existing developments.

Policies applicable to the project actions are listed below.

4.2.1 WATER ALLOCATION AND SYSTEM DEVELOPMENT – GENERAL POLICIES

An adequate supply of non-potable water should be developed for irrigation and other suitable uses in Central O‘ahu in order to conserve the supply of potable water.

The City will reclaim wastewater effluent and distribute non-potable water, provided that customers can be found for this source of non-potable water, and that no threat is posed to the quality of the potable water aquifer.

Alternative 5 calls for the direct reuse of R-1 water from the Wahiawā WWTP through a recycled water distribution system. The overall concept for the recycled water distribution system is to provide as much of Wahiawā WWTP's R-1 water for direct reuse as possible.

A long-term partnership between the ENV and a water purveyor, as well as prospective users, would be necessary in order to implement this disposal alternative. The BWS is the lead as purveyor of potable and non-potable water throughout O‘ahu and has shown a strong interest in Disposal Alternative 5, although a formal ENV-BWS agreement still needs to be accomplished.

This alternative would also involve intermittent and interim discharge of any unused tertiary effluent from the WWTP into Wahiawā Reservoir. This would occur during wet weather conditions when recycled water demands decrease and until such time that the direct reuse recycled water distribution system connects to potential users as much as necessary. During such periods, this alternative would be similar to Disposal Alternative 1 from an operational standpoint.

This alternative will create a marketable product in recycled water, thus benefiting the City. It will also make a major contribution to conservation of water resources on O`ahu because current practice in Central O`ahu is to use potable water for irrigation of public parks and golf courses.

4.3.1 WASTEWATER TREATMENT – GENERAL POLICIES

All wastewater produced by new developments in Central Oahu should be connected to a regional or municipal sewer service system.

Where feasible, effluent should be treated and used as a source of non-potable water for irrigation and other uses below the Underground Injection Control (UIC) line of the DOH and the "No-Pass" Line of the BWS. Above the UIC line and "No Pass" line, use of tertiary treated effluent (R-1 Quality) for irrigation purposes may be appropriate if approved by the DOH and BWS.

Six preferred alternatives for wastewater treatment have been selected from the nine treatment alternatives proposed in the COWFP. These alternatives will strive to improve treatment reliability, support the anticipated long-term disposal requirements, and enable the development of a sustainable recycled water

program. It should be noted that the COWFP will not be recommending any Wahiawā WWTP improvements that may be required to meet future regulatory requirements or to fulfill future third-party agreements with regard to the disposal or reuse of effluent. Recommended WWTP improvements can only be determined after thorough investigation of existing conditions, project requirements, and analyses of possible alternatives.

5.1.1. PUBLIC FACILITY INVESTMENT PRIORITIES

The regional directed growth strategy requires the cooperation of both pubic and private agencies in planning, financing, and constructing infrastructure. The City should take an active role in planning infrastructure and coordinating the expansion of Honouliuli WWTP and reuse of its effluent, improvement of the Wahiawā WWTP, provision of recreational open spaces, and development of the regional transportation system, parks, and police and fire facilities.

The improvement of the Wahiawā WWTP mentioned above as a goal of public facility investment priorities is implicit in the COWFP. The goals of the COWFP are to improve collection system reliability; connect unsewered areas to the sewer system; improve WWTP reliability; improve WWTP effluent water quality; improve water quality in Wahiawā Reservoir; provide recycled water for irrigation; enhance/improve recycled water reservoirs and integrate city, federal and private facilities and programs.

The Urban Land Use map (Map A2) contained in the *Central O`ahu Sustainable Communities Plan* depicts land use designations for the Plan area. The Urban Land Use map indicates that the Wahiawā WWTP is located in an area designated for residential and low-density apartment use. Certain community and public land uses are not specifically designated on the Land Use Map; however, the Plan states that public facilities and utilities are allowable uses within the residential areas they serve. Further, the Wahiawā WWTP is recognized and shown as an existing public facility on both the Public Facilities map (Map A3) and the Urban Land Uses map (Map A2) in the *Central O`ahu Sustainable Communities Plan*.

Much of the shoreline areas immediately surrounding the Wahiawā Reservoir are designated as Parks or as Agriculture and Preservation areas on the Sustainable Plan's Urban Land Use map (Map A2). These include lands encompassing the Wahiawā Public Fishing Area and the Wahiawā Freshwater Park.

<u>Zoning</u>.
Zoning is a method by which the City regulates land use in accordance with the adopted land use policies mentioned above. Zoning designations are shown on City zoning maps.

The Wahiawā WWTP is zoned I-2, Intensive Industrial. The existing wastewater facility is allowed per this zoning designation. The Wahiawā Reservoir is zoned P-1, Restricted

Preservation. Uses, structures, and development standards in the P-1 zoning district are governed by the appropriate state agency (i.e., DLNR).

DPP has commented that a zoning waiver may be required if development exceeds the development standards for those zoning districts not in State Conservation.

O`ahu Water Management Plan (OWMP)

As specified by the State Water Code, a water use and development plan is to be adopted by ordinance and is intended to set forth the allocation of water to land use in each county. The water use and development plan for the City and County of Honolulu is called the Oahu Water Management Plan and is a component of the State's Hawai`i Water Plan. The OWMP describes in detail the nature and extent of Oahu's present water supply, water usage, and water developments (Wilson Okamoto, 1990). The City will work with BWS and/or DPP to incorporate the subject COWFP project into the OWMP.

Special Management Area (SMA).

The CZM Program, as previously mentioned, promulgates the creation of SMAs. SMAs are specially designated areas governed by specific county guidelines. Any development within an SMA requires a SMA permit from the appropriate county. An accepted EIS fulfills a portion of the information necessary to apply for an SMA permit. The City also requires an environmental review following Chapter 343, HRS procedures prior to granting the SMA permit.

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8.0 PERMITS AND APPROVALS REQUIRED

The following permits and approvals have been identified as potential requirements for the proposed project.

Federal

U.S. Army Corps of Engineers **permits and approvals:**

- **Draft jurisdictional reports and written requests for the Army's jurisdictional determination regarding the presence of potential waters of the U.S., including wetlands, associated with the proposed wastewater improvement projects will be submitted, as necessary (prior to construction when more detailed engineering plans are available).**
- Additional review by the U.S. Army Engineer District, Honolulu and Clean Water Act Section 404 permit(s) (i.e., **Department of the Army [DA] authorization**, as necessary.

State of Hawai`i

National Pollutant Discharge Elimination System General and/or Individual Permits (e.g., Discharges of storm water associated with construction activities, hydrotesting waters, and treated effluent)

Community Noise Permit

Community Noise Variance

Clean Water Act Section 401 Water Quality Certification

Stream Channel Alterations and Diversion Works Permit

Conformance with Accessibility Guidelines

Department of Transportation Permits and Approvals:

- **Permit to Perform Work within a State Highway Right-of-Way**
- **Review and approval of construction plans (during design phase) for work performed within the State Highway rights-of-way**
- **"Use and Occupancy Agreements", easements or access rights, etc. from the Highways Division, Rights-of-Way Branch**
- **Permit to transport oversized equipment/overweight loads within DOT's highways facilities**

City and County of Honolulu

Building Permit

Honolulu Board of Water Supply

Permit to Excavate a Public Right-of-Way/Trenching Permit

Grubbing, Grading, and Stockpiling Permit

Erosion Control Plan/Best Management Practices

Repaving Plan

Street Usage Permit

Construction Dewatering Permit (Temporary)

Permit to Discharge Effluent (Non-Storm Water) (Temporary)

Detour Plans/Traffic Control Plans

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9.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Resources such as fossil fuels and construction materials would be irrevocably committed for wastewater system improvements, including the repair and/or replacement of system facilities. Similarly, both fossil fuels and construction materials would be irrevocably committed for project actions such as new construction.

Labor would be required for construction, planning, engineering design, landscaping, purchasing, and services. Once used, the labor is irretrievable; however, the expended effort is also monetarily compensated, thereby supporting the economies of the state and City.

9.1 Relationship between Local Short-Term Uses of Humanity's Environment and the Maintenance of Long-Term Productivity.

Local short-term use of the environment due to implementation of the COWFP will consist mainly of construction activities related to repairs and upgrades to the wastewater system. As discussed in Section 5.0 (Environmental Consequences), short-term impacts may result from construction. These may include negative impacts such as erosion which would affect geology and soils, topography and water quality. Air quality may decrease due to exhaust from construction vehicles and the raising of fugitive dust, and noise may increase due to construction. Highways, roadways and traffic may be adversely affected when the supply lines for treated effluent are installed for Disposal Alternative 5. However, all of these short-term negative impacts can be mitigated.

A positive short-term benefit of construction activities will be the creation of work opportunities for the engineering community during the design phase of the proposed wastewater system improvements, and employment opportunities for the construction industry of O`ahu during the construction phase. The overall design and construction schedule is estimated to run for several years. The largest project in terms of physical effort and dollars spent is expected to be the implementation of Disposal Alternative 5. The design period will run from 2008 to 2010, and construction from 2010 to 2012.

Maintenance of long-term productivity would be enhanced by implementation of the proposed improvements because the overall wastewater system for Central O`ahu would become more efficient, thereby lessening impacts on the environment. It is expected that long-term productivity resulting from wastewater system improvements will significantly outweigh short-term costs.

The relationship between local short-term uses of the environment and the maintenance of long-term productivity is discussed below in terms of four specific areas of potential concern:

- **<u>Narrowing the range of beneficial uses of the environment</u>: The planned improvements to the wastewater system are considered to be beneficial to the environment. Therefore, the range of beneficial uses of the environment would not be narrowed.**

- **<u>Long-term risks to health and safety</u>: Because of the strong correlation between an efficient municipal wastewater system and public health, the proposed actions would not present long-term risks to health and safety. The proposed improvements are expected to actually improve the health and safety of the community by raising the operational standards of Central Oahu's aging wastewater facilities.**

- **<u>Foreclosure of future options</u>: Most of the proposed wastewater system improvements will take place on the existing Wahiawā WWTP and various existing wastewater pumping stations. In terms of the overall geographic service area of the Central O`ahu wastewater system, only a small proportion of land is used to house wastewater facilities. Disposal Alternative 5 will necessitate the running of treated effluent supply lines over a long distance; however the intent is to bury these lines underground, so that the long-term impact above ground will be minimal. Therefore, the proposed improvements will not foreclose future land use options in the Central O`ahu area.**

- **<u>Trade-offs among short- and long-term gains and losses</u>: The planned wastewater system improvements will not result in any significant trade-offs between short- and long-term gains and losses. Planned mitigation measures will offset any short-term impacts and long-term impacts of the proposed actions. In general, short and long-term gains due to the proposed improvements far outweigh any short and long-term losses to the environment.**

To summarize, the planned improvements to the wastewater system are anticipated to enhance and maintain long-term productivity of the environment in the Central O`ahu area.

10.0 SUMMARY OF UNRESOLVED ISSUES

The long-term objective of the Wahiawā WWTP will be determined upon the resolution of the following issues, as indicated in the COWFP:

- TMDL limits for Kaukonahua Stream, Kaiaka Bay, and Wahiawa Reservoir. With the phased development of TMDL limits for all of these water bodies currently underway by the DOH, the TMDL limits will set pollutant-loading limits for all point and non-point source discharges into Kaukonahua Stream, Wahiawā Reservoir, and Kaiaka Bay.
- Classification of agricultural ditches as "State waters". Under the current 2004 version of HAR 11-54, the classification would require NPDES permits for discharges into agricultural irrigation ditches, such as DFC's irrigation ditch, if the ditch can overflow into the adjacent State waters.
- Application of the 2002 recycled water guidelines and the 2004 revision of HAR 11-62. It is not clear whether the City can obtain a NPDES permit, as required under the 1998 Consent Decree, without compliance with these updated guidelines and regulations. The City feels it has met the majority of its obligations under the 1998 Consent Decree, but its application for a NPDES permit has yet to be approved by the DOH.
- Recycled water application in the BWS "No-Pass" zone. The BWS undertook a study to see if recycled water can be safely used on Hawaiian soils above potable aquifers. The final report did not find cause to ban the use of wastewater effluent for irrigation above the "No-Pass" line. While the report did not recommend lifting restrictions immediately, it instead recommended further study using low TDS effluent (e.g., Wahiawa WWTP's), testing for emerging pollutants, and extending the test period to include varying weather conditions.
- Diversified agriculture. Total planted acreage, crop variety, and public health are key factors that will determine the water quality and quantity desired from Wahiawā Reservoir or from the Wahiawā WWTP's effluent.
- New opportunities for integrating the City's and U.S. Army facilities. The recent privatization of the Schofield Barracks wastewater system and potential discontinuation of their discharge agreement with DFC may favor the integration of facilities, since the private operator of the Schofield Barracks system may have fewer restrictions on entering a utility partnership agreement with the City and the BWS. The COWFP did not develop a plan for such an agreement, as it is outside of the scope of the study and would be subject to negotiation between a multitude of parties. **The final decision for any future modifications to the Schofield Barracks wastewater system must be approved by the Army.**
- Integrated water resource planning. The role of recycled water as a source of non-potable water is gaining favor from the regulatory community and from

water purveyors. Decreasing allocations of imported water from the Waiāhole ditch, urban development in Central and Leeward O`ahu, and the demise of sugar cultivation (which had the effect of recharging underlying aquifers) have increased the need for and development of alternative water sources. Developing such opportunities for water reuse is beyond the normal range of services provided by ENV and, in order for this to come to fruition, would likely require a greater effort by the BWS, DLNR, and private interests.

- Resolution to the City's use of DFC's property for the new deep-water outfall. The Wahiawā WWTP currently disposes effluent into Wahiawā Reservoir via a deep-water outfall, for which associated land easement issues are currently under discussion. **The landowner of the property where the new deep-water outfall is located, DFC (which includes Wahiawa Water Company, Inc.), claims that the City discharges through the WWTP outfall onto private property without permission and without compensation. The City's position is that Wahiawa Water Company, Inc. ("Wahiawa Water") has no basis to claim compensation for the discharge of treated effluent into the Wahiawa Reservoir. This is because the City has a preexisting right to discharge such effluent into the reservoir by virtue of previous sewer outfall easements granted to the City by Wahiawa Water or its predecessor in title. Recently, the First Circuit Court agreed with the City and ruled that the City has a preexisting right to discharge into the reservoir, and therefore, denied compensation to DFC for the discharge of treated effluent through the deep-water outfall pipeline.**

The unresolved issues listed above directly impact the range of wastewater reuse and disposal alternatives available to the DDC.

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12.0 PREPARERS OF THE EIS

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Brooke Webber	Project Manager	The Limtiaco Consulting Group
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Richard McGerrow	Senior Planner	Wil Chee - Planning, Inc.
Judy Mariant	Planner	Wil Chee - Planning, Inc.
Kelly Shoji	Planner	Wil Chee - Planning, Inc.
Joshua Hekekia	Planner	Wil Chee - Planning, Inc.

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13.0 LIST OF AGENCIES AND INDIVIDUALS CONSULTED

As previously stated, the DDC initiated the development of the COWFP in conjunction with the EIS to encourage public participation from a very early stage in the project. The WWAC—a group of representatives from agencies, organizations, businesses, and the affected community—re-convened on June 13, 2000. The original EISPN for the *Central Oahu Facilities Plan* (as the COWFP was then titled) project was published in *The Environmental Notice* on August 23, 2000. A first workshop was held on August 26, 2000 in Wahiawā Town to provide an opportunity for the affected community to participate in the development of a long-term wastewater management strategy for Central O`ahu and to provide input or voice their comments to the project team. A follow-up workshop was held in Wahiawā Town on October 4, 2000. At that time, the EIS process did not proceed and a Draft EIS was not completed. Project revisions have since been incorporated into the plan. A revised EISPN for the COWFP was published in *The Environmental Notice* on September 8, 2007.

Below is a list of all the agencies, organizations, elected officials, and individuals 1) consulted during the pre-assessment phase for the EISPN, 2) consulted and comments solicited for the original EISPN, 3) consulted and comments solicited for the revised EISPN, **and 4) consulted and comments solicited for the DEIS**. A total of seven comment letters were received in response to the publication of the EISPN on August 23, 2000. These comment letters are appended to this EIS (Appendix F). A total of seventeen comment letters were received in response to the publication of the EISPN on September 8, 2007. All comment letters along with responses are appended to this EIS (Appendix F)**. A total of twenty-three comment letters were received in response to the publication of the DEIS on January 23, 2008. All comment letters along with responses are appended to this EIS (Appendix G).**

Agencies

U.S. Government
Department of the Interior, U.S. Fish and Wildlife Service – Pacific Region
Department of the Navy, Commander Navy Region Hawaii
U.S. Army Corps of Engineers, Environmental Technical Branch
U.S. Army Corps of Engineers, Honolulu District Regulatory Branch
U.S. Army Garrison, Hawaii
U.S. Environmental Protection Agency, Region 9 – Pacific

State of Hawai`i
Department of Accounting and General Services
Department of Agriculture
Department of Business, Economic Development and Tourism (DBEDT)
DBEDT Energy, Resources and Technology Division
DBEDT Planning Office
Department of Defense

Department of Facility Maintenance
Department of Hawaiian Home Lands
Department of Health
Department of Land and Natural Resources (DLNR)
DLNR, State Historic Preservation Division
DLNR, Commission on Water Resource Management
Department of Transportation
Hawai`i State Public Library, Mililani
Hawai`i State Public Library, Wahiawa
Hawai`i State Library, Documents Section
Office of Hawaiian Affairs
Senatorial District 16, David Y. Ige
Senatorial District 17, Ron Menor
Senatorial District 18, Clarence Nishihara
Senatorial District 19, Mike Gabbard
Senatorial District 22,
House District 35, Alex Sonson
House District 36, Roy Takumi
House District 37, Ryan Yamane
House District 38, Marilyn Lee
House District 39, Marcus Oshiro
House District 40, Sharon Har
House District 41, Jon Karamatsu
House District 42, Rida Cabanilla
House District 46, Michael Magaoay
University of Hawai`i (UH) Environmental Center
UH Water Resources Research Center

City and County of Honolulu
Department of Design and Construction
Department of Environmental Services
Department of Facility Maintenance
Department of Parks and Recreation
Department of Planning and Permitting
Department of Transportation Services
Board of Water Supply
Honolulu Fire Department
Honolulu Police Department
Mayor's Office
Honolulu City Council, District 2
Honolulu City Council, District 8
Honolulu City Council, District 9
Corporation Counsel

Other
Agribusiness Development Corporation
Ahupua`a Action Alliance
Bank of Hawaii, Trust Real Estate
Earth Justice
Helemano Plantation
Dole Food Company, Hawaii
Del Monte Fresh Produce, Hawaii
Gentry Waiawa – Waiawa Ridge Development, LLC
George Galbraith Trust Estate
Hawaii Lions District 50
International Longshoreman Workers Union (ILWU) Local 142
Mililani Golf Club
Wahiawa General Hospital
Whitmore Community Association
Wahiawa Community and Business Association
Wahiawa Neighborhood Board #26
Wahiawa Rainbows Club
Friends of Kukaniloko
Hawaii Audubon Society
Hawaii Freshwater Fishing Association
Hawaiian Civic Club of Wahiawa
Hawaiian Electric Company, Environmental Department
Hawaiian Telcom
Life of the Land
Mililani-Waipi`o Neighborhood Board #25
North Shore Outdoor Circle
North Shore Neighborhood Board #27
North Shore Waste Management Advisory Group
Oceanic Time Warner Cable
Pearl City Neighborhood Board #21
The Gas Company
Wahiawa Wastewater Advisory Committee
Waipahu Neighborhood Board #22

Individuals (Workshop Attendees)

Mr. Paul Achitoff, Earth Justice
Mr. Ben Acohido, Wahiawa Neighborhood Board #26
Ms. Diane Anderson, North Shore Outdoor Circle
Mr. Howard Araki, Hawaii Freshwater Fishing Association
Mr. David Arakawa, Corporation Counsel, CCH
Mr. William Balfour, Director, Department of Parks & Recreation
Ms. Sheri R. Bentley, Wahiawa Neighborhood Board #26
Ms. Kat Brady, Life of the Land

Mr. Michael Buck, DLNR, Division of Forestry & Wildlife
The Honorable Robert Bunda, State Senate
Mr. Ray Camacho, ILWU Local 142
Ms. Susanna Cheung, Helemano Plantation
Mr. Donovan M. Dela Cruz, Treasurer, Wahiawa Neighborhood Board #26
Ms. Lynette Cruz
Mr. Richard Desmond, ILWU Local 142
Mr. Hiram Diamond
Mr Tyler Ericson, President, Wahiawa General Hospital
Mr. Randy Fujiki, Director, Department of Planning & Permitting
Mr. Barry Fukunaga, Department of Environmental Services
LCDR Rod Gibbons, Commander, Navy Region Hawaii
Mr. Kazu Hayashida, Department of Transportation
Mr. Robin Hirano, The Limtiaco Consulting Group
Mr. John Hirota, Dole Foods Corporation – Hawaii
Mr. Don Hibbard, Administrator, DLNR, State Historic Preservation Office
Mr. James Honke, Department of Design and Construction
Mr. Sheldon Hunt
Ms. Ellen B. Hyer
Mr. Cliff Jamile, Board of Water Supply
Mr. Cliff Jenkins, Wahiawa Neighborhood Board #26
Ms. Wendy Johnson, Hawaii Audubon Society
Dr. Gordon Kanemaru, President, Wahiawa Community & Business Association
Mr. Dennis Kato, Principal, Helemano Elementary School
Mr. Jack Kampfer, Vice-Chair, Wahiawa Neighborhood Board #26
Mr. Colin Kippen, Jr., Deputy Administrator, OHA, Hawaiian Rights Division
Ms. Edith J. Kubo, Secretary, Wahiawa Neighborhood Board #26
Mr. Paul Lacerdo, Hawaii Freshwater Fishing Association
Mr. Eusebio Lapenia, President, ILWU Local 142
Mr. Ben Lee, Managing Director, City and County of Honolulu
Ms. Lurline Lee, President, Hawaiian Civic Club of Wahiawa
Ms. Mary Jane Y.S. Lee, Wahiawa Neighborhood Board #26
Mr. Tom Lenchanko, Friends of Kukaniloko, Hawaiian Civic Club of Wahiawa
Ms. Ruth Limtiaco, President, The Limtiaco Company
Mr. Felix Limtiaco, President, The Limtiaco Consulting Group
Ms. Kari Lindo, ILWU Local 142
Mr. Michael Magaoay, North Shore Neighborhood Board #27
The Honorable Rene M. Mansho, City Councilmember
Mr. Norman Minehira, Principal, Leilehua High School
Mr. Yoshiro Nakamura, Wahiawa Neighborhood Board #26
Mr. James Nakatani, Department of Agriculture
Mr. Brian Nishida, General Manager, Del Monte Fresh Produce, Hawaii
Mr. Seiji Naya, Department of Business, Economic Development and Tourism
Ms. Charmaine Noguchi, Hawaiian Trust
Mr. Allan Ornellas, Del Monte Corporation
The Honorable Marcus R. Oshiro, Vice Speaker, State House of Representatives

Ms. Alana Pule, President, Whitmore Community Association
Colonel Bill Ryan, U.S. Army Garrison, Hawaii
Mr. Milt Sagon, Wahiawa General Hospital
Mr. Ed Sakoda, Department of Land and Natural Resources, Water
Dr. James Shimokusu, President, Wahiawa Rainbows Club
Mr. Robert Smith, U.S. Fish and Wildlife Service
Mr. Libby Smithe, WCBA
Dr. Kenneth Sprague, Director, Department of Environmental Services
Mr. Tim Steinberger, Department of Design and Construction
Mr. Clifton Takenaka, Environmental Engineer, Director of Public Works
Mr. Allan Thomas
Ms. Tina Thomas
Ms. Ann Thornock, Legislative Aide to Concilmember Mansho
Ms. Claire Tom, Wil Chee - Planning, Inc.
Ms. Vicki Tsuhako, Manager, Pacific Islands Contact Office, EPA
Mr. Dennis Tulang, Department of Health
Dr. Jerry Vriesenga, Dole Foods Corporation – Hawaii
Mr. Mike Watkins, Department of Planning and Permitting
Mr. Earl Yamamoto, Department of Agriculture
Mr. Jyun K. Yamamoto, Wahiawa Neighborhood Board #26
Mr. Gary Yee, Department of Design and Construction

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